



PRACTICAL MECHANICS



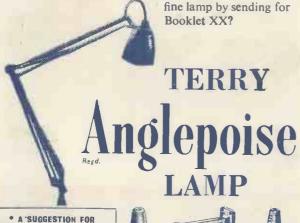


and step up production...

For working within close limits, an Anglepoise is simply indispensable: However good a worker and his eyes may be, he must see the job. This applies in all fine work, drilling, assembling, etc., where instantly adjustable close-to-the-job lighting is a sheer necessity.

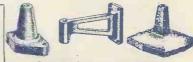
Anglepoise throws a clear, concentrated light right on and into the work, not in the operator's eyes, follows the job from any position or angle, degree by degree, at a finger-touch and 'stays put' in any required position—and out of the way when not needed. It needs only a low-powered bulb for high-class results -a big saving on the lighting bill (it can be supplied with a small shade for low voltage systems). Why not

learn more about this fine lamp by sending for



* A SUGGESTION FOR MACHINE MANUFACTURERS:

Why not fit your products with Anglepoise? We will submit samples on approval.



Some alternative bases.

Sole Makers: HERBERT TERRY & SONS LTD · REDDITCH · WORCS HT20A

"ZYTO" DO IT YOURSELF TOOLKIT

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



Delivered on first payment of

£5′0′0

Balance in Eight Monthly Payments of 32/6 Cash Price

£16/10/0

SET CRAMPHEADS
WIRE BRUSH
STANLEY HAND

DRILL SET TWIST DRILLS SOLDERING IRON

- 1 20" HANDSAW
- 10" BRASS-BACK TENON SAW
- STANLEY ADJUST-ABLE IRON PLANE
- 1 SET OF 3 HANDLED CHISELS, 1", 1", 1"
- CLAW HAMMER
 6" C A B I N E T
 HANDLED SCREW
 DRIVER
- 4" RATCHET ELECTRICIAN'S SCREWDRIVER CROSSPENE PIN

- HANDLED BRAD-
- AWLS
- AWLS
 PAIR PINCERS, 6"
 7" FOOTPRINT PIPE
 WRENCH
 3" PAINT-STRIPPING
- KNIFE PUTTY KNIFE STANLEY RATCHET

- STICK SOLDER TIN FLUX MITRE BLOCK
- PAIR RADIO PLIERS
 JUNIOR HACKSAW
 SPARE HACKSAW
 BLADES
 NAIL PUNCH
 2' BOXWOOD FOLD-
 - ING RULE
 1 INSTRUCTION BOOK

ILLUSTRATED LEAFLET FREE ON REQUEST

S. TYZACK & SON LTD 341-345 OLD ST., E.C.I.

Telephone: SHOREDITCH 8301



Do it yourself with a

Ideal for

HOME HANDYMAN MODEL MAKER CAR OWNER **AMATEUR** DECORATOR

Various applications include SPRAY PAINTING CREOSOTING TYRE INFLATION DISTEMPERING

INSECTICIDE SPRAYING

Easily carried-weighs 45lb.



PRICE: £40-5-0 including gun & hose Hire Purchase Terms: £20.8.0 deposit and insurance, and 12 monthly payments of £1.18.6.

Write for Leaflet CB. 112

B.E.N. PATENTS LTD. (Division of Broom & Wade Ltd.), P.O. Box No. 10, Dept. X, HIGH WYCOMBE, BUCKS. Tel.: High Wycombe 1630



SAMUEL JONES & CO., LTD.
Obtainable from all Booksellers or by requisition









Made by James Neill & Company (Sheffield) Limited and obtainable from your usual tool distributor

FLUORESCENT LIGHTS



These are complete fluorescent lighting fittings. Built-in ballast and starters-stove enamelled white and ready to work. Ideal for the kitchen, over the work-bench and its similar locations. Single 40. 4ft. 3in. long, uses a 40 watt tube. Price 396 complete with tube. Carriage and ins. 5:6.
Twin 20. Uses 2 20-watt standard tubes. Price 29 6 less tubes. Carriage and ins. 4:6.

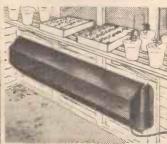


CAR STARTER CHARGER KIT

All parts to build 6- and 12-volt charger which can be connected to a "flat" battery and will enable the car to be started instantly. Kit comprising the

started instantly. Kit corr
following.
Mains transformer
5-amp. rectifier
Regulator Stud Switch
Resistance Wire
Msins on off Switch
0-5 am, Moving Coil Meter...
Constructional Data...
or if hought all together pr or if bought all together price is 62.6.

INSTANTUS HEATER



Convector heater, I kW. rating, 4ft. long, made from heavy gauge Sheet steel (galvanised). Can be used for greenhouse, workshop, avlary, etc. Price £2.10.0, or with thermostat £4.5.0, carriage 57.2 kW MODEL. Free standing thermostatically controlled, £5.17.8. Both are guaranteed for 5 years.

RECORD PLAYERS

All fitted with 4-speed auto-changers of latest type and hi-fi pick-ups. Cabirrets in latest labrics. Special month the Finsbury' £17.17.0 cash or £3 deposit and 6 monthly payments of £2. (Carriage and insurance 7/6.)



ELECTRIC BLANKET WIRE

Waterproof. P.V.C. covered so blanket washable. 1- per yard. Luminous double pole switch, 10/-. Send stamp for free booklet.

THIS MONTH'S

Heavy duty castors—ideal for fitting to T.V. or instrument trolley. Current value 12,6—special snip price 7/8 per set of four plus 1/- post.

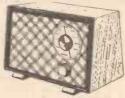


DO-IT-YOURSELF

Hundreds of people have already fitted our T.V. converter and now enjoy BBC & ITA programmes —you can do the same.
Our outfit contains:
ITA Converter — ITA Aerial -- 36ft. Co-ax Down Lead -- Interference Suppressor - Hustrated detailed instructionsnothing else to buy, all for £8 10 -, carriage and insurance 4/6, or 10/-deposit and 9 monthly mameuts of £1.



OUR 19/6 BARGAINS



THE SKYSEARCHER

This is a 2-valve plus metal rectifier set useful as an educational set for beginners, also makes a fine second set for the bedroom, workshop, etc. All parts, less cabinet, chassis and speaker, 19°6. Post & ins. 2°6. Data free with parts or available separately 1/6. 3-valve battery version also available at the same price.

ALL MAINS AMPLIFIER



Construct a powerful three-valve mains amplifier: Ideal for dances, parties, etc. Complete less chassis, cabinet and speaker (available if required). Data 16 (free with parts). Price 19/8 plus 26 post & Ins.





as a double chime and you can make it in a couple of evenings for the total cost of only 196 including instruc-tions, post, 2/--data tions, post, 2/-data available separately. price 1/6.

SIMPLEX TRANSISTOR SET



Makes ideal bedroom radio, uses one tran-sistor and one crystal diode, complete less case, 19 6, case 5'- extra, post & ins. 1/6.



A.C./D.C. MULTI- METER KIT

Measures

Measures

M.A.C. D.C. volts,
D.C. mamps, and
ohms, All the
essential parts including 21m, moving coli
meter, selected resistors, wire for shunts,
range selector, switches, calibrated scale
and full instructions, and metal case,
price 19/6 plus 1/9 post & ins.

BAND III CONVERTER

Suitable London-Midlands-North-Scotland, etc. All the parts including 2 valves, coils, fine tuner, contrast control, condensers and resistors (metal case available as an extra), 19/8, plus 26 post and insurance, Data free with parts or available separately, 1/8.

ELECTRONIC PRECISION EQUIPMENT LTD.

Post orders should be addressed to Dept. 1, 66, Grove Road, Eastbourne.

onal shoppers, however, please call at?

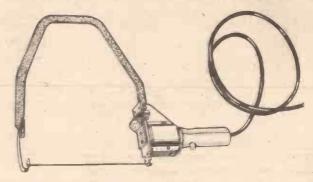
sonat snorpers, nowever, please call at ?
42-46 Windmill Hill, Euislip, Middx, Phone ? RUISLIP 5780—Half day, Wednesday.
152-3, Fleet Street, E.O.4. Phone : FLEet 2883—Half day, Saturday.
28, Strond Green Rd., Finsbury Park, N.4. Phone .: ARChway 1049—Half day, Thursday.
249, Khūner High Rd. Phone : Malda Vale 4921—Malf day, Thursday.
266, London Rd., Croydon Half day, Wednesday.

"New"

ALL ELECTRIC COPING SAW

200-250v. A.C. 50 cycles.

Saws I in. Timber.



Ideal for Hardboard; Hard and Softwoods; Plastics; Fretwork; Asbestos; and soft metals. Saws in a fraction of the time taken by hand. Standard Eclipse blades used obtainable in most Ironmonger shops.

Price £2.12.6 complete with four blades.

"JUST PLUG IN AND SAW"

UTILITY INDUSTRIALS WOKINGHAM STATION POINT

BERKS.

SAVE £££'s ON



Will satisfy the yearning of every youngster. Base 24in, v 18in. Kit includes all materials, pumps, full instructions for building.

HOBBIES KITS

provide the handyman with all the materials necessary to make a really sound job-valuable gifts that will last and really be appreciated by youngsters. Easy to make up with a few simple tools.

Kits from branches, stockists or direct (post free).

GET A KIT NOW

-	To HOBBIES LTD., Dept. 071, Dereham, Norfolk
d	Please send items marked X
Ц	☐ Garage Kit No. 3129. 39/11
	☐ Doll's House Kit No. 254 Special. 39 11
	☐ Hobbies 1958 Annual. 2/3
	Name
F	Address :
ł	

Make them with kits from





CHARMING DOLL'S
HOUSE
Kit No. 254 Special, 18in. x 12in.
x 20in. Low cost 'kit includes
hardboard, gay papers, metal
door, windows, etc.

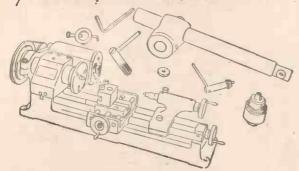
Hundreds of similar kits detailed in

HOBBIES 1958 ANNUAL

from branches, newsagents (2/-), or by post 2/3

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, 1gin. between centres 6gin. Hollow spindle admits lin. Drill chuck cap, Jin. Chuck to drill table (max.). 4%in



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

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

PRICE £27-1 EXTENDED CREDIT AVAILABLE GENEROUS TERMS AVAILABLE

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



Nowadays, it's no laughing matter for a man who hasn't his "third hand" handy in the home, garage or workshop when tackling the inevitable repair and maintenance jobs. With a positive grip, exceeding 2,000 lbs. if required, the Mole Wrench locks on the job-in-hand, leaving both hands free-your "third hand "in fact, used as super-pliers, wrench, hand vice, clamp-whatever the job demands. Join the thousands of satisfied users-visit your Ironmonger, Motor and Motor Cycle Accessory Dealer for



In two sizes: 7in., 12,6 and 10in., 15/-

If in any difficulty write to: M. MOLE & SON LTD., BIRMINGHAM, 3

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 jobsfor 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.

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

COMMERCIAL ART

BOOK-KEEPING & BUSINESS TRAINING

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

BUILDING

Drawing & Designing Quantity Surveying Builders & Surveyors' Clerks Construction Air Conditioning Heating & Ventilating Woodworking

EXAMS: Roy, Inst. of Br. Archts, Inst, of Quant. Survyrs. Roy. Inst. of Chtd. Survyrs. Inst. of Bildrs. Inst. of Clark of Works.

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 & ruit
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. Engg. Joint Board

MECHANICAL ENGINEERING

Subjects include :-Welding, Fitting, Turning Erecting, Jig & Tool Design Production, Oraughtsmanship Maintenance, Diesel Engs, 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

Humination & Heating Power House Artendancs

EXAMS: Soc. of Engrs. C. & G. Cert. in Eloc.

MOTOR ENGINEERING

Diesel Transport Engs. Owner Orivers'

PHOTOGRAPHY

A new Course incl. Colour Work

RADIO & TELEVISION ENGINEERING

Service Engineers'
Television Servicing & Engg. Practical Radio with Equip-ment

ment
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 Oressing EXAMS: Inc. Sales Mangrs. Ass. United Comm. Travellers Ass. Dip.

WRITING FOR PROFIT 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 CO	ORRESPONDENCE	SCHOOLS
------------------	---------------	---------

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

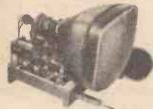
Please send me free booklet on......Age......Age..... (USE BLOCK LETTERS)

Address

Addresses for Overseas Readers

Australia 1 140, Elizabeth Street, Sydney. Eire: 3, North Earl Street, Oublin India: Lakshmi Bldg., Sir Pherozsha 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



T.V. CHASSIS BARGAIN £19-19-6

Latest improved circuits. Higher E.H.7. (Brilliant picture). Improved sensitivity (for greater range). Chassis easily adapted to any cabinet. As supplied to many well-known Rental and Hire Cos. 17in. rectangular tube on adapted chassis. All channels.

TURRET TUNER 50/- extra. Valve line-up (5 valves): 6SN7G, 6V6, EY51, two 6D2s. Others: 6L18, EL38, seven 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. (Vith all valves, £25.19.6. Ins. carr., incl. tube, 25/-. Drawings 3/6 or FREE with order. State B.B.C. channel (and I.T.A. channel if Turret Tuner required).

14in. T.V. CHASSIS . TUBE . SPEAKER . (13.19.6

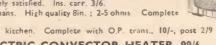
As above with 14in. round tube. Modified ready working. Less valves. 3 months guarantee. With 5 valves, £15.19.6. With all valves, £19.19.6. Ins. carr., incl. tube, 25/-. TURRET TUNER, 50/- extra. T.V. AERIALS, 25/6. For all I.T.A. and F.M. channels. For outdoor or loft. 3 element. P. & P. 2/6. CAR RADIO AERIAL, 6/9. 50in. long, collapsing to 11in. One-hole fixing. Post 1/3. With 5

T.V. MASKS, 3/9. New, white rubber. For 12in. sets. P. & P. 1/3. T.V. MASKS, 1/9. Rubber, for 12in. sets (need washing). P. & P. 1/3.

EXTENSION SPEAKERS, 29/9. In beautiful polished cabinet. Complete, fitted with 8in. P.M. speaker, W.B. or Goodmans. Of the highest quality. Standard matching to any receiver, 2-5 ohms. Flex and switch included. Unrepeatable at this price. Money back guaranteed if not completely satisfied. Ins. carr. 3/6.

P.M. SPEAKERS, 12/9. Elac or Goodmans. High quality 8in.; 2-5 ohns Complete with O.P. trans, 14/-. P. & P. 2/9.

8in. P.M. SPEAKERS, 8/9. Ideal for kitchen. Complete with O.P. trans., 10/-, post 2/9





ELECTRIC CONVECTOR HEATER, 99/6

At this cheap price only while stocks last. Don't wait for the cold spell to arrive. Buy now and be ready. Hotter and cheaper than paraffin. A.C./D.C. Switched for 1 or 2 kilowatt. Illuminated grille. Ins. carr. 10/6.

ELECTRIC FIRES, 17/6. Hammered finish. 200-250 volt A.C./D.C., 750 watt. P. & P. 3/6.

ELECTRIC FIRES, 29/6. Beautiful finish, pencil element, 1 k/watt, lovely reflector. A.C./D.C., 200-250 volt. P. & P. 3/6.

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.

OPULAR RADIO OR RADIOGRAM CHASSIS, 39/9 3 w/band and gram. S/het. 5 valve (intnl. octal). Ideal for table gram, but giving high quality output. 4 knob control. 8in. P.M. speaker 7/9 extra. of knobs 2/-, Size 12in. x 6in. x 7in. Less valves. Ins, carr. 5/6.

INSULATING TAPE, 1/6. (75ft, x ½in wide), finest quality, large roll in sealed metal container. P. & P. 9d. (Post on 6 tins 2/~)

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

o dos

DUKE & CO. (DEPT. 5), 621-623, ROMFORD ROAD, MANOR PARK, E.12.

Liverpool Street—Manor Park Stations 10 mins.

RECTANGULAR T.V. TUBES 12 MONTHS GUARANTEE

AS SUPPLIED TO THE TRADE FOR THE LAST 7 YEARS. 14in. £5.10.0. 17in. £7.10.0.

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

SPECIAL OFFER of 14in.—15in.—16in. T.V. TUBES, £5. Ins. carr. 15/6.

DO IT YOURSELF

Convert your 9in.—10in.—12in. to the above sizes. Details in our FREE Catalogue.

12in. T.V. TUBES.—6. Guaranteed. Ins. carr. 15/6

ELECTROSTATIC T.V. TUBES. All at 10/- each. 89], 4in. E4205/B/7, 2in. DG7/5, 2in. O9D, 4in. E4103/B/4, 1in. VCR131.

11in. Not guaranteed free from defects. Removed from ex-W.D. equipment. Ideal 'scopes and bedside T.V. Post 5/-.

T.V. TUBES (seconds). Standby for experimental. Work perfect. K/H shorts. 30/- Burns, from 15/-. All types and sizes. Please enquire.

T.V. CONSTRUCTOR CHASSIS

T.V. CONSTRUCTOR CHASSIS
SOUND AND VISION STRIPS, 19/6. S/net. 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., 6.3 v. 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.
TORCH LANTERNS, 6d. Ex-W.D. Incl. 2 bulbs. Uses 800 battery. Space urgently required. Single samples, 1/-. 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, midget valve design for A.M. or F.M. Brand new. Cadmium plated on heavy s.w.g. steel. Size 12½in. x 7½in. x 2½in. 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 1.F.s and standard 2-gang condenser, printed dial. P. & P. 2/3. MORSE TAPPERS, 9d. Ex-W.D. P. & P. 6d. 6 fo 3/6. Volume CONTROLS, 2/6 doz, Asst.; Volume and Tone

POST 2/6.

VOLUME CONTROLS, 2/6 doz. Asst.; Volume and Tone Controls, stripped from working chassis. P. & P. 2/-.

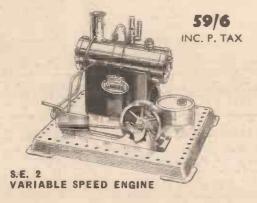
HEADPHONES, 1/9. Single earphone and band. C-LR. Ideal crystal sets, Ext. on radio, etc. P. & P. 1/3.

RECTIFIERS, 2/9 250 volt. 100 m.a. Full or half-wave. P.

NOTE,-New Phone Nos. ILF. 6001-3. FREE CATALOGUE.

MODEL STEAM ENGINES

FOR POWER AND RELIABILITY



OTHER ENGINES from 27/6 to 96/6 WORKING MODELS from 7/6 to 16/8

Manufactured by

MALINS (ENGS) LTD. 25 CAMDEN STREET BIRMINGHAM !

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, 4½in. long, 2½in. 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 Mojs, range with simple aerial 5 to 8 miles, requires or ordinary 2 v. and 120 v. batteries, these are brand new in sealed cartons, our price 50:—carriage (fraid only)

HUGHES 12-VOLT SHENT 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, lin. shaft, size 3fm. long,
lin. dia., weight 20 cz., 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
16: 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 sliver, total length 20in., brand new in
sealed cartons, 15/-, post 1/6.

MERCLERY SWITCHES, 250 v. 10 amp., glass tilt type fitted brackets, specially HUGHES 12-VOLT SHUNT MOTORS, taking





s.b.c. lampholder and snade. Inish ouec and silver, to the controls, 15⁴, post 16.

MERCURY SWITCHES, 250 v. 10 amp., glass tilt type fitted brackets, specially made to give 3-second delay make after tilt, new boxed 5⁴-, post 7d.

"HAMBI" GARDEN SPRAYERS, also auitable for disinfectants, penetrating oil, ilme wash, etc., made by Fisons Pest Control Ltd., consists of the special glass container holding 4 pints, marked in 4 pints, filler cap is a 4 or 1-02. measure, adjustable webbing for shoulder or back, so that both hands are free. 40m. flexible tubing to the polished brass syringe, with nozzle that gives a finely atomized spray. Scrap those messy old-fashioned sprayers that require buckets, boses, etc., invest in a "Bambi," value to-day 45⁴-, our price new boxed 20⁴-post 3⁴-, 2 for 40⁴-, post paid.

MAINS BLOWERS, 200250 v. A.C./D.C., 4 amp., 5,000

post 3/-, 2 for 40'-, post paid.

**MAINS BLOWERN, 200/250 v. A.C./D.C., † amp., 5,000

r.p.m., consists of the motor with attached enclosed fan, end funnel intake 1½n. dia., side outlet lin. x ½n., plinth base ½n. x 5in., finish black crackle and aluminium decast, size overall 9in. long, 5in. high, 4½n. wide. weight tilt. .. very superior blower, fraction of original cost. 25/-, post 3/
**MAPED POLE MOTORS, 12-v. 30-cycles A.C., size 3in. x 2in. x 1½n., complete with 3in. 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 order the 2 instruments new unused, 7/6, post 1/3. twin P.V.C. 14/36 flex up to 300ft.

MAGNETIC RELAYS 50/649, 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 nost 19d.: 24/. doz., post 2/6.

Send s.a.e for current bargains lists.

MIDLAND INSTRUMENT CO., Moordool Circle, B'ham, 17

Build a boat and be proud of it!

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

Streamlinia Hull



The "Streamlinia" Motor Boat Hull is carved from seasoned timber and finished painted ready for final finishing coat. It will carry plant up to 61 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.

'Streamlinia' Hull

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.

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

BASSETT-LOWKE

21, Kingswell Street, NORTHAMPTON

LONDON 112 High Holborn W.C.2

MANCHESTER 22 Corporation Street

Follow the FLUXITE way to Easy Soldering



No. 8. JOINING TWO SURFACES (1)

When soldering a patch, or joining two pieces of metal together, both surfaces must be cleaned with emery and smeared with FLUXITE. Then apply the solder evenly and smoothly to give a good "tinning."

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 Limited, Bermondsey Street, London, S.E.1.

"TRANSITROL" RADIO CONTROL TRANSISTOR RECEIVER



E.D., of course, are again first to introduce this new technique. Its advantages in size, weight, current capacity and quality of reception will appeal to all Radio Control enthusiasts. The valve transistor Receiver combines all the advantages of multi-valve modulated Receivers, together with simplicity and very low Receiver/Battery size and weight. The XFGI Valve is used as a detector in a low current circuit; at 100 to 300 micro-amperes, the valve life is, therefore, considerably increased. The Transistor is not used as a current amplifier, but reacts to the "Noise" level of the detector valve. Upon receipt of the signal, the noise level drops and the Transistor conducts. The benefits of current rise to the signal are well known.

PRICE

£6. 1. 8.

including P. Tax Order from your Model Shop

RECEIVER :

M/cs band. Write for our new illustrated list giving full particulars of all E.D. Engines, Radio Control Units, Accessories, Spare Parts. etc.

ELECTRONIC DEVELOPMENTS (SURREY) LTD ซื้อรัก อิธิรัฐ ISLAND FARM RD. WEST MOLESEY. (SURREY) ENGLAND



"HIS MASTER'S VOICE"
"HIS MASTER'S VOICE"
"HIS MARCONIPHONE GOLUMBIA

for your

CAREER-HOBBY

OR NEW INTEREST

PERSONAL & INDIVIDUAL HOME TRAINING IN: Commercial Subjects Heating & Ventilation Photography Sec

High Speed Oil Engines

Eng.

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

at Hayes, England

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

Industrial Admin.
Jig & Tool Design
Journalism
Languages
Management
Maintenance Eng.
Mathematics
M.C.A. Licences
Mechanical Eng.
Metallurgy
Motor Eng.

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.

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
M.S.E., A.M.Brit.I.R.E.

f Education Painting & Decorating Salesmanship 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!

Gourses with PRACTICAL EQUIPMENT in RADIO • TELEVISION • MECHANICS

CHEMISTRY · ELECTRICITY · DRAUGHTSMANSHIP

PHOTOGRAPHY etc. etc.

EMI INSTITUTES COURSES FROM 15/-PER MONTH



D	n	2	T	T	H I	2	C	n	11	D	n N	1	'n	n	А	V
•	U	J	•		ff I	J	U	u.	U	,	UN		U	U	H	I

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

NAME ______Age (If under 21)

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

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

CAPS
PLEASE

PLEASE

IC 106

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

ADDRESS

Now is the time to buy your tools; those offered below are of the best quality, fully guaranteed, free of purchase tax, and available for immediate delivery.

quality, fully guaranteed, free of purchase tax, and available for immediate delivery.

Set 5 Bit Stock Drills ½in.-lin., 20/-; Cramp Heads, 13/6; 7/8in.-3in., Expanding Bits, 21/3; ½in.-l½in. Expanding Bits, 15/9; ¼in. Cap. Spiral Gear Hand Drills, 20/3; Set 5 Firmer Chisels ¼in.-lin., 23/10; Horizontal Stands for Bridges, Wolf, B. & D. Drills, 21/-; Saw Filer's Vices, 18/9; 6 Wheel Glasscutters, 1/6; Set 5 Solid Centre Twist Bits, 21/8; Set (6) 4in. Hndl. Files, 8/-; Set 13 Twist Drills in Wallet, 1/16in.-¼in., 8/3; Screwdriver Set, incl. 7 Blades in Wallet, 9/8; Set 5/6. M/c Wood Bits ¼in.-½in. 12/6; 3-Way Joiner's Cramps, 10/-; 24in. Best Quality Sundial Hand Saws, 18/6; Set Allen Keys in Wallet, 3/6; Best Quality Carpenter's Pincers, 6in., 3/-; 7in., 4/-; 8in., 4/9; Hand Saw Sharpeners, 21/-; 10in. Carpenter's Braces, 10/11; 4in. G. Cramps, 4/6; Best Quality Brass Back Dovetail Saws, 19/6; 1¼in. Beech Rebate Planes, 14/6; Mecco Spray Guns for all materials, 75/-; ¼in. Cap. Bridges Elect. Drill, £7/19/6; Set 4 Rotary Wire Brushes, 7/6; 10in. Gland Nut Pliers, 4/9; 7in. Rubber Handle Insul. Comb. Pliers, 6/6; 7in. Toggle Top Cutters for Steel Wire, 24/6; Polish Grinding Kit for All Elect. Drills, 22/6; Genuine Stanley Roofing Squares, 30/-; ¾in. Cap. Breast Drill, 27/6; Best Quality Comb. Pliers, 6/6; 7in., 4/1; 8in., 46; Sundial Tipped Masonry Drills No. 8, 10, 12, 56; Set 7 Twist Drills in Wallet, 4/6; 4in. Chrome Pocket Levels, 2/6; Plane Iron and Chisel Sharpeners, 18/6; Wobble Washers to convert saw blades into groove saws (state bore). 10/-; Sundial Ball Bearing Saw Spindle, 59/6; ¾in. Chuck to fit Saw Spindle, 12/6; 2in. Rapier Metal Smoothing Planes, 27/6; 9in. Uphol. Scissors, 12/6; 4in. Steel Squares, 6/-; Genuine 14lb. Plumb B.P. Hammers, 15/-; Set 6 Whit. Spanners, 12/3; Set (3) Short Patt. Ring Spanners 1/8in.-5/16in. Whit. 10/5; Ratchet Socket Sets, 1/8in.-½in. Whit., 22/7; 1,16in.-¼in. Metal Drill Stands. 4/3; 6in. Slide Calipers, 9/-; B. & D. ¼ H.U. Elect. Drill, £6/19/6.

All the above listed items are of the best quality and are fully guaranteed, Carriage paid on orders to the value of 70/2, for under that amount send 3/2 to postage, any excess will be refunded.

1957 FULLY ILLUSTRATED TOOL CATALOGUE NOW AVAILABLE PRICE 6d., POSTAGE 3d.

PARRY & SON (TOOLS) LTD.
329-333 OLD STREET, LONDON, E.C.I
Tel.: SHOreditch 3859, 3918, 3976

IOHNSON

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-2-Snap pack contains full instructions, printing paper, chemicals and all you need to make 16 21 x 31in. prints or 24 21 x 21in. 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



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 21 x 31 in. or 21 x 21in. negatives (ring round size required), plus your FREE BOOKLET on photographic printing, and the Johnson Outfits Leaflet.

(Block capitals please) I enclose P.O. for 3/6 (made out to Johnsons of Hendon Ltd, and crossed & Co.),



Yet Another Great "Practical" Edited by F. J. CAMM

XXXXXXX



It's entirely new . . . and there's never been a magazine quite like it! Every month PRACTICAL HOME MONEY MAKER WIll show you how to use your spare time for profit ... how to earn money in dozens of new ways . . . how to market what you make. It's packed with fascinating, earn-as-youlearn ideas not only for you, but for the whole family. Clear, step-by-step instructions and easy-to-understand diagrams and photographs make success a certainty, even for beginners. Start reading PRACTICAL HOME MONEY MAKER and you'll begin a wonderful new hobby—the hobby of "profit from leisure with pleasure"! Get No. I today and place a regular order!

Some Outstanding Features in No. 1

RUG MAKING . BASKETRY . DRESS JEWELLERY . PHOTOGRAPHY . HOME-MADE POTTERY . STAMP COLLECTING ARTIFICIAL FLOWERS . LAMPSHADES LEATHERWORK . GLASS NOVELTIES SMALL-SCALE POULTRY-FARMING . SMALL MARKET GARDENING . RABBIT-KEEPING . PIG-KEEPING . AQUARIA . SOFT TOYS . HOME KNITTING MACHINES . MUSICAL BOX NOVELTIES . MARKETING METHODS





这次次这里这次这里这里是这里是这里是这里是这里是这里是这里是这里是这里是这里是这里是这些的,



Practical H More Pleasure from Your Leisure --- More Money in your Pocket!

EX-GOVERNMENT BARGAINS

MAKE VOUR OWN ASTRO TELESCOPE, BRAND NEW ACHROMATIC OGS, 20in. focus. 45mm. dia., 254. 20in. paxolin tube to fit with lens retaining rings 646. Focusing eyeplece, 846. 82 the set.
DITTO, but with 27in. OG. and 27in. tube. 50 - the set.
TERRESTRIAL TELESCOPE. ALL BRANS ADMIRALTY TYPE. 20X. 24in. long, 6 lbs., focusing eyeplece 83.10.0 eg.

EVENTOR OF THE STATE OF T

working order, 45/-, ALL SPARES for above available. See lists, NEW LEATHER CASES for ROSS service type 7 and TWIN ALARM BELLS. 6in. dia. gongs, 230 v. A.C., good

condition, 35/- each.

CIRCULAR GLASS PLATES. 9in. x lin., 30-; 15in. x lin., 22.7-8.

MOTOR BLOWERS. 230 v. A.C. 300 w., 1tin. outlet, powerful blast. As new £3.10,0 each.

MOVING COIL METERS. 22in. sq. flush fitting. 0-40 v., 0-20 v., 50-0-50 a., 20-0-20 amp. Ex. equip. 8/6 each type. Post Li-. 0-40 v., new, 10/6.

ODD ACHROMATS. 1tin. dia., 3-4in. focus 6/- ea.; 2in. dia. x lin. or 21 flush.

ODD ACHROMATS, 11n. dia., 3-lin. focus 6/- ea.; iln. dia. y 1lin. or 2lin. 6'-.
TAYLOR HOBSON PROJECTION LENS. 5ln. Fl.5 coated. New, 214 ea. Cost 280.
TELESCOPE Offs. Achros. 3ln. dia. x 12ln. focus New, £14.
3lin. dia., x 12ln. focus New, £14.
3lin. dia., x 32ln. focus. New, £14.
3lin. dia., x 32ln. focus. New, £14.
5lin. dia., x 12ln. See lists for other types.
EYEPIECES, 5/8ln. W.A. Orthoscopic focusing mount.
50/-ea. Ex new equipment. 1lin. Ortho. extra wide angle (2ln. field). 6 coated lenses. Ex. new equip. Focusing mount. £5 ea. Ex used optically sound. 23. 1lin. W.A. ortho. Coated. 1lin. field. New non-focusing. 30-- ea. See our lists for other types

ALUMINISED SURFACE MIRRORS. New. Finest grade flats. 4jin. x3in. x1/8in., 12/ ea.
IRIS DIAPHRAGMS. 40 and 45mm., 10- 60 and

ALLOSANDA COME AS A STATE OF THE ASSOCIATION OF A STATE BOARD STATE OF A STAT

type hand set. 30° post 2.6 LANGE RANGE HIGH POWER DUAL TELESCOPES. A.A. identification. 12X and 35X OG. 80mm, Cost 2165. As previously described or see our lists. In new condition. 215 ea. Used condition, need cleaning, 212.10.0 Carr.

ASTRO TYPE TELESCOPES (Finders) 5X. 11in. OG. Graticaled Oct. 28d eyepiece focusing. Near new. Graticuled OG and eyepiece focusing. Near new, 22.19.3 ea. Post 26. FINDER TELESCOPES. Astro type (inverted image). Fixed focus. Iin. OG. Power 3X, 35'- ea. With or with out crossline graticule. PERISCOPES U.S.A. Tank type. Brand new. 6in. x 42in. x14in. Contain one 90 x 45 x 45 prism 5in. iong x 14in. at one end administed mirror boxed in with optical flats at the other, 10 - ca.

TIME DELAY SWITCH. Ref. No. 27n/56. 24 vt. Gives up to 20 sec. delay after relay release. S.P.C.O. & SP switches. Push button reset. Weatherproof case. New. 15:- ca.

Switches. Fush dates recovered to the control of th

4/-.

