

*An Electric Guitarette*

NEWNES

1/-

# PRACTICAL MECHANICS

EDITOR : F.J.CAMM  
FEBRUARY 1954



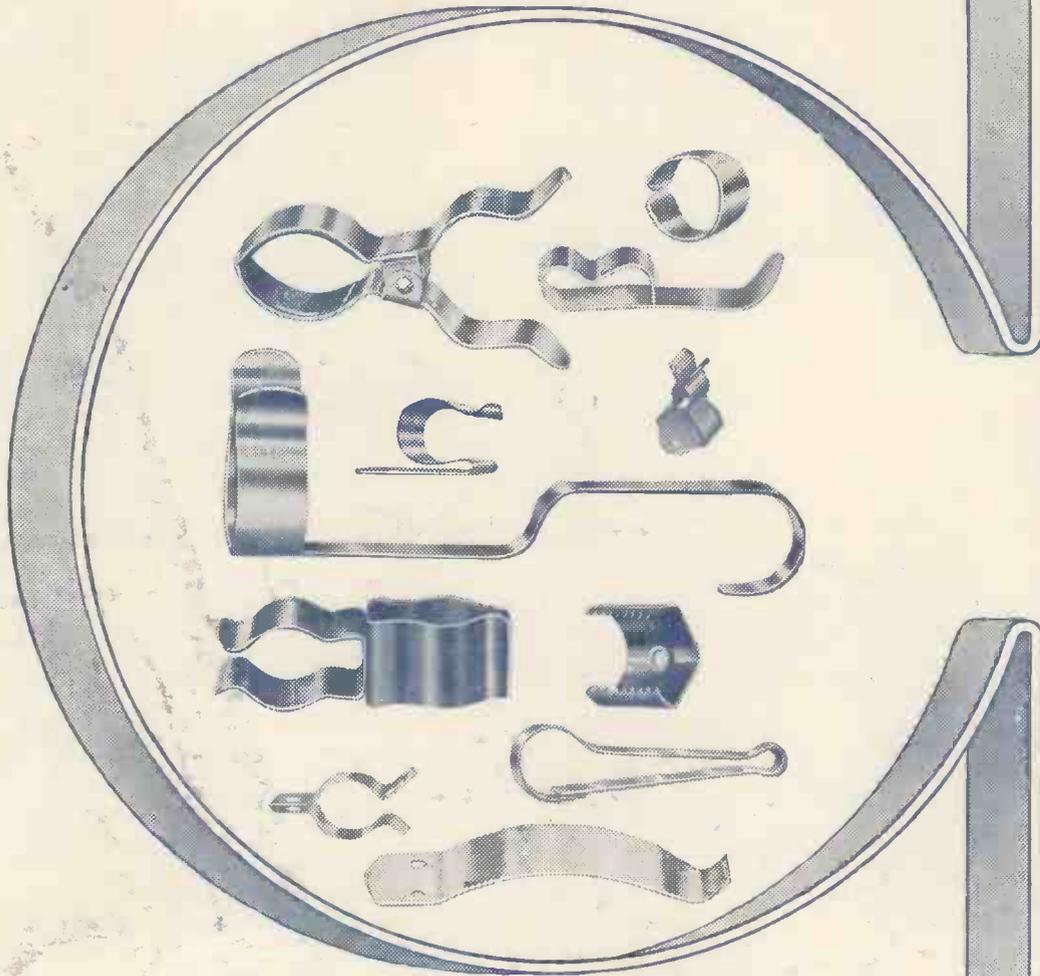
FEATURED IN THIS ISSUE

An A.C. Arc Welder  
A Power-driven Nibbling Machine  
Electrical Repairs at Home, etc.

# How are you fixed for CLIPS?

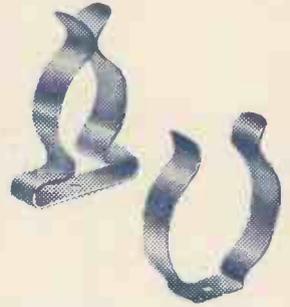
If you are having trouble with clips, bring your problem to us. We show here a few varieties, but these, mark you, are only a **very** small selection from our range of thousands of CLIPS... in every possible shape, size and quantity — in phosphor-bronze, brass, steel, stainless, plated . . . for every trade and profession.

And if you want a 'special' let TERRY'S Research Department design for you — after all, we've got 98 years' experience behind us.



## and 5 very popular 'numbers'

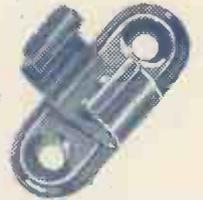
**80 and 81** — general utility clips — for tool racks, etc., from  $\frac{1}{4}$ " to 2" from stock.



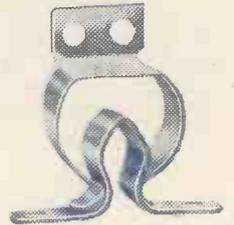
**300** — an exceptionally efficient drawing board clip, 5/- a doz. (inc. p.t.) from stock.



**257** — a useful clip in black enamel, from  $\frac{3}{8}$ " to  $1\frac{1}{2}$ ".



**1364** — a clip for kitchen cabinets — rustproof finish.



Really interested in springs? This book — **Spring Design and Calculations** — packed from cover to cover with spring data, is yours post free for 12/6.

# TERRY Clips

Sole Makers:

HERBERT TERRY & SONS LTD. REDDITCH (The Spring Specialists)  
BIRMINGHAM · LONDON · MANCHESTER



# HANDS WANTED...

to put to good use the X-acto Burlington Hobby Chest, the finest hobby knives and tools you can buy. The superb cabinet and tools are made in England by folk who know that craftsmen strive always for perfection. Every tool and blade designed for a specific job, scalpel sharp and made of the finest surgical steel. See your nearest X-acto Agent — test the balance and see the beautiful workmanship of these tools for yourself, and you will realise why they bring

more skill to your fingertips **84/-**

**TRIX**  
**X-acto**

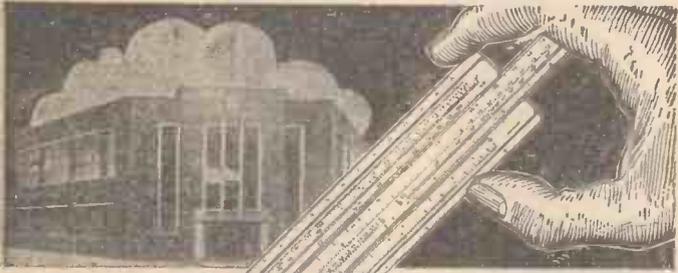
## Burlington Hobby Chest

It consists of three X-acto knives with a set of interchangeable blades, gouges and routers, a block plane, balsa stripper, steel rule and sanding block. Complete with instructions.

X-acto single Knives from 3/-  
X-acto blades are available separately in packets.  
5 short blades, straight 2/6  
5 short blades, curved 3/9 and 2 long blades, 2/-  
Other X-acto Tool Kits from 23/-

Write for illustrated folder to:—

TRIX LTD. (Dept. A) 11 OLD BURLINGTON ST. LONDON, W.1.



**THORNTON'S DRAWING INSTRUMENTS**

## PIC SLIDE RULES

We are the largest manufacturers of high-grade Drawing Instruments and Slide Rules in the British Empire, and our Kinwest Drawing Materials have gained a reputation throughout the world for superb quality and accuracy. Insist on using only Thornton's for complete satisfaction.

Our illustrated Catalogue, which includes particulars of Drawing Instruments, Drawing Boards, Tee and Set Squares, Scales, Curves, etc., is sent Post Free on request.

**A. G. THORNTON LTD**  
Drawing Instrument Specialists  
WYTHENSHAW, MANCHESTER  
Tel: WYThenshawe 2277 (4 lines)

## the BURGESS vibro-tool

the ideal engraving tool for the handyman!



YOU will be really amazed by the Vibro-Tool—the power hand-tool that is as easy to handle as a pencil. With it you can write on steel, engrave jewellery, glass and plastics, tool leather, carve wood and cut stencils—and a host of other handicraft and workshop jobs... with speed and facility you never dreamed possible.

The V.250 Vibro-Tool complete with standard engraving point.

Operating on the vibratory principle, the Vibro-Tool works off 230/250 volts, 200/220 volts, and 110 volts for A.C. supplies only. Just connect to any electric light socket or plug point

**52/6**

Vibro-Tool De Luxe Kit

**97/6**



Write for Brochure V.T.1 to: BURGESS PRODUCTIONS CO. LTD. (Vibro-Tool Dept.), HINCKLEY, LEICESTERSHIRE.

# Look WHAT YOU CAN MAKE AND DO WITH THE **Wolf Cub** HOME CONSTRUCTOR KIT

Here is the new labour-saving way of doing a host of useful construction jobs and making a limitless variety of beautiful things; of model making made easier and more pleasurable than ever before. The Wolf Cub Outfit is the only equipment of its kind where every part is interchangeable. You can begin with as little as the Wolf Cub electric drill and build up with specially planned low price sets of components or you can buy the complete outfit at once.

★ Take the first step today by writing for fully illustrated brochure!



THE COMPLETE **Wolf Cub** OUTFIT INCLUDES...

ELECTRIC SAW KIT

ELECTRIC LATHE KIT

DRILLING GRINDING & POLISHING KIT

...and all powered by

**Wolf Cub** ELECTRIC DRILL



**WOLF ELECTRIC TOOLS LTD · PIONEER WORKS · HANGER LANE · LONDON · W.5**  
 TELEPHONE: PERIVALE 5631-4 BRANCHES: BIRMINGHAM · MANCHESTER · LEEDS · BRISTOL · GLASGOW

## THIS MONTH'S OFFER of **Electradix Bargains**

**PRE-AMPLIFIER FOR TELEVISION.**—Gain 55 D.B. frequency response flat from 42/48 Mc/s. 6 D.B. down at 41.5 Mc/s. input and output impedance 80 ohms co-axial. Standard rack mounting, mains operated, switched milliammeter incorporated for monitoring purposes. Use 4 E.F.50 valves. Enclosed in ventilated steel case 18in. x 8in. x 7in. high. Suitable for Television rediffused in blocks of flats, also ideal fringe areas. Brand new in Maker's Cartons. £8.7.6, carriage extra.

**DYNAMOS.**—14/32 volt 9 amp. shunt wound 2,500 r.p.m., for charging and lighting, 4-hole fixing feet, 70/-, carr. 5/-.

**SWITCHES.**—Dewar Key Switches, 3/6, on-off Toggle Switch, panel type, 1/6, rotary on-off 5 amp. 2/6, Yaxley type 1/6.

**Lighting Plants.**—D.C. 360 watts 20 volts Alco Lyon, £22. J.A.P. 12/20 volts 550 watts with Switchboard, £35. Villiers 1,260 watt 36 volts 36 amps, £40. All guaranteed, write for list.

**MORSE SETS.**—A.M. precision key on bakelite base, brass bar and solid bakelite knob, perfect balance for practice work, 3/6, post 6d., new and boxed. Morse Practice Set. A.M. Key and Buzzer wired on base with space for battery and single headpiece with headband and cord, 10/- post 1/6. Practice Buzzer in bakelite case, 2/6 ea., post 6d.

**MICROPHONES.**—G.P.O. Hand Mikes in black bakelite case fitted latest pattern G.P.O. carbon inset, 4/6, post 9d. G.P.O. Mike button 1in. dia., fine carbon granules and mica diaphragm. Ideal for baby alarms, 3/6, post 6d. Transformer for either type, 2/6, post 9d.

**CRYSTAL SETS.**—The Lesdix Crystal Set has been popular for many years and this year we are offering a model comprising Litz wound coil, variable condenser, germanium diode detector which needs no adjustment, and phone transformers all mounted in neat black bakelite case 6in. x 4½in. x 1½in., fitted aerial and earth terminals and headphones with headband cord and plug. Aerial tested before despatch. PRICE 30/-, post 2/6.

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

## TAKE UP PELMANISM

For Successful Living

**PELMANISM** is beneficial in all the affairs of life. That is its outstanding recommendation to those who wish to make the best of themselves in their occupations, in their social and cultural relations and in their recreations.

Every line written in the Pelman Course is directly applicable to some aspect of human life and conduct. The intention of every word in the Course is to make clear to men and women the means by which they can develop their powers to the fullest extent so that they can live more happily and be more successful—so that, on the one hand, they will make and use occasions for profit and advantage and, on the other hand, be at ease in any company. Both conditions are necessary to complete self-respect and a full life.

Reduced fees for members of Her Majesty's Forces (Apply for Services Enrolment Form)

Personal and Individual

Pelmanists are not left to make the applications themselves. An experienced and sympathetic instructional staff shows them, in exact detail, how to apply the principles of Pelmanism to their own circumstances and aspirations. Thus every Pelman Course is an individual Course.

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

It may be that frustration or anxiety may come your way; if, unfortunately, it does, then with a mind trained to meet the vagaries and turmoil of everyday life, you will be in a position speedily to overcome these hindrances and set-backs; and eventually be free to devote all your mental energies to attain a fuller, richer and happier life.

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 "The Science of Success" which will be sent you, gratis and post free, on application to:—

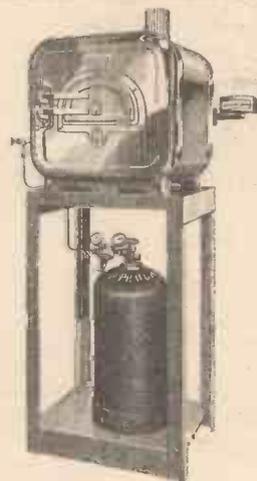
**PELMAN INSTITUTE,**  
 130, Norfolk Mansions,  
 Wigmore Street, London, W.1.

Established over 50 years.

POST THIS FREE COUPON TO-DAY—  
 To the Pelman Institute,  
 130, Norfolk Mansions, Wigmore  
 Street, London, W.1.  
 "The Science of Success," please.

Name .....

Address .....



The NEW **AQUALUX** MUFFLE FURNACE for "BOTTLED GAS" or COAL GAS

These highly efficient furnaces have now been modified to operate off "bottled" gas such as Calor, Pyragas, etc. Type "A" for temperatures up to 1,000 deg. C. Type "B" for temperatures up to 1,250 deg. C. Each available in 5 sizes.

Send for literature,

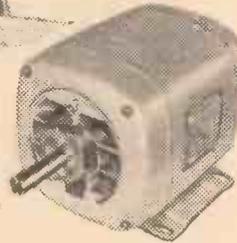
**AQUALUX LTD.**  
 113, EMILY ST., BIRMINGHAM, 12  
 Tel. 1 CALthorpe 1164



**"I MADE IT...**

**you see I've a  
modern workshop!"**

HE has the pride of a craftsman who has planned and executed a skilled job on his own work bench. As every hobbyist knows there is nothing more essential to a workshop than an efficient source of reliable power. So, like hundreds of other young experts, he relies on a Hoover F.H.P. motor. Compact, dependable, precision-made and modern in design, this powerful 'fractional' will give you constant, trouble-free service.



For full details write to:—

**HOOVER LIMITED**

INDUSTRIAL PRODUCTS DEPARTMENT

CAMBUSLANG · LANARKSHIRE · SCOTLAND



**NEVER FORGET**

to keep a regular supply of 'Plasticine' on your bench. This versatile modelling material is wonderfully useful in all branches of practical mechanics. 'Plasticine' makes excellent mock-ups and prototypes. It is clean and easy to handle, and lasts for a very long time. You can buy it at stationers, stores and toy shops, in 16 attractive colours.

**'Plasticine'**  
REGD

**HARBUTT'S  
PLASTICINE LTD**

Bathampton, Bath,  
Somerset



3 1/2" GAUGE  
3/4" SCALE



**0-6-0 TANK LOCOMOTIVE**

A Powerful Model for Amateur Construction  
Walschaert or Baker Valve Gear—Coal  
Fired Boiler

This powerful Locomotive will pull loads up to 728 lbs. Simplicity of construction is the keynote of the design. All parts can be machined on a lathe of 3 1/2 in. or 4 in. centres.

Alternatively we can supply parts already machined.

A complete set of detailed drawings comprising 11 sheets are supplied, together with all necessary information to simplify making and assembling and to ensure a completely successful result.



1 in. SCALE  
(BURRELL TYPE)  
TRACTION  
ENGINE

A specially prepared set of castings simplify the construction of this popular working model. Write for "How to Build a Traction Engine." This book describes construction stage by stage. Price 1/-.



★  
Write for "Model Shipping and Engineering Catalogue." A Manual every model engineer will want to possess. Give the ref. MS/12 Price 2/-.

**BASSETT-LOWKE LTD.**

Head Office and Works, NORTHAMPTON.

London: 112 High Holborn, W.C.1. Manchester: 28 Corporation St.

**AMAZING OFFER!**

First time on Surplus Market



**MINIATURE ACCUMULATORS**

(American made by Willard Battery Co.)

36v. 0.2 A.H. or 6v. 1.2 A.H.

Brand new and uncharged.

Easily filled with hypodermic syringe or "Dermic" oiler.

Note Small Sizes and Weights:

36v. : 3 3/8 in. x 1 1/2 in. x 7/8 in., 5 1/2 ozs.

6v. : 3 3/8 in. x 1 1/2 in. x 7/8 in., 4 1/2 ozs.

Price: 5/- each. P. & P. 9d., or set of four comprising three 36v. and one 6v. in sealed container, 17/6. P. & P. 1/6.

**SAMSONS SURPLUS STORES (P.M.)**

169-171, Edgware Road, W.2

'Phone: PADdington 7851

Open all day Saturday

# I.C.S TRAINED MEN are in Greater Demand than ever

—Maximum production depends on high technical skill, such as that acquired by I.C.S. Students

**TENS OF THOUSANDS MORE TRAINED MEN ARE URGENTLY NEEDED NOW —BUT THERE IS NO WORTH-WHILE PLACE FOR THE UNTRAINED**

*Ambitious men everywhere have succeeded through I.C.S. Home-Study Courses. So also can you.*

The man with an I.C.S. Training in any one of the subjects listed below knows it thoroughly, completely, practically. And he knows how to apply it in his everyday work.

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Accountancy<br/>Air Conditioning<br/>Architecture<br/>Architectural Drawing<br/>Boiler Engineering<br/>Book-keeping<br/>Building Construction<br/>Building Specifications<br/>Business Training<br/>Business Management<br/>Carpentry and Joinery<br/>Chemistry, I. &amp; O.<br/>Civil Engineering<br/>Clerk of Works<br/>Coal Mining<br/>Concrete Engineering<br/>Diesel Engines<br/>Draughtsmanship<br/>Drawing Office Practice<br/>Electrical Engineering</p> | <p>Electric Power, Light-<br/>ing, Transmission,<br/>Traction<br/>Eng. Shop Practice<br/>Fire Engineering<br/>Foremanship<br/>Fuel Technology<br/>Heating and Ventilation<br/>Hydraulic Engineering<br/>Illumination Eng.<br/>Industrial Management<br/>Machine Designing<br/>Machine-Tool Work<br/>Maintenance Eng.<br/>Marine Engineering<br/>Mechanical Drawing<br/>Mechanical Engineering<br/>Mining Engineering<br/>Motor Engineering<br/>Motor Mechanics</p> | <p>Motor Vehicle Elec.<br/>Municipal Engineering<br/>Plumbing<br/>Production Engineering<br/>Quantity Surveying<br/>Radio Engineering<br/>Radio Service Eng.<br/>Refrigeration<br/>Salesmanship<br/>Sanitary and Domestic<br/>Engineering<br/>Sheet-Metal Work<br/>Short-Story Writing<br/>Steam Engineering<br/>Structural Steelwork<br/>Surveying<br/>Television Technology<br/>Welding, Gas and Elec.<br/>Woodwork Drawing<br/>Works Engineering</p> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Students intending to sit for examinations in *Architecture, Quantities, Civil Eng., Mech. Eng.,* and others, should enrol NOW for preparatory Courses. Using a specially prepared Study Programme, the student studies in his spare time, at his own pace and, with time for revision, sits with full confidence of success.

Courses are also available for General Certif. of Education and most other Technical, Professional, Commercial, Civil Service Exams.

(I.C.S. Examination Students are coached until successful.)

Moderate fees include ALL books required.  
REDUCED TERMS TO H.M. FORCES.

If you need technical training, our advice concerning your work and your career is yours for the asking—without obligation. Let us send our special free booklet on the subject in which you are specially interested.

The successful man DOES to-day what the failure INTENDS doing to-morrow. Write to us TO-DAY Dept. 169A, I.C.S., 71, KINGSWAY, W.C.2.

CUT HERE

## INTERNATIONAL CORRESPONDENCE SCHOOLS

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

Please send me the free booklet on.....

Name..... Age.....  
(USE BLOCK LETTERS)

Address.....

### Addresses for Overseas Readers

Australia: 140, Elizabeth Street, Sydney. Egypt: 40, Sharia Abdel Khalek Sarwat Pasha, Cairo. Eire: 3, North Earl Street, Dublin. India: Lakshmi Bldg., Sir Pherozshah 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.

Unsurpassed for  
QUALITY  
REPRODUCTION

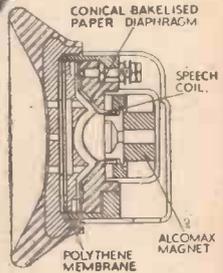
# S. G. Brown



"K"  
TYPE  
MOVING COIL  
HEADPHONES

The increasing appreciation and importance of High Quality Reproduction accounts for S. G. Brown Type "K" headphones being used in Laboratories, Sound Studios for acoustic research, monitoring, DX work, etc.  
D.C. Resistance: 47 ohms  
impedance: 52 ohms at 1,000 c/s.

Full details of the wide range of S. G. Brown Headphones for specific purposes are available in Brochure "P.M."—sent on request.



## S. G. Brown Ltd.

SHAKESPEARE ST., WATFORD, HERTS.  
Telephone: Watford 7241.

## TO HOME CONSTRUCTORS AND DESIGNERS OF OPTICAL INSTRUMENTS

In the past we have supplied all kinds of Ex-Govt. Lenses and Prisms to an ever-growing circle of enthusiasts. We are now compiling a book on the uses of Ex-Govt. Lenses and Prisms and we would welcome your co-operation. If you have designed or constructed an instrument which may be of interest to others, you might like to send us drawings and constructional data. Anything which can be used will be paid for. The instruments which we have in mind are Terrestrial and Celestial Telescopes; Field Glasses; Prism Monoculars; Rifle Sights; Microscopes; Film Viewers; Camera Lucidas; Optical Benches, etc. . .

A list of our available Lenses may be had on request.

### CHARLES FRANK

67-73, SALTMARKET, GLASGOW, C.I.

Phone: BELL 2106/7

Telegraphic Address: BINOCAM, GLASGOW

THE  
NEW  
SUPER

# METALFIX

ADHESIVE  
for all  
CRAFTSMEN

Metals, wood, leather, plastics . . . powerful new Metalfix will join them all, quickly, neatly, permanently. Waterproof, heatproof, acid proof, Metalfix combined adhesive and cold solder can be sawn, drilled, chiselled, planed, painted and polished. For the craftsman, for the hobbyist, for the workshop, Metalfix really sticks to the job.

TWO KINDS:

- COLD SOLDER (tubes and bottles) 1/3  
(bottles only) 1/9
- TRANSPARENT (tubes and bottles) 1/-

from Timothy White & Taylors, Mence Smith, Hobbies and all good Handicraft shops, etc. In case of difficulty write to:—

MERCANTILE MARKETING CO. LTD.  
22, GROSVENOR CRESCENT MEWS, S.W.1. Tel: SLOane 9895

# GAMAGES

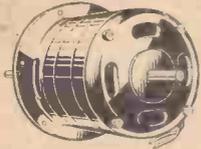
BARGAIN OFFER OF

**1/10 H.P. CAPACITOR START INDUCTION MOTORS WITH DOUBLE SPINDLES**

Mounted on 7in. dia. flange. Strong construction. Durable Black finish. Capacitor is separate. For driving small machines and models and for use as grinder and polisher, etc. Overall length 7 1/2 in. Spindle lengths 1 1/2 in. 200/250 volts A.C. single phase 2,800 r.p.m. Usually 55/-

BARGAIN PRICE **39/6**

Carr. and pkg. 2/6



Orders Value £5 delivered free within 50 miles of Holborn.

Govt. Surplus

## 5-PINT PARAFFIN BRAZING LAMPS

Strong steel construction. Very powerful for brazing and other work that requires an intense heat. Fitted with pressure gauge. Flame can be adjusted from 4in. to 10in. Wt. approx. 10lb. Supplied with 7ft. cable extension, enabling lamp to be used remotely.

Today's Value, £7. **49/6**

Carr. & Pkg. 4/-



## FIRST CLASS HAND DRILLS

at a Bargain Price  
3-jaw 0-1 1/2 in. capacity chuck. Two pinions ensure long life. Overall length 12in. Handles have polished cellulose finish.

Today's Value 16/-

GAMAGES PRICE **9/11**

Post & Pkg. 1/2



## EX-GOVT. ELECTRIC SOLDERING IRONS

New and unused SOLON model. 65 watt, 230-250 volts. Pencil bit. Normal Prices 23/8 and 25/8. Post & Pkg. 1/- With switch and extra cable, 25/3.

**15/-**

## SPECIAL OFFER OF GRANVILLE LATHES on Generous Easy Terms!

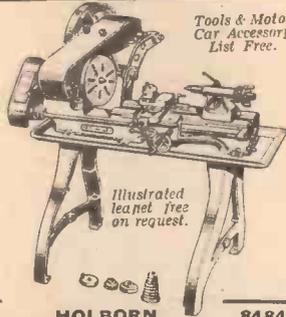
3 1/2 in. back geared, screw cutting centre lathe, 18in. between centres. Height of centres, 3 1/2 in. Swing in gap 10in. diameter, overall length of bed 34in., overall length of lathe 4 1/2 in., bore of headstock spindle 5/8 in. clearance.

Usually £40/14/3. Bench Model **£32/10**

or £8/10/- Deposit and 12 monthly Payments of **44/-**

Stand Model as illustrated (without motor) Usually £53/13/3, £47/10/- or £12 Deposit and 12 monthly Payments of **65/-**

Countershaft, £4/17/0. Carr. extra outside van area.