DIRECTORS. No. 6. By Ross, C.T.S., etc. A valuable instrument to builders, surveyors etc. All the movements of a small theodolike, 3X prismatic scope. In excellent condition, 26. Each cost over £100, see our lists. GEAR TRAINN. 10 genrs, 3 take-offs, speed governor and cam operated switches, ex American equip. New. 7/6 ea.

7/6 ea.

FUEL PUMPS. 21 v., A.C./D.C. Ideal for garden foun-tains and waterfalls. 600 g.p.h., 37/6 ea. Carr. 3/6. Trans-formers to suit, 17/6. Carr. and packing, 4/-, PROJECTION LAMPS. 110 v. 300 w. standard pre focus,

PROLECTION LAMPS. 110 v. 300 w. standard pre locus. 946 ea. 3 for 25'-.

TRIPODS. 36in, legs. Brass pan and tilt head, leather end caps and sling. Brand new. 17.6 ea., carr., 26.
TRIPODS. 56t. medium heavy extending type. Brand new. 35'- ea. Will fit the A.A. scopes. chart boards and No. 5 directors. Carr. 5'-.
TRIPODS. Heavy duty. 5ft. ex. type. Fitted heavy P. & T. head plus ball and socket. Also fitted short metal legs for use at ground level. New. 23.5.0. Carr., 7/6.
HEAT FILTERS. 21n. dia. (3 pieces) for projectors. 6.6.
HINGUILAR MOUNTINGS. Suit most 7 x 50 or similar with clevation and panning adjustments. New. 26 ea.
BURNING GLASSES. 34in. dla., slightly scratched or chipped, 5'- each. New lenses slightly chipped, 34in. dia.

The above is only a small selection from our stocks. Lists free for S.A.E.

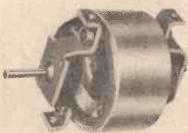
BOOKLETS. "HOW TO USE EX-GOVERNMENT LENSES AND PRISMS," Nos. I and 2.

2/6 ea. PLANS FOR "VERTICAL ENLARGER," 35mm. to 21in. 3/6. PLANS FOR "35mm. BACK PROJECTION TABLE VIEWER," 3/6.

H. W. ENGLISH, RAYLEIGH ROAD, HUTTON, BRENTWOOD, ESSEX.

Phone Brent 1685

The Bestfrend "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, cup-board airing devices, etc. An extremely high-class product,

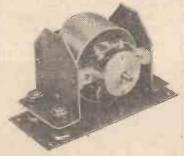
designed by engineers with a quarter of a century 37/6 of experience in motor construction. Post Free

An anti-vibration stand for above motor. Horizontal or vertical mounting. Supplied in breakdown form for home constructors. 43" x 23" x 2". Three point suspension.
Steel, Cadmium plated.
716

Post Free

FANS

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



Electrical The Bestfrend Co. Ltd.. BANSTEAD SURREY

STEEL SHELVING

72 in. HIGH 34 in. WIDE 12 in. DEEP

- Brand new-Manufactured in our own works.
- Shelves adjustable every inch.
- Heavy gauge shelves will carry 400 lbs. each.
- Stove enamelied bronze green.
- 6 shelves per bay-Extra shelves 8/- each.
- Quantity discounts.

Delivered free £3 15s. Ready for erection.



N. C. BROWN LTD.

Green Lane Wing

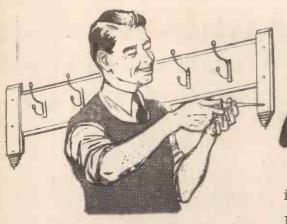
HEYWOOD · LANCS

- the manufacturers!

This shelving is available in WHITE enamel at extra cost.

ALL OTHER SIZES available at equally keen prices.

Telephone: Heywood 69018 (3 ·lines)



IT'S FAR EASIER WITH RAWLPLUGS!

THE EASIEST WAY of fixing screws in masonry is still the world-famous Rawlplug way. Rawlplugs are used by the million in industry! You drill

HIGH-SPEED MASONRY DRILLING -- IN A HAND BRACE!

When drilling brick, tile, stone, enjoy the swift, clean-cutting ease of a Rawlplug DURIUM-tipped Masonry Drill. Drill right through a wall if you wish—easily and silently. There's nothing 'just as good'—look for the name DURIUM on the shank.



a hole, insert a Rawlplug and screw up your fixture. Far easier, far quicker, far safer than any other method. A Rawlplug Outfit (from as little as 3/-!) contains all you need—Rawlplugs, Rawltool, screws, 16-page 'Hints on Fixing'. Get one today!

Rawlplug DURIUM-tipped DRILLS

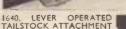
FROM YOUR IRONMONGER OR HARDWARE DEALER

THE RAWLPLUG COMPANY LTD . LONDON . S.W.7

Le Double the usefulness of your must of



With these handy attachments!





MA 68/I. VERTICAL SLIDE SWIVELLING.



4611. LEVER OPERATED COLLET CHUCK: &in. CAPACITY. ADDITIONAL COLLETS STYLE 1027.



1410. FOUR TOOL TURRET TAKES 1/6 in. SQ. CUTTER BITS



1629, TAPER TURNING ATTACHMENT SLIDE BASE 9in, LONG, WORKING LENGTH 6in. ANGULAR MOVEMENT 10° EITHER SIDE OF ZERO



2A 1495. DIVIDING ATTACHMENT (WITH TWO DIVISION PLATES)

Many awkward jobs are within your easy reach, thanks to the range of over 50 Attachments and Accessories provided by the Myford Factory. Careful thought, coupled with research into the requirements of the most exacting user, has produced a series of easily fitted, interchangeable, precision-made extras such as no other comparable Lathe possesses. Write to-day to DEPT, 3/43 for fullest details.

MYFORD ENGINEERING CO. LTD., BEESTON, NOTTINGHAM, ENGLAND.
GRAMS: MYFORD, BEESTON, NOTTS.

Phone BEESTON 25-4222,



VALUABLE NEW HANDRO

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 investigation of 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.

7 7 7 7 7 OF POT SUBJECT? YOUR

MECHANICAL ENGINEERING

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

AUTOMOBILE

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

ELECTRICAL ENGINEERING

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

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

RADIO ENGINEERING

Gen. Radio Eng.—Radio Servicing, Maintenance & Repairs—Sound Film Pro-

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

LESSES THE RELEASE OF THE PRINCIPLE AND LOSSESSES AND LOSSESSES.



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

Repairs—Sound rilin rejection — Telephony Television — C. & G. Telecommunications.

You are bound to benefit from reading "ENGINEERING OPPORTUNITIES," and if you are carning TUNITIES," and if you are earning less than £15 a week you should send for your copy of this enlightening book now—FREE and without oblivelying—Clerk of Works—Carpentry and Joinery—Quantities—Valuations

OLOGO

COLORSES AND OUR STANDARD COLORSES AND OUR COLORSE

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

三人のころのなって

S Z

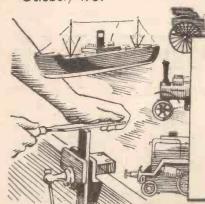
....

Z

Only 2d.
stamp is
needed if
posted in an

unscaled envelope.

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



Practical Mechanics

Vol. XXV. No. 284

OCTOBER, 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 - - - 20s. per annum. Abroad - - - 18s. 6d. per annum. Canada - - - 18s. 6d. 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 initiations of any of these are therefore expressly forbidden.

CONTENTS:

Page

Fair Comment	II					
A Bedside Table	12					
An Electric Pottery Kiln	13					
Audio Amplifier for Use as a Baby						
Alarm or Intercom Unit	16					
The Setting and Sharpening of						
Saws	17					
Science Notes	18					
Build this Useful Toolshed	19					
Radio-controlled Model of the						
Royal Yacht	21					
Netting for Beginners	23					
Making a Draught Excluder	24					
Useful Switching Arrangements	25					
A Photographic Safe-light and	-					
Printer	27					
Printer A Model Scenic Railway	28					
An Unusual Table Lamp	32					
Solving the Problems of Tropical						
Fishkeeping	35					
A Touch-operated Electric Fence						
Control Circuit	36					
A Pan and Tilt Head	39					
IUNIOR SECTION:						
A Catapult Gun	40					
The Junior Chemist	43					
A Novel Barometer	44					
Letters to the Editor	47					
Trade Notes	48					
Your Queries Answered	49					
Information Sought	50					
THE CYCLIST SECTION:						
What I Think	1					
The Hub Dynamo	2					

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 Nevones, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

FAIR COMMENT

"PRACTICAL HOME MONEY MAKER" OUR GREAT NEW COMPANION JOURNAL

N Wednesday, September 18th, the first issue of my new monthly companion magazine, PRACTICAL HOME MONEY MAKER, came on sale throughout the British Isles. It is in the same style and price as PRACTICAL MECHANICS, and bearing in mind the many thousands who were disappointed because they could not obtain the early issues of our companion journal, The Practical Householder (net sales over 934,000 a month), I thought readers of P.M. would welcome this early intimation of the newcomer so that they can ensure obtaining a copy by placing an order with a newsagent for its regular delivery. That is the only means by which you can ensure obtaining a copy. It is a magazine which essentially will interest every reader of P.M., for it teaches you how to apply

your skill to make welcome extra pounds a week. I have often received requests from readers for instructions on how they can conduct their hobbies on a profit-making basis, and hundreds of them have asked for a special journal. Well, here it is!

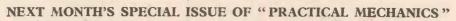
During the past 20 years a large and expanding industry supplying all the materials, tools and equipment for the home moneymaker has grown up, making easy the way to those extra pounds each week.

The object of the new magazine, which strikes an entirely new note in journalism, is to tell readers how to make for profit a wide variety of articles, and how to market them. It explains how to make toys, ornaments, novelties in wood, glass and metal, articles of household equipment and pottery, glassware, mechanical toys, lampshades, jewellery, basketwork, knitwear, articles in plastic, leather

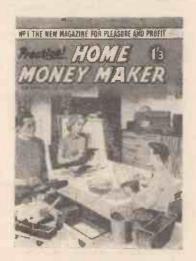
work, knitwear, articles in plastic, leather handbags and wallets, rugs—to mention but a few of the subjects which will appear in early issues. Every possible avenue of profit earning at home is being dealt with. We shall include articles on rabbit breeding, aquaria, photography, poultry breeding and garden produce. Other articles will deal with marketing methods, costing, and the business side of home working.

There is thus a duality of purpose in this new journal, for it will cater for all those who are interested in the various home crafts for the pleasure of achievement and also for those who wish to combine profit with pleasure. Whilst P.M. tells readers how to save money, PRACTICAL HOME MONEY MAKER will tell them how to make it.

Only by placing a regular order can you be quite certain of obtaining your copy. Turn to page 7 of this issue and read the full announcement concerning our new journal.



NEXT month's issue, dated November and on sale Thursday, October 31st, will be greatly enlarged and will contain many new features. This special issue will be packed with topical articles, many of which break new ground. These will be additional to our normal articles and regular features. It will be nationally advertised and this is an additional reason why your newsagent should receive your order for the November issue forthwith.—F. J. C.



which case the top must be cut 15in. square. The legs are fixed in position with

glue and two 14in. countersunk screws up

FDSIDE TAI

through each crosspiece.

Details for Making a Useful Item of Bedroom Furniture By A. E. SMITH

the tenons and the bottom of the leg are marked with the same setting of the bevel, work-

ing from the face edge, and the waste sawn off the bottom of the legs. The tenons are about 3in. thick and these and the mortices are marked with a mortice gauge.

Cut the joints and fit together. Mark the width of the top of the legs level with the edge of the crosspiece and taper to zin. at the bottom.

taper is planed off and in. bevels cut on the edges. Separate the crosspieces and shape and bevel as in Fig 3. Open the tops of the mortices about 3/32in. at each end to allow the tenons to expand when the wedges are driven in and saw down the tenons about in. from the edges. Cut the wedges from a piece of wood the same thickness as the tenons and clean up all the components with smoothing plane and glasspaper. Glue together, ensuring that the legs are at right angles

to the crosspieces, and when the glue has set clean off the projecting tenons.



The Top This is a piece of ½in. plywood 14½in. square covered with Marley-film. The edges are concealed with a strip of ¼in. wood mitred at the corners and glued and pinned in position. Alternatively the Marley-film can be taken round the edges, in

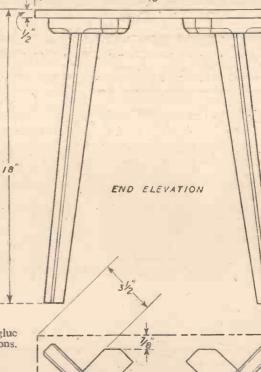


Fig. 4.—General arrangement of the table.

PLAN

Fig. 1.—The completed table.

HIS table, as seen from Figs. 1 and 4, is attractive in appearance, strong, and straightforward in construction. design is easily adaptable to other sizes of table and although the method of making the legs may seem more complicated than

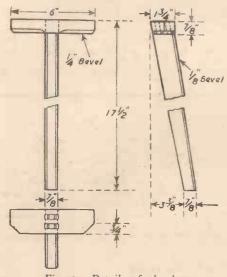


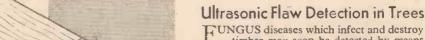
Fig. 2.—Details of the legs.

usual it is very strong and well worth the extra work involved.

Construction

Before commencing work a full-sized drawing of the side of the leg must be made from Fig. 2, so that the correct angles for marking out can be set on a sliding bevel. marking out can be set on a sliding bevel. The length of the legs is also taken from this drawing. Each leg is fixed to a cross-piece with twin wedged mortice and tenon joints (Fig. 3). Allow 18½in. × 1¾in. for each leg and plane face side, face edge and thickness. All marking out is done from the face edge which is the inner edge of the leg. the leg.

The crosspieces are left in one piece, 25in. long and the face edge planed to the correct angle, testing with a sliding bevel set from the drawing. The width of 1\frac{3}{2}in. is across the top surface. The shoulders of



FUNGUS diseases which infect and destroy timber may soon be detected by means of ultrasonic equipment. To use the equipment, the bark of the tree is stripped on the area of the test and the wood smoothed and coated with a coupling agent, such as petroleum jelly, to ensure good contact. High frequency sound waves generated by the equipment are then passed through the wood and reduction of ultrasonic penetration reveals the presence of flaws. Quite small faults are detectable by this method.

The new technique will substantially reduce the financial losses due to disease in trees. Diseases are often present for many years in valuable trees, sometimes causing complete destruction of the tree before they are detected.

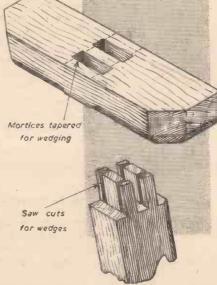


Fig. 3.—The twin wedged mortice and tenon joint.

Chess Table—Correction

WE regret that some of the dimensions were omitted from the article last month on Making a Chess Table. The overall length of the feet is 15in. and the total height of the table 10in. total height of the table 19in.

An Efficient Appliance with 1 Cu. Ft. Capacity which can be Built for Under £25

By R. HUGHES

HIS kiln is the final result of a series of experiments over a period of two years. It is not difficult to build a pottery kiln of reasonable size if unlimited power is available, and if there is no limitation upon the amount of insulation, and its ultimate physi-

As the original kiln was to be used in a school craft room where children would be working every day, it had to be safe, reasonable in size, and be capable of reaching a temperature of about 1,080 deg. C. in a normal school day. The minimum useful internal volume would have to be one cubic foot, or larger if possible. The only power available was a standard 15 amp. well scales. available was a standard 15 amp. wall socket.

Experiments proved that with about 4in. to 6in. of insulation, and using good quality firebricks for the interior walls, it was possible to reach a reasonable temperature with only 15 amps. of current.

The prototype kiln is larger than I cubic foot, but a kiln of I cubic foot internal volume will be described first, and suggestions made later on how it could be made

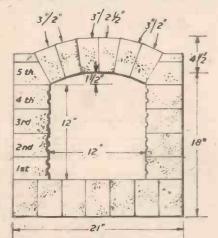


Fig. 2 .- Front view, showing element slots, etc.

larger, and still give the same performance. The kiln in Fig. 1 is 12in. wide, 12in. high and 18in. long, internal dimensions,

The kiln can be built for less than £25.

Basic Design

The kiln design is based upon the use of special "hot-faced low heat storage" M.I. insulating refractory bricks supplied by Morgan Refractories, and coiled hairpin elements made from Kanthal wire. These elements can be obtained with a piece of Kanthal rod fin. diameter welded on to the end of the element, and by being threaded at the "cold" end they simplify the method of connecting up the eight hairpin elements in series to make-up the 'total load of 15

The kiln can be built successfully on any. kind of base which is noninflammable, and capable of taking the weight. It is suggested that the kiln be built on an angle iron frame clear the floor. This is useful in a craft room where it may

be necessary to move the kiln from time to time.



The frame was made from 11 in. angle A piece of steel sheeting, size 28in. 38in., happened to be available, and the bottom section of the frame was made to take this size. In actual fact a wider piece of metal would have been better, as the more width you have at the sides of the kiln the more insulation is possible, and within limits the better the performance. If a piece of metal is not obtainable, no doubt pieces of angle iron could be used. If, however, the kiln is built on a permanent brick foundation, then a foot space or more each side for insulation would be ideal.

Construction of the Frame

The construction of the frame can be seen from the photograph, Fig. 1. sections are made, one for the top and one for the bottom. The four legs are cut to length, and bolted to the main frame. make the structure steady, bracing pieces of metal are bolted from the legs to the bottom section. The top section should be made so that the back piece can be removed separately, as this facilitates construction and future maintenance.

The bottom section takes the base plate

Materials Required M.I.28 Insulating Refractory
Bricks
60 9in. x 4½in. x 3in. /2in. arch
4 9in. x 4½in. x 3in. /2½in. ,,
10 9in. x 4½in. x 3in. /2½in. ,,
2 in yin. x 4½in. x 3in. squares
½ cwt. M.I. High temp. cement Morgan Refrac-tories, London For hearth and walls

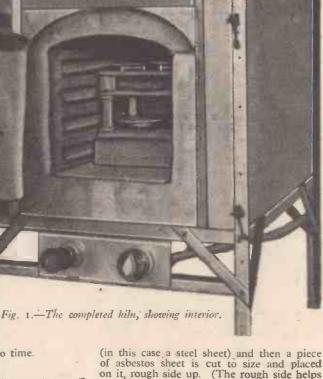
For door

Kanthal Elements.
Hall & Pickles. Ltd., Port St., Manchester, 1
8 Hair-Pin elements. Each.
Resistance, 1-94

Resistance. 1.91 D
Wire quality. Kanthal A
Wire size. 15 s.w.g.
Wire length. 12ft.
Mandrel size. 4in. diam.
Str./Length Leg. 12in.

Distance between centres, Iin.
Leads 15in, long. 4in. Kanthal "D" welded to the element and threaded 4in. Whit. for connecting.

Asbestos Fibre. Local heating engineers.



of asbestos sheet is cut to size and placed on it, rough side up. (The rough side helps the special cement to adhere.) The two sheets are now drilled and bolted to the bottom section of the frame with countersunk bolts. The top section can be removed during construction of the kiln walls, and the frame will be quite steady without it.

Brickwork

The hearth is 21in, wide and 27in, long, and it is a good plan to mark out this rectangle in coloured chalk on the asbestos sheet. The front edge of the hearth should be about gin. away from the inside edge of the angle iron, and the space each side divided equally according to the width of the frame, and this space is where the insulating asbestos fibre is placed. The space behind the hearth will be for the connections from the elements, and later on is filled in with asbestos

Laying the Hearth

The hearth consists of 21 bricks laid on edge in three rows each 7 bricks wide. The high temperature cement is mixed with water to the consistency of putty so that it can be spread easily. It is important to use the cement lightly, and the bricks are laid dry.

A thin layer of cement is spread on the rectangle marked out on the base sheet, and each brick is "buttered" with a coating of cement about in thick. A pointing trowel, and an old household knife are useful tools for this part of the job.

When the bricks are set in position, the hearth should be left undisturbed for about 48 hours to dry out. In the meantime the walls can be erected dry on a separate table, marked out for the elements, and the grooves cut.

Main Walls

The walls consist of four courses, and they can be bonded in the normal manner for a single wall. Mark out a 12in, square, and starting with half a brick arrange the first course around the outside of the square. The other courses are placed on in turn. The bricks which can be cut easily with a hacksaw are reasonably strong, but care should be taken to see that they are not chipped. When the bricks have been cut to size and arranged to fit in with the back wall, mark each course clearly with coloured chalk, and number the bricks so that they can be put back in the same order after the element grooves have been cut. The grooves are ideally cut as shown in Fig. 2. The main aim is to make the grooves wide enough to allow the elements to do their work, yet so shaped that the elements do not become tight when they expand, or fall out. It is also important with a view to future maintenance that the elements should be easily withdrawn and replaced without undue difficulty.

The position for the grooves can now be marked. Each course of bricks takes one complete hairpin element, so that each brick course will need two grooves cut lengthwise. The grooves, which can be seen clearly, are spaced at a distance of 1in. for each hairpin. It would be wise to wait until you have the elements to hand before cutting the grooves.

Cutting the Grooves

There are no doubt many ways in which these grooves could be cut, but as the bricks are so easily worked it was found quite easy to cut each brick separately by hand. The groove can be cut roughly to shape by making two downward cuts with a hacksaw, removing the triangular shaped piece, and then hollowing out to size, and shaping exactly with a blade held in the hand.

Elements

The elements are coiled and have a diameter of in. A piece of dowel rod can be used to check the shape of the bottom of the groove. As the edges of the bricks are now very thin, care must be taken not to force the dowel rod through the grooves. It must slide in easily, and it is a good tip to sharpen the end of the dowel like a chisel and rotate it as it is pushed in. In fact, a tool of this kind is very useful for drilling holes in this type of brick, as the abrasive action soon ruins metal tools. The piece of dowel can be sharpened frequently and can also be used in a carpenter's brace.

The grooves need not be cut in the first 3in. of the courses, as this is cut away to leave space for the stepped part of the door to fit in. Similarly, the bricks which bond into the back wall need not be grooved, but can be drilled. This part of the back wall will carry the connecting rods for the elements.

Erecting the Walls

As soon as the base is dry the walls can be erected. The same method of cementing is used again, and it is a good plan to make only as much cement as is needed for each When the walls are set, the grooves can be lined up by using a piece of tapered dowel rod in a brace. If all the bricks and courses are replaced as originally lettered and numbered there should be no danger of putting a brick in the wrong place or upside down. Before leaving the walls, it is quite a simple matter to check that they are vertical and square, and to see that the width across the top corresponds with the width of the base.

The top of the kiln is arched, and the bricks are obtained cut to shape. A former should be made the same shape as the arch, and with a depth of about 11in. The former, made from thin box wood, is placed

inside the kiln and wedged up to the correct height. When the kiln is eventually completed the wedges are withdrawn and the former removed. To give a smooth surface to the top of the former a piece of cardboard can be placed over the top.

Erecting the Arch

When the walls are quite set and dry, the arch bricks can be tried out with a piece of thin cardboard between each one (to represent the thickness of the cement). course can be measured and cut away to fit, as shown in the drawing. Once again a small allowance should be made for the cement. When the arch is a good tight fit the pieces of cardboard can be removed, and the arch set finally in position with cement. It is important that the arch should be erected very carefully.

The back wall and the small spaces at

the top of the fifth course can be filled in with offcuts. When all is dry a sin. hele

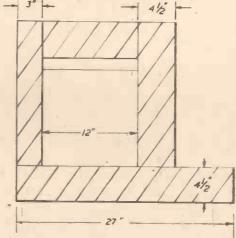


Fig. 3.-Sectional view of the kiln.

is drilled in the centre of the fourth course in the back wall. This hole serves the double purpose of allowing the steam to escape during the early stages of firing, and also acts as a safety vent.

Drying Out

The kiln should be left for a day or two, and after the arch former has been removed (just remove the wedges), any spaces should be filled in with cement.

The Door

The door is made from a layer of half bricks cemented together. If a liberal coating of cement is used, and the bricks lightly cramped together, a sound solid brick slab results. It is a good plan to make a cardboard template the same size as the door opening, and this is placed on the brick slab and marked out with coloured chalk. The door is stepped, and the amount which actually enters the kiln is only about 3in., so that when the step has been sawn and shaped there will be an overlap of 1-in.

The door is made and cut on the large size, and finally completed when it is fitted in position on its hinge. There is no need for special hinges, or specially designed cut-away portions which are difficult to mark out and cut; long as the door blocks up satisfactory.

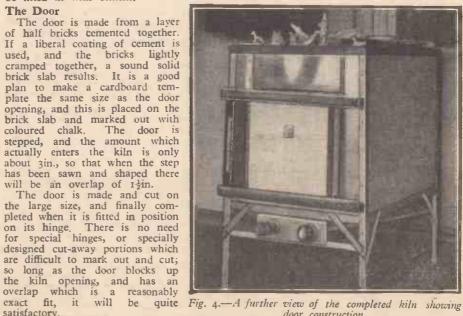
The Door Hinges

Two pieces of angle iron the same length as the width of the frame are used to sup-port the door and also act as the hinge. The angle is placed on the door as shown in Fig. 1, and four holes are marked out and drilled, two each side of the centre, and through the course of bricks. Through these holes pieces of kin. rod, threaded at both ends are inserted, and fastened with nuts. and washers. Care should be taken to see that the nuts are not tightened too much. The ends of the two pieces of angle also form the hinge. Two holes are drilled out gin., and another threaded gin. rod inserted. Where the rod will pivot mount two L-shaped brackets on the left-hand side of the front framework, but do not drill them. The brackets should be placed in such a position that when they are drilled they will form the other part of the hinge. other ends of the angle are slotted. There are many ways of fastening the door, but wing nuts and bolts which slide into the slots are very effective and keep the door tight.

When the door is shaped to fit it is offered up to the front opening of the kiln and gently eased and shaped until it is a good, straight push fit. The holes for the hinge brackets are now located on the frame and drilled. The long bolt can now be tried and fitted. The bolt is now removed, and the door taken out. The door is now fitted on to its hinge in the open position, and gently eased in and out of the kiln opening until the abrasive action of brick upon brick wears away sufficient material to allow the door to swing to without any difficulty. The door is shown closed in Fig. 4.

Elements

These are placed in position and carefully guided through until they protrude a few inches at the back. Care must be taken to see that they are not pushed through too far without support, as the connecting rods are very heavy. A piece of asbestos sheeting is cut to fit inside the A piece frame and slid along inside until it touches the ends of the elements. The positions of the elements are marked, and the holes drilled. Each connecting rod requires two lin. Whitworth nuts, two washers and a wing nut. Before the rods are finally pulled through the back sheet into position, the



door construction.

first nut is threaded on as far as it will Then the rods are pushed through and secured on the other side with another nut. When all the elements are assembled, the asbestos sheet is pushed back to the rear framework and bolted. This will then be the back of the kiln. The two washers and the wing nut are used to make the connections between the elements.

Connecting Up

The method of connecting is quite simple, and details are shown in Fig. 5. The top link is better if it is insulated with porcelain fish-spine beads. Two separate \(\frac{1}{2}\)in. bolts fish-spine beads. Two separate 4in. bolts are fitted on the back sheet at a convenient point, and these are used to anchor the leads from the elements that will be connected to the flex going to the mains plug. If no indicator light or switch are required at the front of the kiln, the connections are taken direct to the mains. A yard of standard, asbestos-insulated, three-core power cable is used. 'The red and the black wires are connected to the two mains bolts, and the third "earth" wire is connected very carefully by means of a nut and bolt to the metal framework. The other ends of the cable are taken to a 15-amp plug. again care must be taken to ensure that the earth connection is correctly made. Details of connections for both a switch and an indicator light will be given later on in the

Sheeting the Framework

The framework can be covered with either asbestos or aluminium sheet. The aluminium, about 22 s.w.g., is more expensive but is permanent. Asbestos tends to crack unless it is very loosely secured, and in any case becomes distorted with the heat. The easiest method of securing either type of sheet is with self-tapping screws from the outside.

The top section is bolted to the main framework last of all, and then the top sheet is fastened with self-tapping screws,

Electrical Connections

For safety's sake the connections at the back of the kiln should be covered at all times when the kiln is plugged in. The covering can be a simple box lid shape, secured with small brackets. If the box lid is drilled with some holes it will improve the ventilation, although with the type of connecting rods used there is very little heat at this end of the kiln. Great care must be taken to see that when connections are made the washers and wing nuts are tightened very

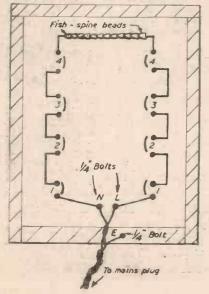


Fig. 5.—Connecting the elements in series.

firmly as loose connections cause arcing.

Front of the Kiln

The metal sheeting to the front of the kiln is carried out last of all. A piece of sheet aluminium is cut to form a mask around the front opening. The kin, allowance between the front of the hearth and the angle iron bottom frame will be just enough space to force the mask in. It will only need an overlap of about 1½in., and will be improved if the inside edges are bent in slightly.

Testing

There should be no difficulties with the electrical connections, and the kiln should "Buzz" when it is first switched on. It is a simple matter to test for continuity with battery and bulb if there seems to be any This test will, of course, only be carried out with the mains plug disconnected. The elements do not glow very brightly

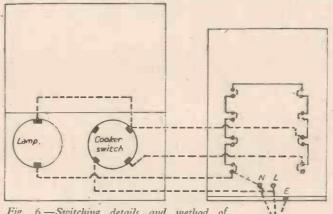


Fig. 6.—Switching details and method of wiring lamp into the circuit.

with the door open, but once the door is closed for a short time they will begin to glow clearly. The kiln should be dried out with the door open for a few hours. must be taken not to touch the elements once they have been in use as they become very brittle.

Performance

Biscuit firing to about 950-1,000 deg. C. should take about $6\frac{1}{2}$ hours, and glaze firings to about 1,080 deg. C. about 7-7½ hours. These figures will, of course, vary with different loadings, and they can be con-siderably improved with extra insulation, particularly at the sides and top.

Insulation Material

When the kiln has been tested, the spaces between the walls and the outside sheeting are loosely packed with asbestos fibre. fibre tends to powder after many firings, and a certain amount of bulk will be lost. top sheet should be made so that it can be removed easily, in order to replenish the fibre from time to time. In general about to I cwt. of fibre will be needed. interior of the kiln should be brushed out occasionally, and great care must be taken to see that the elements are not disturbed.

Element life cannot, of course, be guaranteed, but if the kiln is moved about as little as possible, and if the firings are carefully controlled their life will be extended. The greatest danger to elements is over-

Modifications

The same basic design can be modified to make a larger kiln without much difficulty.

Only a small amount of extra power, and an additional hour or two of firing time are needed to reach a temperature of 1,100 deg. C. with an internal volume of 12in. X 12in. X 18in. The small amount of extra power needed will not overload the power point; and with a little experimenting the results can be well worth while.

Modifications for Larger Kiln

Use same size hearth, but extend the walls to 18in, internal length. Cut half arch brick using full arch bricks as template. Construct as before but make the back wall outside the outer walls, which will give the extra length needed on the same hearth. Bond as before.

Elements

The same elements can be obtained with a stretched length of 18in., or can be stretched easily and safely when new.

If the extra time alone is not sufficient to reach the desired temperature, an extra elements is made from either Kanthal or Nichrome wire. This extra element is housed in three bricks cemented together and

slotted just like an ordinary electrical boiling ring. This element can be placed on the hearth, or made to fit against the back wall.

The connections are brought out 'through two holes in the back wall, and common the in parallel with the The wall, and connected up space occupied by this small heater is amply compensated for by the all round increase in internal volume.

Alternatively, of course, the element could be fitted into the floor bricks, and covered with a

piece of Sillimanite shelving. When winding the element by trial and error, the aim is to cut the wire to such a length that it will not glow red until it

is covered with a shelf.

To mains

In this way the current consumption is kept low, and it will have a reasonably long

In the prototype kiln the element was wound from Nichrome wire of about 22 s.w.g. and about 60ft, were needed.

Hall & Pickles can also supply suitable wire for this heater, and if it is desired to arrange switching, the same total loading of 15 amps. can be obtained for the main elements, arranging them in two banks. The only drawback is that there would be six elements in each bank and it would, therefore, be necessary to use the hearth bricks to take elements as a total of 12 grooves are necessary.

Another possibility if the kiln reaches nearly the correct temperature without the additional heater, is to arrange to short out one hairpin element. This should be done for example at the seventh hour if on trial an eight hour firing does not quite reach the desired temperature. Provided this is not overdone, it should not shorten the life of the elements appreciably, and is a worthwhile tip.

Details of switching from the front of the kiln are given in Fig. 6, and also the connections for an indicator light. Any

wires taken from the back of the kiln to the front should run underneath, with a clearance from the bottom of the kiln of about 6in. These wires should run in metal tubing of some sort, which can be fastened to the main frame with screws, etc. All metal parts should be bonded to the

main kiln, and earthed. For extra safety in, say a school, a wire guard is desirable.



By M. W. KIRBY

THIS amplifier makes no claim to originality, but, in view of the high cost of its commercial counterpart and the fact that wireless experimenters will probably have many of the parts to hand, it will probably be of interest to people requiring such a unit on account of its simplicity and wide application of uses. The circuit is shown in Fig. 1. It may be used as a baby alarm, when the output can either be fed into the speaker or into the audio stages of a radio or t.v., the volume control being

for the multitude of other uses for which an audio amplifier is required.