Tools & Motor Car Accessory List Free.

Illustrated leaflet free on request.

GAMAGES, HOLBORN, E.C.1.

HOLBORN

8484.

## PLEASURE AND PROFIT

### SILK SCREEN PRINTER with ALL SUPPLIES & FREE COURSE!

PRINTS IN SIX COLOURS This is the great new printing and colouring process for amateurs or professionals alike and all handcraft workers. Its versatility is enormous. It will print a few copies, or hundreds, to a professional standard, in solid colours, or intricate designs, on cloth, paper, wood, etc. Print notices, greeting cards, drawings, paintings in full colour, photographs, type-script. Fluorescent colours, suede flock and novelty finishes, transfer papers for printing your own transfers also available. Can also be used as first-rate duplicator with any typewriter. Nowhere else is such a large and comprehensive outfit offered for so little money. Hundreds of customers testify to the quality and amazing value. Do not miss this opportunity.

—ON PAPER, WOOD, CLOTH, PLASTICS, etc.  
AMERICAN PUBLISHERS SERVICE  
(Graphic Arts Div.),  
DOCKING ROAD, SEDGFORD, NORFOLK

### This IS the BARGAIN OF THE YEAR

COMPARE THE VALUE SEE WHAT YOU GET!  
Large 16in. x 12in. PRINTING FRAME. Stout Laminated WOODEN BASE. Patented ADJUSTABLE HINGES (for printing on material up to 1in. thick). Fine Quality SQUEECEE SIX CONTAINERS COLOURS—Red, Blue, Yellow, Green, Black, White. STENCIL FILM (design traced and applied with hot iron). STENCIL CUTTERS and HOLDER. Register Guides, Masking Tape, etc., etc. And FREE 10/- COURSE giving step by step procedure for every application of process, including PHOTO STENCILS, DAYGLO. FLOCK finishes, etc.

for 47/6 post paid REFUND GUARANTEED IF NOT APPROVED WITHIN 7 DAYS.

## Plastic Marble

KARLENITE—the entirely new Karlene artificial Stone for casting Bookends, Ashtrays, Wall-vases, Statuettes, etc. Sets rock hard with a scintillating crystalline structure like marble or alabaster for colour, veining, texture, density and hardness. It is enormously strong, highly resistant to heat, impervious to water. Natural "veining" can be simulated in any colour. A range of pigments is available for this purpose. Most attractive marble effect in models, plaques and statuary.

Make your own Elastomold

## Flexible Moulds

ELASTOMOLD—high quality synthetic rubber for making flexible moulds which faithfully reproduce the most minute details of ornamentation and surface texture. ELASTOMOLD is permanent and ideal for repetition casting of plaques, bookends, ashtrays, and art models. Moulds can be taken from any type of material including Karleneite, wood, metal, plaster, cement, stone, glass, ivory. ELASTOMOLD has great dimensional stability, but flexes easily for the release of cast without damage to fine detail or undercuts. ELASTOMOLD is simple to use and fully recoverable.

Send for full details of this new, fascinating and profitable craft.

KARLENA ART STONE COMPANY LTD.

PLASTICS 2. F. DIVISION

KARLENA HOUSE, 270/272, OXFORD ROAD, MANCHESTER 13

# SANKEY'S PYRUMA PLASTIC CEMENT



for a house — or a horse!

## ONE PLASTIC MODELLING MATERIAL

From rough, rugged stone to smooth animal muscles—any surface, any shape can be easily modelled, moulded or cut from plastic, ready-to-use PYRUMA. Baked or air-dried to stone-hardness, your Pyruma models can be painted or enamelled in realistic colours, as instructed in the Illustrated Book offered below. Send for it today and learn how to make model—

HOUSES, BUILDINGS FOR MODEL RAILWAYS, DOCKS AND AIRPORTS, SHIPS, MODEL FURNITURE, ANIMALS, FIGURES, RELIEF MAPS, Etc., as well as utility objects such as ASHTRAYS, BOOKENDS, MENU HOLDERS, PAPER WEIGHTS, ORNAMENTS AND DECORATIVE OBJECTS.

NO SKILL OR SPECIAL TOOLS REQUIRED.

Inexpensive, PYRUMA is obtainable from Ironmongers, Art-material Shops and Hobbies Stores.



4d. brings this book!

COUPON

TO DEPT. P.M.

J.H. SANKEY & SON, L.P.

ILFORD

ESSEX

Enclosed 4d. in stamps for PYRUMA MODELLING INSTRUCTION BOOK addressed:

NAME.....

ADDRESS.....

Post in unsealed envelope (1 1/2 d. STAMP)

**IT IS SIMPLE TO MAKE THIS LUXURIOUS ELECTRIC BLANKET FOR COLDER NIGHTS**



**COUNTLESS THOUSANDS ALREADY MADE AND IN REGULAR USE**

With all necessary heater cable and easy-to-follow blueprint. For £20-250 volts A.C. or D.C.

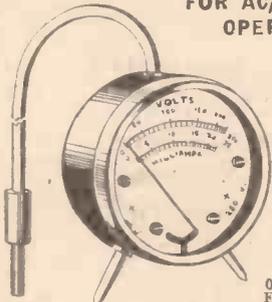
60in. x 30in. 20/- post free.

60in. x 50in. 30/- post free.

Blueprint only (either size) 1/6 post free.

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

**TEST METER FOR AC/DC OPERATION**



Postage 1/- any model.

ILLUSTRATED ELECTRICAL CATALOGUE—Send 3d. in Stamps.

**ANEROID BAROMETER**



AS SOLD FOR 5 Gns YOURS FOR 5/- DEPOSIT Balance by monthly payments of 11/- or 5/- CASH

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

First grade moving-iron meter of great accuracy and robust construction. Indispensable to all who have to do with radio, electrical circuits, etc. BRAND NEW AND GUARANTEED. Offered at exceptionally favourable price.

AMMETERS 0-5 amp or 0-10 amp. F.s.d. 1 1/2 in. dial projection mounting. 18/- v. A.C./D.C. 0-250 v. A.C./D.C. 0-250 19/-

**MAGSTATS SPECIAL THERMOSTATS**



- CARRY 1 AMP. A.C.
- ADJUSTABLE FROM 50-220° F.
- IDEAL FOR THE HOME AQUARIUM

Measures only 1 1/2 in. x 1 in. x 1 in. The Magstat (shown here with cover removed) incorporates ingenious magnetic snap action and is fully controllable from 50-220° F. Applications to which it may be put are very many, and a fully descriptive leaflet will be sent on receipt of S.A.E. The Magstat has a Post Office Eng. Dept. certified compliance of B.S.800.

When you buy from Technical Services Co., you buy with a difference. The bargains we offer each month are brand-new quality lines, very favourably priced and all orders are given personal attention. We invite enquiries, and will always gladly advise without obligation. Please send S.A.E. for matters other than orders requiring a reply from us.

**THE TECHNICAL SERVICES CO**

SHRUBLAND WORKS · BANSTEAD · SURREY

Telephone: BURGH-HEATH 3830.

**HIGH QUALITY GUARANTEED HAIR DRYER**

YOURS FOR 5/- DEPOSIT Balance by monthly payments of 11/-

A soundly made, brand new hair-dryer. Blows hot or cold as desired. Has many other useful applications. Will give years of unflinching service. For 200/250 v. A.C. or D.C. Cash Price 6 1/2-

BRAND NEW AND GUARANTEED.

**BRAND-NEW PRECISION BUILT ELECTRIC MOTORS**

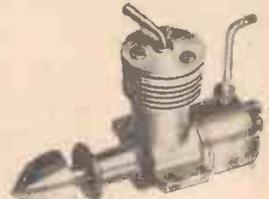


dryers, Drink and Food Mixers, etc. Four-blade Fan to fit the spindle for 2/- each. Post 6d. 38/-

**E.D. DIESELS FOR YOUR MODELS**



**E.D. 46 BABY**  
Specification: Bore 3/8 in. R.P.M. 9,000-12,000. Height 1 1/4 in. Stroke 3/4 in. cu. capacity 0.46 c.c. B.H.P. 0.04. Weight 1.4 oz. with tank. Length 2 3/4 in. Width 1 1/2 in. Fuel Control placed at 30 deg. for easy access. Price £2.12.3

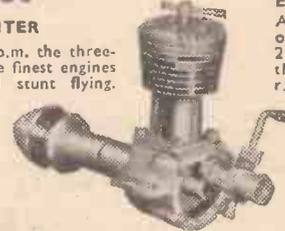


**E.D. 1 c.c. (BEE)**  
A compact little motor with an overall height of 2 1/2 in. Weight 2 1/2 oz. Bore 0.437 in. static thrust 12 oz., stroke 0.400 r.p.m., 7,000 plus. Price £2.14.9 (Watercooled, £3.16.3)

**E.D. 3.46 c.c. HUNTER**

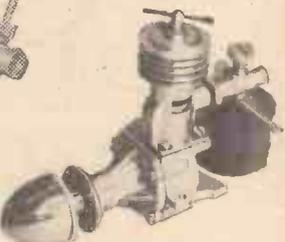
Developing 10,000 r.p.m. the three-forty-six is one of the finest engines for control-line and stunt flying. Stroke 0.625 in., height 3 in., width 1 1/2 in., length 4 1/2 in., weight 5 1/2 oz.

Price £3.18.6 (Watercooled, £5.9.3)



**E.D. 2.46 c.c. RACING ENGINE**

Specially designed for use as a diesel, glow-plug or spark ignition engine, the 2.46 develops over 1/2 h.p. at 14,000 r.p.m. plus. Total weight 5 oz. Price £3.18.6 (Watercooled £5.9.3)



**E.D. 2 c.c. COMPETITION SPECIAL**

Gives 23 oz. static thrust and incorporates vernier compression adjustment. Height 3 in., width 1 1/2 in., length 4 in., weight 5 1/2 oz. Price £3.1.9 (Watercooled, £4.10.3)

**E.D. ELECTRONIC DEVELOPMENTS (SURREY) LTD.**  
DEVELOPMENT ENGINEERS  
12.23 18, VILLIERS ROAD, KINGSTON-ON-THAMES, SURREY, ENGLAND.

**Tyler SPIRAL BLADES**



METAL-PLASTIC WOOD  
Six Blades and Adaptor, 3/6  
Extra Blades, 3 for 1/-

**CUT IN ANY DIRECTION**

The round blade with its 360 deg. cutting edge is revolutionary and eliminates the problems of sawing intricate curves and angles which would be impossible with ordinary hacksaw blades and at a speed three times that of any similar device. It cuts tubing without tearing or binding. The spiral blade (with adaptors) fits any standard frame. Blade length 10 in., blade diameter .050. Obtainable from all leading Tool Dealers.

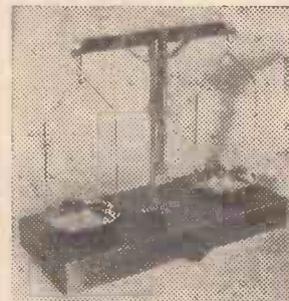
**SPIRAL SAWS LTD., TRADING ESTATE, SLOUGH, BUCKS**

**SCIENTIFIC STUDENTS, KEEN PHOTOGRAPHERS &**

anyone needing a good reliable Balance at a really

**REASONABLE PRICE**

should secure a "COURIER" Precision Balance Outfit (Pat. App. for) with which to build for themselves this Balance from genuine commercial balance parts, including real AGATE bearings, steel knives, brass pans and fittings. Capacity: 100 grm. Sensivity: 10 mgrm.



These outfits are designed and produced by Balance specialists. Complete, with full instructions and blueprint. From your usual supplier or direct.

**WILLIAM A. WEBB LTD. (DEPT. C) 47/6**  
1-9, Perryman's Farm Road, ILFORD, ESSEX, ENG. (UK postage 1/-)

# Lay Your Own Floors

Oak Flooring Blocks Free of Licence

PRICE  
**19/6**  
PER  
SQ. YD.  
CARRIAGE  
EXTRA



FULL  
DETAILS,  
SAMPLE  
AND  
LAYING  
INSTRUC-  
TIONS  
ON  
APPLICA-  
TION

Hardwood floors are not difficult to lay on concrete or wooden sub-floors. We supply kiln dried flooring blocks accurately manufactured from Prime quality Scandinavian Oak ready for laying with full instructions. At a modest cost you can transform concrete or wooden surfaces into a beautiful polished Oak Parquet floor that will last a lifetime, and add to the value of your property.

**THE SURREYBOARD CO. LTD.**  
(DEPT. P.M.),  
72, HIGH STREET, CROYDON, SURREY

## MAKE MONEY—making casts with **VINAMOLD**

A grand spare-time occupation



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

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

VINATEX LIMITED (Dept. P.M.2a), CARSHALTON, SURREY.

## THE ULTRA LENS AIDS PRODUCTION

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

The ULTRA LENS has won the enthusiasm of technical experts especially in the field of engineering, and is used extensively in collieries, foundries, electricity works, tool shops, forges, motor works, and practically every branch of the engineering trade.