In the loudspeaker cabinet is the best place to build the amplifier and power supply. This keeps the unit compact, the only leads being for microphone (or record player) and mains.

The Circuit

The circuit is simple and its construction is within the capabilities of anyone who can follow a diagram accurately. The valve

input circuit, carbon, moving ceil or crys;al microphones can be used. When a carbon microphone is used it requires a bias voltage and this is most easily obtained by using a small 4½-volt dry cell wired in series with one half of the D.P. D.T. mains switch, so that the battery is only connected when the amplifier is in use. A condenser microphone is not advised as the output is insufficient to drive the amplifier fully without the

use of a pre-amplifier.

S.2 is optional and may be omitted if two-way communication is not required. The mains power supply is fed via an isolating transformer as this gives less chance of the amplifier ever becoming alive due to the mains plug being connected the wrong way round and is well worth the extra cost if it is to be used where there are babies or young children. The microphone lead may be any reasonable length, although with a crystal microphone some loss may occur. Screened cable should be used if a crystal microphone is used, but this is not as important when a low impedance input, i.e., carbon or moving coil, is used. If there is some television type co-axial cable about this is satisfactory as microphone cable.

Construction

The amplifier and power supply can be built on a chassis 8in, x 6in, x 2in, and can easily be built into a reasonably sized loudspeaker cabinet. The on/off volume control and the tone control are mounted on the front so that the spindles protrude through the cabinet. The mains lead and the terminal panel can then be mounted at the back and the switch S.2 if fitted can be mounted between the two front controls. No trouble should be experienced in getting the amplifier to work, but before connecting the mains, check that the wiring is correct. When Switch on and allow to warm up. warm turn the volume control to maximum and touch the grid connection of the crystal microphone input with the finger, when there

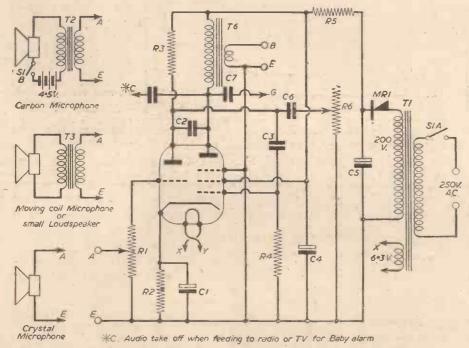


Fig. 1. - The theoretical circuit, showing input circuits for carbon, moving coil and crystal microphones.

so arranged to swamp the programme should the baby start crying. With the simple switch shown in Fig. 2 it is possible to use the amplifier as a two-way intercom, system, The amplifier may also be used as an amplifier for use with a record player or



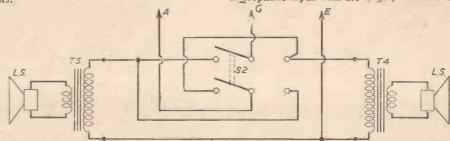


Fig. 2—Switching arrangements to use the circuit as a two-way intercom.

used is an ECL80. Being a double valve it will give good output with very little input voltage. The overall gain is controlled by the volume control and a tone control is fitted for use when used as a record player or audio amplifier.

A moving coil microphone was used on the original but, by using the appropriate

should be a loud hum in the speaker (this test'is done with the switch S.2 in the send position).

Use as an Intercom.

When the unit is to be used as an intercom, unit it must be remembered that (Concluded on page 48).

The setting and sharpeni ZWEZ

Equipment and Methods for Both Hand and Circular Saws

By A SAW DOCTOR

HE first thing required is a vice, which should be mounted between 43in. and 48in. from the ground. The one in is suitable for handsaws, ranging Fig.

Screw jaws onto uprights

from dovetails up to cross cuts. block on the bench to take overhang when working on the end of a long cross-cut saw. The vice jaws are 1½in. x ¾in. beech, the uprights 8in. x 1¼in. deal.

The backboard extends past the hinges

so that the vice can be fixed to the bench either in the woodworking vice or by clamps. Length therefore is left to suit individual requirements.

A circular saw vice is shown in Fig. 2 and hardwood is

prevent saws slipping off when fitting the front board. Types of Teeth

There are only two basic shapes of saw
and cross cut. The rip

slightly upwards to ensure a good fit and

tooth is chisel shaped and is used for cutting with the grain. The cross cut is knife shaped to cut cleanly across the fibres where a rip would tear them. No matter what finished shape the teeth have they are all based on these two patterns.

New Saws and Rusty Saws

It is usual to set a saw before sharpening but there are two exceptions.

Punch-slides out through plunger Anvil adjusting Moving handle 8 Plunger for holding son

> Fig. 4.—The handsaw set. Fig. 3.—(Left) Rubbing down a handsaw. If the file has warped a little in the same way as the file warps and it will slide more easily over the saw.

In the process of manufacture saws may become brittle at the teeth edge; file them well down, before setting and sharpening in the usual way, this will break the hard skin and prevent cracked teeth.

Rust causes a brittle skin, and rusty saws should be treated in the same way as new ones.



To keep a saw true an old 8in, or 10in.

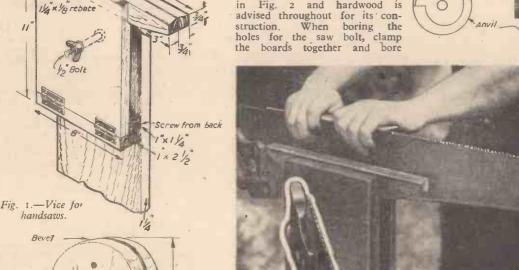
flat file is rubbed along the teeth edge.

The file is held in the palms of the hands, the fingers resting against the saw blade; this will steady the file and keep it level. Dovetail and tenon saws should be handsaws should be slightly Look along the teeth edge after straight. rounded. rubbing down to ensure their being true. Rubbing down is shown in progress in Fig. 3.

Setting

The handsaw set looks rather like a pair of pliers, one handle moves and operates the punch, the other is generally incorporated in the body of the set, to which is attached the anvil, a rotating disc with a graduated bevel on its face and numbers on its edge

The numbers represent the points-not teeth-per inch of saw; the larger the teeth the lower the number and the greater the set on the saw. Do not use a lower number than advised by the makers or you will strain the blade at the root of the tooth, making the saw slack—a common mistake in dovetail and tenon saws.



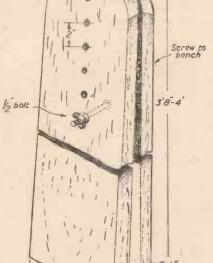
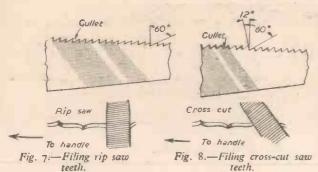


Fig. 2.—Vice for circular saw blades.

Dowel to floor



Fig. 5.—(Centre) Setting the saw.
Fig. 6.—With a well set and sharpened saw it should be possible to slide a needle down its edge without it falling off.



Place the set over the saw with the required number on the top of the anvil, squeeze the handles and the large plunger will hold the saw firm as the punch pushes the tooth over against the anvil (Fig. 5). A favourite test is shown in Fig. 6.

Files

As a general rule sharp cornered files are required for handsaws, round cornered for machine saws. Make sure they are single cut; double cut files will tear out when used on saw steel.

To Sharpen Handsaws

The face of a tooth is that portion which

does the work on the forward thrust, the rip saw face is vertical (Fig. 7).

Hold the file level but pointed very slightly wards the saw handle. to-

The cross cut face is laid back 12 degrees and the file is pointed up to 45 degrees towards the handle (Fig. 8).

By filing towards the handle the resulting burr is on the back of the tooth giving the harder working face a little extra sharpness. Keep the saw low in the vice to reduce chatter. Always hold the file level and give three or four strokes to every other gullet, sharpening the face of one tooth and the back of the next; then turn the saw round and do the same for the other teeth.

To sharpen the saw properly you may

have to turn it round another three or even four more times; it's better to do that than to spoil it.

Circular Saws

Saws with a rim speed of 9,000 to 10,000ft. per min. should be stoned down to keep them true. An old piece of carborundum wheel, large enough to hold in safety, is held in both hands, the edge of the palms and the edge of the stone are

rested on the saw bench, as in Fig. 9.

With the saw running the stone is carefully moved forward until the teeth just impinge upon it, a few seconds will be enough to bring down any high teeth.

Always make sure the saw is fitted in the same position, make a mark on the fixed collar and on the saw, fit the saw in your bench with the marks at the top to counteract any play in spindle or bearings.

To Set

Unless of the fine peg tooth kind, where a handsaw set can be used, a gauge (Fig. 10) and wrench type set (Fig. 11) are used.

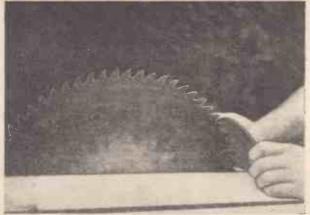


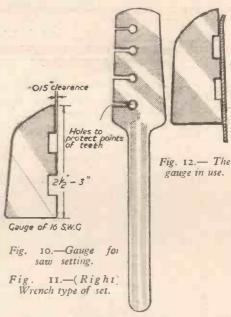
Fig. 9.—Stoning down a circular saw. The guard is removed and saw stopped for demonstration.

Place the gauge against the side of the saw (Fig. 12) and move it gently to and fro, the tooth should just touch, if not, place the appropriate slot over the tooth and carefully bend it; test it again and keep making adjustments until it is exact. Correct setting is just as important as correct sharpening.

Hollow ground saws do not require set-ting, the hollow grinding gives them clearance.

To Sharpen

The shape and variety of circular saws is immense and it is impossible to give detailed instructions here, but a few pointers will help.



Take a rubbing of a new saw and refer to it now and again so that your sharpening will not distort tooth shape too much,

Use round-edged files to relieve strain in the bottoms of the gullets.

Avoid too much face bevel; the sideways pull of the teeth will often cause a crack.

If a saw should crack and it is not more than 1/6th the radius of the saw, drill a in. or 5/16in, hole where the crack ends to stop it spreading.

If it is more than 1/6th, do not use it again; it is not safe.



Latest Element

NEW element, number 102, has been A created by an international team of scientists from the Nobel Institute of Physics, Stockholm, Harwell in Britain and the Argonne National Laboratory in America. The element was discovered by bombarding another synthetic element, Curium, with carbon ions accelerated to great speeds in the cyclotron of the Nobel Institute. Nobelium is the suggested name for the new element. It is very unstable, having a half-life of about ten minutes, and the atomic mass number has been reported as 253.

New Helicopter

NAMED the Fairy Rotodyne, a new helicopter with stub wings fitted with turboprop engines for forward propulsion is being built. The rotor blades will have pressure jets on their tips and the 48 passengers will be carried at a maximum speed of 170 m.p.h.

Balloon Lift

SAID to be the world's largest, a balloon in the United States has carried almost two tons of military equipment to a height of over 104,000ft. The diameter of the balloon is 200ft.

Ceramic Wings for Aircraft?

DRELIMINARY research has been commenced on this project to overcome the problem posed by aerodynamic heating at very high speeds, raising aircraft surface temperatures beyond that which can be withstood by available metal alloys. Ceramic materials can withstand very high temperatures but normally are too brittle for aircraft structures. The use of tension cables for pre-stressing overcomes this difficulty.

Gas Turbine Vehicles Practicable

AMERICAN engineers have stated that the use of gas turbines is practical and feasible in heavy vehicles. Tests have shown that it compares favourably in performance with the standard lorry engine. The main drawback to production is the necessity for special alloys to withstand heat, but this is expected to be overcome in the near future.

Shrinking Aircraft Floor

SHORT BROS. AND HARLAND have designed a special floor for R.A.F. Transport Command Britannia 253s. floor will move as the fuselage skin of the aircraft contracts in low temperatures at great heights, and it is able to do this because it is constructed in sections with spaces between. If the metal floor, which is capable of carrying heavy military equipment, had no give, metal fatigue might result.

New Jet Fuels

INCREASED ranges of up to 50 per cent. and the elimination of high altitude engine failures are two of the attributes of new fuels being developed for the U.S. Air The new compounds are based on Force. derivatives of boron.

Fig. 1.—The completed shed.

THE dimensions of this small shed make it ideal for erection in a small garden, and it can be used either for storing tools and garden implements or as a small workshop. It measures 6ft. × 5ft. and is 7ft. 4in. high. As can be seen from the heading picture (Fig. 1), it has a large double-

BUILD THIS USEFUL TOOLSHED

Small, Sturdy and Designed for the Small Garden

door at one end and two large sliding windows, one at either side. The sides are of tongued and grooved matchboard and the roof is ordinary weather boarding; this will make a sound roof but tarred felt can be added if preferred.

The Two Ends

The material used for the end framing is 2in. × 2in., except the roof pieces which are 2in. × 1in.

The dimensions and construction are clearly

shown in Fig. 2. It will be noticed that the crossbeam at the door end is Ift. higher than the one of the other end; this to allow for greater door height.

The back end has a crosspiece 2ft. 6in. from the floor and another vertical one down the middle. The floor supports are fitted so as to leave 2in. legs. All the joints are scarf joints a n d before being finally screwed together they should be creosoted to prevent rot.

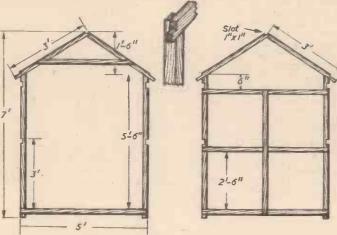
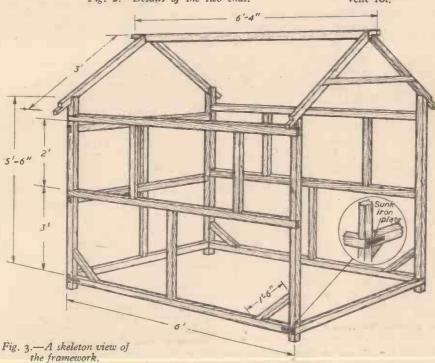
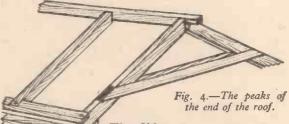


Fig. 2 .- Details of the two ends.





The Sides

The two ends are next joined together by 6ft. lengths of 2in. × 2in. at a point 3ft. from the top of the floor beams. Scarf joints are again used. Further lengths are fitted at the same height as the floor beams, but these are only 5ft. 8in. long as they fit inside the two end frames and are held in

place by means of small plates screwed in position as shown in Fig. 3. A shaped chock of wood is also nailed in place as shown. If the plates cannot be obtained from an ironmonger's they can be made quite easily. They should be about 3in, long X

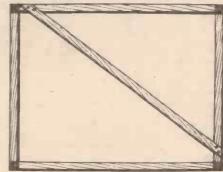


Fig. 5.—The floor support.

rin. wide and in. thick, with two screw holes at either end.

Two further lengths of 2in, × 2in, wood are used to tie the two end frames together and these are scarf jointed in position as shown in Fig. 3.

The peaks of the ends of the roof are joined by a 6ft, 4in, length of 2in, X zin, wood as shown in Fig. 4. It is overlapped 2in, at each end.



Fig. 6.—The door end of the floorboards.

The Corner Pieces

These corner supports, which are shown in Fig. 3, strengthen the whole framework. They are pieces of 2in. X 2in. material about 18in. long, with their ends cut at an angle and screwed into place as shown. The side frames of the windows are added next and positioned 18in, from each end and thus leaving a window space of 3ft. Also fix a

supporting piece in the centre of the window frame spaces.

To support the floor a 2in. X 2in. member is scarf jointed in a transverse position as shown in Fig. 5.

All that remains now to complete the framework is the fitting of the roof slats and the method of doing this is shown in Fig. 4.

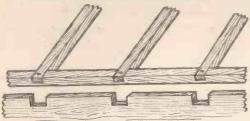


Fig. 7.—How the roof is fitted.

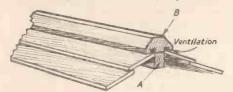


Fig. 8.—Planking the roof.

They are placed ift. apart and there are five of them on each side, 3ft. long, and in. \times 1/2 in. in section. The ends are scarf jointed into a piece of in. \times 1/2 in. which runs the length of the shed.

The Floorboards

These are of 6in. X Iin. planking and run lengthways from door to back. Do not take the boards right up to the edge of the floorbeam, but lap them about an inch on to it. Along the inch space lay a length of Iin. X Iin. wood to give the floor a good finish.

Fig. 6 shows one end of the floorboards laid with the finishing strip. The dotted line is the extent of overlap on

to the floorbeam.

Planking

Start with the back and sides and use tongued and grooved boards, if possible without the beaded edge. If this is unobtainable, use the beaded type, but plank up with the beaded edge on the inside. Six-inch boards are the best size to use.

Plank the back end horizontally across. Every plank should be nailed twice at each beam it crosses. The best nails for the job are 2in. galvanised.

The side planking consists of 6ft. olin. lengths of the same material. The extra half inch

is to cover the depth of the planking on the back. To bring the top plank to meet the roof, small pieces will have to be chiselled out to take the roof slats (Fig. 7). The position of these slots can best be ascertained by positioning the plank and marking from the slat. Do not forget to leave the window space open.

To make a pleasing contrast from the horizontal planking the small part over the door is vertically planked so that the aperture is filled and also the two sloping roof frames covered, see Fig. 1. A half-inch wide strip of the horizontal beam is left uncovered, so that the door can close on it.

The End Planks

Run the two end planks right down the side beams, flush on the inside, but overlapping on the outside to cover the end of

the side planking. If it is found that the boards do not fill the area to be covered, they must be split down the entire width.

For the roof 6ft. 4in. lengths of weather-boarding should be used; they overlap 2in. at each end of the shed. When laying the first plank (Fig. 8), leave it about 4in. away from the tie (A). To prevent the roof from leaking at this point a piece (B) is

leaking at this point a piece (B) is firmly nailed along the ridge. Grooves are cut along the whole length with a rabbeting plane, to prevent drips running in. The whole purpose of this arrangement is good ventilation.

The planks must be firmly nailed at each slat. Should any gap appear between the weatherboarding, a screw put in from the underside will soon remedy it.

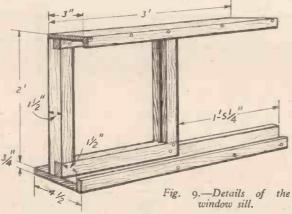
The Windows

These are, for convenience, made to slide. First of all construct two frames from 1½in. × 1½in. window sash, each to measure Ift. 10½in. high × 1ft. 7¾in. When these two frames are overlapped 1½in. they should fit into the window space; the overlap is to prevent wind and rain finding a direct entrance when the window is closed.

Having made the frames so that the glass can be fitted from the outside and puttied, obtain some \$\frac{3}{4}\text{in}\$. planking and cut out a sill as in Fig. 9, 3ft. long and \$4\frac{1}{2}\text{in}\$. wide; also cut a top piece 3in. wide \$\times\$ 3ft. long. Take one of the window frames and screw it on to these pieces in the position shown in Fig. 9 and then screw the whole assembly into the window space. Running strips will have to be fitted for the second frame to slide in. The frame must be made to run quite loosely, otherwise the damp will swell the wood and the window will stick. A similar framework is constructed for the other window.

The Doors

These are built from tongued and grooved wood similar to the walls, The planking



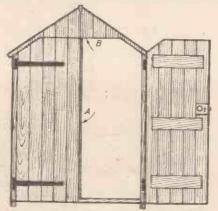


Fig. 10.—The two doors in position.

though is vertical; each door measures 6ft. 2in. high × 2ft. 4in. except where the corners are cut off at each hinge side. It will be found best to construct the door to its full dimensions and cut off the corners afterwards by marking from the actual shed. They are tied together with 4in. × 1in. battens in three places, see Fig. 11.

battens in three places, see Fig. 11.

The outside planks with the tongue left on should be planed down until it is

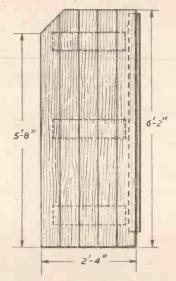


Fig. 11.-The left-hand door.

removed. To hang the doors, obtain some large gate hinges which should come nearly half way across the doors and screw them on the outside over the position of the battens. The left-hand door has a strip of wood (A, Fig. 10) zin. × ½in. screwed to the back and overlapping Iin.; it runs the whole length of the door except for ½in. at the top and zin. at the bottom. The ½in. space at the top is where the door shuts on the beam. A bolt should be fitted top and bottom of the left-hand door, one to drive into the floor and the other into the top beam. The other door can be secured either by a button or hasp and padlock or, better still, a lock and key.

Latest Careers Booklet

THE latest booklet in the "Choice of Careers" series issued by the Central Youth Employment Executive is "The Electrician" (No. 79 H.M.S.O., 18, 9d.).

The boy who is thinking of becoming an electrician will find in this booklet information of what he has to learn about the installation, repair and maintenance of all kinds of electrical wiring and equipment. He will also find details of the personal qualities required, the arrangements for apprenticeships and for studies, and promotion opportunities.

Like others in the series this booklet is intended primarily for young people deciding what kind of work to take up on leaving school, but it will also be of interest to parents, teachers and others who are concerned in helping young people to make a wise choice of career.

HOW-TO-MAKE-IT BOOK

12/6 (13/- by post)

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

OF THE RUNALL

Part Two of a Series Describing the Construction of a 6ft.-long Boat, Electrically Driven

THE plank ends are simply glued and nailed, allowing an overlap of about lin., these being tapered away with a file later to blend with the stem and stern block. No great care need be taken to make a sound joint between each plank as water-tightness will be achieved later with the covering. Even a gap of 1/16in. can be tolerated, although for neatness it should be as close as possible. Extreme care should, however, be taken to see that all planks follow the line of the hull closely between frames, where occasionally a plank may stand proud of its neighbours, but this is only likely to occur near the bow and along the bilges. Ribands about ¼in. wide of planking material may be glued to the edges of the offending planks on the inside to pull them flush, but the difficulty, if it does occur, can usually be cured by stitching the plank edges together with linen thread and a brushful of glue. When set the thread can be filed off the outside of the hull.

After having completed the planking the entire hull is given a rub down to smooth off any projections, not forgetting to file away the ends of all the planks which overlap the solid stem and stern. The bulwarks, being only the same length as the planking, will later have brass stem and stern counterparts fitted.

Fit the bilge keels next. They are best made from 4in. square mahogany, glued and screwed through the planking into the frames. All sharp edges can then be removed and dressed slightly taper towards bow and stern.

Fitting the Stern Tubes

Having completed the hull so far, the next and probably the most difficult job is the fitting of the stern tubes. It can be done quite easily if the procedure outlined is followed. Two holes have already been drilled in mould 4, through which the forward ends of the propeller shafts have to

pass. All that is necessary is to take another mould, marked and drilled to the dimensions shown in Fig. 5, and fix this to the building board hard up against the stern of the boat. Be quite sure that it is correctly centred and not tilted over to one side or the other, otherwise the shafts will not line up and the boat will have a tendency to run off course. The shafts are 7/32in. diameter stainless steel rod, ground to size, and can be bought in 2ft. lengths. Thread a length of rod through one of the holes in this after mould and judging as accurately as possible, pierce the planking and push the rod into the corresponding hole in No. 4 mould. No doubt it will be out of line, so file the hole until the rod clears the planking. Repeat this for the

By G. W. PATTISON

other shaft and here it will be easier to hit the exact spot where the rod passes through the planking. The stern tubes are made from drawn brass tube, 1/4 in. outside diameter, with a brass bush pressed into each end and reamed 7/32in. for the shaft. Having made the stern tubes, thread them on to the shafts, enlarging the holes in the planking if necessary and let them butt up against No. 4 mould. This will This will ensure that they project the right distance from the hull bottom. The wedge shaped

web between

stern tube and bottom

supports the

ove rhanging end and is

roughly tee-

shaped in sec-

tion, the top of this tee

being bolted

through the

is shown in

Fig. 6. Cut

the top plate

first from thin

sheet brass

about 3in. wide, drill a

hole, which must be elon-

gated, to fit neatly bver

the stern tube

planking. sketch of this

hull

2.13/16 LW.L 51/4 Base line 0 0

Section of building board Fig. 5.—Drilling for the stern and fasten to tubes.

the planking with 8 B.A. countersunk head brass bolts. Strips of wood 3/16in. thick, glued inside the hull, will form a firm foundation for the bolts to pass through and be tightened up with nuts on the inside.

The web is first cut from in. wood, shaped neatly to fit in place as shown in Fig. 6. It is slanted off at its after end and tapers slightly aft in plan. When it fits, cover it with tinplate and solder to hull plate and

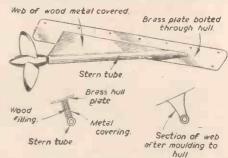


Fig. 6.—Fixing the stern tubes.

stern tube. Careful soldering will keep the wood interior watertight, and any super-fluous solder can be filed off.

Covering

The entire hulf is covered inside and out with linen or cotton strips, impregnated with resin glue. This "one-shot" resin glue should be mixed according to the directions on the container which will result in a mixture about the consistency of thick cream. Brush over a portion of the hull first with the glue, then lay on a strip of dry linen or cotton bandage. Thoroughly soak this with more glue and continue until the entire hull has been covered, wrapping the bandage around the whole of the solid stem and stern and smoothing off with glue. Allow to dry (drying can be accelerated by holding an electric fire over it), then follow with layer upon layer, drying out each one before starting the next. Should any slight hollows develop, fill in level with short pieces of bandage before putting on the final layer. should be criss-crossed in all

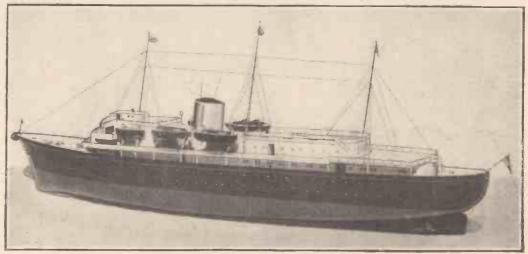


Fig. 7.—A view of the completed model.

less the rubbing down, and follow on the

inside only with a coat of enamel. The decks can be given a coat of flat buff paint

and, when dry, lined off to represent planks with a hard, sharp-pointed pencil, spacing

the lines about 1/16in. apart. After this

give a coat of varnish to fix the lines and

protect the surface from being soiled. Later

it can be washed and rubbed down and

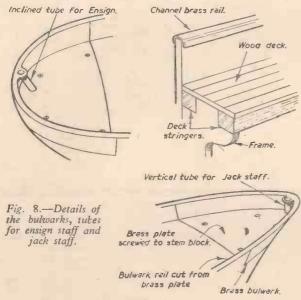
given a final coat. A curved breakwater is

directions with the last two laid in a horizontal direction from stem to stern. Any bandige overlapping the bulwark can be left until dry when it can be filed or snipped off later. The stern tubes are neatly covered with the material which can be easily moulded whilst wet to fill in all the sharp angles and form fillets, so that the final result will make them look as though they had been cast in a mould with the rest of the hall. Quite a lot of dressing up can be done with the hull still rigidly anchored to the building board.

The easiest way to separate the hull from the building board is to saw through each mould just above the base line and withdraw the screws holding stem and stern extensions. This is simpler than trying to pull out the nails. When the hull is upright, fit the two remaining inner deck stringers and saw through each of the moulds in turn to remove the centre waste; also unscrew the two supports attached to moulds o and 19.

Deck Supports

Frames 16, 17, 18 at the fore end will need beams to support the deck as will No. I for the afterdeck. These are cut from 4in. wood, not ply, about 4in. deep at their centres and cambered by the use of the cardboard template. They are notched at the



ends to bring them level with the deck stringers and glued and nailed to the side face of the frames. Double beams, one on either side of the frame, are fixed to Nos. 4, 9, 13 to strengthen the hull and act as lifting These need not necessarily be handles. cambered, being simply straight lengths of wood notched out for the deck stringers and glued and nailed to the frame.

The whole of the interior of the hull can now be given at least two layers of bandage and glue, covering all planking and frames and again moulding the bandage around the stern tubes. Next measure up to the bulwark rail and file or plane the top edges to the sheer line.

The Bulwarks

Before fitting the decks, the bulwarks at stem and stern must be fitted. Taking the bow first, a brass plate is cut to the shape of the deck at the fore end and secured to the solid stern with screws. A thin card template is then carefully bent and fitted, exactly representing the fore end of the bulwarks and continuing aft to overlap the wood bulwarks by \(\frac{1}{2}\)in. The shape of the template is then transferred to a piece of brass plate, and having got this to fit

accurately it is soldered to the deck plate. Similar treatment is given to the bulwark around the stern, first fixing the brass deck plate and then soldering the bulwark to it. A sketch of this arrangement is shown in Fig. 8, which also shows a section of the wood bulwark amidships. The rail which will be fitted to this wood bulwark is of channel brass in. wide, and to get a continuation of this, the bow and stern rails

are cut from sheet brass and shaped exactly to rest on top of the brass bul-These warks. are soldered in position, projecting equally on either side and forming a tee section. Stern They are also shaped piece in one to accommodate the jack staff at the bows and ensign staff at the stern, a short length of brass tube being soldered rail and between deck plate to act as a socket or ferrule into which the staffs may be screwed or soldered.

Geared drive to rudder. Frame positions. with false keel 3/8" thick. rivetted on (see text). Rudder bottom bracket. Keel slotted and nailed to both sides of stern Diece.

Fig. 9 .- How the rudder is fitted.

The outsides of these brass bulwarks can now be covered with bandage and glue to mould them to the rest of the hull, and when dry finally smoothed off to make the joint almost invisible.

The channel brass used to cap the wood bulwarks and the railings on the shelter deck was purchased from Whistons, of Stockport, but failing this it could be readily formed from brass shim-stock. Short lengths were used and neatly soldered To fix the at the joints. channel it was filled with thick resin glue and pressed over the wood bulwark and held down by weights until The ends were then dry. soldered to the stem and stern rails. Drill the holes for the fairleads and file them ovala rim of 22-gauge wire can be stuck on with glue to improve the appearance if 'desired.

Holes to lighten the solid nose and stern blocks were not drilled in the original, but if preferred can be used to save an ounce or two of weight. They will have to be drilled before the brass plates are screwed on, but remember that two quite large chunks have to be cut in the sides of the nose block to house the anchors, and from these holes are drilled up through to the deck for the hawse pipes. It is just as well to drill these first and keep any lightening holes well clear. anchor cable passes up through the hawse pipe, through the chain stopper at the top, then along the deck and round the capstan, then forward again, where it disappears through a hooded opening into the chain locker below.

The decks are cut from the same material as the planking. Cut the foredeck and chamfer underneath the edge to fit neatly against the sloping bulwark. Glue and nail to nose block, stringers and deck beams. The afterdeck can then be fitted in the same manner.

Preliminary Painting

This consists of a priming coat and two undercoats on the outside, rubbing down between each. Do the same to the inside, fitted to the foredeck and locates the fore end of the superstructure, making an almost invisible joint. It is of aluminium angle and can be conveniently cut from a length of curtain rail. The kin side is pinned to the deck and the side which stands at right angles to it is left standing a in. high, against which butts the fore end of the superstructure. A similar fitting could be fitted to the afterdeck to locate the afterend of the superstructure, but this was found to be unnecessary, the weight of the upper deck works holding it in position. Some idea of the appearance of the completed hull can be gained from Fig. 7.

The Rudder

Make this from 1/16in. sheet brass. If brazing facilities exist a short length of tube to accommodate the operating rod can be brazed direct to the brass. Failing this, wrap a strip of thin brass around the rod and rivet to the rudder plate and sweat the whole assembly with soft solder. Now dress it up with a file until it blends with the These details are shown in Fig. 9. plate. The rod is of bronze or stainless steel riveted in position and, if of bronze, soldered as well. There is just sufficient clearance between the foot of the rod and the balanced part of the rudder to admit the bottom bearing. This bearing is a hole drilled in a strip of gin. by 1/16in. brass, bent and screwed to the false keel. A collar is attached to the upper end of the rod on which the weight is taken, and above this is a gearwheel. The distance from the centre of the rudder post to the centre of the ratchet motor shaft is 6in., but this can be varied to suit the size of gearwheels available.

The maximum arc traversed by the rudder is about 30 deg. either side of the centre line. In the present case a 21 in. gearwheel is attached to the rudder and a rin. pinion on the driving motor. This means that the driving motor covers an arc of 75 deg. either side. Although the driving motor was amply powerful enough to operate the rudder direct, it was purposely geared down to spread out the operating contacts. of these latter contacts are positioned some 3 deg. at either side of the centre line and only used to correct drift due to wind direction, etc., when on a straight course.

(To be continued)

0 D D

General Notes and Details for Making a Hammock

Fig. 2 shows a becket hitch, which can

easily be followed from the illustration. All

that is necessary to know now is how to

start about making the net, as netting is

worker and what the net is to be used for.

If a hammock is required or any square or oblong piece of netting, the usual way of

starting is to make a loop 3in. or 4in. from

the end of the twine, as shown at A, Fig. 3,

and make fast the end of the twine to a hook

or nail driven in somewhere at a convenient height to allow comfort in working.

loop can be made with a becket hitch;

(B) in Fig. 3 clearly shows the manner in

simply a succession of becket hitches. There are several ways in which to start netting; it depends on the choice of the

The Becket Hitch

ETTING is not difficult to learn, and the materials necessary are expensive. All the implements needed are a meshstick and shuttle, which can be cut from suitable wood with a fretsaw and finished with glass-paper.

The meshstick need only

Fig. (A)The shuttle and (B) the directions for filling it.

Fig. 4.—First stage in forming becket hitch in commencement of net. Fig. 5.—(Right) Second stage in forming becket hitch in commencement of net.

purpose.

be a 12in. wood rule; that being about tin. wide would give a 2in. mesh. The shuttle (A in Fig. 1) should be about 8in. long and 1in, or more wide.

The Twine

Common twine is quite good enough, but, of course, Seine twine, which is smoother to work, can be used. If the twine is bought in a skein, it should be wound, as it is handier in a ball.

Having collected the implements and twine, the shuttle should be filled. This operation is started by making fast the end of the twine to the tine, as the inside point of the shuttle is termed, then leading the twine under the crutch at the foot, up the other side and over the tine again, back under the crutch up the other side, over the tine, and so on, as shown at B, Fig. I, until the shuttle is full.

Fig. 2 .- The becket hitch.

Fig. 3.—(A) The first loop to begin and the end made fast to hook; (B) Method of forming loop with becket hitch.

which the becket hitch is made for this

Having made the loop and made fast the end of the twine to the hook or nail, the meshstick is laid over the twine, below the loop. The shuttle is brought forward and upwards, bringing the twine over the mesh-The twine is held to the meshstick under the thumb and the shuttle reeved up through the loop from back to front and pulled until the upper edge of the meshstick touches the lower part of the loop (Fig. 4). The loop with the twine through it is held under the thumb and the shuttle

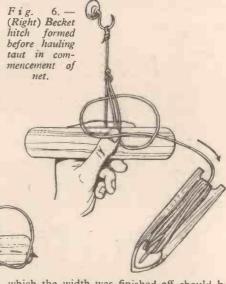
passed round behind the loop and the single part behind it (Fig. 5). The shuttle is then brought forward and down through the bight from left to right (Fig. 6) and pulled in the direction of the arrow.

Working the Meshstick

The meshstick is slipped from the mesh just made and the same procedure carried out for the next one below it, and so on, until enough have been made. If a hammock with 2in. mesh is being made, it should be about 50 meshes wide. Therefore, 50 meshes or so should be worked and the result so far should look something like B, Fig. 7. A, Fig. 7, is a close-up of a portion of the first two rows of meshes worked in this way, showing the hitches.

When the required number of meshes for the width have been worked, take the work off the hook and reeve a piece of twine or

cord through all the meshes on one side, in other words, through one row. Now the cord, with the work on it, should either be stretched between two firm objects horizontally, a foot or two apart, or the ends of it reef-knotted together, and put over the hook or round a toe. The work can be fixed up in any of these ways ready for working down the length. The end at

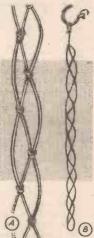


which the width was finished off should be to the left (A, Fig. 8) so that the work goes left to right, making each mesh in the same manner as for the width.

B, Fig. 8, shows the continuation of the third row, the first two having been worked across the width in the beginning.

On finishing this third row, which is the first row made since reeving the cord through the end meshes, and putting it up one way or another, if it is found to be awkward with the left hand, the work should be turned over, or, if it is on the stretch, the other side worked, when it will be possible to work from left to right as before. If this is not done, the meshstick

will have to be used in the right hand and the shuttle in the left to do the work properly and this may be found awkward.



Another Method

There is another method which may be better and quicker. This is how to proceed.

A piece of wire or cord (preferably wire) is stretched horizontally between two

7.—(Left) Enlarged portion of B showing hitches. (B) First two rows of net complete, forming the width.

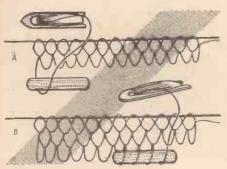
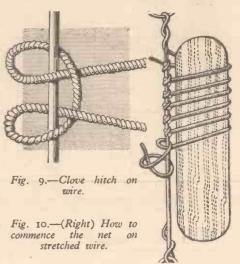


Fig. 8.—(A) First two rows on a stretch ready to start working third row from left to right; (B) Continuation of third row.

firm objects a foot or two apart. The end of the twine is made fast to the right-hand end of the wire with a clove hitch, which is shown in Fig. 9. Now the meshstick is taken in the left hand and placed over the twine below the clove hitch, and the twine brought towards the operator and up over the meshstick to the wire. Another clove hitch is made, and so on, as in Fig. 10.

To make a hammock with 2in, mesh starting this way, fifty or so bights or loops should be made along the wire by means of the clove hitches, working from right to The second row is carried on with the becket hitch on the loop as before, from left to right, and so on, until enough is made.

Why wire is preferable to cord upon which to commence the work is because, when the length is finished, all the clove hitches put in at the start can be run off the end of the wire. Any kinks in the wire caused by its having been made fast at each end, which might interfere with the running off of the clove hitches, can be nipped off. Whereas, if the work was stretched on cord to begin with, all the clove hitches would have to be eased up before they could be run off the end.



Make Your Own Draught Excluder

A Device Which Rises to Clear the Carpet When the Door is Opened

THIS device is basically a flap at the bottom of the door that will effectively seal even the largest gap when the door is closed, but will rise and clear floor or carpet when it is opened.

Materials

Items required are a length of wood 1½in. wide by about ½in. thick, a pair of small hinges, a letter-box spring (a small coiled spring with ends about 1½in. long), a fibre

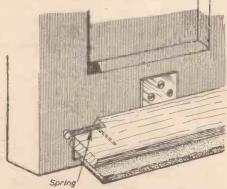


Fig. 1.—A view of the completed device.

tap washer, a few screws and drawing pins and a strip of rubber 1in. by 1/16in. thick. This latter may be purchased, cut from a motor-car inner tube or alternatively a length of knife-edge section draught exclusion rubber may be used.

First of all cut the wood to a length

By P. W. EDWARDS

slightly less than the width of the door aperture, then glue a similar length of the rubber strip along one face of the wood, leaving about in. protruding along the entire length and secure with drawing pins before the glue sets. If the knife edge section rubber is used, it can be secured by means of small screws with washers under the heads and will not require gluing.

Next, holding the wood with the rubber strip at the back and protruding beyond the lower edge, cut away a small piece of wood from the upper left-hand corner sufficient to accommodate the letter-box spring, usually about Iin. long. Secure the spring in position by passing a long thin screw through the spring and into the end of the wood, being careful to first drill a hole to receive the screw. Another small hole should be drilled into the wood at right angles to the first to receive one end of the spring, the other end being left free to bear against the

Next screw the two hinges to the wood about 2in. from each end, on the same side as, but the opposite edge to the rubber

The flap is now ready for fixing to the First close the door, then place the door. flap firmly against the bottom of the door and press down until the rubber just begins to double over and seals any gap between floor and door.

Holding it in this position, screw the free leaves of the hinges to the door. When released the flap should raise itself clear of When the floor by reason of the spring bearing against the door.

If the flap is again pressed down and the fibre tap washer screwed to the bottom of the pillar of the door frame in such a position as to hold the flap down but left free to revolve, then it will depress the flap each time the door is closed and being free to revolve, the action will be smooth and will not be felt by anyone closing the door.

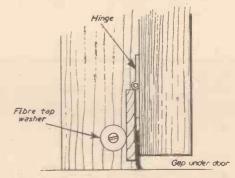


Fig. 2.—The position of the fibre tap washer.

To ensure that the flap engages with the washer each time, it may be necessary to limit the amount by which the flap raises itself; this can easily be done by using a small screw as a stop in the door itself.

If the excluder including the hinges be painted to match the door, it becomes very unobtrusive and is in fact hardly noticed.



HERE are some algebraical swindles which may amuse you. The fallacy will be obvious to the mathematician, but those whose algebra has not been refreshed since schooldays may have some difficulty in finding it.

Suppose a=b then

 $ab=a^2$ $ab-b^2=a^2-b^2$

b(a-b)=(a+b)(a-b)

b=a+b

b = 2b

1=2 therefore:

Here is another bogus calculation, in which 5 is proved to equal 4.

 $+5 \times +5 = 25$ $-5 \times -5 = 25$

 $\sqrt{25} = \pm 5$

Euclid said that things which are equal to the same thing are equal to each other:

therefore +5=-5and as +5=+5

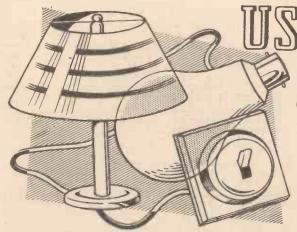
we can add to get +10=0 Similarly we can prove

> 14=-4 +4 = +4

so by addition +8=0 therefore: if both 10 and 8=0

10=8 and 5=4

Q. E. D.



Some Wiring Details and Circuits for Household Lighting

By J. L. WATTS

HERE are many circuits for which the usual single and two-way switches are not adequate, and for which less common switches are more suitable.

Use of Time-lag Switches

There is a little known time-lag switch which may be obtained either as a metalclad switch, or may have a case of moulded insulating material for surface or semi-This switch may be recessed mounting. obtained as a single-pole single-way switch, or as a single-pole two-way switch. The special feature of this switch is that a pushbutton is pressed to make contact; after the contact has been made the switch is controlled by means of a small dashpot so that after a given delay, which may be adjusted for any period from two seconds to

cupboard light, in which case it is advisable to experiment with a lamp in different positions before wiring up permanently. The best light-ing position for a cupboard

having deep shelves is often outside the cupboard at about 6ft, from the floor.

Additions to a Lighting Circuit

This raises the question of additions to lighting circuits. In this connection it is important that no addition should be made to any circuit which will overload the circuit, and that the rating of the cables used should be equal to the current-rate of the fuse which protects the circuit. Subject to these provisions it is permissible to add one or two low-current points, such as lighting points, an electric clock socket-outlet, or a socket-outlet rated at not more than 5 amps. to a circuit rated up to 15 amps. The total assumed current loading must not exceed 15 amps., however. In calculating the assumed loading at least amp, must be reckoned for a 2-amp, socketa 30-amp. circuit which supplies a 30-amp. cooker unit, however, one socket-outlet may be included on the cooker unit.

Locating the Feeding Points

The next point to consider is where additional wiring may be connected into an existing circuit. In all cases the feed must be taken from two points on the circuit, one of which must be a "live" pole and the other a neutral pole. Where a small socket-outlet is connected in the circuit the connections are quite suitable as "live" (L) and neutral (N) terminals are available at the socket-The connections to the socket-outlet should be such that when the earth (E) socket is at the top the L socket should be on the right (when viewed from the front of the socket-outlet), with the N socket on the left, as in Fig. 1. The red cable should be connected to the L terminal and the black cable to the N terminal. It is advisable to check that the connections are correct, however

In order to do this a lampholder with a mains-voltage lamp may be fitted with flexible leads A and B as in Fig. 1. One lead A should then be connected to a reliable earthing point, such as a main cold water pipe, the other lead B being applied in turn to the two circuit sockets. The lamp should to the two circuit sockets. The lamp should then light when the lead B is applied to the L socket. If the socket-outlet is of the three-pin type and the third socket E is earthed, the lamp should light when connected between L and E. If the lamp lights when connected as in Fig. 1 but descript when connected as in Fig. 1, but does light when connected between L and E this indicates that the E socket is not connected to earth. If the connections are not as indicated the other socket-outlets should be similarly tested, and the connections of the cables to the L and N terminals changed over if necessary.

In the case of a lighting circuit additional wiring must also be connected to L and N terminals. If three-terminal ceiling roses terminals. are employed the L and N terminals will be available at each ceiling rose, as indicated in Fig. 2(a). To identify these terminals remove the lamp from its holder and place the lamp switch in the off position. Then

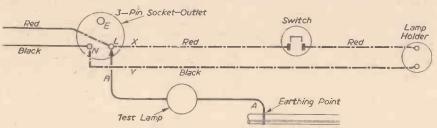


Fig. 1.—Use of test lamp.

one hour, the switch contacts are opened automatically. automatically. The switch may also be arranged so that the contacts opened when the push button is pressed and automatically

closed after a pre-set period.

The switch is suitable for many purposes such as the control of lights on staircases, corridors, cupboards, bathrooms, toilets, cloakrooms, garages, window displays, radio sets, etc. The switch may be used to control an outside light to illuminate the approach to the coal shed, etc. It is by no means uncommon for a shed or garage at the end of a garden to have an electricity supply provided through an underground or overhead cable. In this case great care is often necessary in moving from the house to the garage, or vice versa, during the long winter evenings. If an external light is fitted outside the house and controlled by a time-lag switch in the house, with a similar lamp outside the garage which is controlled by a time-lag switch in the garage, the problem may be solved without running cables between the house and garage for two-way switches. On leaving the house the button on the house switch is pressed and the lamp remains lit long enough to illuminate the

path to the garage, the lamp then being The switch can also be used to control a

switched off automatically.

outlet, an electric clock may be neglected, 5 amps. must be reckoned for a 5-amp. socket-outlet and, for each lampholder 100 watts must be reckoned, or the actual wattage of the lamp if greater than 100 watts. The current loading (amps.) of

a lamp is equal to Watts A circuit having

a rating exceeding 15 amps. must supply no. more than one point, except where the circuit is a ring circuit supplying 13 amp. socket-outlets with fused plugs. In the case of

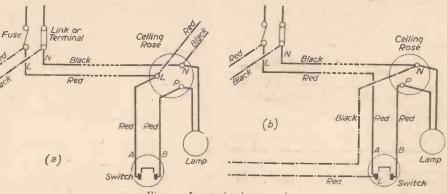


Fig. 2.—Lamp circuit connections.

door, so that all the new wiring can be accommodated under the bedroom floor. Fig. 3 shows the two-way circuits which

may be compared with the single-way circuits shown in Fig. 2. Fig 3(a) refers to a

lighting, circuit having three-terminal ceiling roses, whilst Fig. 3(b) refers to a lighting

circuit having two-terminal ceiling roses. Considering the former circuit, having located the L and N terminals by the

methods described previously, switch off at

the main switch, mark the end of the lead A at the lamp switch and remove this switch. If a single-core wiring is used, the next step is easy. Secure the switch end of the lead B to the two ends of two new leads C and

D. Draw the other end of the lead B into the space above the ceiling, bringing with

it the new leads C and D. The ends of the three leads B C D may then be con-

nected to the ceiling switch as shown. The other ends of the leads C and D may then

be connected together with the lead A, to the new single-pole two-way wall switch as shown. A similar method may be employed with a circuit having a two-terminal ceiling rose, as in Fig. 3(b). If twin-lead-sheathed cable is used it will be necessary to run two new cables, C and D, between the two

switches, cutting out the lead B to the wall switch and running a new lead E from the

lead E may also be required if B is not long

Three-way Switching and Two-lamp

Where a house has more than two floors

ceiling rose to the ceiling switch.

connect the test lamp between an earthing point and each of the three ceiling rose terminals in turn. The lamp should light when connected to the L terminal. connect the test lamp between the L terminal and each of the other two ceiling rose terminals in turn. The lamp will then light when connected between L and N. If the ceiling roses have only two terminals, as in Fig. 2(b), an additional circuit may be fed from the L terminal at the switch and the N terminal at the ceiling rose. The L

thickness of the floor, wall, etc., and the cable must be kept clear of gas and water pipes.

Uses of Cord-operated Ceiling Switches

The ordinary cord-operated ceiling switch, which is obtainable as a single-pole single-way (on and off) switch, or as a single-pole two-way switch, has many uses. The single-way switch, of the insulated pattern, is quite safe to use in a bathroom when it is mounted on the ceiling and is

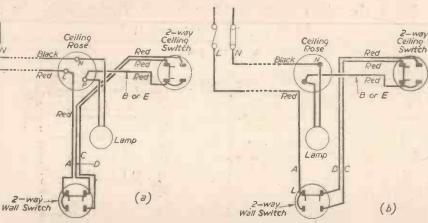


Fig. 3.—Connections for two-way switching with ceiling switch.

terminal at the switch can be identified by connecting the test lamp between an earthing point and each of the two switch terminals n turn with the controlled lamp removed from its holder; it will light when connected to L. Then connect the test lamp between the L terminal at the switch and each of the ceiling rose terminals in turn. It will then light when connected between L at the switch and N at the ceiling rose. A new circuit may also be fed from L and N at the fuses. The chain dotted lines in Figs. the fuses. The chain dotted lines in Figs. 2(a) and 2(b) indicate possible connections or an additional circuit.

Wiring

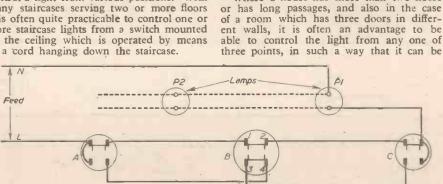
Having established which are the L and N rerminals, the new circuit may be connected with the leads X and Y connected to the back of the L and N sockets of a bocket outlet, as in Fig. 1; or to he L and N terminals of the lighting circuits shown in Fig. 2. The red-coloured conductor should be connected in the live (L) pole, with the black conductor in the neutral pole. The switch should be connected in the live (L) pole.

The most suitable cables for the average consecutive to the connected in the live (L) pole.

householder to use for interior wiring are probably tough-rubber sheathed cables or P.V.C. sheathed cables, together with lampholders and switches of all-insulated construction; 1/0.044 cable may be used for amps., 3/0.029 for 10 amps., or 3/0.036 cable for 15 amps. Connections in conductors should be made at fuses, switches, ceiling roses, socket-outlets, junction boxes, porcelain shrouded brass connectors, or should be well soldered, dry-twisted joints not being permissible. Tough-rubber not being permissible. Tough-rubber sheathed cables or P.V.C. sheathed cables nay be embedded in plaster or concrete, but if liable to mechanical damage, such as might occur due to nails being driven into plaster, the cables should be protected by running them in conduit or metal casing or similar means. The cables should be supported by means of suitable clips at horizontal distances not exceeding 9in., or vertical distances not exceeding 15in. Where cables pass through floors, walls, partitions or ceilings the hole must be made good with cement or fire-resisting material to the full

controlled by means of an insulated cord. It has also been used quite satisfactorily to control a light from various positions. With many staircases serving two or more floors it is often quite practicable to control one or more staircase lights from a switch mounted on the ceiling which is operated by means

of a cord hanging down the staircase.



enough.

Switching

Fig. 4.—Three-way switching circuit.

A hand lamp (of the Board of Trade insulated pattern) may be hung from the garage roof over a car, but quite often one has to squeeze back round the car to switch This can be avoided by using a single-pole single-way cord operated switch to control the socket-outlet into which the hand lamp is plugged. The switch may be fitted on a rafter with the switch base vertical, the control cord being passed round the walls of the garage through smooth hooks or small pulleys. In this way the lamp can be switched on or off from any point in the garage.

A single-pole two-way cord-operated switch is also very useful when it is required to provide an additional switching point. Too many builders seem to lack imagination on some points so that one finds that on entering, say, the back door in the dark, one has to fumble one's way across the kitchen to find the switch placed inside the door leading to the hall. In order to convert to two-way switching one may then have to employ unsightly surface wiring to a new switch near the back door, or spoil the decorations by cutting a chase in the

The cord-operated switch, however, provides a third alternative. Such a switch can be fitted on the ceiling just inside the back switched on or off at any of these points irrespective of the point at which it was previously switched. This can be effected by using two single-pole two-way switches A and C, as in Fig. 4, together with an intermediate switch B. This switch is arranged so that in one position terminal I

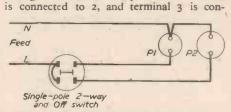


Fig. 5.—Circuit for two-stage illumination.

nected to 4; in the other position terminal 1 is connected to 3 and terminal 2 to 4. A double-pole two-way switch may be used in place of B if required.

A single-pole two-way switch with off position may be used to give two values of illumination as in Fig. 5. The switch can control two lampholders for use in a nursery or similar place; one lampholder may contain a neon lamp whilst the other lampholder contains a lamp of normal wattage.

A Photographic Safe-Light & Printer

An Extremely Useful Combined Accessory for Making Contact Prints

By J. A. LOGUE



Fig. 1.—The completed safe-light and printer.

A PHOTOGRAPHIC printing frame can be readily converted into a combined photographic printer and safe-light cabinet. A feature of the design is the hinged safe-light panel, which hinges down over the light bulb and provides a safe light for positioning the photographic negative and printing paper in the frame. It can be mounted at a convenient working height on the dark room wall by means of mirror plates or used on a bench or table top. The photograph, Fig. 1, shows the general arrangement of the completed printer/safe-light cabinet.

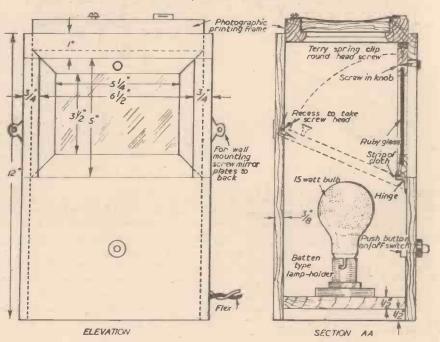
The dimensions shown in Fig. 2 are for a printing frame 7½in. × 5¼in. outside measurements, but these can be modified to suit other sizes. Wood ¾in. thick is used throughout except for the base which is ½in.

The Hinged Panel

Wood strip $\frac{3}{4}$ in. \times $\frac{2}{8}$ in., rebated $\frac{1}{4}$ in. deep and of a width to suit the safelight glass, is used for making the safelight panel frame. The corners are mitred and the frame-assembled, glued and tacked around the glass. A piece of ruby safelight glass can be purchased, cut to size.

Assembly

The sides, back and base are assembled, glued and tacked together before the front is fitted. A batten type lampholder is next screwed to the centre of the base and a ½in. dia. hole is drilled in one side to take the electric flex. The front is drilled and an off/on push button is fitted. The hinged panel is now attached to the front with two rin. × ½in. brass hinges and a strip of cloth is glued along this edge covering the hinges as shown in the sectional view (Fig. 2). The sides of the hinged panel are sanded or planed to allow it to swing freely between the sides of the cabinet, before finally gluing and tacking the front in place. A ½in. × No. 6 round head woodscrew is screwed centrally into the top edge of the hinged panel, its head registering with a ½in. Terry spring clip fitted to the top as shown. The printing frame is now fitted into the top and is screwed in place. A small screw-in knob is fitted as shown in section AA in Fig. 2 and this also shows the swing of the safelight panel dotted. A small recess is cut inside in the back to take



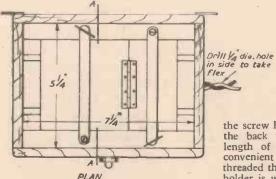


Fig. 2.—Front elevation, plan and sectional views of the safe-light printer, showing constructional details and dimensions.

the screw head to allow the edge to lie along the back when in the down position. A length of light flex, sufficient to reach a convenient plug socket or lighting point, is threaded through the side hole and the lampholder is wired with the switch in circuit.



Some of the Principal Contents: Fitting Carpets to Winding Stairs; Making Leaded Windows; Refinishing Refrigerators, Washing Machines, etc.; Sharpening Woodworking Tools; A Comfortable Folding Canvas Chair; Decoration of Damp Walls; A Corner Greenhouse or Conservatory; Colour Schemes for Indoors.

THIS model of a 4ft. long X 16in. wide X 16in. high figure-of-eight scenic railway is constructed in sections which must be made according to instructions and plans for each section, completing one section before commencing another. The completed model is shown in Figs. -I and 6.

The motive power is supplied by a well-known construction kit 20 v. A.C. electric motor, driven from the mains through a transformer. It is coupled to pulley wheels driving an endless felt band. The track is composed of oo Wrenn flexible 2 rail track mounted on Wrenn ballast strip for silent running. The car or cars (3-seater) are made of \$\frac{1}{6}\$ in. balsa or other light wood and

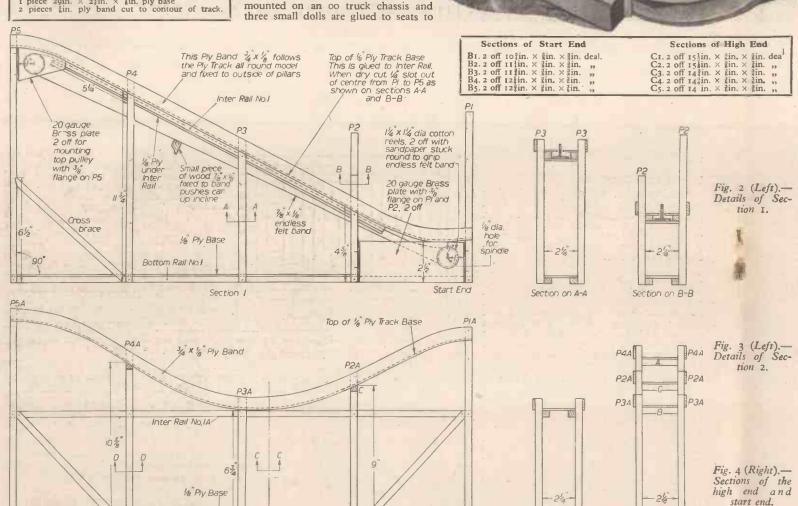
Bottom Rail No. IA.

Section 2

High End

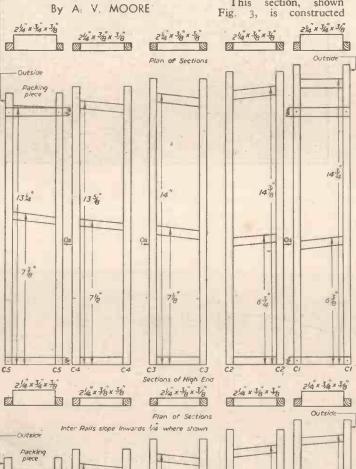


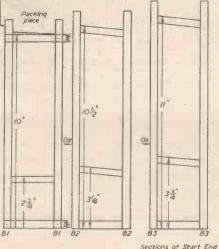
Section on C-C





Drawings and Notes on the Construction of a Unique Working Model





11/3

give realistic effect. The main construction is of $\frac{3}{8}$ in. \times $\frac{3}{8}$ in. deal and $\frac{1}{8}$ in. plywood.

Section I

Bottom rail No. 1 and inter rail No. 1 are Placed on table or bench and pillars Pr, P2, P3, P4 and P5 are screwed to these at the heights shown in Fig. 2 and squared up by inserting cross-braces. A pair of these are made, the only difference being that P2 is lower on the incide assetion.

is longer on the inside section as shown on section B-B. Two 20G. brass plates are now fixed between P1 and P2 and two other 20G. brass plates fixed at top of incline to P5 and inter rail No. 1. These plates are drilled with a kin. dia. hole where shown to take pulley spindles. This section is then laid by for time being.

Section 2

This section, shown Fig. 3, is constructed

by cross rails half-lapped into both Br's and both B5's. Three pieces of in. plywood are now cut to sizes and radius shown in Fig. 5. The whole of these five sections are now joined together by inserting the plywood base and the plywood track bases into these sections as shown on Fig. 5. The high end shown in Fig. 7 is constructed in exactly the same way.

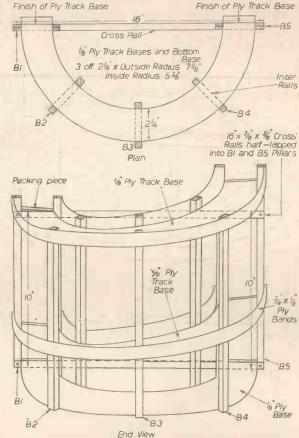


Fig. 5.-End view of the start end.

exactly the same way as Fig. 2 with the exception of cross rails A, B and C which are inserted between the pairs of pillars P2A, P₃A and P₄A as shown on section D-D. When construction has been completed this is left for time being.

Fig. 4 shows sections of the start end and high end. These ends are made up accordto the ing m e a s u r e -ments shown and assembled one at a time. The start end, after sections have been been made, is joined together

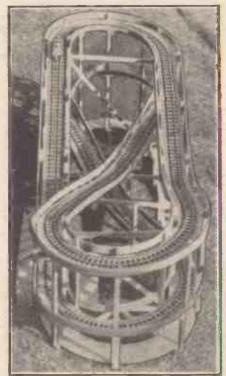
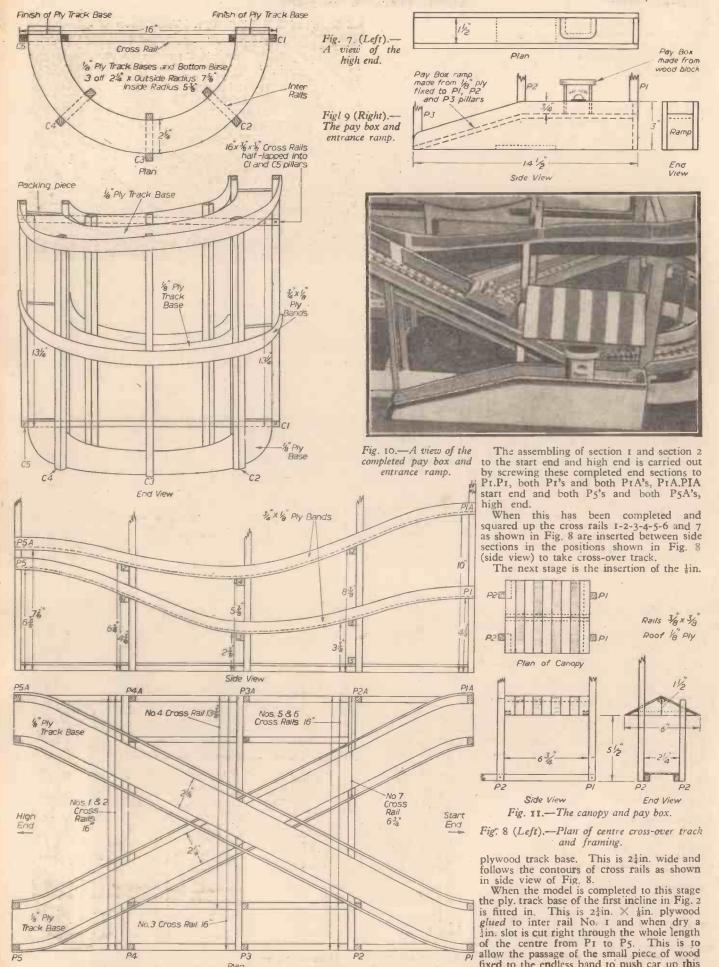


Fig. 6 .- A further view of the completed model.

fixed to the endless band to push car up this

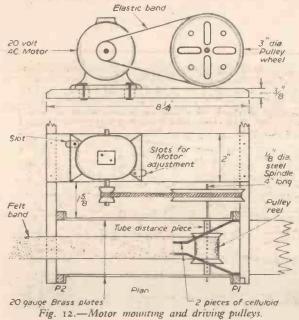


Plan

incline. The plywood track base, 2½in. × ½in., can also be inserted following contour as shown in Fig. 3. The \(\frac{1}{4}\)in. \(\times\)in. plywood band can now be fitted to the outside of pillars and this follows the contour of the track from start to finish as shown on various

Pay Box and Entrance Ramp

The pay box and entrance ramp are con-



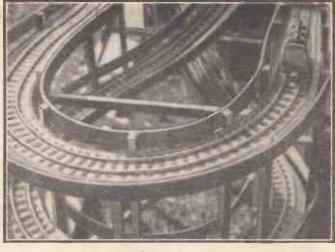
structed of ain. plywood to sizes shown in Fig. 9 and are fixed to and levelled with the waiting to be carried up the incline. bottom of PI, P2 and P3.

Canopy and Pay Box

These are constructed according to measurements shown in Fig. 11 of \$\frac{1}{6}\text{in.} \times \$\f entrance ramp are shown in Fig. 10.

Fig. 13 (Right).

—A close-up view of the track and the car.



Motor Mounting and Driving Pulleys

Details of engine mounting and driving pulleys are given in The base board is Fig. 12. slotted where the motor fixing bolts pass through, to allow for any adjustment to the rubber driving band.

rails. They measure 3in. × ½in. and hold the car in position while

The Car

Details of the car are given in Fig. 14 The small tinplate angle piece at rear of car is to engage with the wooden carrier piece on the felt band. The car can be seen running in Fig. 13.

Painting

Paint the model in contrasting colours of light blue; mushroom and

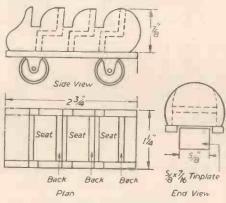


Fig. 14.—Details of the car.

throughout except for horizontal lines which are picked out in light blue. The canopy awning is in blue and mushroom stripes.

A HANDY CLOTHES HORSE

A Household Item You Can Make Yourself By K. W. Burton

HIS is an easily made clothes horse consisting of two three-barred wings hinged together as can be seen in Any fairly straight-grained wood can be used. It is a help if the wood is bought ready planed.

Materials Required

Four lengths 36in. x 11in. x 3in. for the uprights, six lengths 36in. x 1½in. x ¾in. for the uprights, six lengths 36in. x 1½in. x ¾in. for the horizontal bars, three 2in. brass hinges, and 36 ½in. brass wood screws.

Construction

First cut the cross-bar receiving slots in the uprights, with hinge recesses in two of the uprights only, as shown in Fig. 2. Then cut the notches on the ends of the cross-bars as also shown in Fig. 2.

When slots, etc., are complete assemble each wing as in Fig. 1, glueing and screwing

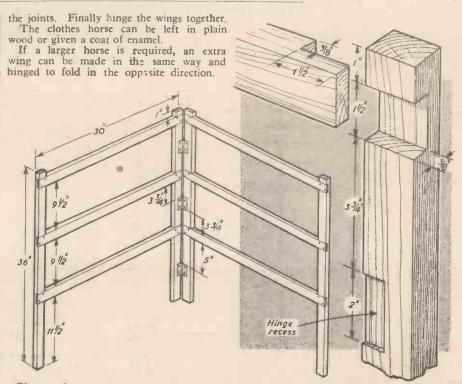


Fig. 1.—A perspective view of the clothes horse, giving some dimensions.