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

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



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

Write today for full particulars and price list to

**THE ULTRA LENS COMPANY**

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

# Handymen & Housewives!

## you can **POLISH-SAND-DRILL**

with



### NO TV Interference!

NOW you can do all those household jobs where and when you like without the risk of spoiling TV reception... yours or the neighbours! These versatile power tools are fitted with TV interference suppressors which have full GPO approval... compact, light and powerful they really take the drudgery out of all the jobs you do!



**1/4" Drill**  
**NOW ONLY**  
**£5-19-6**

**5" SANDER  
POLISHER**  
**£8-7-6**



# Black & Decker



**PORTABLE  
ELECTRIC  
TOOLS**

Write for free 48pp  
booklet "Handy Tips  
for the Handyman"

**BLACK & DECKER LTD. Dept. PM HARMONDSWORTH MIDD.**

# VALUABLE NEW HANDBOOK FREE TO AMBITIOUS ENGINEERS

Have you had your copy of "Engineering Opportunities"?

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

We definitely Guarantee  
"NO PASS—NO FEE"

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

## WHICH OF THESE IS YOUR PET SUBJECT?

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

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

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

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

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

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

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

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

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

THE BRITISH INSTITUTE OF  
ENGINEERING TECHNOLOGY



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

Phone: MAYfair 0812

### 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 becomes a "key-man" quickly and easily.
- ★ HOW to benefit from our free Advisory and Appointments Depts.
- ★ WHERE today's real opportunities are . . . and HOW you can take advantage of the chances you are now missing.
- ★ HOW, irrespective of your age, education or experience, YOU can succeed in any branch of Engineering that appeals to you.

144 PAGES OF EXPERT CAREER-GUIDANCE

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

## POST NOW!

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

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

NAME .....

ADDRESS .....

WRITE IF YOU PREFER NOT TO CUT THIS PAGE



Only 1d. stamp is needed if posted in an unsealed envelope.

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

FEBRUARY,  
1954  
VOL. XXI  
No. 242

# PRACTICAL MECHANICS

EDITOR  
F. J. CAMM

The "Cyclist," "Practical Motorist," and "Home Movies" are temporarily incorporated.

FAIR COMMENT

By The Editor

## Television On Tape

UP to the present the only satisfactory means of recording a television programme has been by means of film. Unlike sound broadcasting, programmes cannot be recorded on wax, because of the wide frequency band involved. Telefilm has certain drawbacks and this means that every time a particular programme, such as a play, is repeated, the cast must be present in costume in the studio and the scenes reassembled. This is costly. Magnetic tape, however, has provided the answer. The recording of television pictures on tape in colour and in black and white was publicly demonstrated for the first time in December, 1953, by the Radio Corporation of America at its laboratories in New York in a preview of a new technique that will simplify the entire art of making motion pictures. The new method of recording vision is similar in basic principles to the recording of sound on tape. It is the first major step into an era of electronic photography in which motion pictures in colour, black or monochrome will be produced quickly and economically without any photographic development or processing.

Hitherto there have been two major missing links in television—a video tape recorder and a means of amplifying light, just as we can amplify sound. The first of the missing links has been forged and experiments are continuing with the second.

The new system has great possibilities, not only for television broadcasting but for national defence, for the cinema industry, for education, home entertainment and for industry in general. It is likely that it will be in general use within two years. The cost of recording a colour television programme on tape will be only about 5 per cent. of what it would cost to put it on colour film, since the tape can be re-used. Video tape recorders give the television industry a practical low cost solution to programme recording, immediate playback and rapid distribution. Pictures can be viewed the instant they are recorded and an unlimited number of copies can be made quickly. Recorded tapes can be preserved indefinitely for historic reference, or they can be electronically erased and the tape used over and over again.

With further developments of the technique, numerous possibilities occur. Small portable television cameras are already in wide use in industry, schools and colleges. Low cost television cameras that work like slaves off home television receivers are ultimately possible.

In the demonstration a colour television programme originating in the studios in the Radio City, New York, was beamed by radio micro-waves across the forty-five mile span to the R.C.A. research centre at Princeton, New Jersey. The programme was seen as it arrived. At the same instant R.C.A.'s tape recording system recorded the television picture on a strip of magnetically coated plastic tape, half an inch wide and of newsprint thickness. During part of the transmission both the live programme from the micro-wave radio relay and an immediate playback of the magnetic tape recording were shown. As soon as the tape wheel was rewound it was played back and the recorded television pictures appeared on two colour television receivers.

The advantages over the film process are obvious. In the latter the pictures pass from the television camera through most of the television system to be reproduced on a small picture tube. A camera then photographs the programme on to film, which must be chemically processed and a print made before the pictures can be reproduced. The reproduction requires another installation in which a television camera tube picks up the scene from a motion picture projector for re-broadcast.

Great Britain was the first to record a

television programme, but it was in connection with the low definition (30 line) transmissions.

### Competition for Model Engineers

A NATIONAL competition, organised by the Auto-Cycle Union, which controls motor cycling sport in this country and, by its race promotions, improves the "breed" of British motor cycles, announces a national competition for models of motor cycles, which should be of great interest to our model engineering readers. Competitors are invited to submit models not more than 10 ins. long of pioneer motor cycles (models of machines manufactured up to December 31st, 1914); models of vintage motor cycles (models of machines manufactured between January 1st, 1915, and December 31st, 1930); models of modern motor cycles (models of machines manufactured since January 1st, 1931).

The Auto-Cycle Union will be responsible for the safe custody of all models sent in and will return them to entrants immediately after the 1954 Motor Cycle Show. Entries should be received at the offices of the A.C.U. not later than September 30th, 1954.

It is a condition of entry that all models entered in the competition may at the absolute discretion of the Auto-Cycle Union be placed on exhibition on the A.C.U. stand at the Motor Cycle Show to be held in November, 1954. All entries and correspondence in connection with the competition should be addressed to the Secretary, marking envelopes and/or packages "Model Competition." The address is 83, Pall Mall, London, S.W.1.

In each category there are three prizes: first £20 and an engraved souvenir plaque, second £10 and third prize £5. I have no doubt there will be some excellent entries. I think that instead of limiting the length, competitors should have been asked to make models to a positive scale, say an inch to the foot, so that visitors to the Motor Cycle Show would gain an idea of the relative sizes of the prototypes.

—F. J. C.

#### SUBSCRIPTION RATES

including postage for one year

Inland - - - - 14s. per annum.

Abroad - - - - 14s. per annum.

Editorial and Advertisement Office: "Practical

Mechanics," George Newnes, Ltd.,

Tower House, Southampton Street, Strand, W.C.2

Phone: Temple Bar 4363

Telegrams: Newnes, Rand, London.

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. Reproductions or imitations of any of these are therefore expressly forbidden.



# AN Electric Guitazette

A Novel Musical Instrument to Construct

By "EXPERIMENTALIST"

**T**HIS instrument is played like a Hawaiian guitar and sounds like one, but unlike such six-stringed instruments, it only boasts a single steel string. A test model, designed and built by the writer, gave surprisingly good results, using an earphone as a reproducer unit. Reproduction has to be heard to be believed; the familiar wailing notes come through the amplifier (any radio receiver having pick-up terminals or sockets) as clear as a bell and, to play this instrument, one does not have

a soft nature, easily cut with a fretsaw handframe fitted with a coarse toy-making blade.

The handle requires a piece of wood 26in. long by 1 1/2in. wide. A recess is cut for the earphone casing, as shown. The bottom side is recessed 2in. long by 1/4in. deep for the knee piece, the latter (see Fig. 2) being recessed to make a groove, allowing both parts to half-lap accurately together.

When cutting the handle to shape, note that the head end (for the string peg) is 1/2in. narrower in width. The neck shape, when cut, is rounded at the underside with a spokeshave and rasp, then filed and glass-papered smooth. This is done more for appearance, since the instrument is laid across the knees, not held in the left hand, which is the case with most stringed instruments.

A 1/4in. square notch, for the bone nut piece is cut across the finger-board surface, 3 1/2in. from the head end, then the latter cut to slope and planed neatly as shown

### Earphone Collar Pieces

Two "collar" pieces to grip the base of the earphone casing are prepared by marking out the shape shown in Fig. 2 on 1/2in. thick wood. Keep the shapes 1/4in. apart, as this is the distance they will be apart when attached to the side of the handle piece. The central circular aperture is scribed according to the diameter of the earphone used.

Having cut the collar pieces to shape, true up the side edges with a plane, or by rubbing on a sheet of medium glasspaper thumb-tacked to a flat board. Alternatively, the collar pieces could be marked out along the planed edges of a piece of wood, thus avoiding the need for truing with a plane.

The collar pieces are affixed to the handle by means of two 2 1/2in. lengths of B.A. threaded brass rod about 1/4in. diameter; old coil rods would suit. Suitable holes for the entry of the rods are made with a 5/32in. drill about 1in. from the ends of the collar pieces and similar holes to correspond are made in the handle.

### The Assembly

Glue and screw the knee piece to the handle, then attach the collar pieces; the nuts on the fixing rods should be based with 1/2in. or 3/4in. brass washers. A 3/16in. No. 6 mooring screw for the string is driven into the handle piece in the position shown by the enlarged side view in Fig. 3.

The peg used was a ukelele type, but a suitable one can be made from 1/4in. wood, as shown in Fig. 3. The finger grip may be left flat or made convex or concave by

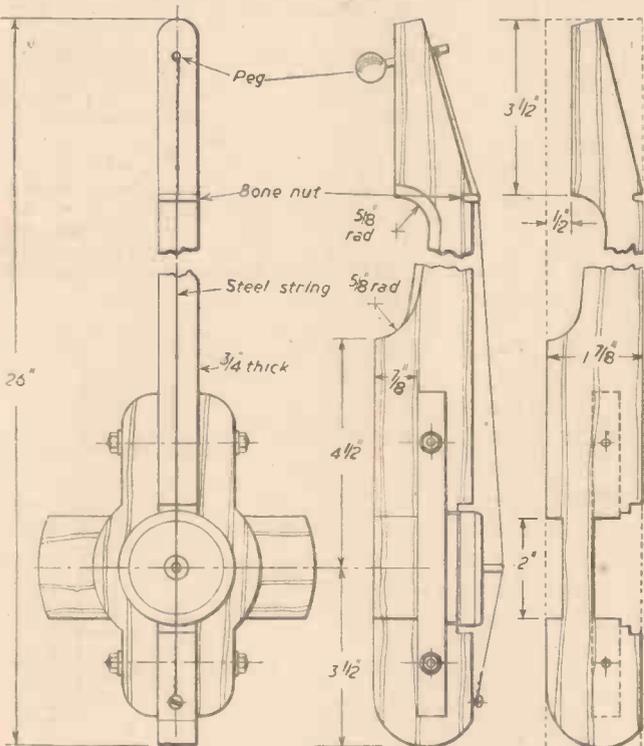


Fig. 1.—Shortened top and side views of instrument and handle.

to be an experienced musician.

The smooth-playing "comb" used was the back of a penknife, the "plectrum" was the forefinger of the right hand and the amplifier a straight two-valve set. It is possible, with such primitive accessories, to get as much pleasure from the Guitazette as from a proper, expensive model.

There is no harmony, of course, because there are no other strings for tuning in unison. The effect obtained is reminiscent of the sound obtained from a one-stringed fiddle, only the notes are louder, sharper and of longer duration. The notes can be prolonged if a celluloid plectrum is used and the tremolo (shake) put on the string as in mandolin playing.

in Fig. 1. Bore a 3/16in. hole for the peg about 1in. from the head end; the hole is bored at right angles to the head slope, as seen in the side view, Fig. 1.

The nut piece, which is fitted and glued in position at this juncture, measures 1/2in. long by 1/4in. wide by 1/4in. thick. It may be cut from bone or any white composition, such as a piece of comb. A light groove is cut or filed in the centre of the top edge to keep the string in place.

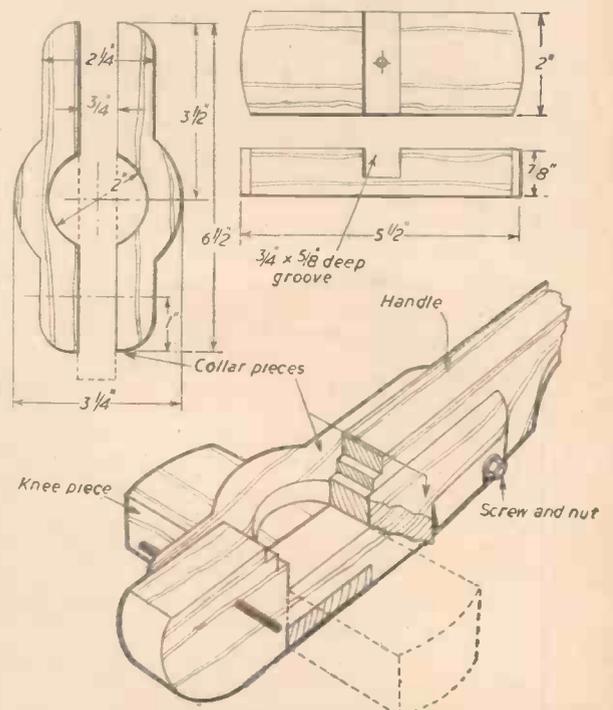


Fig. 2.—Shape and sizes of collar pieces and knee piece, with constructional detail.

filing, as preferred. A very fine hole should be bored for the string near the tip.

Try the earphone in position. The casing should be a neat tight fit. If a bit slack, a few shavings can be removed from the sides of the collar pieces or a short piece of insulation could be pressed around the base of the casing. By adjusting the tightness of the rod nuts, it should be possible to ease or tighten the grip on the reproducer unit. Slackness must be avoided, if possible, as it is apt to "dead" some of the necessary vibration set up by the manipulated string.

**A Special Diaphragm**

Readers who have made the 3/32 in. thick diaphragm shown—greatly exaggerated in comparison with the other enlarged views at Fig. 3—need to file the three "arm" shapes to half thickness. A 1/8 in. hole is drilled in the centre and countersunk on the reverse side for a 1/2 in. long by 3/8 in. dia. bolt with a flat head.

A tiny nick (for the string) is made across the end of the bolt which is then inserted in the diaphragm by means of a suitable washer and nut. The bolt head needs to be filed flush with the surface of the diaphragm should it project a trifle, or else the hole countersunk a little more.

An alternative diaphragm, cut from 1/16 in. thick sheet iron or mild steel, is detailed. The shape is one easily cut with a hacksaw. It can, if necessary, be made more sensitive by filing the "arms" a trifle thinner.

**The Steel String Used**

The writer used a plain steel 2nd (A) mandolin string. It was hooked over the mooring screw and brought over the diaphragm post and nut to the peg, it being threaded through this and turned in an anti-clockwise direction to tighten it. Owing to the exceptional length, in comparison with the fingerboard of a mandolin, the string is best tuned to middle C on a piano or organ.

Owing to the difficulty of obtaining steel strings for musical instruments in most districts, the strands of steel wire found in

bicycle brake cables can be used as a temporary substitute. Such strands are finer and not so smooth as a proper "A" mandolin string, naturally. They are more like "E" mandolin strings, which may also be used.

**The Keyboard Fret Positions**  
Actual frets need

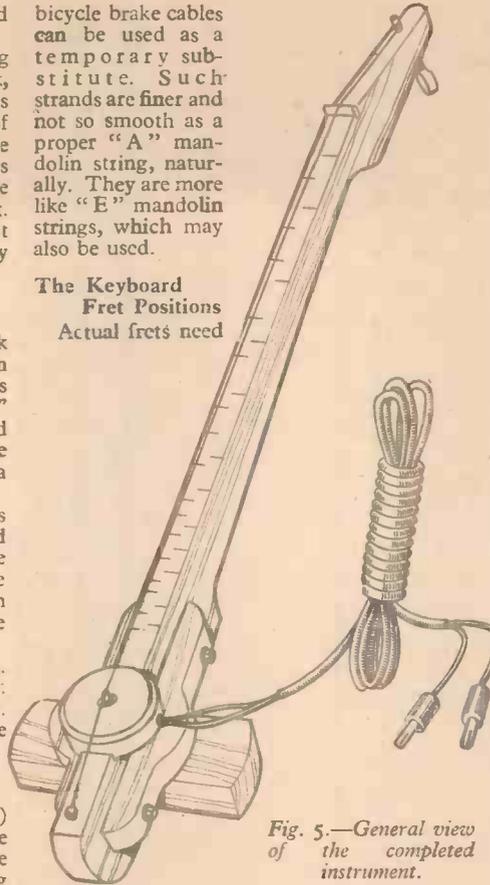


Fig. 5.—General view of the completed instrument.

sequently, looking down on the instrument upon one's knees; a piano keyboard can be made out.

The natural notes are C (the open string note), D, E, F, G, A, B, C. That is one octave and as there are two octaves complete with sharps and flats quite a useful range of melodies is possible.

Always begin your tunes approximately in the middle of the fingerboard. This ensures a good compass of high and low notes and keeps the melody going at an even rate, without sudden "jumps" to notes of a higher octave.

**Final Hints**

When using the steel comb or penknife, press on the string with it gently, but firmly. Pluck the string with the forefinger of the right hand for each note wanted. When a note is a breve or semibreve (lasting for four beats to a bar in the first case, and two beats in the latter case), keep gliding the comb quickly from side to side to produce the proper sustained wailing affect.

**Adjusting the Diaphragm**

If, under test, reproduction is weak, the diaphragm is likely to be too far distant from the earphone pole pieces, or vice versa, in which case packing with 2 in. rings of blotting paper is necessary. Volume can be controlled by adjusting the earphone cover itself. The tightness or slackness of the cover of the diaphragm also affects reproduction, either making it bad or improving it.

The writer had to pack his diaphragm between two rings of blotting paper. The surface ring (on which the cover screws) helped to cut out a slight harshness.

**Painting**

A good long piece of twin flex is wanted, of course. For ordinary purposes, an 8 ft. length should suffice. As a finish, the writer painted his model with ebony polish and marked the fingerboard fret positions with white paint.

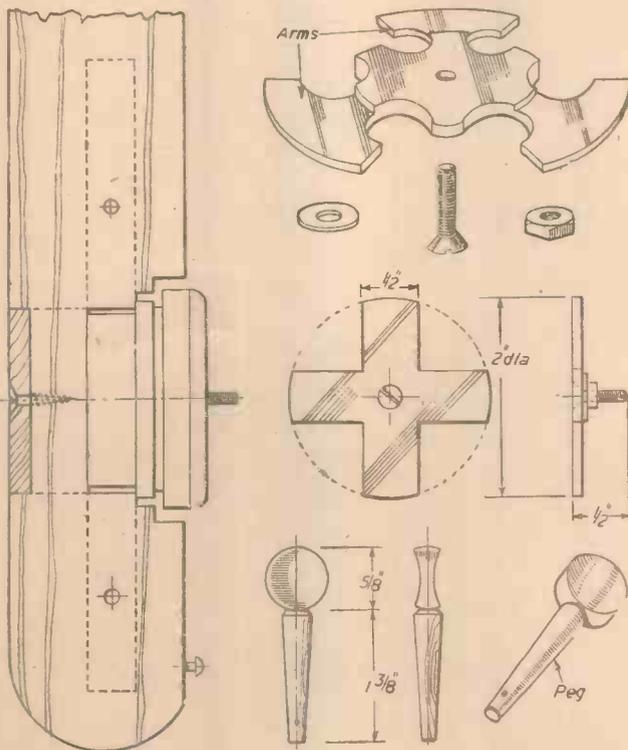


Fig. 3.—Enlarged detail of body, showing how earphone fits in its recess, with details of diaphragm and wooden peg.

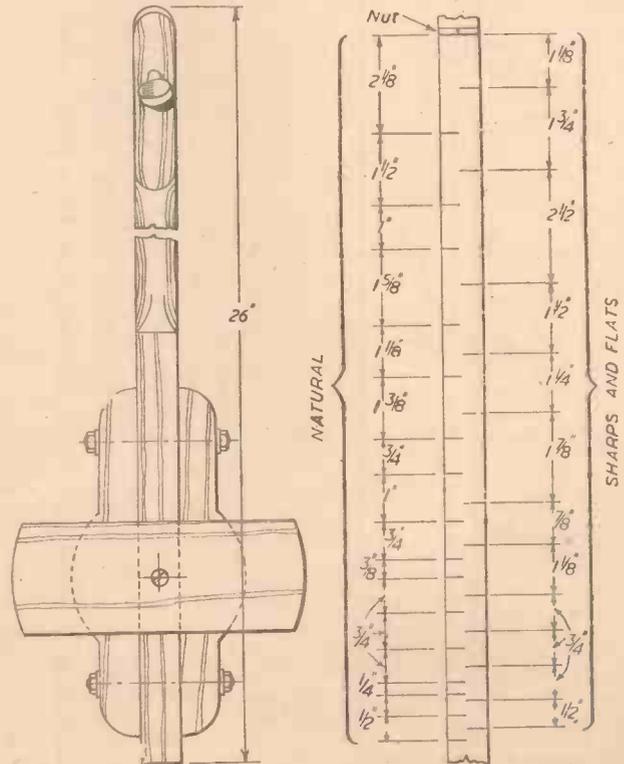


Fig. 4.—A back view and diagram showing how the fingerboard is marked to give the usual "fret" positions.

# A Miniature Electric Motor

This Easily Made Working Model is Built Round the Balance Wheel of an Alarm Clock, and Operates from a 4-volt Flashlight Battery

By "HANDYMAN"

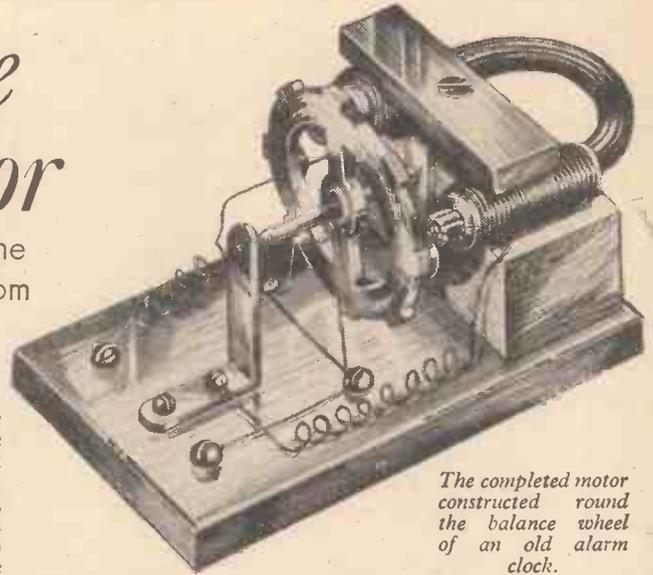
**T**HIS novel form of electric motor, which can be made in a couple of hours, runs at a good speed when connected to an ordinary flash-lamp battery. Many interesting models have had their origin in the junk box, and the tiny motor shown in the accompanying illustrations is no exception, as the chief part, the armature, is a balance wheel taken from the works of a discarded alarm clock.

### Preparing the Rotor

To prepare the armature, or rotor, two soft iron discs are sweated to the side of the rim of the wheel at the ends of the two radial arms, as shown at A in Figs. 1, 2 and 3. These discs are 5/32in. dia., and were cut with a hacksaw from the shank of

together. The ends of the magnet must be the same distance apart as the soft iron discs, A, A, on the rotor. Two brass washers, about 1/4in. dia., are slipped on to each magnet limb to form the cheeks for the coils, as shown in Fig. 4. The distance between the washers is 1/2in., and the end washers are 1/4in. from the ends of the magnet. The ends of the magnet must be filed flat and square, and to do this bind each end tightly with copper wire and use a fine file.

The magnet is wound with No. 30 gauge enamelled wire, 3yds. being wound on each coil. After winding one coil, the other one is wound in the reverse direction, as indicated at C, Fig. 4. A few inches of wire should be left at the starting and finishing ends of the winding for connecting-up purposes.



The completed motor constructed round the balance wheel of an old alarm clock.

of No. 28 gauge bare copper wire, clamped under the heads of two screws near the rotor. A wire from one of these screws is connected to another screw near the front corner of the baseboard, as indicated in Fig. 6. By having two brushes connected as shown, two impulses per revolution are given to the rotor.

The wire "brushes" should be inclined towards the spindle so that they press lightly against the contact pin when the rotor revolves. It is also necessary to slightly bend the top end of each wire so that the pin just makes contact as the iron discs approach the ends of the magnet. Contact must be broken the moment the discs come opposite the magnet ends.

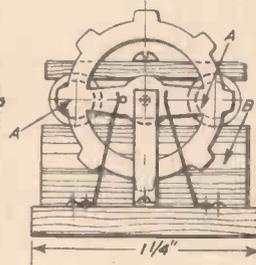
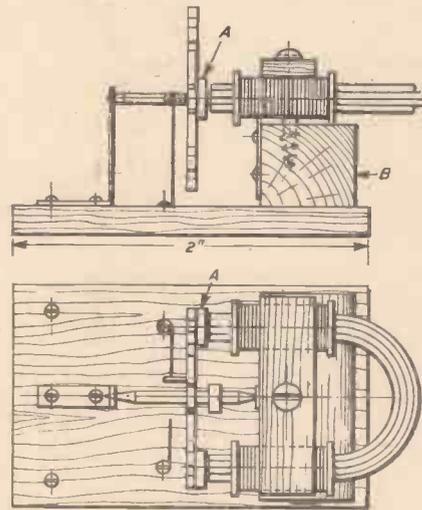
### Final Adjustments

On connecting up to a flash-lamp battery the little motor will run at a fast rate after the necessary adjustments to the wire "brushes" have been made. A touch of very fine machine oil should be applied to the ends of the rotor spindle before starting up the motor.

As an alternative to using a balance wheel for the rotor, a strip of tinfoil with a soft iron disc soldered to each end would answer the purpose. A piece of steel knitting needle of the required length, with both ends filed to a point, will do for the spindle. Drill a hole in the centre of the tinfoil strip, put it on the spindle and solder it in place after making adjustments so that the whole runs truly when placed between the bearings.

### Concealing the Battery

The battery could be conveniently concealed by mounting the motor on a hollow plinth in the form of a box, so arranged that the battery lies flat within it. Suitable connections could be made through the top of the box to the screw terminals on the baseboard, and a small switch could be fitted to the side of the box.



Figs. 1 to 3.—Side, end and plan views of the miniature electric motor, using the balance wheel of an old alarm clock as an armature.

an iron wood-screw. They are filed to a thickness of 1/20in. before sweating in place.