Fig. 2.—Details of the joints.



A Simply-made and Attractive Lamp for the Modern Home

By E. FEASEY



To make it you need the following:

Two pieces 5\(\frac{1}{4}\)in. \times 12\(\text{in.}\) \\ \frac{1}{4}\(\text{in.}\) plywood. One piece 4\(\text{in.}\) \times 11\(\frac{1}{2}\)in. \\ \frac{1}{4}\(\text{in.}\) plywood. Two pieces 7\(\text{in.}\) \times 8\(\text{in.}\) \\ \frac{1}{2}\(\text{in.}\) frosted glass. One piece 8\(\frac{1}{2}\)in. \times 12\(\text{in.}\) frosted glass.

Also needed are a short length of beading with a "lip," a 40-watt bulb, holder and flex with plug, and a few short panel pins.

Construction.

First of all mark out the ends, using a pair of compasses to draw in the curved legs. Cut the curves with a fretsaw and the angled sides with a tenon. The only other cutting involved is the ventilation holes in the base. They are necessary because even quite a small lamp creates appreciable heat in a confined space. Fig. 2 shows holes of 1½in. diameter, but these can be smaller, of course, in which case they may be made by drilling holes through the ply.

To assemble the case, place the sides flat on a firm surface and drive about six of the

To assemble the case, place the sides flat on a firm surface and drive about six of the panel pins through each end, spacing them at equal intervals along a line \(\frac{1}{8}\) in. from the end and making sure that the points only just protrude from the underside of the ply.

Next place one of the sides in position against an end, and drive the panel pins home. Place the other end in position and secure, then add the other side in a similar way.

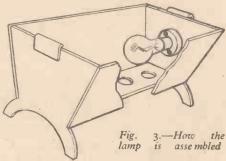
Secure the perforated bottom with panel pins driven through the end-pieces. It will be noted that the bottom does not fit flush to the sides but is slightly narrower, leaving two further strips through which air circulates and light from the lamp shines.

The main structure of the lamp is completed. now and if the dimensions are correct, the frosted glass top should rest on the top of the case without overlapping. Place it in position and add the two short lengths of beading so that the lip of each holds glass in place. Secure them with panel pins.

Lamp and Holder

Drill a ¼in. hole through one end to

take the flex for the lamp. Place the holder in position so that it is centred over the hole, and drill the screw holes, but before the holder is screwed into place the inside of the case must be given one or two coats of flat white paint. Give the outside a coat of gloss paint to match the colour scheme of your room, and the job is complete.

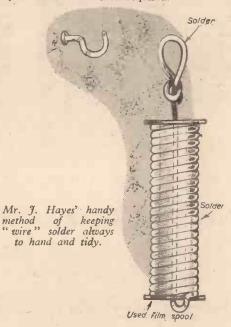


There is no lamp switch included in this arrangement as I have not found one necessary, but it is not a difficult matter to break the flex and add a torpedo switch.

Storing Solder

By J. "HAYES

SOLDERS of the "wire" type are often left lying around the workshop to become tangled with tools, dropped on the floor or lost in other ways. The method shown in the sketch keeps the solder tidy and always to hand. An old film spool is wound with the solder and as shown the end of the solder taken up through the centre hole and a loop formed at the top. A hook in the workshop wall on which to hang the spool is all that is then required.



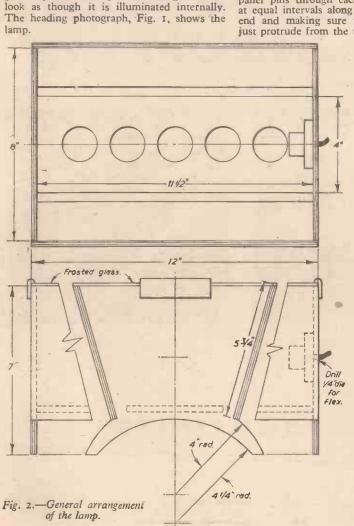


Fig. 1.—The completed table lamp.

ing that it is now in constant use to set off a

cut glass vase of flowers, the light from the

40-watt bulb shining up through the frosted

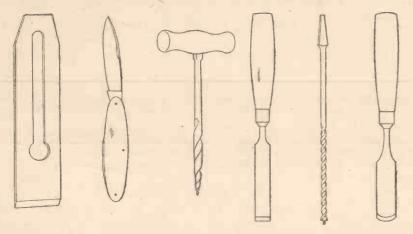
glass top of the lamp and making the vase

HIS little table lamp was designed

primarily for use as a television lamp,

but it looks so attractive when work-

For Every Cutting Tool



.. there's a



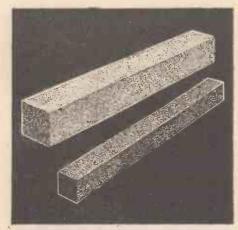
FOR CHISELS AND PLANE IRONS Flat stones suitable for sharpening any flatbladed tool, and for outside-bevelled gouges. In coarse or fine grits of silicon carbide or of ALOXITE abrasive. Combination coarse and fine stones are also available.

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.

Sharpening Stone by CARBORUNDUM



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

Responsible organisations may borrow a 16 mm. sound film on the art of sharpening. This instructive film is in colour, and is entitled 'Here's How'.



This is a precision bi-metal thermostat for the control of alternating currents of up to a mp. 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 \(\frac{1}{2}\)in. x \(\frac{1}{2}\)in.

PRICE. 5/6 each. Post 3d.

For Single Bed 20/- Post Free.

For Double Bed 30/- Post Free.

THE 'MAGSTAT'



* 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 I amp. Price 3/6, Post Free.

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.

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

THERMOSTAT. CS. Convector Thermo- | THERMOSTAT. BW/I. 3 amps., 250 stat for Space Heaters and Low tempera-ture 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 12in. x 2in. A beautiful instrument. Temp. ranges 30/90, 40/100, 40/80, 60/100 deg. F. as required. £2.0.0, post 6d.

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 4 kW and in stem lengths Ilin. to 42in. Please send for our catalogue

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 4\frac{1}{2}in. x 2in. x 1\frac{3}{2}in. x \frac{8}{2}in. x \frac{1}{2}in. x \frac{1}{2}in.

PRICE: 35/-. Post 6d.

Model Pl. Miniature Thermostat for control of domestic Electric frons and special-purpose machines where space is limited. Capacity . 5 amps., 250 volts A.C. screw fixing. Price 9/3 Post 3d.



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 INDI-CATION THAT IT IS ON (SOLDERING IRONS, ETC.)

THE TECHNICAL SERVICES CO

SHRUBLAND WORKS BANSTEAD SURREY



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/Bin. Length closed 12in. Wigh th-ee draws extended 28in. Weight only 12 ozs.

ET-7.0 Post

Ex-Government Toble TriFree. pod 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.

67-73 SALTMARKET, GLASGOW, C.1

Telephone . Bell 2106/7

(Established 1907)

Telegrams: "Binocam," Glasgow

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. Asso 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



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

Also at LIVERPOOL

SLOane 3463

LEEDS MANCHESTER BIRMINGHAM

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, Curcain 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

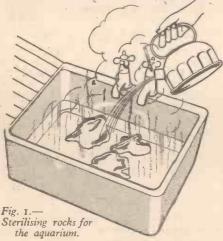
2 MINS. EALING BROADWAY STATION, OPPOSITE BENTALLS

Solving the Problems of Tropical Fishkeeping

Some Useful Hints for the Home Aquarist

By I. W. BRASSINGTON

PROVIDING a few basic rules are followed, fish are probably the easiest of pets to keep, but from time to time fish die for no readily apparent reason, plants fail to grow, etc., and one has to delve



a little deeper than usual to find out why. Some of the less obvious reasons for possible failure are included in this article.

Death of Fish

One hears fairly regularly of the unexplained death of fish, when the aquarium water appears perfectly clear, the plants growing well, and no other evidence of trouble can be seen, and in cases like this there are quite a number of things which should be checked.

First, try to remember what new additions, if any, have been made recently. New fish and plants will certainly be remembered, but it is easy to overlook the addition of a new piece of rock, an ornament, or even a handful of gravel to fill in a depression. Each of these may have contained some substance which has proved toxic to the fish. New rocks, etc., should always be sterilised (see Fig. 1)

How many aquarists remember to wash their hands before splashing about in the tank after decayed leaves? This may appear to be a small point, yet oil, grease, nicotine, etc., will certainly not improve the fishes' environment.

Also check the iron frame of the aquarium for the possibility of water condensing and dripping off newly-painted parts into the water, also from rusted parts of the lighting shade.

If the death in question is an isolated one, consider the possibility of plain old age. The life-span of most tropical fishes is only two or three years, for they breed often, live in warmer water and move about more rapidly than cold-water fish, each factor tending to shorten their life. For this reason also, always buy young fish.

Fish quite often die when they are transferred to new tanks, or if the aquarium water is completely changed. Old water in an aquarium is said to "mature." Living organisms occur, especially of plant life which give the water a greenish tinge and give rise to the term "green water," which are most beneficial to the fish, and a sudden change to sterile water may prove fatal, especially if temperatures are not carefully watched. When setting up a new tank some "green water" from an established tank should be used whenever possible, and the water should never be comple:ely changed.

Failure of Plants

Sometimes, although the fish appear healthy, the plants just will not grow. Often this is due to insufficient light. The average 24in, tank needs 75w-100w for about seven hours each day, but local conditions may make a considerable difference

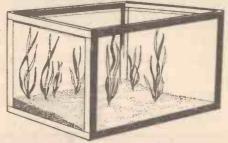


Fig. 2.—Plant heavily with Vallisneria to combat Brown Algae.

ro this figure, e.g., the availability of natural light must be taken into account, as well as the aspect of a tank, if it is in or near a window. The type of plant used is another factor of importance, for such plants as Sagittaria and Cryptocoryne are shade lovers, while the more usual Vallisneria and Myriophyllum like a really bright light.

Plants from local ponds will very frequently die off in an established aquarium, even though they may be of a species normally used in tanks. Sometimes this is due to the fact that they are collected at the wrong time of the year, that is, during the winter months when most plants are resting anyway, so that new root systems cannot be induced to form. But more often than not it is, as with the fish, due to the sudden change of environment—both the chemical content and the temperature of the water being new to them. Plants which are bought, however, even if they belong to the same species, are from a strain whose ancestors have become used to the more artificial surroundings of the aquarium.

pH Value

Aquarists often ask about the pH value of the water, a question which, under normal conditions, they should never need to investigate. For all practical purposes, the pH (meaning percentage Hydrogen) scale is a measure of the acidity or otherwise of the

water. The scale reads from 0 to 14. Seven being neutral, above 7 the water is increasingly alkaline and below 7 it is acid. Simple apparatus is available with which to make tests, but it should be made clear that over-acid or over-alkaline water is only an effect and that the cause of either lies somewhere else, and will be almost certainly shown by other symptoms.

For instance, choice of rocks for decoration purposes may have a bearing on this question. Rock of a chalky nature, such as marble and limestone, may make the water much more alkaline, which in turn will encourage the growth of a soft green alga. (This would be a symptom.) The rocks to use, then, are either insoluble or contain no soluble particles which will have a harmful effect. The best for the purpose are granite, flint, coal or Westmorland stone.

Algæ

The soft green algæ mentioned above, being a symptom of alkalinity, should be cleaned off the sides of the tank and some of the aquarium water may be strained through sterilised peat several times to increase its acid content. Brown algæ is often caused by hard water and looks very unsightly, but it will not normally compete

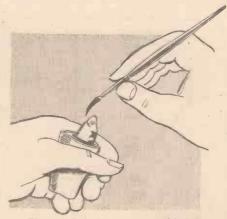


Fig. 3.—Painting an ulcer with iodine.

with other plants, so clean out as much as possible and plant very heavily with Vallisneria around the back and sides of the tank (see Fig. 2).

Two types of illness which are sometimes encountered are dropsy and ulcers. The former is often fatal and it is kinder to kill the patient immediately it is confirmed. The symptoms are a bloated look about the body and later the scales appear to stand on end, making the fish look very rough.

If a fish develops an ulcer it should be held gently but firmly in a soft, wet rag, while the affected part is painted with iodine several times as shown in Fig. 3.

A Touch-operated Electric Fence Control Circuit

Adaptable to a Wide Variety of Contactoperated Devices

OLD cathode trigger tubes combine a high input resistance with negligible standby loss. They are therefore ideal for standby "touch" control applications in which a relay is required to operate when the resistance between two points changes from the normal insulation value. The relay may actuate an alarm, energise a circuit, or perform some other function. The principle is applicable also to some applications in which no relay is used, such as purely electronic switching.

The introduction of primed trigger tubes, such as the Mullard Z803U, with close tolerance breakdown characteristics and high stability, makes possible the design of circuits with very good discrimination against stray or leakage resistance. An example of such a circuit, designed to provide high voltage impulses to a fence when it is touched, is described in this article.

Electric Fences

RI IZOKO

The need to retain animals within a certain area, or within a sequence of areas, makes necessary a form of fencing which is

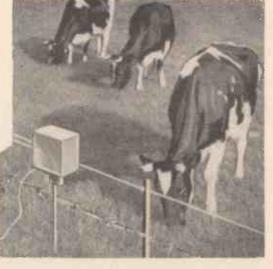
the fence terminal. These controllers operate continuously.

Description of the Proposed

The system described in the present article has been developed in the Mullard Applications Research Laboratory from a controller designed by N. V. Philips' Gloeilampenfabrieken of Eindhoven. It makes use of an RC circuit which is discharged into the

transformer primary by means of a cold cathode trigger tube. A further very important difference between this circuit (and its prototype) and earlier controllers is that energisation of the fence takes place only while an animal is in contact with the wire; thus the battery drain is minimised. If the fence is touched its lowered earth resistance causes the trigger tube to fire. A relay then operates, and a high impedence high voltage pulse is injected into the fence. If the contact persists, the pulse is repeated at a frequency of about I c/s. When the contact

RL A3



fence, its body resistance R touch is in parallel with R leak. The potential divider values are thus altered, and C2 will charge to a higher voltage which is above the critical value for firing.

critical value for firing.

As soon as the tube has fired, the relay RLA (which is pulled in by the partial discharge of CI through the tube) connects the fence to the secondary by means of contact RLA3 and connects C3 across the primary of the step-up transformer TI by means of RLA2. The capacitor discharges through the transformer and delivers a high voltage pulse to the fence. The remaining relay contact, RLA1, short-circuits the trigger tube and ensures that the anode-cathode discharge is extinguished. The discharge of CI continues via RLA1, until it is no longer sufficient to hold in the relay. The current now flowing through R1 and RLA1 is also not sufficient to hold in the relay, and all three contacts return to their original states. The trigger circuit is self-extinguishing. The capacitors C1 and C3 recharge, and the circuit is ready to operate again either when R touch is next applied to the fence, or (if R touch has not been removed) after a short interval determined by the time constants of the trigger circuit.

RLAI REAL REST Solve Rest Rest

both cheap and easily movable, and is at the same time not liable to be pushed through and is not harmful to man or beast. These varied requirements are not completely met by any single conventional fence.

The electric fence, on the other hand, meets them all. It repels effectively, and therefore does not need to withstand pushing. Its structure can therefore be very light (a single plain wire on widely spaced supports is sufficient for most animals) rendering it both cheap and easily movable. If its electrical control circuit is properly designed it is not a source of danger and damage. It compares well with barbed wire.

Barlier circuits for electric fence controllers have normally in Britain been of the battery-operated inductive discharge type, in which the input voltage is chopped by a magnetically actuated mechanical "oscillator" with a period of about one second, or by a simple relaxation oscillator using a gas-filled diode. The chopped voltage is fed to the primary of a step-up transformer, and the high voltage output pulses are delivered to

ceases, the circuit immediately returns to its standby condition.

Although this development of the basic system can provide repetitive action, adaptation for "one shot" applications such as liquid level control and batch counting by touch is possible.

Operation

The fence control circuit is shown in Fig. 1, which illustrates the standby condition. The capacitor C1, charged through R1, maintains a steady voltage between the cathode and anode of the trigger tube. A small priming discharge of 10µA maintained in the tube via R2, ensures that the tube vill operate at a closely controlled trigger voltage and without delay. The trigger standby voltage across C2, which is below the critical value for firing, is determined by the potential divider formed by R6, and the leakage resistance of the fence R leak. A steady voltage is maintained across the capacitor C3, which is charged through R4. When an animal makes contact with the

Practical Values

In the circuit shown:

 $R_1 = 120k\Omega$.

 $R_2 = 10M\Omega$

 $R_3 = 5.6k\Omega$. $R_4 = 200k\Omega$.

 $R_5 = 5.6M\Omega$.

 $R6 = 1.0M\Omega$.

 $C_1 = 2.0 \mu F$.

 $C_2 = 0.33 \mu F$.

 $C_3 = 8.0 \mu F$.

These values are based on an assumed fence leakage resistance of about 1MW. The circuit can, however, be designed to cover a whole range of conditions. The practice of providing alternative outputs for "dry" and "wet" conditions could readily be followed.

The low pre-ignition current of the Z803U (3×10-8A) allows its use in similar applications where the leakage and contact resistances are very high (for example, > 100MΩ).

Transformer

An existing transformer was used. If suitably redesigned it could be taken via R4 to the 240v. line rather than to a 120v. tap: Redesign of the transformer is essential in any practical controller based on this experimental circuit. The present arrangement allows the possibility of moving the 120v. tap to a much higher position on the battery, with, as a consequence, a prohibitively high output delivered to the fence.

24 v. Blower Motors as used for Hedge Trimmer, 19/6. 10K6/115 12-24 volts as used for car heater, 31/-.

as used for car heater, 31/-.

Transformers, Input 200/240 v. Sec. tapped 3-4-5-6-8-9-10-12-15-18-20-24-30 volts at 2 amps., 23/9, 17-11-5 volts at 5 amps., 23/9, 17-11-5 volts at 1½ amps., 11/9, 7.3 volts, 2 amps., 9/6. 12 months' guarantee.Input 240, Output 16 v. Iamp. 14/6. Also Output 200 v. 30 mA. and 6.3 v. 1½ amp., 14/6. 25% Booster Transformers for T.V. Tubes, 14/6. Selenium Rectifiers F.W. 12-6 volt, 100 mA, 4/-. 1A, 9/-. 3 A., 13/6. 4 A, 18/6. 6 A, 31/6. 16 A., 53/-. 250 v. 100 mA-H., W., 12/6. 300 mA., 19/6.

Miniature 12 or 6 v. Relays 10 amp.

Miniature 12 or 6 v. Relays 10 amp. Silver Contacts. SM, DM or SM and B, SCO, 9/3.

Special. Transformer and F.W. Rectifier for 12 v. 1 A. output, 19/6.

Chrome Vanadium H.S. Steel Twist Drills. Sets of 9, 1/16in. to \$\frac{1}{2}\times\$in., 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., 11/6.

Rheostats, 12 v. 1 A., 2/6. 12 v. 5 A., 11/6. New 6 v. or 12 v. Vibrators. 4 Pin, 9/6. Fishing Rod Aerials. Sets of 3 9/-. Plus 1/9 Rail Charge. Bases 6/-. Uniselector Switches. 50 point 3 bank 50 v. D.C., 27/-. 12 v. 25P, 3 B, 27/-. Miniature Model Motors. 12 v. 180 mA., D.C. 2in, x 1½in., 11/-. New 24in. 'T' Square. Ex M.O.S., 6/6.

Chrome Car Extension Aerials, 1st. to 4ft., 13/6.

LESDIX CRYSTAL SET



MINIATURE MOTORS. 4½/6 volts. The lightest and most efficient electric motor in the world. For 18in. motor boats, motor cars, aeroplanes, toys and models. Weight only ¾ oz., size ¾in. dia., ¾in. wide. 10/9 post free.

Fin. wide. 10/y post tree.

THE DIXON-LESLEY HOLE
CUTTER. For use with portable or
bench drills \(\frac{1}{2} \) in. cap. and upwards. Cuts
metal plates with the same case and
efficiency as a 5/16in. twist drill. Steel
teeth removable for regrinding or replacement. Sizes \(\frac{1}{2} \) in. x 1\(\frac{1}{2} \) in. straight, 15/No. 1 Morse, 17/6; No. 2 Morse, 18/6.

No. 1 Morse, 17/6; No. 2 Morse, 18/6. SUPERSLOT SLOTTED ANGLE. For the Home Builder, for benches, garages, sheds, etc. Easily cut with hacksaw or special cutter, can be bolted together to form any desired shape. Manufactured from cold rolled steel of highest quality, degreased, primed and sprayed dove grey and stoved. 10ft. length, 1/5 per foot with 7 nuts and bolts and 2 gusset plates; 100ti. bundle with 75 nuts and bolts and 20 gusset plates, £6.19.0. Carr. extra at cost. extra at cost

D.C. CUTOUTS in bakelite box. 24 volts 60 amps., 15/-, carr. 1/6.

ELECTRADIX RADIOS

Dept. H, 214 Queenstown Road, London, S.W.8. MACaulay 2159

SPECIAL SCREWCUTTING BACK GEARED



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

PRECISION LATHE

35 in. x 161 in. approx.

Today's Finest Value!

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



'VALTOCK' SCREWDRIVER

Grips any slotted screw-Non-magnetic and Fully Insulated. Tempered Steel Blade. Post & Pkg. 4d.



The NEW BELT SANDING MACHINE

Little skill is Needed

compact and efficient light duty unit designed to trim small parts. The low power requirements, namely 1 h.p., proves most advantageous; Max. overall size 14 by 6 ins. Table size 8 by 4 ins. Adjustable fence.

GAMAGES £5/5 or nine monthly 12/8 payments of

Carr. & Pkg. outside our extensive van delivery area. 4/- England and Wales, 5/6 Scotland.

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



Diameter of driving pulleys 3 ins. Face of driving pulleys 3 ins. Driving pulley 3 ins. by \(\frac{1}{2}\) in. Vee by

Steel spindles running in cast-iron bearings Recommended motor pulley 3 ins. Extra belt 30 by 3 ins., fine, medium

Weight approx. 13-14 lb.

4fc., 13/6.

Nite Nickel Batteries. Practically everlasting. 1.2 v. 2.5 A., 2\(\frac{3}{2}\) in. x \(\frac{7}{2}\) in., \(\frac{7}{2}\) in. x \(\frac{7}{2}\) in., \(\frac{7}{2}\) in. x \(\frac{7}{2}\) in., \(\frac{7}{2}\) in. x \(\frac{7}{2}\) in. x \(\frac{7}{2}\) in., \(\frac{7}{2}\) in. x \(\frac{7}{2}\) in. x \(\frac{7}{2}\) in., \(\frac{7}{2}\) in. x \(\frac{7}{2}\) THE RADIO & ELECTRICAL MART 309 Harrow Rd., Wembley, Middx. Nr. The Triangle. Telephone: WEMbley 6655.

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

PERSONAL POSTAL TUITIO

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? [

Architectura Building Carpentry Commercial Art Dieset Engines Draughtsmanship Electrical Eng. Electric Wiring Forestry

Locomotive Eng. Machine Design Machanical Eng.
Motor Engineering
Plumbing
Power Station Eng.
Quantity Surveying
Radio Engineering
Sanitary Science

Surveying Languages
Telecommunications Mathematics Television Textiles

Book-keeping

English Geography Journalism

Methods
Police Subjects Salesmanship Shorthand Short Story Writing and many others

Modern Business

OR WHY NOT OBTAIN A QUALIFICATION?

A.M.I.C.E. A.M.I.Mech.E. A.R.I.B.A.

A.M.I.Struct.E. A.M.I.Mun.E. A.M.S.E.

A.A.C.C.A. A.C.W.A. A.C.I.S.

A.C.C.S. A.R.I.C.S. A.A.I.

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

Post this coupon NOW!



BENNETT

(Dept. J.76 PT) SHEFFIELD

Please	send ine	the Prosp	ectus	on	 	• • • • • • • • • • • • • • • • • • • •
					 	and my fre

copy of "Train your mind to SUCCESS."

ADDRESS

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

2/0

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.

V.H.F. 1456 RECEIVER, 27/6. Ex-W.D. New condition. Incl. 6 valves. Receives T.V., sound and amateurs. 30.5-40 mc/s LF.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.

R.F. 24 UNIT, 7/9. Including valves. Drawings FREE with order. P. & P. 2/6.

TELEPHONE SETS, 7/9. Ex-W.D. Wireless remote control unit. E. Mk. II. New condition, morse tapper, switched, jack plugs, etc. Less phone. Ins., carr. 3/6.

12 VOLT CONVERTER, 7/6. Ex-W.D. 275 and

500 v. out. Used, need cleaning. Carr. 3/6.
24 VOLT CONVERTER, 7/6. Motor generator, 24 v. in 200 v. 50 m.a. 13 v.-1.8 amp. relay. New condition. Carr. 3/6.



9

Carr. 3/6.

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.

IMPELLER 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 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 in. dia. P. & P. 3/6.

CANDELABRUM, 19/9. Attractive 3-light lounge fitting, including flex, lamp holders and 3 shades. P. & P. 2/9.

				MA	IN2 IK	ANSFO	KMEK2	
350-0-350	v. 80	m.a.	4 v.,	4 v.	heaters,	200-250	v. prim.	
350-0-350	v RC	m 2	4 v 1	2 v	heaters	200.250	v prim	

000 0 000 1, 00 111111, 1 1			*** ***	do La
350-0-350 v. 80 m.a. 4 v.	. 12 v. heaters, 200-25	0 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 shroude			***	5/9
611 00611. 11011 3111 0000	(All above 2/3			0/2
	(All above 213			

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 O.P. TRANSFORMERS, 1/3. Standard size 2-5 ohms. Post 1/-. 20 for £1. P. & P. on 20, 5/6.

FREE Cata'ogus.

DUKE & CO.

621/3, ROMFORD ROAD, MANOR PARK, E.12. ILF. 6001-3

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

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



Its real value



It's a Gallaher Tobacco

TAKE UP PELMANISM

And Develop Power

PELMANISM is a training in power. It is a means by which knowledge is more easily acquired, retained and used; a means through which natural aptitudes find greater expression and by which individual faculties are developed. The main idea is all the time on use, for with practice and use more knowledge comes, and and use more knowledge comes, and skill, wisdom and power grow.

"First-class" Minds

To-day trained minds are more than ever necessary. Also they are more in demand. Efficiency is the need of the moment—and mental efficiency above everything else. To do your job superlatively well must be the desire and duty of every man and woman to-day, and the best way of making yourself "first-class" from the point of view of personal efficiency is to train your mind by means of Pelmanism.

What Pelmanism Does

Pelmanism eliminates the feeling of Frustration and Inferiority, and many other weaknesses as well. So why other weaknesses as well. So why suffer from these mental failings any longer ?

Pelmanism develops and strengthens your Will-power, your Determination and your powers of Initiative and Concentration. Whatever your age, whatever your occupation Pel-manism will free your mind from unhappy conditions and change for the better your whole outlook on

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

A True Philosophy

Pelmanism is a true philosophy of living for ordinary sensible people who wish to make the best of themselves at all times and under all circumstances. The Pelman Institute has won and held its unique position through all wars and worries, trials and tribulations during the last half century. To-day Pelmanism is appreciated as much as ever. The test of time has proved the power of Pelmanism power of Pelmanism.

The general effect of the training is to induce an attitude of mind and a personal efficiency favourable to the happy management of life.

Send for the 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 a book entitled "The Science of Success," which will be sent you, gratis and post free, on application to: application to :-

PELMAN INSTITUTE

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

	WELbeck 1411	
2	POST THIS FREE COUPON T	O-DAY
1	Pelman Institute,	
-	130, Norfolk Mansions, Wi	gmore
	Street, London, W.1.	
-	"The Science of Success," ple	ease.
0 0 0 0	Name	***********
	A 3 3	

The details of the existing transformer (for use at primary voltages not exceeding 135v.) are as follows:—

Laminations, 0.5 mm. Stalloy E + 1.

Window area, 8.ocm².

Stack, 20 × 25 mm.
Primary, 600 turns of 0.35 mm. (28 s.w.g.) tested to 2kV.

Secondary, 9,000 turns of 0.08 mm (44 s.w.g.) tested to 10kV.

Relay

Contact RLA2 should preferably operate later than RLA3.

Safety

The circuit is battery-operated, in accordance with normal British practice. It is generally considered that mains operation, with its possibility of great available power

under certain fault conditions, is inherently rather less safe than battery operation. And, of course, the need for a mains connection reduces movability. It is significant that the safety recommendations for mains units are very exacting.

Standard specifications or (occasionally) regulations, have been drawn up in many countries. The British specifications are neither legally compelling nor legally protecting; they are guides to what has appeared to be good practice.

A thorough study of American practice, with particular reference to safety, can be found in "Agricultural Engineering"—which is the journal of the American Society of Agricultural Engineers. The gradual development of safety regulations, from the original code instituted in Oregon in 1936 to the present code of the American Underwriters Laboratories, is discussed, and the

performances of four main types of controller are critically examined:—

(i) Inductive discharge: usually batteryoperated, with a mechanical interruptor and an induction coil. (This is the type normally used in Great Britain.)

(ii) Capacitive discharge: similar to (i) but with capacitor output.

(iii) Intermittent a.c.: a current-limiting transformer and an oscillating motor or positive make-and-break mechanism—usually in the primary.

(iv) Continuous a.c.: continuous high voltage from a transformer secondary.

The general conclusion to be drawn from this American work is very much in line with the views implied by the British Standard specifications: namely, that the most advisable system is one which provides a strictly limited and closely controlled impulse to the fence, and is preferably battery-operated.

ArUs

Fig. 1.—The pan and tilt head in position on the tripod.

THIS device was mainly designed to facilitate tilting rather than panning. The base was made first and consists of a circular piece of 4in. thick plywood 3½in. in diameter. A square hole was sunk three-quarters of the way into the centre of the base, and the centre of this drilled to take a 4in. bolt. A metal strip Iin. long and 4in. wide was then screwed down on top of the bolt. If this is left protruding a little, the strip when screwed down will hold it really firm.

Four small right angle brackets are required next, 1 in. \times in. thick. If they cannot be obtained from the local hardware shop, they can be made easily.

The Camera Platform

This was designed to take a Rolleicord and measured 4in. long × 3in. wide. The platform was faced with a piece of an old cork table mat and black Sellotape used to make a border around it. A hole to take a \$\frac{1}{2}\text{in.}\$ bolt was made \$1\frac{3}{4}\text{in.}\$ from the front of the platform. The bolt is of the type used

A Pan and Tilt Head

An Accessory for Use with Your Tripod

By D. G. JONES

to retain the camera in its case and has, therefore, the same thread as the tripod bush.

the tripod bush.

The brackets were drilled next with two gin. holes in each angle for screwing to the base and the platform. A nut and bolt were used on the left hand side and a bolt and wing nut on the right.

The Arm

A 6in, nail was used for the arm and it was drilled with two holes for screwing to the platform and a rubber knob fixed to the end. This was purchased from a cycle store for 6d. It should be possible to build the complete pan and tilt head for less than 5s.

The system for panning is to release the retaining screw on the tripod, thus allowing the

head to pan.

The device was designed to suit the author's own camera and tripod, but can easily be adapted to meet individual requirements.

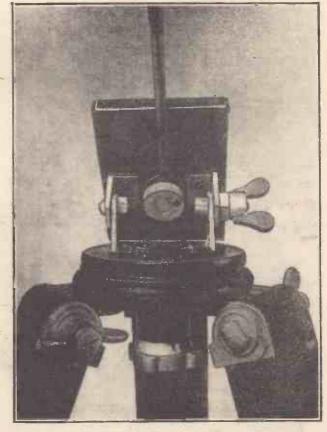
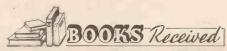


Fig. 2.—A close-up view giving details of construction.



The Fascination of Numbers. By W. J. Reichmann. 175 pages. 15s. net. Published by Methuen and Co., Ltd.

DESIDES containing a great deal for the expert in mathematics, this book will also be of interest to the student and to the general public. It is not by any means a textbook, but contains much of serious interest to the student as well as recreational interest to the seriously minded reader. The book sets out to show the ways in which numbers or groups of numbers are related to each other; how they may be expressed

in terms of each other; and the general nature of number behaviour in varying circumstances. To understand the greater part of this book, little more than elementary mathematical knowledge is necessary. Chapters on magic squares, number peculiarities, pseudo-telepathy and mathematical recreations form the book's lighter side. A short index is included.

Perspective Drawing for Technical Illustrators and Draughtsmen. By Manktelow. 120 pages. 30s. net. Published by George Newnes, Ltd.

AS the title indicates, this is a book for the art student, technical illustrator and draughtsman. It deals with one-point, two-

point and three-point perspective and the preparation of complex subjects with the aid of the grid or perspective underlay. Its purpose is to enable the principles of these various methods to be understood by explaining them in the form of a series of progressive steps.

Included in the contents are chapters entitled Projection Classified; Effects of Perspective; The Cube in Perspective; The Grid or Perspective Underlay; The Perspective Circle; Examples of Finished Work; Perspectives of Inclined Objects and Applying Orthographic Drawings to the Perspective Grid. The volume is competently and extensively illustrated and an index is included.



A Catapult Gun

A Device for Firing Arrows at

a Target

THIS instrument is simple to make and use, and will provide endless amusement when aimed at a target. The materials required are:—

Some pieces of strong, tough wood, scrap pieces of 1/16in. and \(\frac{1}{2}\)in. thick sheet iron or brass, a few \(\frac{1}{2}\)in. thick bamboo sticks,

along their length to form the barrel. A slot should now be cut at one end to receive the trigger. (See Figs. 1 and 2.)

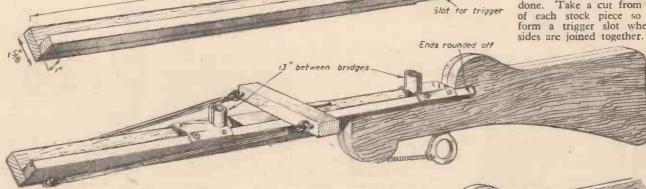
Cut the trigger from in. sheet iron or brass to the shape and dimensions shown. Cut with chisel or hack-saw, drill holes for

and butt to the shape and dimensions shown in Fig. 3. This can

be done with a fret- or bow-saw, or with a band-saw at any joiner's shop.

Note that suitable bevels

should be cut with a tenon-saw to accommodate the end of the barrel after the shaping has been done. Take a cut from inside of each stock piece so as to form a trigger slot when the sides are joined together. (See



hen's feathers, screw eyes, a small spiral spring, thin cord, aeroplane elastic, screws and nails, sin. thick wire nail, glue, paint and oil.

Construction

Obtain two lengths of strong wood—28in. long x \frac{1}{2}in. thick x Iin. and I\frac{1}{2}in. broad respectively. Join these with glue and nails

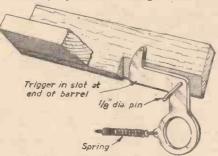


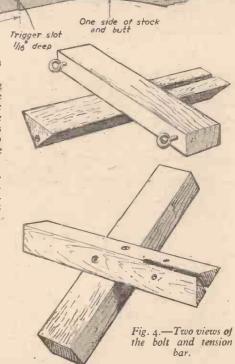
Fig. 2.—The trigger in position

Fig. 1. — The completed gun and details of the trigger slot and barrel.

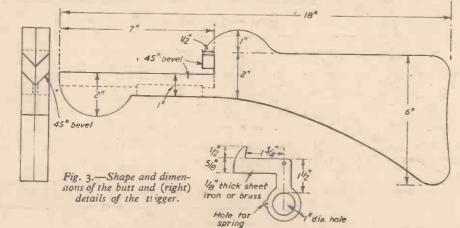
pin, spring and finger, and smooth off with a file (Fig. 3).

Fix the trigger in the barrel slot, using a piece of sin. wire nail as a pin. The pin should be an easy fit through the trigger hole, but a tight driving fit in the sides of the barrel. See that the trigger is not fitted too high nor too low. The top of the trigger should be positioned in the slot as shown in Fig. 2.

The stock and butt are made together. Obtain two good pieces of strong wood §in. thick, having the grain running lengthways. Cut out the two separate sides of the stock



Figs. 2 and 3.) The two sides of stock and barrel may now be joined by glue and short screws after which any inequalities round the edge of the shape can be smoothed down with a rasp file. The barrel should now fit snugly into the bevels of the stock, and should be (Concluded on page 43)



READERS'

SALES AND WANT

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.

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. Techniview 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.

TLLUSTRATED CATALOGUE No. 13 Control Equipment, 2/2, refunded on purchase of goods; 2/6 overseas seamail, Arthur Saliks Radio Control Edu., Department P.M., 93. North Road, Brighton,

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

WOODWORKING

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 Myblo 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

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, Nots.

PHOTOGRAPHY

PHOTO-ENLARGER Castings and Beliows, for 35mm., 2½in. x 2½in., 2½in. x 3½in., 35/- per set; s.a.e. for details. V. J. Cottle, 84A. Chaplin Road. Easton, Bristol, 5.

BELLOWS, Camera, Enlarger, Process, Industrial. Collapsible Machine Guards. Beers, 4, St. Cuthbert's Road, Derby. (Tel.: 41263.)

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.

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., Ch. Hd. and Csk. State 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 24d. stamp for catalogue
and details of special offer.
Scientific & Technical Supplies Ltd.,
Dept. P.M., 9, Wellington Circus,
Nottingham.

TELESCOPE MAKING.—Non-Achro Object Glasses, 2\in. diam.. 40in. 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.

1/3 H.P. B.T.H. MOTORS and Switches for sale, 1,426 r.p.m. for 400/440 volts, 3 phase, 50 cycles. F. J. Edwards Limited, 359, Euston Road, London, N.W.1.

MOTORIST BARGAIN.—"Little Giant" (U.S.A.) Screwing Sets. Jin. to Jin. combination, national coarse, national fine, 10 dies, collets, V guides, tap to each size, diestock, tapholder, polished case, £9 complete S. Tyzack & Son Ltd., 341-345, Old Street, Londou, E.C.1.

S. Tyzack & Son Ltd., 341-345, Old Street, Londou, E.C.1.

MAIL ORDERS.—New bargains, post 1/- extra under £1. Sets K.S. Drills No. 1-60 with stand, 50, -; Vanadium 17 drills 1/16in.-5/16in., 3/16in. 7/32in., 4in., 2/- each.; Stillson Wrenches, 6in. 4/6, 8in. 6/-, 10in. 7/6; Dies 1/5/16in., 2/- 8/6; Hand Drills 4in. 10/-; Breast 4in., 27/6; Drill Chucks 4in. No. 1 or 2 M.T., 10/6, superior, 16/6; Burnerd Independent Chucks 4in. 70/- 44in. 75/- 6in. £6/4/6; H.S. Small Milling Cutters, 6 different, 9/-; H.S. Tool Bits, 4in. 1/6, 5/16in. 1/11, 4in. 2/3; Vee Blocks 3in. 6/-, 4in. 1/6; Angle Plates 3in. 6/-, 4in. 10/-; H.S. Centre Drills, size 1 2/-, 2/3, 3/9, 4/3/-; Precision Drill Chucks 4in. No. 2 M.T., 44/-; Machine Vices. 18/6; Wood Chisels, set 4in., 4in., 4in., 4in., 1in., 16/-, 12 different, 1/32in.-9/16in. round silver steet, 10/-; Expanding Wood Bits, 4in.-14in., 41/-, 7/8in.-3in., 19/- S. Grimshaw, 7. Hall Street, Manchester, 18.

A LBA SHAPER (14in.), tip-top condition, done very little work, 2180 as it stands. Devon Instruments Ltd., Countess Wear, Exeter.

DOXFORD 41N. C. LATHE, 48in. bed, 230 volts, new condition. 287/10/-; 12in. Wood Surface Planer. 400 volts, new £87/10/-; Wadkin Senior Type Pattern Makers Milling Machine, 400 volts, weight 30 cwt. accept £85; Brooks 2 h.p.. 400 volts, 1,400 r.p.m., new, £15; Twin-cylinder Air Compressor, about 4½ C.F., £5. Andrews, Willow Green House, Little Leigh, near Northwich.

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

HANDICRAFTS

MUSICAL BOX MOVEMENTS

14/9 post free.

More new kits and tunes available from 21/6 complete. Please send 21/d, stamp for FREE illustrated brochure.

The SWISSCROSS Co. (Dept. VII6), Winifred Road, COULSDON, Surrey

ELECTRICAL

AIL 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.)

BROOKS ELECTRIC MOTORS

Single Phase. § h.p. 1,425 r.p.m. £7. 5.0 § h.p. 3,000 r.p.m. £9. 5.0 I 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. ‡ 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 Vacs. and Drills. Emergency Rewinding Service to 30 h.p. available. Hodson (Croydon) Ltd., 75A, George Street. Croydon, Surrey.

MODEL ELECTRIC MOTORS.

Model ELECTRIC MOTORS.

Manazingly 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‡ln. x
1‡ln.; weight, 1joz. Drives: Boat-Propellers, lin. and 1‡ln.; Aero-plane 5in. and 8in. Model. Electric Motors (Dept. H.), "Highland." Alkrington Green, Middleton, Manchester.

EDUCATIONAL

EARN IT AS YOU DO IT—we pro-bined with instruction in Radio, Television Electricity, Mechanics, Chemistry, Photography, etc. Write for full details to E.M.I. Institutes, Dept. PM47, London, W.4.

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.

CRAMMAR SCHOOL Entrance Examinations. Free Attainment testing for children 7½-13½. Write for details of Simplified Postal Courses to the Registrar, Mercer's Correspondence College (Dept. CG2), 69, Wimpole Street, London, W.1.

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.

PATENTS

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

! 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.

WATCHMAKERS

WATCH REPAIR SERVICE, un-rivalled 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' too's, 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.,

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.

YOUNG & SON, Watch, Clock and Jewellery Repairers, Tool and Material Dealers, 133, London Road. Chippenham, Wilts.

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/-5; state bore and if rip or crosscut tooth; cash with order; postage paid. Dept. "C." J. A. Fowle, 18-22, Bell Street, London, N.W.1. (Established 1840.)

MISCELLANEOUS

BULD YOUR OWN REFRIGERATOR. all components available at reasonable prices. Frigidaire flowing cold units. £5; small units, Kelvinator, etc.. £4; ‡ 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.)

A QUALUNG and Compressor Equipment, Ballraces and Miscellaneous Items. Lists 2d. Pryce, 157, Malden Road, Cheam.

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

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

MOTOR CYCLISTS build Towing Caravan, Plans 2/-. Burns, 6, Niddrie Road, Portobello, Scotland.

SMALL PADDINGTON FIRM wishes to contact local skilled Tool-maker with use of workshop for making parts, small tools, jigs, etc., spare or part-time. Box 136.

STEAM CARS, Boats and Small Stationary Power Units are described in "Light Steam Power." Your copy and comprehensive illustrated lists of drawings, including Light Steam Car Power Unit, and Castings for 3/8. "Light Steam Power." Kirk Michael, Isle of Man, United Kingdom.

UNRIVALLED IN ITS CLASS

The E.W. 24 in. x 10 in. lathe. Model "A" plain lathe, £17/-/- Fully convertible to back gear and screwcutting. Let us quote you. We specialise in this lathe and can still offer best credit terms. All accessories from stock. Descriptive pamphet & lists, etc., S.A.E.

OUTBOARD CLUTCH-BRAKE

Fits on any Motor Shaft † in. or † in. dia. up to † h.p. This unit when fitted in place of normal Pulley on Motor Shaft saves continual starting and stopping of Motor. Suitable for Lathes, Shapers, and other Machine Tools. Price £6 10 -, or £1/10 - Deposit and five instalments of £1. Carriage and Packing extra. Details S.A.E.

3/8in. HIGH-SPEED SENSITIVE POWER BENCH DRILLING MACHINE

Price £6/10'- net, or 10'- Deposit and six monthly payments of £1, carriage and packing extra.
(S.A.E.) for specification and descriptive pamphlet.

DRILLS : DRILLS : DRILLS Sets of Drills and Auger Bits in Wallets and Cases. Competitive prices. Send for details. S.A.E.

WANSTEAD SUPPLY CO. 30 THE BROADWAY, WOODFORD GREEN, ESSEX

IRISH READERS

We are CORONET stockists

Come and see them working or write for Leaflet.

H.P. available as under: Minorette Complete, £4.10.0 deposit. Minor (§ H.P.), M3 with swivel base and 7in. saw table, £5.0.0 deposit.

Major (I H.P.) with 8in. saw and planer unit, £8.0.0 deposit.

WE SELL GOOD TOOLS OF ALL KINDS

W. B. KAY

53 Lower Georges St., Dun Laoghaire, Dublin. Phone: 83443.

THE WORLD'S GREATEST BOOKSHOP

FAMED CENTRE FOR

Technical Books

STOCK OF OVER THREE **MILLION VOLUMES**

119-125 CHARING CROSS RD. LONDON WC2

Gerrard 5660 (20 lines) Open 9-6 (inc. Sats.) Nearest Station: Tottenham Court Rd.

92,000 PIANISTS



AUTOMATIC (TIME) SWITCHES

New and reconditioned 15 day clock-work and electric switches

from 35/-

Send S.A.E. for illustrated details to :-DONOHOE (TIMERS) GEORGE STREET, NORTH SHIELDS,

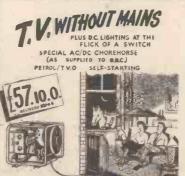
HEAVY DUTY AUTO-TRANSFORMERS

(ZA22917). Input and output 100/120 v., 150/170 v., 200/250 v., 40,60 cycles, 500 watts approx. All brand new in maker's boxes, 49/6. Part cost packing and carriage 7/6.

BRAND NEW ELECTRIC MOTORS

1/6 h.p. Standard ½ in. shaft, continuous 1,400 r.p.m. rating made by Hoover, Crompton Parkinson, etc. 120-125 volt A.C. 50 cycle single phase or 110-120 v. A.C. 50 cycle single phase, 59/6; 220-230 D.C., 55/-; 200-220 v. A.C. single phase, 79/6. Part cost packing and carriage 7/6 in each case.

WALTON'S WIRELESS STORES 46, 47 and 48, Stafford Street, WOLVERHAMPTON





AIR COMPRESSORS AND

Compressed air equipment to pro-fessional 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

GENERAL CERT

THE KEY TO SUCCESS & SECURITY

Essential to success in any walk of life! What-ever your age, you can now prepare at home for the important new General Cert. of Viducation Exam, on "NO PASS—NO FEE" terms. You choose your own subjects—Educational, Commercial of Technical. Recently announced big extension of subjects gives everyone the chance to get this valuable Ceruticate.

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. 160 29-31, Wright's Lane, London, W.S.

"NO PASS-NO FEE"

FREE DRAWINGS showing STEAM and HOT-WATER

Readers of "Practical Mechanics" are rectairs of Practice Mechanics are offered, without charge or obligation, useful drawings showing correct installations of thermostatic control, steam trapping and automatic air venting equipment on a wide variety of steam and hotwater heating and process applications. Ask for current list from which to select.

INSTALLATIONS

SPIRAX-SARCO LTD.

(TECHNICAL DEPT.) Cheltenham, Glos.



A "FERROUS" ELECTRIC ARC WELDing SET will complete your workshop
equipment. For joining and reinforcing,
from approx. 146° up to any thickness,
Mild Steel, Wrought orl/Maileable Iron.
Type F.M.60 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 PRODUETS (MFC) LYD.

FERROUS PRODUCTS (M.E.C.) LTD., Church Rd., Croydon, Surrey. CRO 8351/3

CHEMISTRY APPARATUS Send 3d, stamp for

COMPLETE PRICE LIST



Booklets : "Experiments" 1/2 'Fornulas' 1/2 " Home

Chemistry" new ed. 29 (Post Paid.)

BECK 60 HIGH STREET Stoke Newington, London, N.16

BUILD YOUR OWN CANOE

Printed Illustrated Instructions 1/6

TYNE FOLDING BOATS LTD. 206 Amyand Park Road, St. Margaret's, Twickenham, Middx.

ACCURATE MARDHITTING I AIR PISTOLS ATR RIFLES . ACCESSORIES Write for cetalogue WEMEY & SCOTT Ltd.

GOVERNMENT SURPLUS BARGAINS

SURFLUS DARGERIAN
TRIPODS. Unused. 33° 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
WITHON GEAR, approx. 41
(24-45-80) 6-12 v. D.C., 1 amp., ea. 15/-, post 1.8. MOTOR ONLY as above (dimensions

3" x2" x2") ea. 7/6, post 1/-, BATTERY CHARGING TRANS-FORMERS. 10 v. & 16 v. A.C. (for 6 & 12 v. charging at 1 amp.), ea. 17/6, post

RECTIFIERS to suit above, ea. 7/6.

RECTIFIERS to suit above, ea. 7/8. post 3d. These transformers & rectifiers will rectifiers will rectifier will rectifier to the voltage motors.)

Fit the state of the voltage motors.)

Fit the state of the voltage motors. The transformers will rectifie the voltage motors. The voltage rectifier will rectifie to the voltage rectifier will rectifie the voltage rectifier and rectifier will rectifie the voltage rectifier will rectifie the voltage rectifier and r

MILLIGANS

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

SERIES III **NUCLEAVE PRESS**



Ask your Tool Dealer, or send for details to:-

Sole Manufacturers,

FITZNER LTD. 197-199, KINGS ROAD. KINGSTON-ON-THAMES

"STAR" FIRST QUALITY EXTENSION ADDERS DOWN

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

The rust-proof bettings.

6)- deposit and 6 monthly payments.

CASH 6 m¹/₂.

Closed Extended PRICE pyunts.

81t. 14ft. 24 10/- 16/9

10ft. 18ft. 25 10/- 29-
12ft. 21ft. f8 18:- 25/6

14ft. 25ft. 18 5:- 31/
16ft. 29ft. 18/5:- 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

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 glued and screwed in place. See that the

two slots register.

The trigger is tensioned by a spiral spring, obtainable from any cycle dealer, one end through a small hole in the trigger, the other end made fast to the bottom of the stock by means of a screw. (See Fig. 1.)

Fig. 4 shows the complete bolt and tension bar. The bolt is a piece of hardwood 6¼ in. long, and of right-angle triangle section. A slot 3/16in. wide should be cut along a distance of 21 in, from one end of the bolt and a suitable length of kin. wire nail driven into a drilled hole kin. from the head of the slot.

The tension bar is a piece of plain tough wood 74in. long, glued and screwed to the middle of the bolt. Two screw eyes receive

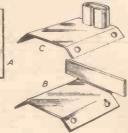
the elastic.

Try the bolt in the barrel and make sure that the trigger, etc., is so fitted that the bolt will be securely held against the tension of the elastic when completed. Two bridge pieces should now be cut from in thick sheet iron or brass. Cut and slit these with hack-saw and bend to shape as shown in Drill four holes in each and fix securely to the top edges of the barrel with stout screws in the positions shown in Fig. 1. The bolt should slip under these bridges as far as the tension bar.

Put two strong screw eyes in the barrel, one either side, about rin. from the muzzle.



Fig. 5. — Three stages in forming the bridge pieces.



Obtain 3 yds. of 1in. broad model aeroplane elastic and cut to two equal lengths of 1½ yds. Thread a piece three times through the screw eyes in the barrel and tension bar and join the ends by a secure knot. This will give strength equal to six single lengths of elastic and will drive the arrows a considerable distance. Thread the other side in the same way. pins of the trigger and bolt, and the gun is finished. The "catapult gun" is is finished. designed to fire 12in. bamboo arrows, but small stones of a size that will go under the bridge piece may also be used.

Warning must be given regarding the danger of accident which may result from the misuse of this gun. Do not fall into the error of pointing the gun at anyone loaded or unloaded. The gun should not even be poised in the direction where any person happens to be. It is not intended to be used in mimic warfare, but only in target

THE JUNIOR CHEMIS

Elementary Chemical Analysis

HIS decomposition can be hastened by introducing a lighted match into the test tube. Notice the brown colour of the nitrogen peroxide, and smell it gently.

Now heat some potassium nitrate strongly in a test tube, for a few minutes, holding the test tube with a piece of folded paper, as shown in Fig. 3. Allow the test tube to become cold before placing it in the test tube stand. Next, add dilute sulphuric acid to



the solid in the test tube; nitrogen peroxide should be evolved.

When potassium nitrate is heated, potassium nitrite is formed. Potassium nitrate gives no nitrogen peroxide with dilute sulphuric acid, but potassium nitrite does.

Table 2.

	Gas	Colour	Smell	Confirmatory test
	Carbon dioxide	_	Very slightly acid.	Turns lime water milky.
	Sulphur dioxide	. = =	Burning sulphur	Chromate paper becomes green*.
	Hydrochloric acid	Colourless, but fumes in air.	Acid	Forms white fumes with ammonia gas. A solution of the gas gives a dense white precipitate
The second	Nitrogen peroxide.	Brown or brownish yellow.	Acid.	with silver ni- trate solution.

* Hydrochloric acid gas also turns a chromate paper green, but only after a long time.

(Concluded from September issue.)

Detection of Gases

When testing gases, notice the following properties:

I. Colour.

Smell (carefully).

The colour and smell usually suggest a certain gas, and then a suitable experiment may be performed to prove if you have judged correctly. Table 2 will help.

Fig. 4.—A brown ring at the junction of solutions confirms nitrate.



Examination for Acid Radical

When testing for an acid radical, use the table given below. It is important that the tests should be carried out in the order stated.

Always take a small quantity of the substance to be analysed, and if a gas is liberated upon treating it with acid, smell it very carefully.

A nitrate cannot be tested for when nitric acid is present, nor a chloride when hydrochloric acid is present, nor a sulphate when sulphuric acid is present.

This article is the final one in the present series, which was designed especially for our junior readers.

		1 40	16 3.		
Experiment	Observation	Inference	Experiment	Observation	Inference
Warm the sub- stance with di- lute sulphuric acid.		Carbonate or bi- carbonate. Note.—A strong solution of a bicarbonate gives	Warm the sub- stance with strong sul- phuric acid.		Same as with dilute acid.
		carbon dioxide upon heating, but a carbonate does not.	- '.	Hydrochloric acid evolved. Nitrogen peroxide	Chloride.* Nitrate.†
-	Nitrogen perox- ide evolved.	Nitrite.	Add barium	evolved. Dense white pre- cipitate	Sulphate or bi- sulphate.
	Sulphur dioxide evolved, and a precipitate of sulphur.	Thosulphate.	tion and dilute nitric acid	(insoluble).‡	Note —A bisul- phate is acid to litmus, but a sul- phate is very slightly acid.

* Confirm by making a solution of the substance in distilled water, and adding silver nitrate solution and dilute nitric acid. A dense white precipitate insoluble in the nitric acid indicates chloride. A small quantity of the white precipitate is merely an impurity.

Prepare a solution of the substance in cold, distilled water, and then a solution of ferrous sulphate, by dissolving two or three crystals in about 2in. of cold, distilled water in a test tube. Now mix these two solutions in a test tube, and carefully pour a little strong sulphuric acid down the side of the tube, which should not be shaken.

A brown ring formed at the junction of the solutions confirms a nitrate (see Fig. 4).

‡ A small amount of the precipitate denotes an impurity.

A NOVIEL BAIROMIETER

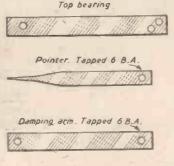
Details of a Cellophane Actuated Weather Indicator

PIECE of Cel-9in. long in the dry reach length of 95 in. when it is saturated with water: it is this property that is used Variation here. the atmosphere will give only in. movement, but the com-pleted hygrometer in Fig. 1 magnifies this movement. The Cellophane strip is between clamps, to the lower of which is attached a length of silk. The other end of the silk wrapped round a drum mounted on a spindle, with a pointer

in diameter. If it is very much less, the magnification of the movement will be so great that the pointer will run off the scale. In line with the pointer at the opposite end of the spindle is fixed another strip of brass with a small hole drilled in the outer end A little lead weight is hung on here to steady the pointer.

Set up the spindle in its bearings truly perpendicular to the baseboard (Fig. 3) and see that it turns quite freely and without undue shake in the bearings. The silk thread is passed through a hole in the periphery of the drum and secured by a knot inside. The free end is passed once round the drum anticlockwise and fixed to the lower brass clamp. The faces of the clamps which come into contact with the Cellophane must be true and smooth (Fig. 4). The lower half of the bottom clamp has a small hole drilled near its edge for attaching the silk while a nick is cut with a small round file in the top half The top clamp is so to clear this hole. mounted that it provides for adjustment of

the setting of the pointer. adjusting rod threaded 2B.A., equipped with and a knurled ebonite knob. Rotation of the knob moves the clamp in the desired direction to raise or lower the pointer. Shape the guides for the clamp with care, the clamp runs easily with the least possible sideplay. A piece of 4B.A. rod is screwed into the underside of the clamp and secured with a nut behind the baseboard.



Bottom bearing

For wood screws, drilled half through

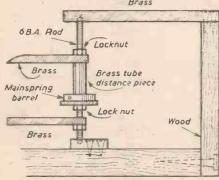
Fig. 2.—Details of the bearings

Fig. 1.—The completed 66 barometer.

attached. A slight rotary movement of the drum makes a comparatively large movement of the tip of the pointer.

The Base

and pointer. The base on which the working parts are mounted is a wood batten 2in. X in., and 16in. long. Polished mahogany will give an attractive and workmanlike finish to the instrument. The pointer and drum are mounted on a threaded rod as a spindle. ends of the rod are turned off to a point, and the bearings are made by drilling halfway through two brass strips (Fig. 2). The drum is the mainspring barrel from an old watch. This should be about \(\frac{1}{2}\)in. Arass



Baseboard Fig. 3.—The assembly of the movement.

The Guides

To cut the slots in the guides, mark out with dividers, drill holes (4B.A. clearance) at each end of the slots, then more holes close together along their length

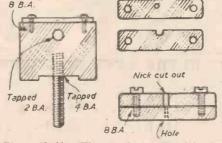


Fig. 4 (Left).—The top clamp. (Right) The bottom clamp.

(Fig. 5). Chip out the webs with a chisel and finish to the scribed lines with a file. fix the top guide on the baseboard with two screws. Drill right through the baseboard at each end of the slot and clear out the slot with a sharp chisel. This will give the correct location for the brass guide underneath. The assembly of the top clamp and adjustment is shown in Fig. 6.

The scale is drawn on paper and glued to a wooden platform fixed between the drum and the pointer, clos: underneath the latter. A piece is cut away to clear the spindle. Lines at every ten degrees will be

ample for all practical purposes. The instrument is intended to work in a vertical position, so you will need to fix a brass hanger at the top of the baseboard.

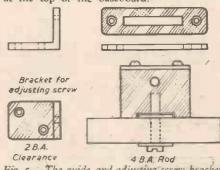


Fig. 5.—The guide and adjusting screw bracket.

The Cellophane

Standard Cellophane, thickness 600in., is sed and make sure it is not "moistureused and make sure it is not "moisture-proof" Cellophane. Hold the sheet up to the light and fairly wel defined lines will be seen running in one direction across it. Cut a strip lin. wide off the edge at right angles to these lines; this direction of cutting takes off a strip with the greater expansion. Use a razor blade or a very sharp knife, and cut with one sweep of the blade. Do not handle the strip more than necessary.

Set the top clamp midway in the guide slot, fix the ends of the Cellophane strip in the clamps, leave 1 in. projecting through the top clamp for subsequent adjustments and cut off the remainder. There should be cut off the remainder. about 9in. of Cellophane between the clamps. Now hang up the instrument and make sure that the silk is wound round the drum. Adjust the top clamp till the pointer is horizontal Slight vibration of the Cellophane zontal makes the pointer wobble up and down. counteract this tendency, hang a small blob of lead on the damping arm by means of a wire hook. Vibration and draughts will then not affect the pointer so seriously.

To test the hygrometer hold it above a gas burner. Keep it at least 2ft above the flame, since scorching of the Cellophane destroys its properties. The pointer rapidly rises as the Cellophane dries. Play the steam from a kettle on it and it will fall as rapidly.

Remove all the brass fittings from the baseboard and stain and polish the latter and then reassemble.

Adjusting For Use

Dry over the gas as before until the pointer will go no higher, indicating that the Cello-

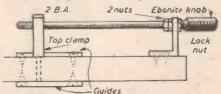


Fig. 6.—Assembly of the top clamp.

phane has fully contracted. Adjust the top clamp till the pointer coincides with one of the scale divisions near the top and mark this "very dry." If it happens to be a wet day, you will be able to mark the "rain" position, following this with "fair," position, foll "stormy," etc.

ADVERTISERS ANNOUNCEMENT

CHORE

WATSON'S SPECIAL OFFERS

HORSE 12/15v. 300w.

£18.10.0 Carr, 15/-

Fine Generating Sets ready for use. Also 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 lin. bore medium grade best quality. Price, 10/- each. Post 2/-.

GEAR PUMPS. Beautifully made, will deal with a large volume of liquid. Inlet \{\frac{1}{2}\text{in.}\text{Outlet }\{\frac{2}{2}\text{in.}\text{Outlet}\}\}.

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.



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. Magslip Indicator Units, suitable for light indicating purposes, 12,6 each. Post

DUAL GAUGES. 23in. 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.



Use a "DERMIC" Oller for clean and accurate hibrication of models, clocks, watches, sewing machines, typewriters, movie cameras and projectors and any delicate instruments or mechanism. Get one from your local Model or Tool Dealer or send direct to the actual manufacturers.

S. & B. PRODUCTIONS. Orton Buildings, Portland Read, South Norwood, London, S.E.25, Phone: LIV 4943

MODEL BOATS

Plans: Kits: Engines: Etc.

4d. in stamps for Lists.

LAWRENCE MODEL SHOP 106, LAWRENCE ROAD, LIVERPOOL, 15.

SPARKS' DATA SHEETS

THE "331" A.C. SHORT WAVE 4-VALVE T.R.F. Rx. OUTSTANDING IN DESIGN & PERFORMANCE

Incorporates "Cathode-coupled Regenera-tion" which ensures Highest Efficiency, Selectivity, perfect Stability plus amazing Ease of operation. Coverage 10 to 220 metres. Switched Coils. Separate Power Pack. 4-5 Watts Output.

rauk. 4-9 watts Output.

show every detail of construction and point-to-point wiring in simplified form, the Data Sheet is 27in. x 22in. This, together with generous instructions and Operational Notes, costs 3:6 Post Free.

All Components and Chassis available. L. ORMOND SPARKS (M), VALLEY ROAD, CORFE CASTLE, DORSET.

Win Friends, Popularity With Little Tricks of Everyday Talk

A well-known publisher reports there is a simple technique of everyday conversation which can pay you real dividends in both social and professional advancement and works like magic to give you added poise, self-confidence, and greater popularity. The details of this method are described in a fascinating booklet "Adventures in Conversation," sent free on

According to this publisher, many people do not realize how much they could influence others simply by what they say and how they say it. Those who realize this radiate enthusiasm, hold the attention of their listeners with bright, sparkling conversation that attracts friends and opportunities wherever they go. Whether in business, at social functions, or even in casual conversations with new acquaintances, there are ways in which you

can make a good impression every time you talk.

You know, through your own observation, that good talkers always win attention. They command respect! They become quickly not only popular, but often more entertaining - all of which directly helps them to bring more happiness to others while winning for themselves the good things of life.

To acquaint more readers of this publication with the easy-to-follow rules for developing skill in everyday conversations, the publishers have printed full details of their interesting self-training method in a 24-page booklet which will be sent free to anyone who requests it. The address is: Conversation Studies (Dept. PR/CS1), Marple, Cheshire. Enclose 3d. stamp for

NEW CABLES & FITTINGS

TOUGH RUBBER CABLES

per yd. 25 yds. 50 yds. 100 vds

per yd. 25 yds, 50 yds, 100 yds, 1044 Twin 84d, 151-27/3 53/6 1044 3-core 141d, 211-38/6 75/6 3029 Twin 11d, 19/6 351-68/8 7029 T. & E. 104d, 23/6 42/- 82/6 7029 Twin 1/5 31/9 56/6 111/8 7029 T. & E. 104d, 23/6 42/- 82/6 70/6 13/6 70/4 Twin 1/5 31/9 56/6 111/8 7029 T. & E. 1/9 38/6 70/6 13/6 70/4 Twin Lead, 50 yds, 3029, 68/3 7/029, 110/9 YIR, 50 yds, 10/6 Twin Lead, 50 yds, 12/6 7/020, 7/6 Twin Lead, 50 yds, 12/6 7/6 Yds, 1

LONDON WHOLESALE WAREHOUSE

165 (PM), QUEENS ROAD PECKHAM, S.E.15

Tel. : NEW Cross 7143 or 0890.

THE ULTRA LENS AIDS PRODUCTION

electric magnifier is of the most modern. design modern. designed and has proved its extreme and sustained usefulness to countless indus-trial firms en-gaged on minute examination of surfaces of every con-ceivable object.



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

iantly-

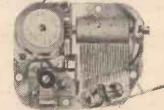
lit field

The Famous "GUEISSAZ". SWISS MUSICAL BOX MOVEMENTS

The ONLY Movement with a 12 Months' Unconditional Guarantee

ONE TUNE, 18 TEETH, 18/- ea. (As illustrated)

ONE AND TWO TUNE, 22 TEETH, Long playing, 28/- ea. Movements up to 50 teeth in stock. Also fine quality Cigarette Boxes, Swiss Chalets, Stein Mugs, etc., ready to fit any Movement, from 15/-. to fit any Movement, from 15/-.
ALSO MANY TYPES OF KITS
Including fine Grand Piano kit 33/in solid Mahogany (Complete with movement), and the 'Mosscot' self-winding
door chime, 45/- complete.



Return - Complete Delivery by Satisfaction Assured Illustrated Catalogue I/- refunded on 1st order.
Send S.A.E. for free tune list.

M. MOSS & CO., Dept. PM1, Woodlands Parade, Feltham Hill Road, Ashford, Middx. Telephone: ASHFORD (Middlesex) 4465/3382

SPECIAL OFFER

G.E.C., B.T.H. & WESTINGHOUSE GERMANIUM CRYSTAL DIODES

- 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

3.A. SCREWS, NUTS, WASHERS, soldering tags, eyelets and rivets. EBONITE AND BAKELITE PANES,
TUFNOL 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

PORTASS LATHES

DIRECT PERSONAL SERVICE LARGE DISCOUNT FOR CASH NO INTEREST CHARGED

CAN ANYONE DO BETTER ? I/- for Lists, please. Dept. P.M. BUTTERMERE WKS., Sheffield, 8

ALUMINIUM

BRASS - COPPER

- SHEETS
- RODS
- **© TUBES**
- e 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)

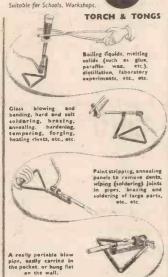


THE BUSBY BURNER

ON THE "BUNSEN" PRINCIPLE (Complete with a pair of TONGS)

The ideal GIFT for the practical HOUSEHOLDER.