The bearing plates are cut from a strip of 22 gauge sheet brass to the sizes given in Fig. 5, and two holes are drilled in each to take small brass round-headed screws. Near the top end of each bearing a deep centre-punch mark is made to take the pointed ends of the armature spindle.

The supporting block, B, is a piece of 1/2in. square wood 1 1/2in. long, and is fixed to the baseboard with two countersunk screws driven in from underneath.

The short bearing plate is screwed to the block, B, while the longer plate is bent at right angles and screwed to the base, as shown in Figs. 1 and 2. The distance between these plates must be such that the rotor revolves easily when the pointed ends of the spindle engage in the centre-punched holes made to receive them.

### The Magnet

The magnet consists of eight pieces of 16 gauge soft iron wire 2 1/2in. long, each bent to a horse-shoe shape and then bunched

course, that the parts do not touch when the rotor revolves.

### Making the Connections

The circuit diagram is given in Fig. 6, from which it will be seen that the wire from one magnet coil is connected to one of the screws near the front corner of the baseboard. The wire from the other coil is connected to one of the screws at the foot of the L-shaped bearing plate. The two "brushes," with which the small pin on the rotor makes contact, consist of pieces

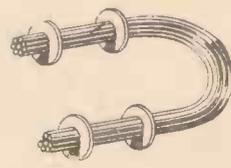


Fig. 4 (Left).—Details of magnet and direction of winding.

Fig. 5 (Right).—Bearing plates.

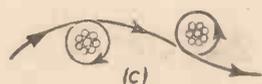
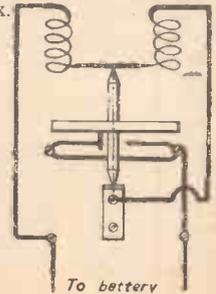
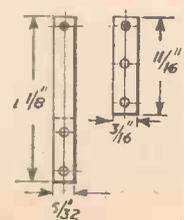


Fig. 6 (Extreme right).—Diagram of connections.



# A Motion-picture Machine

A Simple Device for Producing Motion Pictures of Cartoons, Diagrams, or Mechanisms

By R. BRIERLEY

$\frac{1}{2}$  in. wood (Fig. 6) recess each part according to the size of hinges utilised. Hinge the door to the pillar and screw the pillar to the base through the hole marked "E" (Fig. 3). The sheet-metal wrapper plate (Fig. 7) is drilled and filed before bending and setting accurately to the required shape. Care must be taken to file the large hole neatly as this forms the mask for the picture shape.

Next the cowl (Fig. 8) is made. The grooves shown dotted in the sides are cut to suit the thickness of glass available for the window.

The interior of the cowl, base, sides and wrapper plate are painted a matt black at this stage in construction.

When dry, the glass window ( $2\frac{1}{2}$  in. by

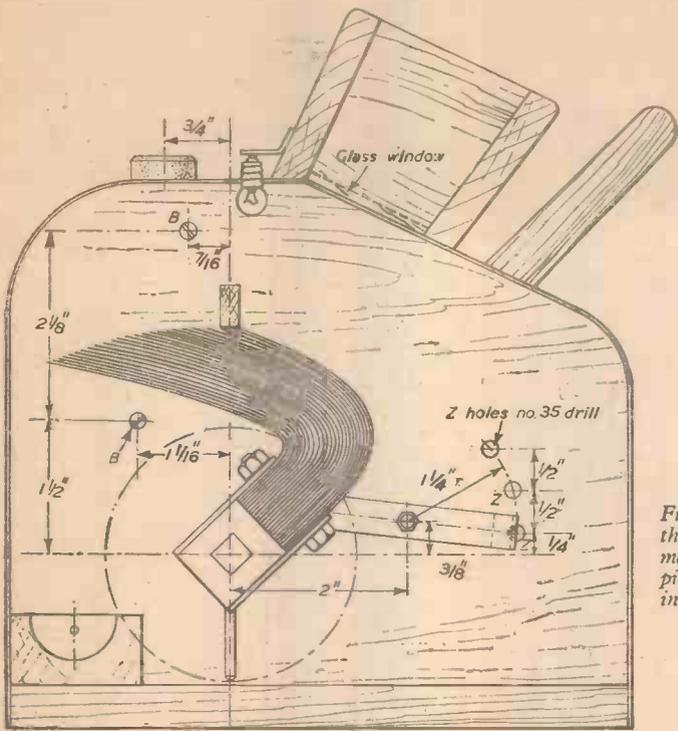


Fig. 2 (left).—Section through the centre line of machine, showing the picture pack and handle in the operating position.

**T**HE general arrangement of the machine is shown in Figs. 1 and 2. By pressing the handle downwards against the resistance of the spring plunger unit, the pictures or diagrams are made to flip rapidly across the line of vision, through the glass panel contained within the cowl. Each picture or diagram is retained in the viewing position for a fraction of a second by the fixed horizontal bar protruding from the side. The pictures are illuminated by a 2.5 volt bulb located at the top of the housing. The light is operated automatically by a swinging arm contact, and is synchronised to provide illumination at the correct period.

**Construction**

Cut the base (Fig. 3) from  $\frac{1}{2}$  in. thick wood and the battery cradle (Fig. 4) from wood,

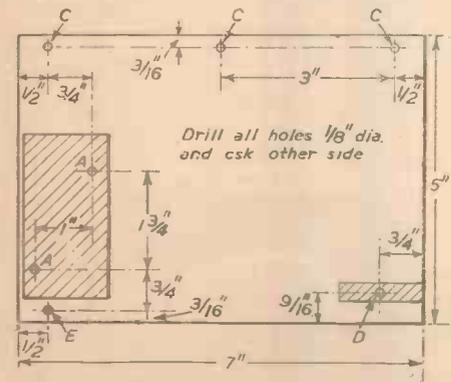


Fig. 3.—The base. The shaded portions show positions of battery cradle and door stop.

making a metal strip  $\frac{1}{16}$  in. thick to fit one end of the cradle. Drill three holes in this strip, two for wood screws which secure the strip to the cradle, and drill the third and centre hole with morse No. 32, and tap 4 B.A. to take a screw which serves the dual purpose of holding the battery in position and providing an electrical contact. The cradle assembly should be screwed to the rear left-hand corner of the base through the holes marked "A" (Fig. 3). Next cut the right-hand side from  $\frac{1}{2}$  in. wood (Fig. 5).

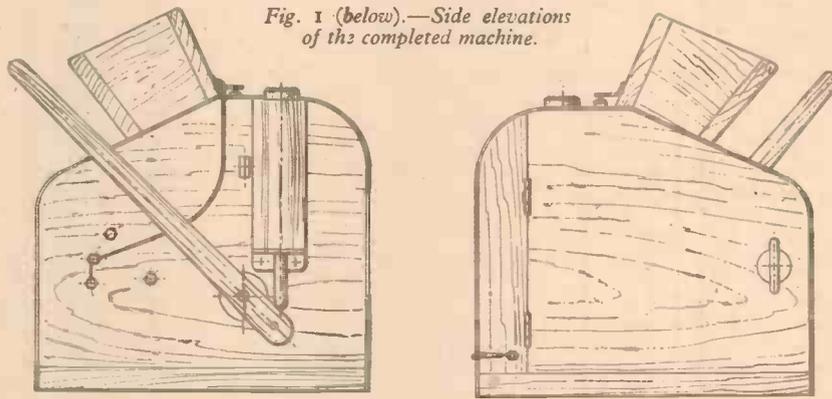


Fig. 1 (below).—Side elevations of the completed machine.

Drill the two holes marked "B" (Fig. 2) to enable the spring plunger unit to be fitted easily at a later stage in construction. The  $\frac{1}{2}$  in. dia. hole must be undersize to provide a press fit for the spindle bearing bush (Fig. 13). The  $\frac{1}{2}$  in. by  $\frac{1}{4}$  in. slot must also be cut slightly undersize to allow for the fitting of the picture stop bar (Fig. 16). This must be pushed and glued into the slot in a truly square position. The right-hand side is screwed to the base through the holes marked "C." Make the door stop (Fig. 9) from  $\frac{1}{2}$  in. wood and screw it to the base through the hole marked "D" (Fig. 3) after the key plate (Fig. 11G) has been cut from brass or steel and screwed on the inner face. When making the door and pillar from

$1\frac{1}{2}$  in.) is placed within the cowl slots and the cowl is screwed to the outside of the wrapper plate through the holes marked "F" (Fig. 7). The wrapper plate is placed in position on the sides and screwed through the holes marked "G" (Fig. 7).

**Spring Plunger**

The spring plunger assembly (Fig. 10) provides a resistance to movement of the handle, enabling it to be pressed steadily downwards thus providing a uniform speed of picture movement. This is constructed to the details given and assembled as a complete unit, which is fixed to the side of the cabinet by means of two screws "B"

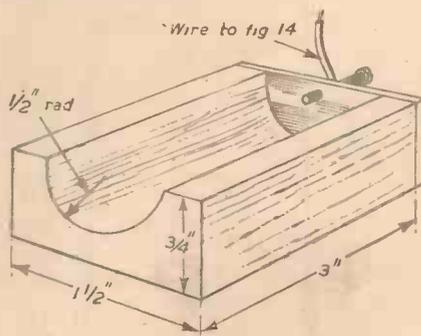


Fig. 4.—Battery cradle.

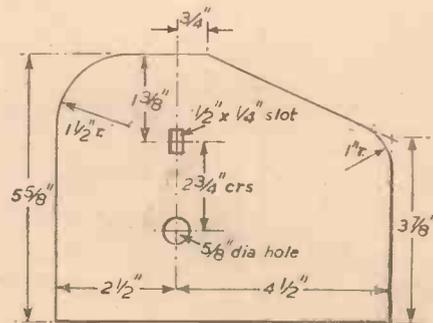


Fig. 5.—The right-hand side of cabinet. The drill holes are shown in Fig. 2.



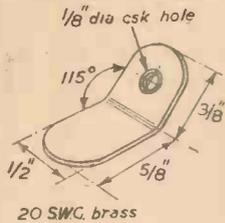


Fig. 18 (left). — Bulb contact bracket.

20 SWG brass

the metal contact arm of the main spindle. Assemble the metal contact arm (Fig. 15) with a 6 B.A. bolt (1 1/4 in. long) and nut, fitting a small spring between the arm and side of cabinet. Screw the bulb in position and the bulb bracket (Fig. 18). Load the battery in its cradle and test the function of the machine.

The picture clip is made from metal (Fig. 19). It is essential that the clip is a push fit on the shaft in order that the pictures will run steadily and to facilitate easy removal and changing of the clip and picture pack. The picture pack can be made by cutting strips of paper 4 in. by 2 1/2 in. Punch the two location holes in the position shown and then assemble in the clip, ensuring all strips are exactly the same length at the free end and are in alignment with the clip,

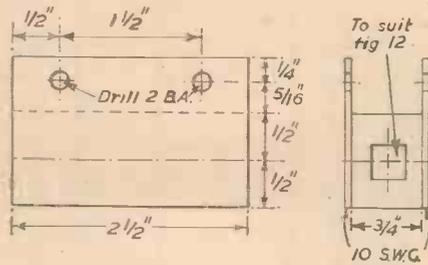


Fig. 19 (right). — Picture clip.

otherwise the time lag between pictures will vary, resulting in uneven movement. Now load the pack into the machine and test the action. Make any necessary adjustment to the pack and then set the swinging arm contact, if necessary. Adjustment of the picture period in conjunction with the lighting period may also be made by using longer or shorter, thicker or thinner, paper strips, or by utilising packing within the clip to shorten the period, or packing on the clip boss to increase the capacity.

**Preparing the Diagrams**

We are now ready to sketch or trace our cartoons, diagrams, or mechanisms. When the first drawing has been made a good plan

is to trace consecutive drawings by means of the simple apparatus shown in Fig. 20. Each sketch will, of course, vary slightly from the previous one, in order to produce the desired movement. Tone and colours

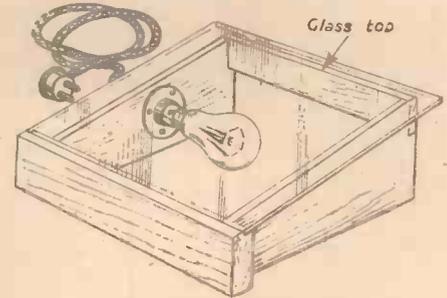


Fig. 20.—Tracing table.

may be added to the sketches to give additional effect. Any number of picture packs may be made, both sides of each pack being utilised.

With care in construction the machine will function effectually. The appearance of the cabinet may be greatly enhanced by staining the wooden sections and enamelling the metal portions.