Obtainable from local fronmangers or direct from makers on receipt of P.O. 61- (including postage). **BUSBY & COMPANY LIMITED** BUSCO WORKS, PRICE STREET, BIRMINGHAM

PUBLICATION 7



NEWNES

All the Essential Information for the Efficient Operation of CENTRE, CAPSTAN, TURRET and AUTOMATIC LATHES

560 pages dealing with the complete subject of Lathework—Centre Lathes; multi-cut lathes; turret, capsian and automatic lathes.

660 660 photographic illustrations, drawings and diagrams. Technical data. Tables. Operating Notes, etc.

2 Volumes strongly bound in rich dark-blue Moroquette and lettered in real gold.

Special Chart Case containing 16 unique Data Charts in large size of 9\(\frac{1}{6}\) in. x 13\(\frac{1}{2}\) in.

FREE Copy of TUR-RET LATHE SETTERS' POCKET BOOK for every purchaser, (value 6/-) and in addition

2 YEARS'

Free Postal Advisory Service
A continuing service worth
pounds to the keen technician!

only 101- monthly if kept after examination

This new, up-to-date work is now ready for you to examine without cost or obligation. It is designed to assist the lathe operator to become a highlyskilled craftsman, and fully conversant with the various types of lathe in present-day use.

Don't miss this opportunity-the complete work will be sent, carriage paid for you to judge for yourself! Post the coupon to-day!

A Few Subjects from the Extensive Index

Differential Threading. Floating-blade reamers. Trepan boring. Back facing. Deep-hole boring. Boring bar cutters. Tool design, multi-cut. Turning universal-joint flange. Camshafts, machining. Gear cutting on lathe. Right-angle lathes. Profile turning. Grinding carbide tools. Chip breakers. Turning compound tapers. Acme threads. Norton quick-change gearbox. End-train. Eccentric turning. High-speed screwcutting. Designing cams.

★ SPECIAL FEATURES ★

IN ADDITION to the wealth of information on setting up ond operation, considerable space is devoted to-

LATHE TOOLS TYPICAL TOOLING ARRANGEMENTS MULTI-CUT LATHES THREAD CHASING AND THREAD ROLLING

ECT NOW No obligation

No Cost !

To: George Newnes Ltd., 66-69, Gt. Queen St., London, W.C.99 Please send me Newnes Complete Lathework without obligation to purchase. I will either return it in 8 days or send 5s. deposit 8 days after delivery, then 10 monthly subscriptions of 10s., paying £5 5s. in all. Cash price in 8 days is £5.

Name	 	
Address		

Place X where it applies

Signature.....

(Or your Parent's Signature if under 21)

L W

HouseOWNER-Householder Living with Parents Lodging Address

Wireless Sci, 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 handmike and earphones. Ideal farms, scouts. 44/61 mc/s. Price 396. Carriage 5/6.

One-Value Amplifier, No. A.1271. Contains V.R.56. Two trans., Pot., 5 Condensers, 7 Resistors. In metal box. Can modify

tains V.R.5. "we trans. Pot. 5 Condensers. 7 Resistors. In metal box. Can modify for player unit. 36, post 23.
Nife Cells. New. Superior to lead acid type. Almost Indestructible voltage 1.2 to 1.5 fully charged). Size 3 x 2 x 1 approx. 7 6 cach, post 11. 724 dozen, carr.

U.S.A. Transcrivers. R.T.34. 17 valve generator. New, perfect condition.

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 6/d, 36/- dozen.

Speedometers with Reset. By Jaeger.

Speedometers with Reset, By Jaeger, ph. New. Half-moon shape, fitting size 74/* 3/3/-, chromed beautiful condition, price 95/-. 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 9d.

Battery Chargers. New our own make, Input 200:260, output 6 or 12 v. at 11 amps, trans, and rectifier mounted on wood base, ready for us, 29/6, post 2/-.

rans, and rectner monted on wood base, ready for us, 29/6, post 2/-.

Intercom. Sels. Sound powered. Consists of two balanced armature carpiece microphones. 20' twin flex all new equipment. Suitable baby alarms, remote radio listening, car to caravan, communication, etc. Price 12/6, post 1/-.

Miniature Electrie 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, Sile 21'x 1'x 1'. Suitable locos, research, price 15/-, post 1/-.

Battery charging Mc Voltmeter Tester. New in case. 30-3 and 30-0-30 volts, test prods included. 20/-, post 1/9.

Rear Car Laupp Assembly. By Lucas.

included, 20%- post 19%.

Rear Car Launp Assembly, By Lucas, New. Sult Humber 1866 or modern similar types, trailers, specials. Contains red glass for rear light, double filament lamps for brakins, 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 26%. Send 6d. for new list. All communications

THE SCIENTIFIC INSTRUMENT CO.

16, Holly Road, Quinton, Birmingham, 32

Callers welcomed at Showrooms, 353, Bearwood Road, Smethwick,



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 £3/6/- including p. & p.

Empress Unit takes up to 20in. diameter Saw.

Price £5/15/- including p. & p.

These units are fitted with high-speed ball bearings.

Also supplied with Jin. Drill Chucks 14/- extra. Any size made to order.

Trade and Export Enquiries invited. Send for Lists.

S.G.S. ENGINEERS OLD COSTESSEY, NORWICH

Tel.: Costessey 327



Chemical Distiller

SIR,—Mr. R. E. Rayner (Information Sought, August) is obviously thinking of an Ion Exchange Resin such as are supplied by the Permutit Co. Ltd., Gunners-bury Avenue, London, W.4, and Messrs. Joseph Crosfield & Sons Ltd., Bank Quay, Warrington, although for small quantities he would probably have to go to suppliers like British Drug Houses Ltd., Graham St., N.I., or Messsrs. Hopkin & Williams Ltd., 14, St. Cross Street, E.C.I.

14, St. Cross Street, E.C.r.
Several firms of laboratory suppliers, however, supply wash-bottles and appliances for dispensing small quantities of "distilled" water.—J. C. WILLIAMS (Edgware).

Flattening Perspex

SIR,—With reference to your answer to the query in the August issue on "Flattening Perspex," I should like to mention a very simple method of doing such a job as your correspondent requires. had a quantity of off-cuts of corrugated Perspex, which is used in factories to allow more light through a roof. It is about sin.

I placed the corrugated Perspex on a perfectly flat metal plate and heated it in an oven maintained at a temperature of about 260° F.

After some 20 minutes the Perspex softened and collapsed on the plate, becoming as flat as the plate, The Perspex was rapidly removed at this stage from the oven, and put between two pieces of wood (the thicker the better) with a weight on top. The object of the latter operation was to allow the Perspex to cool slowly. The result, when cold, was a dead-flat piece of Perspex.

The temperature of the oven will vary with the type of Perspex used. It must not be too high as bubbles are likely to appear on the surface.

The oven I used was electric and thermostatically controlled, but I see no reason why an ordinary domestic gas oven should not prove equally successful.—M. J. MAIZELS (N.20).

Drill Stand Modification

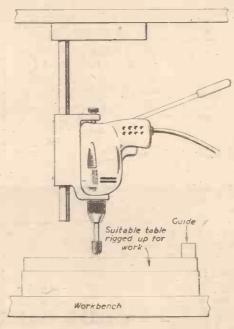
SIR,—In the article in February issue of PRACTICAL MECHANICS entitled "Using a Vertical Bench Drill as a Wood Miller, the writer states that limitations are imposed by the restricted distance between the centre line of the drill table and the pillar, the case of the Black and Decker drill stand this restriction can be overcome by removing

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

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

the drill clamp from the pillar and then screwing the base of the pillar to a suitable batten or plate above the workbench so that the pillar is hanging

Replace the drill clamp on the pillar and a suitable table can be rigged up with a guide; the workbench itself can of course be used provided it is smooth and will not scratch the face of the wood being worked.



Mr. L. J. Edwards' drill stand modification.

Large sheets of plywood, such as are for cabinet making, can be worked without any hindrance by the pillar. With this method there is no need for modifying the drill pillar as suggested by the author.—L. J. EDWARDS (Cornwall).

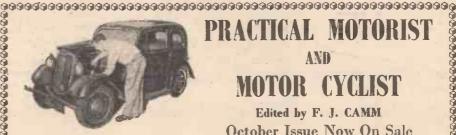
Electric Vehicle Transmission

SIR,—I have read with interest Mr. Dowsett's comments on my letter on electric vehicle transmission in the August issue.

My only personal experience with "Nife" batteries was when they were fitted to some motor cycles, where they didn't last long, mainly due to vibration. But I have a suspicion too that it was partly due to people not being careful enough to see that no acid got near, testing gravity with a hydro-meter that had been used on an acid battery, or using a hydrometer to top up with distilled water, etc.

The objections Mr. Dowsett put forward seem rather minor details, which if true would just be found and overcome during the making of the vehicle, though it might not work as it is drawn.

I would remind Mr. Dowsett that experts were "proving conclusively" in 1896 that heavier-than-air machines could never fly, and at about the same time that the human body could not withstand a speed of Ico. m.p.h., that motion pictures would never come to much, and that wireless would never work. In about 1927 they said talking pictures would never oust silent, in 1930 that television would never be more than a scientific toy, and right down to last year, when the BBC said they could never get a successful "live" TV broadcast from Scarborough for various reasons—but 1.T.V have done it!—W. R. BROOKS (Scarborough).



AND

IOTOR CYCLIST

Edited by F. J. CAMM October Issue Now On Sale

PRINCIPAL CONTENTS

Some Winter Preparations; Carburetter Maintenance; Easily-constructed Car Ramps; Overhauling the Austin A70 and A90; Valve Gear Troubles; Tracing Engine Noises; Tuning for Slow Running; P.M. and M.C. Data Sheets; An Economical Car Heater; Overhauling the Jowett 8 and 7; Overhauling the Lanchester 11; Motor Cycle Carburation and Ignition; Garage Mechanic's Diary and many other interesting articles.

The Elge Radio Pen

AS can be seen from the photograph, this pocket-sized fault finder does indeed resemble a pen. It is used for voltage testing, signal tracing, spark plug testing, valve and component testing and mains and



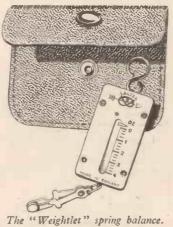
polarity indications. Its chief field of use will, therefore, be for the quick location of faults in TV, radio and electronic equipment generally. The pen is constructed so that the test prod can be inserted into either end, according to the nature of the test, while the banana plug on a fly-lead can

be plugged into the opposite socket.

The distributors are Mercia Enterprises
Limited, Coventry, and the price of the Radio Pen is £1 4s.

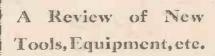
Pocket Spring Balance

FROM Messrs. George Salter & Co., Ltd., West Bromwich, Staffs., comes news of the "Weightlet," a newly introduced small pocket spring balance designed specially for checking the weight of letters. As can be seen in the sketch, it has a white Ivorine dial with black figures and a spring clip for holding the corner of the letter to be weighed. When not in use it fits neatly into a 3in. x 2in. snap fastening leather pouch. It is obtainable from stationers, ironmongers and gift shops and costs 8s, 9d,

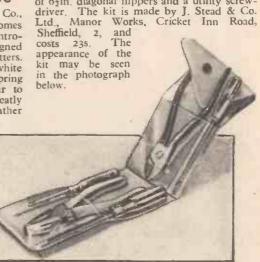


Electrician's Kit

THE Stead Electrician's Kit No. 4 consists of an attractive plastic wallet containing a fully insulated mains tester, a pair of 6in. pliers,



electrician's 4in. sleeved Screwmaster, a pair of 6½in, diagonal nippers and a utility screw-



Stead Electrician's Kit No. 4.

New Live Centre

A NEW, practical live centre has been introduced by A. A. Jones & Shipman Ltd., Leicester, which enables turning jobs to be carried out much faster and more

easily than with standard dead centres.

This neatly designed "J. & S.-Centrex" live centre (see photograph) has a small diameter head, revolving on three bearings



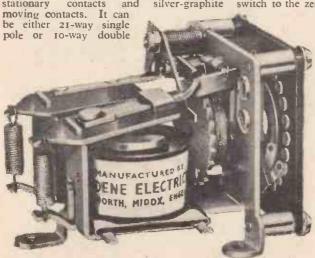
The new live centre.

which will take all the thrust and radial load that would burn out an ordinary dead centre. The point has a short overhang from the shank so that chatter is avoided. All parts are hardened and ground. A lubricator is provided for greasing the bearings

and a felt seal keeps out dirt and suds.
"J. & S.-Centrex" live centre is manufactured in three sizes—No. 1, No. 2 and No. 3 morse taper—and is stocked by all J. & S." small tool distributing agents. Further information may be obtained from A. A. Jones & Shipman, Ltd., Narborough Road South, Leicester.

RODENE COUNTING RELAY

INTENDED for use as a selector, counting or memory relay in such applications as the automatic control of apparatus and production processes, this unit has a rotary switch with heavy stud-type fine silver stationary contacts and silver-graphite



The Rodene counting relay.

pole, and is stepped forward one position every time a pulse is fed to the coil shown in the front of the photograph.

A momentary impulse to a second coil lifts a pawl and allows a spring to reset the switch to the zero position. This is assured by a latch which holds the pawl out until the next forward pulse. The relay

forward pulse.

out the switch-bank for use as a "pecker-motor" or "rotary solenoid." Important features are that the unit can be operated direct from A.C., and that the consumption is only 45 VA on A.C., or 15 watts on D.C. The size is 3in. x 3in. x 2½in.; the maximum speed is 40 steps per second, and the price with standard coils is

can also be supplied with-

£3 18s. nett. Further details of this relay and of a wide range of others are available from D. Robinson & Company, 58, Oaks Avenue, Worcester Park, Surrey.

BABY ALARM OR INTERCOM UNIT

(Concluded from page 16)

the microphone should be in the form of a small loudspeaker as it will be required to act as such when the unit is switched to send. When the unit has been tested as described, the microphone should be con-nected up to the amplifier and preferably taken into another room. The volume control should then be increased until the microphone pick-up is adequate. If a loud howl results when the volume control is advanced it is due to the microphone picking up the sounds from the loudspeaker, and it will therefore be necessary to provide some form of screening between them.



Converting D.C. to A.C.

OULD you tell me the best method for converting my 230 D.C. supply to A.C. ?-A. Fraser (Bradford).

THE most practical method of obtaining the A.C. supply would be by means of a D.C. motor coupled to an alternator, or by means of a rotary converter. It would, however, be quite practicable to convert an ordinary D.C. motor (shunt type) to operate as a converter. In order to obtain a 50-cycle supply a 4-pole motor should run at 1,500 r.p.m., or a 2-pole motor should run at 3,000 r.p.m.

Points on the commutator, which are connected to armature conductors which are one-pole pitch apart, should be connected to two slip rings on the shaft, the A.C. output being obtained from brushes on these slip rings. If a 4-pole motor is used with a lap-wound armature, points on the commutator which are diametrically opposite each other could be connected to one slip sing, the two commutator segments midway between these being connected to the other slip ring.

A 2- to 3-h.p. motor is suggested. With 230 volts D.C. input the output of the converter will be about 160 volts; thus the output side should be used in conjunction with a step-up transformer, preferably having tapped secondary windings. We could supply constructional details for a suitable transformer, if required, on receipt of a note of the current rating or h.p. of the motor and the A.C. voltage(s) required.

Alternatively, you could probably buy a suitable rotary converter from one of the suitable rotary converter from one of the following firms:—Croydon Engineering Co. Ltd., Commerce Way, Croydon. Electro-Dynamic Construction Co. Ltd., St. Mary's Cray, Kent. General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2. Newton Bros. (Derby) Ltd., Alfreton Road, Derby. Small Power Dynamo & Motor Co. Ltd., Gordon St., Hyde, Cheshire.

Ceramic Paints

AM interested in pottery painting and design, etc., but cannot get any information about the materials used in the manufacture of the paints.

I use the colours in powder form, each one mixed separately on a pallette, a small quantity mixed with oil with a pallette knife and picked up with a touch of oil of turpentine on a small painting brush.

What are the powders composed of? What is the oil?—M. J. B. (Yorks).

THE colours used for the painting of ceramic wares comprise various coloured oxides. The oil used for moistening them is usually a high-grade raw linseed oil to which, as you say, a little genuine turpentine is sometimes added. These colours may be obtained in powder form from Wengers, Ltd., Etruria, Staffs. You may possibly be able to obtain them in very small amounts from a firm of handicraft material dealers such as Dryad Ltd., St. Nicholas Street, Leicester.

Renewing Bronze Finish

HAVE a heavy wrought-iron curb which originally had a bronze finish. This has quite disappeared and I would like to know how it could be renewed.

The curb is in use before a fire and



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.

something heat resisting would be necessary .- J. S. Barton (Yorks).

FIRST of all, thoroughly clean your wrought-iron curb, making it as bright as possible with emery paper or similar abra-

THE P.M. BLUE-PRINT SERVICE

12FT. ALL-WOOD CANOE. New Series. No. 1,

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. CAMM'S FLASH STEAM PLANT. New Series. No. 5, 5s. 6d.*

SYNCHRONOUS ELECTRIC CLOCK. New Series. No. 6, 5s. 6d.

ELECTRIC DOOR-CHIME. No. 7, 45.* 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.

Its. 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.
Is. 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.

sive treatment. Then make up the following solution: - Caustic soda, 200z.; saltpetre, 12.50z.; water, ‡ gallon approx. joz. of urea added to the above solution improves the colour of the bronzing.)

Heat the solution to 150 deg. C. and brush it repeatedly on to the warm fender

for about half an hour, or until the desired depth of bronzing has been obtained.

Another method is to make a thin paste of turpentine and flowers of sulphur. brushed on the fender and then set alight. As it burns, the fender is given a black coloration, which is deepened and made more uniform with each repetition of the process.

In the case of the former treatment, the fender must be well rinsed with water and, in both cases, it should be eventually rubbed over with an oily cloth in order to add depth and lustre. The coloration thus produced is quite heat proof.

Washing Bleach

OULD you give me details of a washing bleach and method of manufacture, if it does not involve the use of very expensive equipment.-S. Higson (Bolton),

THE following is a formula for a good, effective, useful and cheap household bleacher:

Bleaching powder (chloride of lime), 1lb.; washing soda, 1lb.; common salt, 1lb.; water, I gallon.

The soda and salt should be dissolved in the water, the latter being either hot or cold. This done, the resulting solution must be allowed to get dead cold after which the bleaching powder should be made into a thick paste with a portion of the cold solution. This paste is then thinned out with the remaining solution so that a milky fluid is obtained. The fluid is next strained through several folds of fine cloth or fabric. It is then filled into clean wine bottles, the bottles being filled up to the necks and then tightly corked in this condition, and stored away from light. The solution will remain in good order for five or six weeks but seldom for a longer period. When the bottles are opened, and the solution is exposed to air, it will not remain good for more than ten days, the solution rapidly for more than ten days, the solution rapidly losing its bleaching power and becoming acidic in nature.

Photographic Trick

HAVE a photo of three race horses apparently hidden underneath the glossy surface of the print; a special piece of tissue paper is moistened well and the glossy side is well rubbed with it till the complete photo appears. Could you tell me what it is?—F. Westoby (Doncaster).

YOUR photograph is based on a photographic "trick" which is at least ninety years old. These so-called "magic photographs" can be produced in the following way. Take an ordinary photograph (preferably one on printing-out or self-tening paper) and imperse it in self-toning paper) and immerse it in a strong-solution of mercuric chloride (poison) until the image has completely disappeared. Then the image has completely disappeared. Then wash the paper and dry it. Take a sheet of tissue paper, immerse it for a moment or two in a strong solution of sodium thiosulphate ("hypo") and, without rinsing, allow the tissue to dry. Place the tissue thus treated in contact with the bleached surface of the print, moisten the tissue and rub it down well. Then strip it away from the print surface. The original photograph will immediately reappear after contact with

the moistened tissue. If this reconstituted photograph is again bleached in mercuric chloride solution the process can be repeated

Colouring Conservatory Glass

I WISH to colour the glass roof of my conservatory to a semi-transparent green in order to cut down the light. Is there any stain or varnish I could apply which would give this appearance?

The conservatory is heated, and during the winter months there is considerable condensation on the glass.—C. L. Jackson (Essex).

BTAIN from Vinyl Products, Ltd, Butter Hill, Carshalton, Surrey, a quantity of a toluene solution of poly-methyl methacrylate. This is a clear varnish or lacquer of quick-drying character. You can dye it any colour by dissolving in it a small amount of an oil soluble dye, such as Oil Green, Waxoline Green (I.C.I.) or Anthraquinone Green G. These oil-soluble colours can sometimes be obtained from large paint as Messrs. Griffin & Tatlock, Ltd., Kemble Street, Kingsway, London, W.C.2.

An alternative procedure is to obtain from a local paint shop a can of clear cellulose varnish or lacquer and to dissolve in it a small amount of a spirit-soluble dye, such as Brilliant Green or Malachite Green.

Oil-soluble dyes dissolved in a light pale oil varnish will give satisfactory results when brushed on to the inner side of the glass.

All the above preparations should, of course, be applied to the inner side of the glass and not to the external side. You cannot expect the colour to remain for two or three years without fading, for none of these dyes can withstand the influence of strong sunshine. The colours obtained, however, will be perfectly transparent.

H.T. Line Carrying Poles

WHAT is the safe working life of a pole carrying overhead H.T. lines, IIKV., lines being Itin. in size? What method of testing these poles is used and approved by regulations that govern them? How often should they be tested for rot? What measures are to be taken against rot whilst poles are in use?—J. Anderson (Neath).

WE do not know of any regulations which specify in detail the inspection and testing of wooden poles used for overhead lines. The Overhead Lines Regulations governing the construction and installation of such lines are obtainable from H.M. Stationery Office.

These regulations require that all wooden supports, other than oak or hard wood cross arms shall, unless otherwise approved by the Eiectricity Commissioners, be of red fir impregnated with creosote. The factor of safety of a wooden pole support must be 3.5, calculated on the assumption that all line conductors are at a temperature of 22 deg. F. and have a covering of ice (57lb. per cubic foot) of radial thickness of §in., and are simultaneously subjected to a wind of 50 m.p.h. at right angles to the line; this wind being taken as exerting a pressure equivalent to 8lb. per square foot calculated on the whole of the projected area of the ice-covered lines. These regulations require that every overhead line, including its supports and structural parts, shall be regulately inspected and efficiently maintained

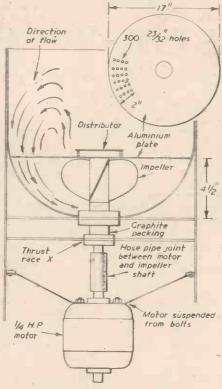
larly inspected and efficiently maintained.

The poles should be impregnated with creosote, preferably by the vacuum-pressure process. The butt of the pole should be tarred to well above ground level. We suggest that the depth of the pole in the ground should not be less than 4ft. for a 24ft. pole, 5ft. for a 36ft. pole, and 6ft. for a 48ft. pole, and preferably greater, especially in made-up ground. The safe life of a new

pole which has been properly installed and treated may be about 10 to 15 years. We suggest that each new pole be tested annually for rotting for the first three years, and afterwards tested about three times a year; the poles could be tested by pressing a thin-pointed steel rod into the pole around and below ground level.

Electric Washing Machine

I AM making an electric washer as sketch below. The motor is suspended from its bolts by stays to frame of washer. The motor shaft is connected to impeller shaft by hosepipe (for flexibility). The impeller is to have three 4in. blades with rain. core, 3in. long.



Suggested washing machine design.

Is this impeller large enough? The motor speed is 1,400 r.p.m. What is correct pitch? Will 300 holes as shown be sufficient?

Is it correct to run a motor in a vertical position?

Is in. brass shaft suitable for the impeller?

Would you advise thrust bearing at x to lift the impeller (it will of course be pressing down when in action).?—T. Johnson (Hull).

WE consider that the impeller will be large enough if it has a pitch of about 45 deg.; the area of the holes should also be sufficient.

also be sufficient.

If a motor is to be run in a vertical position it should have at least one ball bearing or else have a special thrust bearing. It is also advisable that the top end shield should be of a type which will not allow any dripping water or condensate to enter the motor.

We consider that the diameter of the shaft should be at least lin., and that it should be provided with a thrust bearing. We suggest that stainless steel might be suitable for the flat surfaces.

Parking Lights Arrangement

COULD you give me any information as to how I could build a transformer or any other simple device for cutting down

the voltage of a 6 volt, 12 amp. motor cycle battery to feed three 2.5 volt torch bulbs. I wish to make a set of parking lights for my motor cycle combination and so save on the battery. I thought of wiring the bulbs in series to equalise the load, but if one bulb were to fail the remaining two would also fail. What do you suggest?—J. W. Warwick (Middx),

A TRANSFORMER will only function on alternating current or fluctuating direct current, and would thus be useless for your purpose. The simplest and most economical method of using the three 2.5-volt lamps on a 6-volt circuit would be for you to wire them in series as you suggest. We think the risk of one lamp burning out unexpectedly would be rather remote if you renewed the bulbs periodically. Such bulbs are generally used on 3 volts, whilst you would be using them on 2 volts only. Bulbs which are used in series must have the same current and voltage rating. You could safeguard yourself by using two separate sets of three 2.5 bulbs in series across the 6-volt supply, in which case the failure of one bulb would only extinguish one bulb in each lamp.

If you prefer to use one 2.5-volt bulb in each lamp circuit with a series resistance the ohmic value of the series resistance should be equal to 3.5 divided by the current rating of the bulb. For currents up to 0.5 amp. you could use 34 s.w.g. Eureka resistance wire or 34 s.w.g. nickel-chrome wire. The Eureka wire has a resistance of approximately 10 ohms per yard, whilst nickel-chrome wire has a resistance of approximately 22 ohms per yard. Thus for a lamp having a current of 0.3 amp. a resistance of approximately 12 ohms, so that 0.54 yards (19in.) of 34 s.w.g. nickel-chrome wire could be used. The wire could be wound into

It should be noted, however, that with three such lamps, each with a series resistance, the total current taken from the battery would be approximately three times the current of each lamp due to losses in the resistances. We suggest that you would find it simpler and better to use three separate 6-volt lamps of low current rating, such as those used with a cycle dynamo

Information Sought

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

Beeswax candles

I WISH to make some beeswax candles, Can you give me any information or recommend any books on this subject? What gauge of wick to thickness of wax is required for equal burning? What is the dipping process?—H. PILKINGTON (Stroud).

Dies for Embossing

I WISH to make some dies for an embossing press for notepaper. The steel die presents little difficulty, but I should be grateful for some help with the copper counterpart.—J. PHILLIPS (Ringwood).

3-D Photographs

I HAVE a 3-D photograph, to view which I have to use the red and green glasses. Can you give me any information as to how it is made?—J. PAYNE (Dublin).



Announce

NEW PRACTICAL WAY

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.

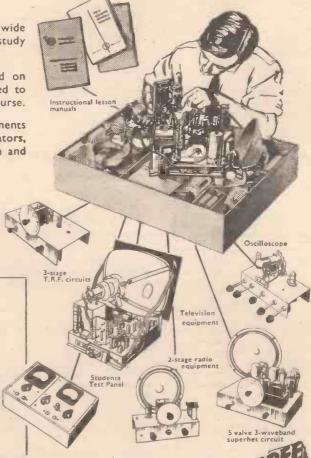
NEW—experimental outfits and lesson manuals are despatched on enrolment and remain the student's property. A tutor is allotted to each student for personal and individual tuition throughout the course.

Radio and television courses, with which specially prepared components are supplied, teach the basic electronic circuits (amplifiers, oscillators, detectors, etc.) and lead, by easy stages, to the complete design and servicing of modern Radio and T/V equipments.

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.

Courses with Equipment

RADIO • SHORT WAVE RADIO
TELEVISION • MECHANICS
CHEMISTRY • PHOTOGRAPHY
ELECTRICITY • CARPENTRY
ELECTRICAL WIRING
DRAUGHTSMANSHIP • ART, etc.





Fill in for	FREE	BROC	HURE
-------------	------	------	------

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

NAME

ADDRESS

(if under 21)

BLOCK CAPS PLEASE

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

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

IC.107

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

BATTERY CHARGERS



10 amps controlled by two 4-position rotary switches for fine and coarse control. Input 200'250 v. A.C. 50 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/-4

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.

each, post 2/9.

VOLTMETERS for A.C.

Mains 50 cy. reading 0 to
300 volts with clear 5in. dial only, 60/-;
also 24in. Flush Round type 25/-, post 1/6.

AMMETERS.—2in. Flush Moving Coli
D.C. 50-50. 12/6 ea. 24in. Flush Moving Iron
D.C. 025. 7/8 each, post 1/6.

CIRCUIT TENTER in wood case 9in. x
6in. x 4in. 24in. Flush round meter 50
milliamps, basic movement 10 mA. with
leads. 10 ohm potr., provision for 1.5 v. batt.
Ideal for conversion. 17/6, post 2/6.

AIR BLOWERS.—230 v. A.C., 37 H.P.
16in. Ian. 6in. x 4in. outlet. Brand New.
295. Carrin England 20.

D.C. 300 wattewith switch and leads.
D.C. 300 wattewith switch and leads.
RELAYS.—Hife:H. SPECED.—1,700 + 1,700
ohms just the job for radio controlled
models. 25/- each, post 1/3.



BULKHEAD FIT-TING. 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.

CHARTHOARDS.—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
200/250 voit A.C., 130'-. 12 voit D.C., 90 -.

200229 Volt A.C., 1802-12 Volt D.C., 307-ROTARY CONVERTOR.—Input 24 v. D.C. Output 230 v. A.C. 50 cycles 100 watt, 92.6; also available in metal case with switch, 1052-, carriage 76. TELEPHONES SOUND POWERED. No flex for clear speech. Transmitter Receiver Units, 406 ea. Twin Flex, 414, 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 MO-

perfect 2-way conversation can be made.

GEARED MOTOR for the
model maker,
small and very
powerful 12/24
typ.m. 35/s. post
26 will work
from 230 v. A.C.
mains with our transformer and rectifier.
17/L avtra

Triperta.

Telephone sets. Modern desk Type. 48.17.6 per pair complete.

WALL Type also available. 2 complete
units 55. Batteries 56. Twin Wire 2d. per yd.

MOTOR. --12 vol. D. C. 1in. x 2in. approx.

3.000 r.p.m. with speed regulator in end cap.

A precision 1001. 194.6 post 1.6.

A precision 1004. 194.6 post 1.6.

control handle. Suitable for dimming, etc.,
25°. post 29. Also 500 ohms 1.5 amp Log.

50°-.



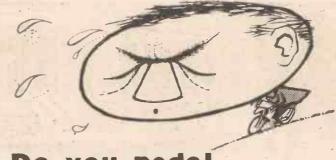
CROSS POINTER METER with 2 separate 100 microamp move-ments. Brand New, 22/6, post 2/-.

VOLTMETERS, D.C.— 0-20, 0-40, or 0-300, 2in. Flush, 10 6 each, post 1/6.

SWITCHES.—A row of 5 in a flush mounting bakelite moulding 5 in. x 1 in. x 2 in. Ideal for model rallways. 5/6, post 1/6. HEADPHONES.—High resistance 4,000 ohms. Type CHR. 12/6 pr. Post 1/6. HEADPHONES.—High resistance, very sensitive Balanced Armature. Type DHR. 17/6 pr. Post 1/6.

sensitive Balanced Armature. Type DHR. 17/6 pr. Post 1/6. ROOM THERMOSTAT.—Adjustable 45 to 75 deg. Fahr. 250 volts 10 amp. A.C. Ideal for greenhouses, etc., 35/-, post 2/-. THERMOSTAT.—For frost protection, on at 34 deg. F., off at 49 deg. F., 14 amps. at 250 volts, adjustable, 4/6, post 1/-. INSPECTION LAMP:—Fits on forehead, leaving hands free. battery case clips on belt. 7/6, post 1/6. Takes E.R. Battery No. 1215. 2/9, post 90. THRUST RACES.—13/161n. x 3/81n., 1/6. 15/- doz., post free.

L. WILKINSON (CROYDON) LTD.
19 Lansdowne Road, Croydon.
'Phone: CRO 0839.



Do you pedal Downhill ...?

> do you replace ball-bearings

B·M·B Ballpaks

TRADE NOTICE. Genuine B.M.B. Ballpaks bear the famous Trade Mark and contain precision made steel balls only.

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 maintenancewhich includes regular replacement of ball-bearings.

Ballpaks B. M. B. are obtainable from Cycle dealers everywhere.



B.M.B (Salas) Ltd HIGH STREET . CRAWLEY . SUSSEX



Buy this easy way

- DEPOSIT

Deposit refunded if not satisfied.

ELECTRIC DRILL HOME WORKSHOP

and DRILL KIT also available. Please write for

details.

TAKE advantage of this special CURRYS postal offer. The famous Black & Decker drill sent to you BY POST for only 10/- deposit. A robust power unit for drilling up to \forall in steel and \forall in wood. It will take all the many Black & Decker attachments to complete your home workshop. For sanding, polishing,

Cash Price £6.19.6 Fully guaranteed

4 INCH

de-rusting, buffing, grinding, sawing or turning. AC/DC motor. State volt. required. Postal Terms: Use it while you pay-it's the easiest way to buy on CURRYS gradual payment terms. Balance by 24 weekly payments of 5/11.

POST 10/- NOW TO-



CURRYS LTD., DEPT. A.75 WORTHY PARK, WINCHESTER. HANTS. OR FROM ANY CURRYS BRANCH 5,000 High Speed Slifting Saws and Slotting Cutters, 2 1/4' diam. 5/8' bore, 0.045', 0.051', 0.057', 0.058', 0.051', 0.057', 0.058', 0

bolt holes on castings too for facing Glit 12/8 each.

1,000 H.S. Inserted Blade Expanding Reamers, 21/32, 23/32, 16/11/16'-3/4'-17/6: 27/32, 15/16'18/3-18/2, 18/6', 15/16'-11/16'- 29/13/32'-1 18/32, 23/6 cach.

30/5-11/32'-32/6 cach.

30/5-3/6', 7/16' and 12' Whit., B.S.F. American Car thread or 26 brass thread. These sets are in a neat case. Present day value over 30/- per 26t, to clear 15per set any thread. Two sets 28/6, sour sets 55/- Also 56' and 34' in Whit. and B.S.F. only. 58' 56' and 58' in Whit. B.S. 56' in Whit. B.S. 56'

All tlems brand new. at orders post rold, except overseas. 2,000 Small H.S. Twist Drills, approx. 182°, 3/32°, 4/4° doz. approx.; 1/16°-1/4°, 7/6 per doz. approx.; 9/32°-15/32°, stx for 10/-.
3,000 Circular Spill Dies I dia. cutting 14°, 5/16°, 3/8°, 7/16°, 1/8° White. B.S.F., also brass thread, 26 thread all sizes and American N.S. 12/2° por set of 5 sizes, 2 sets 22°6, 4 sets 42°6. Taps to suit 12/6 per set, either taper or second or plug. 1° dia. stocks 6-each.

each, 1,000 Hand Reamers, 5/16°, L/6 each, 5/8°, 4/9 each,

5/8', 4/9 each, 1,000 High Speed Parting Oil Tool Bludes, Eclipse brand: 11/10' x 3/32' x 5' long, 5/- each; 13/16' x 1/16' x 6' long, 5/- each: 15/16' x 3/32' x 6' long, 6/- each: 15/16' x 3/32' x 6' long, 6/-

1018, 54- each: 1016° x 3/32° x 6° lons.
7,000 Pratt & Whitney, circular split dies, superior quality precision round 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 tock, 3/6 each.
5,000 Ball Ruees, 18' bore, 3/8° o.c., 18' thick, 4'- pair; 1/8' bore, 3/4' o.d., 7/32° thick, 4'- pair; 1/8' mm. bore, 26 mm. o.d. 8 mm. thick, 4'- pair; 9 mm. bore, 26 mm. o.d. 8 mm. thick, 4'- pair; 3/6' bore, 7/8' o.d., 7/32° thick, 5'- pair, 3/16' bore, 1/2' o.d., 5/32' thick, 4'- pair, 3/16' bore, 1/2' o.d., 5/32' thick, 4'

5- pair, 3/10 boto, 4- pair, 2,000 File: 4'-6' good assortment, 10'6 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.

letters, 25% per set, any size.
2,000 Straight Shank End Mills,
size 18°, 5/32°, 3/16°, 7/32°, 1/4°, 5/16°,
list price 30%-set, 15%-set, also 3/6°,
7/16°, 1/2° ditto, 12/16 set,
500 H.S. 90° Countersiaks, body
1,000 Revelled Wood Chisels,
1,000 Revelled Wood Chisels,
handled, 14°, 5/16°, 3/8°, 1/2°, 5/8°, 3/4°,
7/8°, 1°. Actual value 37/6. Gift 25%set

set.

200 Cast Steel Circular Saws for
Wood 4, dia, 6/- cach; 6', 10/-;
8', 13/6: 10', 18/-; 12', 24/-,
1,000 Semi High Speed Centre
Drills, Slocombe brand 5/16' body dia,
3/32' point, 1/6 each, 18/6 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,



VOL. XXVI

OCTOBER, 1957

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 опримения применя в в размения в размения в в размения в разм

Control of Dogs on Roads

THAT menace to cyclists' safety, the wandering dog, is to come under control and persons who allow dogs off leads in certain roads will be liable to a fine of up to £5 under two Orders made by the Barnes Borough Council and the Eastwood Urban District Council. These Orders have been confirmed by the M.O.T. The Eastwood Order, now in force, is the first to be made under the powers granted to local authorities in Section 15 of the Road Traffic Act, 1956, which makes it an offence for any person to permit a dog to be on any designated road without being held on a lead. It does not apply to dogs kept for driving or tending sheep or cattle in the course of trade or busi-The Order made by the Barnes Borough Council comes into force on Octo-

ber I. I hope that other borough councils rapidly follow suit. At the same time it should be remembered that anyone suffering injury caused by a dog can sue the owner of the dog for damages. With motor cars, a of the dog for damages. With motor cars, a motorist may not plead that he caused an accident as a result of swerving to miss a dog. Presumably, in those circumstances, the motorist must run over the dog. A cyclist is unable to do so. The dog which chases cyclists and quite often brings them down, causing damage to rider and machine, is a public menace, and owners should be made to shoulder their responsibilities.

Those Stand-by Lamps

OBSERVE that the Standing Joint Committee on Cycling has urged the Minister of Transport to suspend the Road Vehicles Lighting (Stationary Cycles) Order 1957, because it would necessitate bicycles fitted with dynamos being fitted with stand-by batteries which would take over the lighting when the cycle is temporarily at a standstill. Under the 1945 Order, it was permissible for a cyclist not to have the lamp alight when stopped. An unlighted cycle may still be wheeled close to the kerb and this will still be permitted if the new order comes into force. The argument advanced against the stand-by battery is that the battery rapidly deteriorates and that it sul-phates and damages the lamp case. If the lamp is properly constructed and the right materials are used, this cannot take place, and we have no doubt that the Minister of Transport will draw attention to this. It is also possible to design a battery which does not sulphate. The defects are rather due to poor design than to a fundamental defect.

When the committee argues that there is

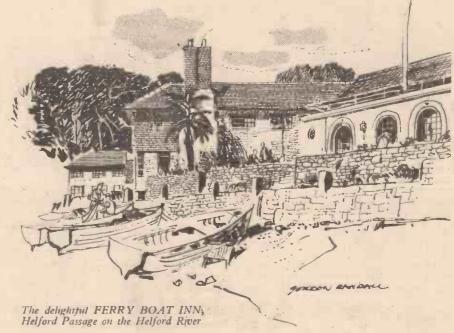
an absence of evidence of accidents being caused as the result of a dynamo-operated lamp going out at a traffic stop, they are on sounder ground. In any case, cyclists have rear reflectors and we can see no purpose in making the Order on those grounds alone. A motorist who cannot see a cyclist when his bicycle is fitted with a reflector should not drive at night at all.

About Brakes

HERE is a new school of thought on bicycle braking. The tendency now is to advise people to use the front brake in

preference to the rear, and driving instructors are teaching drivers of scooters and motor cycles to rely mainly on the front brake. I take leave to question this practice. On a wet road, application of the front brakes tends to promote a skid, and it is well known that it is practically impossible to correct a front wheel skid and comparatively easy to rectify a rear wheel skid. In my view, front wheel braking only is dangerous, almost suicidal. For one thing, there is less load on the front wheel, secondly there quite often is judder, when the head bearings are not properly adjusted and thirdly, it is generally agreed that braking pressure using both brakes, should be distributed in the ratio of one-third to the front wheel and two-thirds to the rear wheel. The maximum tyre adhesion is with the rear wheel. I learn that the police at the Hendon Driving School advocate the use of the front brake. I think this is wrong and unwise. The chief engineer of the Automobile Association was acceptly defending a test seem ciation was recently defending a test case relating to inefficient brakes on a scooter. It was stated that the police method of testing brakes was unfair. The constable giving evidence said he could pull the scooter along the road with two fingers with the rider sitting astride and the front brake applied, but surely the rider should have been asked to apply both brakes. The A.A. chief engineer said: "That method is quite unsatisfactory. On these scooters, the brake is not intended to lock the front wheel. It is only intended to supplement the foot brake. If the front wheel is locked the rider would go over the handlebars." One should never use such braking power that the wheel is locked. Maximum braking efficiency occurs just before the wheel is locked. If the pressure does lock the wheel, it merely means that the wheel will skid. It was stated that instructions at

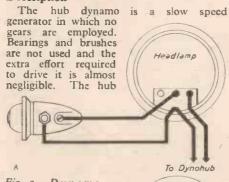
the Hendon Police College are that 60 per cent. of the total braking force should be on the front wheel. Engineers question the wisdom of that figure and I think it is time that the Hendon Police College took the advice of some qualified engineers on the subject and ceased from inviting motor cyclists to commit suicide. It is a most dangerous practice to suggest that the maximum braking pressure should be on the front wheel. The scooter in question had standard brakes as fitted by the makers. They were in good order and correctly adjusted, but the defendant was fined £1. This means that thousands of motor cyclists using standard braking equipment in good order are likely to be prosecuted, and it also means that every motor cyclist so fined will be able to sue his manufacturer for breach of implied warranty. We think this is a matter which the police should have taken up direct with the manufacturers concerned. The magistrate was also remiss in accepting evidence from the Hendon Police College without asking for independent evidence from qualified engineers. I do not accept the opinions of the Hendon Police College as the ultimate and beyond question, and I invite them to give further consideration to According to the D.S.I.R. the matter. report, during 1955 the percentage of accidents on wet roads which involved skidding was found to have increased to 26 per cent., an increase of 3 per cent. over the figures for the previous year. Perhaps it is because of this new fangled practice having police sup-port that the accidents have increased. This port that the accidents have increased. This is a serious matter and I hope the manufacturers, in view of the decision in the case I have quoted, will vigorously take up the matter with the object of convincing the police that they are in error.

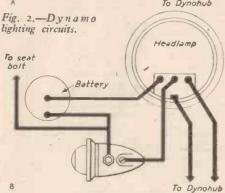


THE HUB DYNAM C

A N excellent example of this type of lighting is the unit made by Sturmey Archer, which gives an output of 6v., .34 amp. at normal speed. The set consists of a generator hub (see Fig. 1) headlamp and rearlamp. A dry battery unit can also be included to provide light when the cycle stops.

Description





shell contains the magnet and this revolves around the armature which is fixed to the hub spindle and remains stationary. The voltage control incorporated is very efficient.

Wiring

This is simply done and if the Sturmey Archer headlamp is used, the circuit will be as A in Fig. 2. If the generator is used in conjunction with other lighting equipment, it should not be difficult to adapt the wiring to suit. The circuit to include the dry battery unit is shown at B in Fig. 2.

The Dry Battery Unit

Fitted to the seat tube of the cycle, this is essentially a container enclosing three r½-volt dry batteries. The purpose of the unit is to provide a standby light when the cycle is stationary at traffic lights or parked. Connection is made to the two terminals at the top of the unit and it is closed by means of a rubber cap, locked by means of a washer and nut. There is little that can go wrong with this unit, but it is well to remember that the spring in the base provides the earth contact and should thus be kept clean and preferably greased with petroleum jelly.

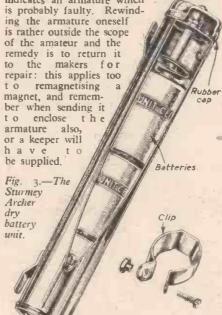
The use of this unit is entirely optional, and if batteries are not replaced the dynamo lighting will function, without, of course, the parking light. The unit is shown in Fig. 3.

Fault Finding

The failure of the lamps to light or a reduced beam only can often be attributed

Description: Wiring: Dismantling: Reassembly

to the same causes as in wheel driven dynamos. Provided that the wiring is correct and the bulbs used of the correct rating, possible reasons for failure could include loose or corroded connections, and bulbs which are failing. The frequent burning out of bulbs is almost always due to loose contacts or to wrongly rated bulbs. In the hub unit itself, a fault in the armature would almost certainly cause a complete failure of the lighting. Dim lights might also be due to a magnet which is not up to strength. To test for a faulty armature, connect a bulb across the armature terminals and spin the wheel, failure to light indicates an armature which

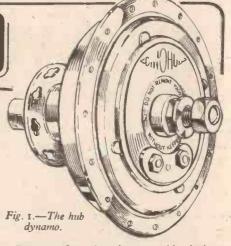


The correct bulbs to use with a hub dynamo are for the headlamp a 6v. .25 amp. and for the rear lamp a 6v. .04 amp. It is most important that the correct bulbs be used.

Spring ring

Dismantling

Reference should be made to Fig. 4, which shows all the parts of the Sturmey Archer GH6 hub dynamo; this hub was chosen for description as it is not incorporated with the hub three-speed and therefore description is simplified.



Remove first the dynamo side locknut and washers and then the four magnet fixing screws and nuts. The dynamo unit is next removed complete by laying the wheel on a bench and tapping the wheel spindle at the other end, causing the dynamo to drop out. Lift the magnet spacing ring from the hub drum.

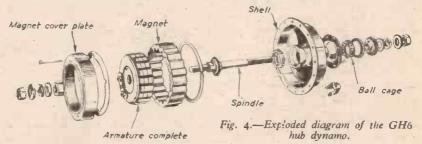
The armature acts as a keeper to the magnet and the two should therefore never be parted, unless it is absolutely necessary, in which case a keeper should be provided. Magnetism is lost immediately the magnet is separated from the keeper ring.

If the armature is separated, it may be tested for continuity either by means of a test meter or by connecting a battery and bulb in series between the two armature terminals. As a further test, one of the leads may be disconnected and touched on to the outside of the armature. If the bulb lights a short circuit is indicated.

To continue dismantling the hub, unscrew the right hand cone and locknut, prise out the dustcap with a screwdriver and remove the ball cage. The spindle can be removed together with the left hand cone and then the other ball race removed. Checking ball races, cones, etc., for wear follows normal procedure.

Reassembly

Fit the ball cage into the smaller end of the hub shell and follow this with the dustcap. If it has been removed, refit the dynamo side cone on to the spindle, screwing it right up to the shoulder. Fit the dynamo-side ball cage and insert the spindle from the dynamo side. Fit the right hand cone and locking nut and adjust the bearing for free running with only slight play on the wheel rim. Replace the card disc inside the cover plate and then fit the cover plate over the magnet, making sure that the holes in the cover plate are in line with the notches in the card and magnet. Fit the metal spacing ring into the hub shell and the shim washer over the cone. Replace the complete dynamo unit in the hub shell, lining up the holes correctly and then fit the fixing screws through the magnet. Replace dynamo side cone, locknut, washers, etc.



HIGHSTONE UTILITIES



new stream lined from in the direction of the second line of the secon

EX-R.A.F. 2-valve (2 voit 61.) MICRO-PHONE AMPILIFIERS as used in plane intercom, in self-contained metal case; can be used to make up a deaf-aid outfit, intercommunication system, or with crystal set; complete with valves and fitting instructions 20t-, post 3/r. Useful wooden box with partitions to hold amplifier, 2/r-

AMPLIFIERS, less valves, 10/-, post 3/-.

SPARKING PLUG NEON TESTERS, with vestpocket clip, 3/3, and with gauge, 3/6, post 4d, S.B.C. Neon Indicator Lamps, for use on mains showing, "live" side of for use on mains showing "live" side of switches, etc., 2/6, post 44. Newn Indicator, complete with condense with epoch type, with vestpooket clip, lindispensale for electricians, etc., 2/6, post 54s.



BELL TRANSFORMERS. These

CRYSTAL SETS. Our latest Model is a real radio receiver, which is fitted with a permanent crystal detector. Why not have a set in your own room? 12.6 post 1/c. Spare Permanent Detectors, 2/c each. When ordered separately, 2/6. With clips end screws, 2/10, post 3d. Special Crystal Diodes, 2.6, post 3d. Headphones, brand new, S. G. Brown, G.E.C., etc., 23/c, and super-sensitive, 30/c a pair, post 1/6.

HEADPHONES IN GOOD ORDER, 6/-Better quality, 7% and 10.— Balanced armature type (very sensitive), 13%. All post 16. New Single Eurpieces, 3%. Italanced armature type, 4% (two of these will make an intercom, set or Baby Alarm). Far.R.A.F. earpiece, 2%. all post 6d. Heeplace and the sensitive of the sensitiv

HAND MICROPHONES with switch in HAND MICROPHONES with switch in bandle and lead 5.6. Tannoy, 79. Similar instrument, moving coll, 8/6. All post 1/6. Mask type with switch, 3.6, post 61. Mike Buttons (carbon), 2. Moving Coll, 3.6; Transformers, 5.- All post 4d. each. Throat Mikes, 5.- post 7d.

MORSE KEYS.—Standard size keys wired to work Buzzer or Lamp, 3/-, post 8d. Slightly smaller keys, 2/6, post 6d. BUZ-ZERS, 4/3, Post 5d.

Ferminals, brass 2BA. mounted on strip, 6d. pair. 0005 Airspaced Variable Condensers, 26, post 6d. 0003 twin gang with trimmers, 2,6, post 6d. 24 volt, 15 mm., M.E.S. Buths for model railways, etc., 1-each, 10.- doz., post 4d. Wander Plurs, Brass, 1 6 doz., post 4d. Fuses,—1 amp 1fin, packet of 10, 2.6, post 3d. Also 150 mA. and 250 mA. same price. Ex-C.P.O. Telephone Tvin Bells, with box, 5/-, post 16. Single Telephone Bell, 3.6, post 9d.

TELEPHONE HAND GENERATOR. C.P.O. type, giving 70 voits for ringing hells, etc., 86, post 2. Telephone hand comb sets, 126, post 16.

Bargain Parcels of really useful equipment, containing Switches. Meters, Comdensers, Resistances, Phones, etc., 10f-, or double assortment, 176; treble, 25f-, All carriage 3f-. This country only.

METERS, 20 amp. 2in. m/c. 8/6; 20 v. 2in. m/c, 8/-; 150 v. 2in. m/c, 104-; 3.5 amp. 2in. T.C., in case with switch, 9/6; 100 mA. 2in. m/c. 7/6; all post extra. Meter units containing 2-500 microamp. movements, 9/-, post 1/6. Money refunded if not completely satisfied.

HIGHSTONE UTILITIES 58 New Wanstead, London, E.11

Letters only,

New Illustrated List sent on request with 2d. stamp and S.A.E.

YOU CAN BUILD YOUR OWN QUALITY TAPE RECORDER



ASPDEN TAPE DECK and AMPLIFIER KITS

with

Tape Decks, 2 Models, 2-speed twin track recording finest motor, Ferroxcube heads, easy to assemble. All parts machined, drilled and punched. Full assembly drawings.

Compact Model 521, 8in. x Itin., kie, £8.5.0. } Standard Model 721, Ilin. x I5in., kie, £9.5.0. } Built and tested 30/- extra

RECORD-REPLAY AMPLIFIER KIT, £5,18.0. 21 wact. Neon record indicator, etc. POWER PACK for above, £2.18.6. Postage and packing extra.

W.P. of Portsmouth writes : Must congratulate you for supplying such an excellent kit."

Send stamp for full particulars to:

W. S. ASPDEN, Electronics, Black Clevedon Road, BLACKPOOL, Lancs.

SAVE ON REPAIRS WITH

GLASS FIBRE

Kit I-15/-Kit II-25/-Kit III--30/-Postage 2/-

Kits for Cars, etc., £5-10-0, £9-10-0. Carriage Paid

These kits carry a comprehensive range of materials, with full instructions to suit all forms of car body repairs and model making.

" Glass Reinforced Plastics" Book et, 1/9 Inc. Postage.

WESTPOLE MOTORS LTD.

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



A superb 100% beavy double-texture water-proof motor cyclist's coat, popular fawn shade, extra long. The Rolls Royce of them all. Often imitated but never agnalled—for goodness'

Often imitated du never equalled—for goodness' sake get the real thing now while you have a chance. Genuine Brand New ex-Army Dispatch Rider's coat. Sizes 38-42, only 89 6. post, etc. 3-, 4-4 16 12/6 extra. New Officers' D.R. Boots. Sizes : 5, 6, 7. 12 and 13, 42 -, post, etc., 2/6. TENT, TERMS, LISTS CLOTHING.

58/6 Carr. Br tish Isles 10/... worth £14.14.0. Gen. British Commando cycle. Amazing burst of speed. Strong & reliable. Specification—everything B.S.A. except tyres and inner tubes, which are heavy duty Dunlop, etc. 28in, wheels. Gen. Ministry purchase, therefore 58 6 buys £14.14.6 cycle. Brand new and unused. Carr. 10.- BARGAIN LISTS, BINOCULARS, TELESCOPES, CAMFRAS, WATCHES, TENTS, CAMPING EQUIPMENT, SLEEPING BAGS.

(E)EADQUARTER and () ENERAL SUPPLIES LTD.

(DEPT. PMC/23), 196-200, COLDHARBOUR LANE, LOUGHBOROUGH JUNCTION, LONDON, S.E.S. Open all Saturday, I p.m. Wednesday



STEEL FRAMED-EXTENDIBLE For protection and easy maintenance. All garages fitted with anchors, shelf, door retainers. Yale lock. FREE site plans, LOWIEST TERMS of any manufacturer including FREE Security Insurance. including FREE Security Insurance. HINGED & OVERHEAD TYPE DOORS BOWSER, MONKS & WHITEHOUSE LTD. (Dept. ME3), Spring Gardens, DONCASTER

THE FAMOUS HARRIS ELECTRIC WELDER and Complete Kit For Welding, Soldering, Brazing and metal construction of repairs in the home, on the car or cycle. Instant heat 0,000° F. Worke from 0v. or 12v. car battery or transformer from A.C. mains. Complete kit of Welding Tool, 9 ft. cable, elip, carbons, cleansing fluid, flures, filler rods, goggles, instructions, hints. Thomsands in daily use. As supplied to Depta. of H.M. Government, I.C.I., Standard Felephones, etc. Welds all Metal's Up to one-ength inch. C.O.D. IF REQUIRED. C.O.D. IF REQUIRED. C.O.D. Terma Available. (Post Free U.K. only) HARRIS ENGINEERING CO. (Dept. P.M. 17) 269 Kingsland Road, London, E.2. and Complete Kit

n. I approximation of

GALPIN'S

ELECTRICAL STORES

408 HIGH STREET, LEWISHAM. S.E.13.

Tel.: Lee Green 0309. 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 coll, in first-class condition, 10/-post 1/6.

EX-GOVT. ROTARY CONVERTORS 24 volts D.C. Input 50 volts 50 cycles, I phase at 450 watts. OUTPUT (complete with Step Up Transformer) from 50 volts to 230 volts, £13/10/- each or CON VERTOR 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, guaran-teed weight approx. 110 lb., £13/10/- each

ASSORTED RESISTANCES. Wire ends, all new, plain, wire, silver and gold tipped, 10/- per 100, P/F.

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 0/6/12/18/24/30/36 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 TRANS-FORMERS, Input 200/250 volts. OUTPUT combination of 0/2/4/6/8/10/12 volts 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 I/- 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/ changer 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 51 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, 2½ 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. Spt. bargains for visitors. Splendid odd

SEE EARTH SATELLITE



AMAZING NEW OFFER

ASTRONOMICAL TELESCOPES 99/6!!

See the Moon at Close Quarters, Examine the Immense Craters, Moun-tain Ranges, etc. Observe Saturn's Rings, Nebulæ, etc., etc.

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

Registered postage and packing including strong stowing cylinder with caps, 12/6.

Altazimuth Portable Clamp Stands. Extra 37/6, P./P. 2/6. Fixes anywhere.

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/-.

Astronomical Books, Charts, Guides, Maps, Revolving Planispheres, etc.

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

HOLMES, WILSON & CO. SCIENTIFIC INSTRUMENT MAKERS (Dept. PM27), Martins Bank Chambers, 33 Bedford Street, North Shields, Northumberland.



POULTRY HOUSES from £8.5.0 or 33/- down. GREENHOUSES TOURSES TOUR 221.5.0 or \$85- down.
Also Aviaries, Birdrooms, Pigeon Lots, Greenhouse Heaters, Ladders etc.
Tel; STAMFORD HILL 9211-3
PARK LINES, LTD. (Dept. :88), 717-719, Seven SistersRd, London, N. 16

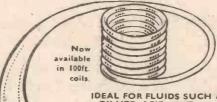
ROGERS 31 NELSON ST

SUPER-ADEPT LATHES and Accessories

Iğin. centres, 6in. between Particulars on receipt of stamp.

F. W. PORTASS MACHINE TOOLS, LTD. Adept Works, I4la Nicholson Rd., Heeley, SHEFFIELD, 8.

CRYSTAL CLEAR FLEXIBLE P.V.C. TUBING



This non-perishing thermoplastic tubing, which possesses glass-like clarity, has a multitude of industrial uses.

IDEAL FOR FLUIDS SUCH AS CUTTING OILS, FUELS,
DILUTE ACID AND ALKALI SOLUTIONS. ETC.

IE ACID	AND AL	KALI SO	LOHONS	
Bore	Wall	Per I	00ft. coil	
3/16in	1/16in.	£1.11.0.	P. & P. 1/	9
1/4in	1/16in.	£1.19.0.	P. & P. 1/	9
3/8in	3/32in.	£4.16.0.	P. & P. 3/-	
I/2in.	1/8in.	€7.14.0.	P. & P. 3/	
7/8in	1/8in.	€9.17.0.	P. & P. 4/-	-

Trade enquiries invited for large quantities at special prices.

TENSILE **PRODUCTS**

Willoughby Road, HARPENDEN, Herts.

Tel. Harpenden 311

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

WORLD WIDE 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

PARKER'S SHEET METAL FOLDING HEAVY VICE MODELS MACHINES.

No. I (illustrated) Capacity. 18 gauge mild steel x 3ft. wide. No. 2 Capacity. 18 gauge mild steel x 2ft, wide. No. 3 Capacity. 16 gauge mild steel x 18in, wide, End folding attachments for Radio Chassis

Tray or Box

making, are

supplied if

required

3ft. model, weight 56lb., £6/5/-, carr. 10/-. 2ft. model, weight 22lb., 65/-. 18in. model, weight 18lb., 65/-, carr. on small models If with attachments, 5/6.

Attachme 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.

GREATEST INVENTION SINCE THE ALPHABET

Gives the RIGHT word at a glance

EASY • QUICK • SURE

This absolutely new and wonderfully simple Idea and Word Chart is the most stimulating aid to quick thinking ever devised. It gives the word you wantwhen you want it It puts words and ideas at your fingertips. It provides brilliant word power. Your imagination is stirred by this simple but simply marvellous Chart. Like a mariner's compass it steers the course of your thoughts into those amazing word-channels that enable you to make your talks, letters, advertisements or any use you make of words, sparkle with brilliance, charm and power, and ideas leap into the mind-vitalise the message-grip the interest-swayconvince—compel. This astonishing Idea and Word Chart will make your ideas more scintillant, your conversation more sparkling, your speaking and writing more brilliant.

Send 3d, stamp today for a specimen of the idea and Word Chart embodied in a descriptive brochure. You will find its new and simple principles as vital to your daily thinking and writing as breath

PSYCHOLOGY PUBLISHING CO. LTD. (Dept. PR/HV 29) MARPLE, CHESHIRE



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

METWOOD

for Complete range of Swiss Musical Movements and Box Kits

Movements by THORENS AND REUGE of Switzerland ranging from 1 tune/18 teeth—3 tunes/72 teeth.

* 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. 1/3 postage free. P.O. please.

METWOOD ACCESSORIES (PM10) 65 Church Street, Wolverton, (Importers and Manufacturers)

FOR ALL YOUR STICKY TRICKY

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



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

MAKE SOUND JOINTS SIMPLY BY USING Multico

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.



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.



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.

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 precleaning. Flux residue cleaning. Flux residue is easily removed with

SIZE 8 CARTON 5/-

Handymans Carton 6d.

BIB WIRE STRIPPER AND CUTTER

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



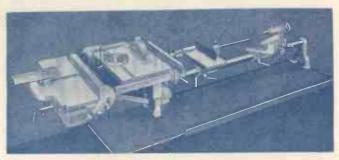
MULTICORE SOLDERS LTD.,

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

Over 75 years experience and world-wide experience for quality reputation for quality DRAWING INSTRUMENTS MINERVA SERIES PROFESSIONAL QUALITY TECHSET SERIES STANDARD QUALITY KINWEST SERIES SCHOOL QUALITY JAYWESS SERIES A.G. THORNTON LTD. P.O. BOX 3, WYTHENSHAWE, MANCHESTER Write for illustrated leaflets and address MANUFACTURERS OF FIRST QUALITY ORAWING INSTRUMENTS nearest stockist to: P.L.C. SLIDE RULES AND DRAWING EQUIPMENT

THE "MINOR" IO in I

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 A view of the 4 in. planer with saw mortiser and planer ready for use. and mortiser ready for use. 7 in. saw with $2\frac{1}{8}$ in. cut. FINE, MEDIUM & COARSE SAWS AVAILABLE.





varying lengths.



Combination table being used for Spindle moulding. Cutter block, panel cutting. Easily adjustable for takes the place of the circular saw.



sanding disc. This table has many



Combination table in use with Combination table in use with slot mortiser. Mortises from 4 in. to

Announcement-See us on Stand 365, BUILDERS EXHIBITION. EMPIRE HALL, OLYMPIA (13th-27th NOVEMBER)

Send Stamp NOW for illustrated brochures to:

CORONET TOOL CO., Dept. PM, Mansfield Rd., DERBY

Published about the 30th of each month by GEORGE NEWNES LIMITED, Tower House, Southampton Street, Strand, London, W.C.2, and Printed in England by W. Speaight & Sons, Exmoor Street, London, W.10. Sole Agents for Australia and New Zealand—Gordon & Gotch (A/sia), Ltd. Sole Agents for South Africa—Central News Agency Ltd. Subscription Rate (including postage): For one year, Inland 20s., Overseas 18s. 6d., Canada 18s. 6d.

"Practical Mechanics" Advice Bureau. COUPON
This coupon is available until October 31st, 1957, and must be attached to all letters containing queries, together with 6d. Postal Order. A stamped addressed envelope must also be enclosed. October, 1957.

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
Jig & Tool Design
Press Tool & Die Design
Sheet Metalwork
Automobile Repairs
Garage Management
Works M'gmnt. & Admin.
Practical Foremanship
Ratefixing & Estimating
Time & Motion Study
Engineering Inspection
Metallurgy
Refrigeration
Welding (all branches)
Maintenance Engineering
Steam Engine Technology
Diesel Engine Technology
Ordnance Survey Dr'ship.

Elec. Draughtsmanship
Machine "Automobile "Structural "R/F Concrete "Structural Engineering
Mathematics (all stages)
Radio Technology
Telecommunications
Wiring & Installation
Television
Radio Servicing
Gen. Elec. Engineering
Generators & Motors
Generation & Supply
Aircraft Mainten. Licences
Aerodynamics
Electrical Design

BUILDING AND STRUCTURAL

L.I.O.B. A.I.A.S.
A.M.I.P.H.E. A.A.L.P.A.
Building Construction
Costs & Accounts
Surveying & Levelling
Clerk of Works
Quantity Surveying

A.R.S.H. M.R.S.H.
A.F.S. A.R.I.C.S.
Builders' Quantities
Carpentry & Joinery
Building Inspector
Building Draughtsmanship
Heating and Ventilating

GENERAL, LOCAL GOVERNMENT, ETC.

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

BECOME A DRAUGHTSMAN—LEARN AT HOME AND EARN BIG MONEY

Men and Youths urgently wanted for well paid positions as Draughtsmen, Inspectors, etc., in Aero, Jig and Tool, Press Tool, Electrical, Mechanical and other Branches of



Engineering. Practical experience is unnecessary for those who are willing to learn—our Guaranteed "Home Study" courses will get you in. Those already engaged in the General Drawing Office should study some specialised Branch such as Jig and Tool or Press Tool Work and so considerably increase their scope and earning capacity.

OVER SEVENTY YEARS OF CONTINUOUS SUCCESS

ATION AL MOTITUTE OF ENGINEERS

NATIONAL INSTITUTE OF ENGINEERING

(In association with CHAMBERS COLLEGE-Founded 1885)

(Dept. 29)

148, HOLBORN, LONDON, E.C.I

SOUTH AFRICA: E.C.S.A., P.O. BOX NO. 8417, JOHANNESBURG AUSTRALIA: P.O. BOX NO. 4570, MELBOURNE

132-PAGE BOOK FREE! SEND FOR YOUR COPY

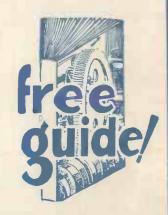
This remarkable FREE GUIDE explains:

- 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

NAMEADDRESS

My general interest is in: (1) ENGINEERING (2) AERO (3) RADIO (4) BUILDING (5) MUNICIPAL WORK

(Place a cross against the branches in which you are interested.)

SEND OFF

THIS COUPON

NOW AND BE

ALL SET FOR

SUCCESS

The subject of examination in which I am especially interested is

To be filled in where you already have a special preference. (21d, stamp only required if unsealed envelope used.)

FOUNDED 1885 - FOREMOST TODAY