# Drilling for Oil in England

*Drilling for oil at Arreton, Isle of Wight, where operations have already reached a depth of over 1,700ft. Illustration shows the connecting link on the drill being tightened.*

**A**N early record of oil or natural gas in England goes back to the middle of the 17th century, when gas escaping from a spring near Wigan was found to be inflammable. Later, in the same vicinity, crude oil was noticed on the surface of water in the drainage ditches and it was also observed that portions of peat were impregnated with oil. In Shropshire, too, tarry oil saturated many of the rocks and in some of the coal mines colliers had to be protected by iron plates from oil that dripped from the roofs of the underground workings. About 100 years ago, Dr. James Young, a Glasgow chemist, built a refinery to treat the oil that seeped into the workings of an Alfreton (Derbyshire) coal mine. This supply was small and was soon exhausted, and later he

collected to justify renewed exploration. Boreholes were drilled at Portsdown, Kingsclere, Henfield, Poxwell, Pevensy, Eskdale, Hardstoft, Keele, Cousland, Formby and Eakring. Once more, these early borings proved disappointing, but finally, in 1939, oil in commercial quantities was secured from the Eakring district in Nottinghamshire and, to a smaller extent, at Formby in Lancashire. Success in locating the oil-bearing rocks was due largely to the geophysical exploration of the underground strata, the seismic (refraction) system being chiefly used.

Owing to the great demand for oil during the war years every effort was made to develop the home production of natural crude oil, and in 1943 the output of Eakring field,

coupled with that of the smaller field at Formby, and a small production in Midlothian, was at the rate of over 100,000 tons (26,000,000 gals.) a year—a comparatively small but useful contribution to Britain's oil requirements. The crude oil is of excellent quality and provides a raw material for the manufacture of high-quality petroleum products; petrol, lubricants and paraffin wax.

Britain's oil wells are pumping wells, owing to rapid decline of underground pressures; at Eakring producing depths are 2,000/2,500 feet; at Formby they are very shallow. Production has declined since 1943, being at an annual rate of about 45,000 tons in 1950, but exploration and drilling have been continued in several areas. During the exploration for oil, valuable information about the geology and mineral resources in the sub-soil, including new coal and potash deposits, has been obtained.

The ownership of natural petroleum deposits in Great Britain is vested in the Crown, by the Petroleum (Production) Act, 1934. Licences to bore and obtain petroleum are granted by the Board of Trade to "such persons as they think fit" on a royalty (or other) basis.

(Reprinted by courtesy of the Petroleum Information Bureau.)

NEW AND FULLY REVISED EDITION (8th)

## PRACTICAL MOTORIST'S ENCYCLOPAEDIA

17/6, or 18/- by post from

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

# A New Radar Meteorological System

Particulars of the World's First Fully Automatic Radar System for Weather Observations in the Upper Air



The aerial unit.

THE world's first fully automatic meteorological system for accurately observing or "sounding" weather conditions in the upper air is at present being installed at a new meteorological station near Crawley, Sussex. This station will form a vital part of a network of eight upper-air meteorological stations that have, in recent years, been set up in Great Britain. It will also link up with a similar network of stations located in Western Europe, and thence throughout the world.

In order to take full advantage of the improved features of the new system, the Crawley Meteorological Station is of an entirely new design, and might well provide a pattern for future meteorological stations of this type in Great Britain and in many other

parts of the world. Experimental operation of the station for the precise computation of wind conditions in the upper air commenced last October; it is anticipated that the system will be ready for automatic observations of temperature, pressure and humidity—sonde working—early this year. The system employs a continuous rate method of computation providing instantaneous readings of wind speed and direction.

When the station is set up for routine operation, the final meteorological readings, in the form of numerically coded weather reports, will be sent via teleprinters to the Central Meteorological Office, at Dunstable. These reports, together with similar reports obtained from meteorological observing centres throughout the world, will be used for all kinds of weather forecasting; they will be essential for airlines operating high-speed, high-flying aircraft.

**Significance of Improved Upper-air Observations**  
There is no doubt that this new meteorological

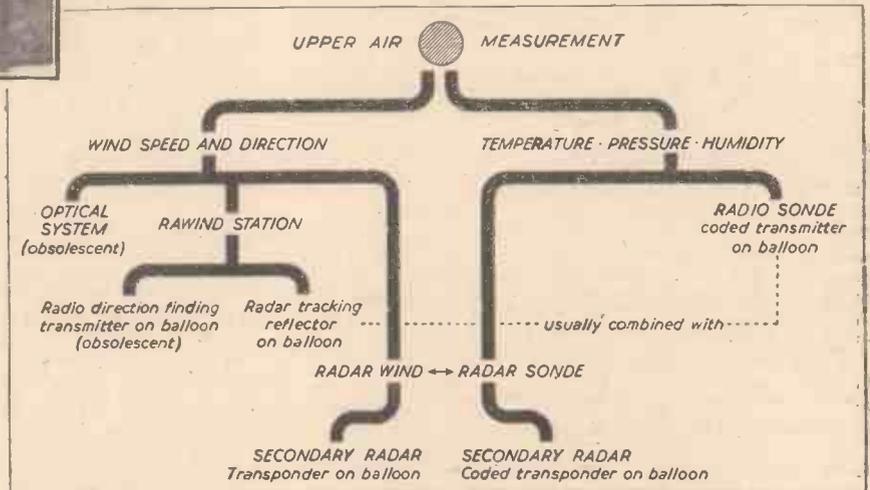
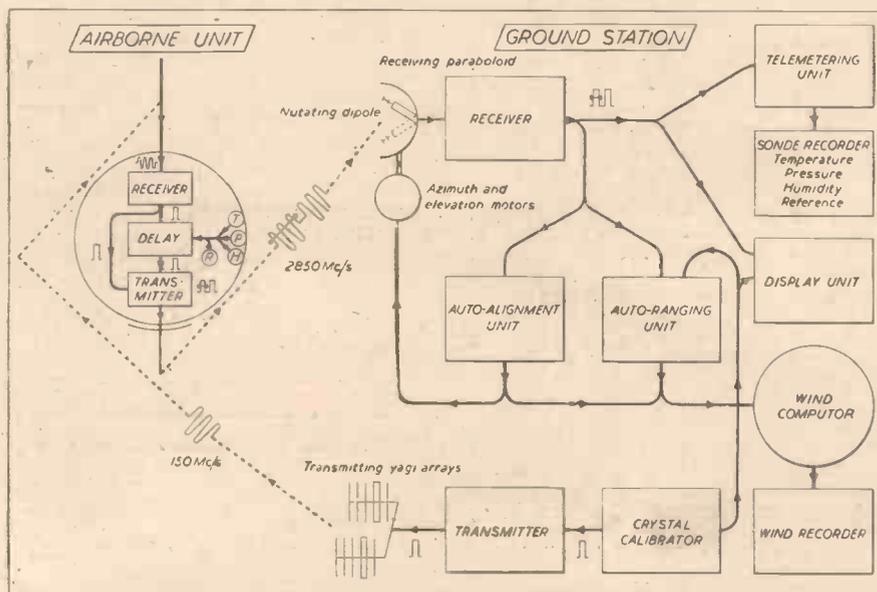


Diagram illustrating methods of upper-air measurement.

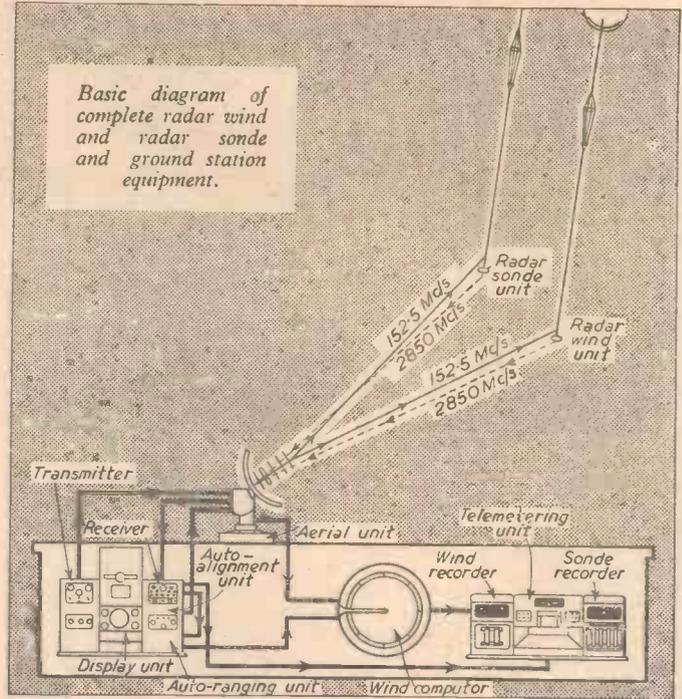
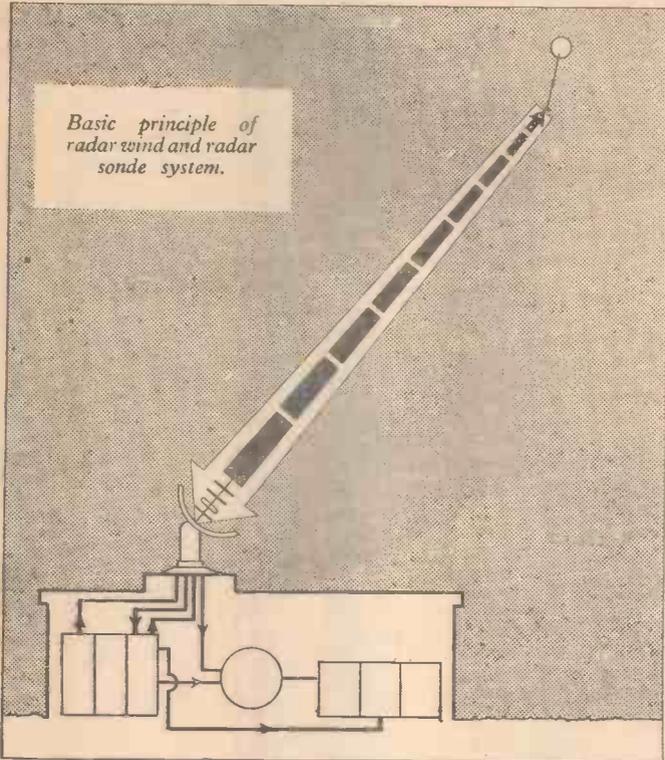


Schematic diagram of complete radar wind and radar sonde theodolite.

logical system, which is called "radar sonde" as distinct from the well-known radio sonde system, marks an important step forward in world meteorological progress. For accurate upper-air observations of wind, temperature, pressure and humidity at the greatest possible height have, in recent years, assumed a new and vital importance. It is, for example, on information of this kind that the forecaster bases his estimate of the present and anticipated winds that will be encountered by high-flying aircraft. These winds also determine, to a large extent, the movement and pattern of other weather characteristics of interest in aviation and shipping and for every other form of general weather forecasting.

Upper-air observations are of equal importance in many other fields. For instance, statistics of the mean and extreme upper-air weather conditions, experienced in different parts of the world and at different seasons, are required by designers of aircraft engines and structures, and by civil aviation planning experts. Such information is likewise of vital importance for planning the tactics of military aircraft operations, for research work in radar and radio establishments and for many other purposes.

Greatly improved meteorological services



are of particular significance to-day in view of the world-wide tendency to operate modern aircraft at increased ceiling heights and speeds. In 1944 the average ceiling height for civil transport was 12,000ft. (3,600 metres). By 1950 this figure had increased to 23,000ft. (7,000 metres). To-day jet aircraft, such as the Comet, are carrying out normal flights at heights of up to 40,000ft. (12,000 metres), and recently a jet aircraft broke the world's altitude record by reaching a height of over 60,000ft. (18,000 metres).

These rapid developments in aviation have brought into prominence the need for a completely automatic meteorological system capable of maintaining a high order of wind-finding accuracy at a range of at least 100 nautical miles, and at the same time providing means of telemetering sonde information to the ground with greater accuracy. Meteorological information from ever-increasing heights is likewise required more and more as an aid to everyday forecasting. For weather at ground level cannot be forecasted on the basis of knowledge of the prevailing surface conditions alone; it is closely bound up with conditions in the upper air. Any new system must also be capable of measuring the very strong winds—particularly jet streams\*—that are encountered at great heights. The new radar observing system, now being installed at the Crawley Meteorological Station, has been specifically designed to meet these requirements. It represents Britain's latest contribution to upper-air meteorology, and it is considered that if the system could form the basis of a world-wide network of upper-air observing stations, it would certainly lead to notable improvements in weather forecasting throughout the world.

**Basic Principle of Operation**

The new meteorological equipment has been developed and built for the British Meteorological Office by the Research Laboratories of Mullard Ltd. in collaboration with other laboratories in the organisation. It is based on initial research work under-

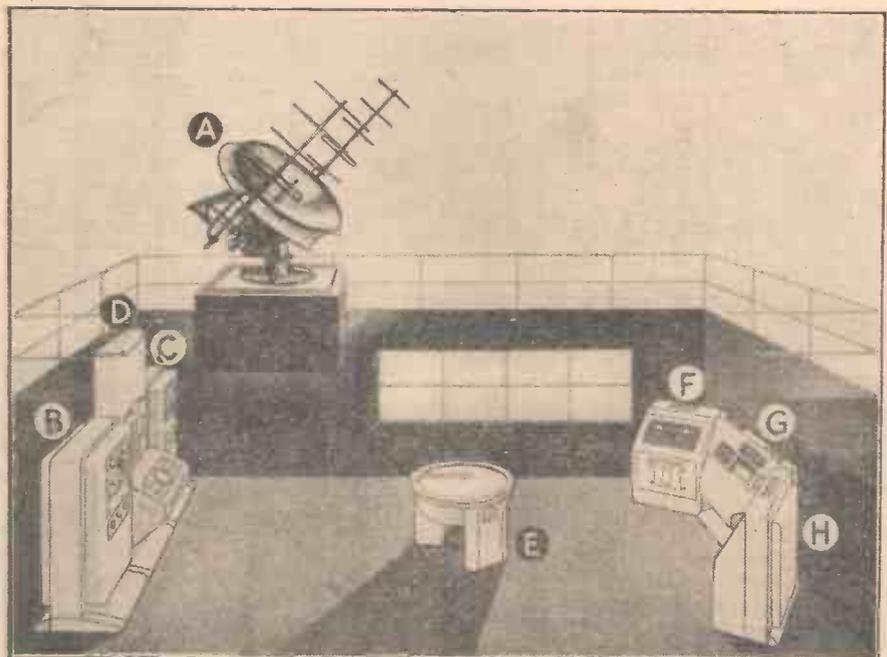
\* Narrow tracks with winds of phenomenally high speeds.

taken some years ago by the Telecommunications Research Establishment (T.R.E.) of the Ministry of Supply, and the project has been carried through with their collaboration.

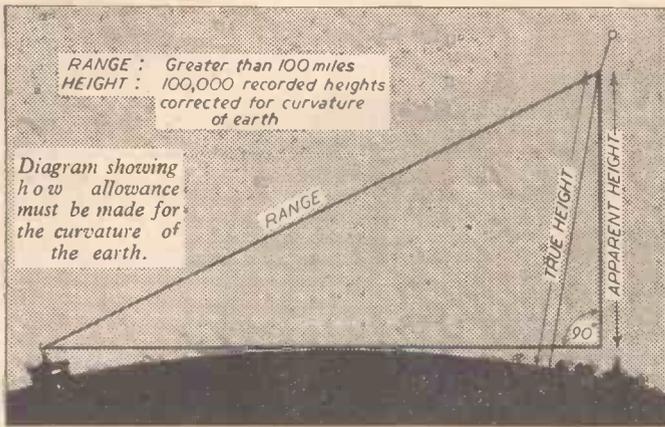
The system consists basically of an automatic ground interrogator and computing station, working in conjunction with airborne electronic units called transponders. Two types of transponder are available; one is confined to wind measurements only; the other, in addition, provides sonde information. During the operation of the system, one of these units, depending on the extent of the observations to be made, is suspended from a hydrogen-filled balloon. The maximum slant range of the system is

about 100 nautical miles (185 km.). In order to reach this extreme range under normal conditions, the balloon would have to ascend to a very great height. A standard balloon, as at present used, would burst before this height is reached. Thus, the height to which soundings and wind measurements can be made is, at present, largely limited by the height performance of the balloon. It is important to note, however, that the equipment is capable of operating at a ceiling height of at least 100,000ft. (30.5 km.).

The balloons are released from the ground station at certain internationally agreed times. As the balloon ascends into the upper air, its airborne transponder is interrogated from the ground station by radar pulses of 2-microsecond duration. These



Artist's impression of the Meteorological Ground Station with radar wind and radar sonde theodolite installed. (a) aerial unit; (b) transmitter; (c) receiver; (d) display unit; (e) wind computer; (f) wind recorder; (g) telemetering unit; (h) sonde recorder.



are transmitted from a 50-kW. (peak) transmitter, operating on a primary frequency of 152.5 Mc/s. The interrogating pulses are received by the balloon-borne unit. Here they are used to make the airborne transmitter send back pulses to the ground station on a secondary frequency of 2,850 Mc/s (10 cm. band). These pulses, in turn, are received at the ground station by an automatic following aerial.

The slant range of the airborne unit is readily determined by measuring the transit time of the pulse to and from the transponder. From this, and from the values of the azimuth and elevation angles of the aerial unit, the drift of the airborne unit in space is computed. Wind speed and direction are computed automatically and continuously from the rates of change of the measured parameters. The height of the balloon is also computed and a correction for the curvature of the earth is applied automatically.

Telemetry of temperature, pressure and humidity information, registered by the meteorological elements in the sonde unit, is effected by causing the sonde to transmit twin pulses each time it is interrogated from the ground station. The degree of separation between the two pulses serves as a measure of the meteorological parameter in circuit at any particular time. The three elements for measuring pressure, temperature and



The wind computer.

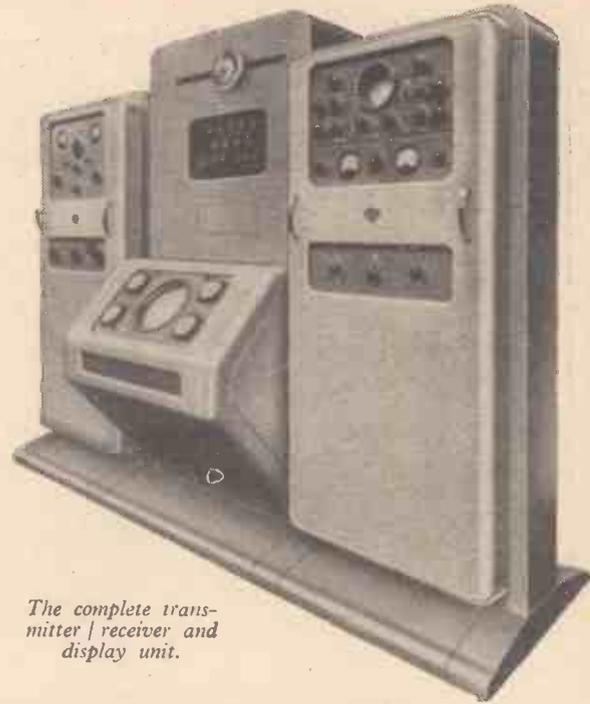
humidity are switched into the telemetry circuit in sequence by a motor-driven switch. In this way, a complete cycle of sonde observations is telemetered to the ground station every 15 seconds during the flight of the balloon. A fourth element is included in the cycle providing a constant reference reading. Any change in the constants of the

telemetry circuits affecting the accuracy of the meteorological readings will be indicated by a change in the reference reading. When the balloon bursts on reaching its maximum altitude, a parachute opens and the transponder unit slowly descends. During the descent, the airborne unit continues to be interrogated by the ground station provided, of course, that it remains within the 100 nautical-mile range of the equipment.

#### Advantages of the New System

This new radar meteorological system has many distinct advantages over previous radio sonde methods. The use of secondary radar, for example, allows for greater ranges to be obtained than can be economically achieved with primary radar with the same degree of accuracy. In other words, observations over longer ranges can be made using transmitters of normal power, whereas with primary radar, transmitters of greatly increased power would have to be used to obtain the same range. It is important to note that greater ranges will enable balloons to be followed to their bursting level, even under conditions of the strongest winds.

The new system also makes possible notable improvements in measuring accuracies. For example, temperature, pressure and humidity can be telemetered to an accuracy of 0.1 per cent. of their operating range, although the elements at present available may not be capable of measuring meteorological parameters to this degree of accuracy. In view of this, the equipment will be of enhanced value when advances are made in the design of any of the measuring elements. Another important feature of the system



The complete transmitter/receiver and display unit.

is that it is completely automatic in operation, thereby eliminating human errors and reducing operating staff to a minimum. Moreover, all information is obtained with a single ground station and there are no severe restrictions on its siting. At the ground station, a continuous rate method of wind computation is employed giving instantaneous values of speed, direction and height. Wind direction is recorded on a polar chart, whilst speed and height are registered on standard strip recorders. Duplicate records are made of the sonde parameters—graphical records for the rapid pictorial observation of changes in the meteorological readings, and accurate digital recordings from which information can be extracted for sending to the forecasting centre. The graphical records are made by pen recorders to an accuracy of 2 per cent.; the digital recordings to an accuracy of 2 per cent.; the digital recordings are given by a printer to an accuracy of 0.1 per cent.

#### Servicing and Maintenance

In the design of the equipment, particular attention has been paid to servicing and maintenance. The electronic circuits are divided into standard unit chassis, most of which are fitted with a tip-up and quick-release mechanism to enable maintenance work to be carried out without removal from the main equipment. Internal monitoring is provided, including three oscilloscopes and some hundred meter readings.

(To be concluded)



The complete recording and telemetering unit.

# Westminster Chimes Mechanism

A Re-modelled Motorised Version of the Striking Gear

By "TEST ENGINEER"

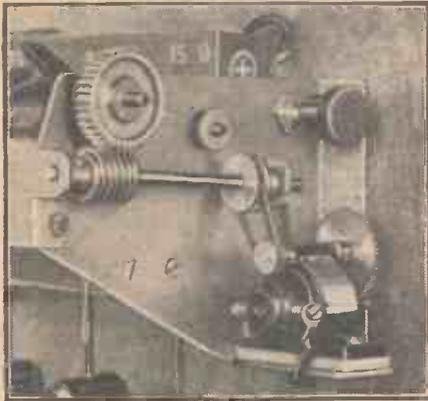


Fig. 2.—End view showing the gearing, motor and the speed control knob in the top right hand corner.

THIS is a modified version of the Westminster Door Chimes which appeared in our May, 1952, issue. It is much simplified and, therefore, easier to construct and its compactness can be seen

The tension springs lie across the beam with one end fixed to the front brass strip. Tensioning was first roughly obtained and the fine adjustment arrived at by pushing the springs up the striker rod, then fixing into position.

### Suspension of Chiming Tubes

Hooks made from cheese wire were screwed to the wooden beam. Another piece of cheese wire was connected between the holes in the tubes. This had a small kink in the centre which enables the chiming tube to be attached to the hook. This method of suspension meant that the chiming tubes always hung vertically. The wooden bar has a 1in. by 1/2in. cross section which includes a 1/4in. diameter thin-walled rubber

information on the "Mighty Midget" in PRACTICAL MECHANICS "Trade Notes." A 3 to 6 volt motor with a speed of 600-800 r.p.m. I decided to use this, although it was slightly noisy its current consumption was low and its speed known. It was mounted on a piece of felt to cut down vibrational noise.

Timing my original bell chimes with a stop watch, I found that a total chiming time of 5 seconds was most pleasing to me, and I worked out the gearing accordingly.

### Gearing

All rods were made from 5/32in. silver steel. The gearing can be seen on Fig. 2; it consists of a worm gear driving a 38-toothed gear wheel. The drive from the

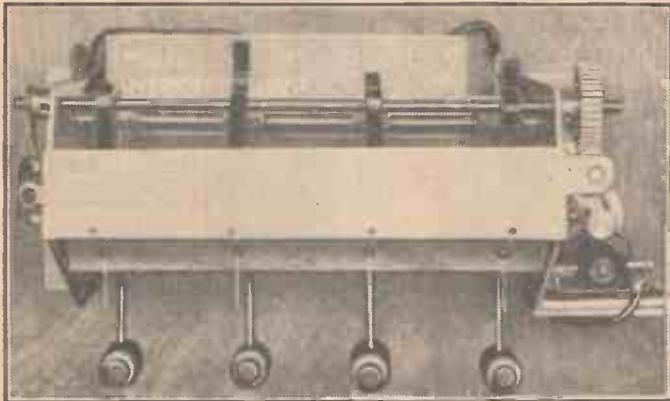
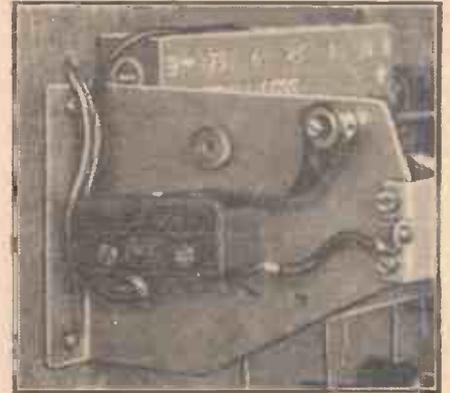


Fig. 1 (left).—Front view of the completed chimes mechanism.

Fig. 3 (Right).—End view showing the micro switch and in the top left-hand corner the leads to the push button.



from the overall dimensions which are 8 1/2in. by 4 1/4in. by 4 1/16in. It is motorised and the rate of chiming can be adjusted to suit individual taste. What is more important is that the parts—gearing, motor, etc.—can be obtained easily. The finished unit is contained in a felt-lined box with holes in the base for the chiming tubes. Figs. 1, 2 and 3 show the unit from various angles and are almost self-explanatory.

### Frame Rigidity

The end-plates are of 16 s.w.g. brass, 4in. by 3in., with surplus metal cut away to lessen weight and improve appearance. Rigidity of the frame is due to the 3-hole fixing in the end-plates, the wooden stop beam, the 1in. strip on the front and the retaining bar of the hammer mechanism which is screwed into the end-plates, these being 6in. apart.

### Strikers

From Fig. 4 it can be seen that the striker blade and rod are silver soldered to a brass tube. The original hammer heads, at 19 gms. were found to bounce on striking and so six different sets of hammer heads were made in 1, 2, 4, 8, 11 and 16 gms. weight from various materials and combinations of these materials. All hammers were the original size, but I preferred tufnol at 4 gms., or a heavier one at 11 gms. consisting of 16 s.w.g. brass tube with a 1/4in. wood insert.

tube. The rubber tube acting as a stop to the striking rods.

### Motor

On looking for a small motor I came across

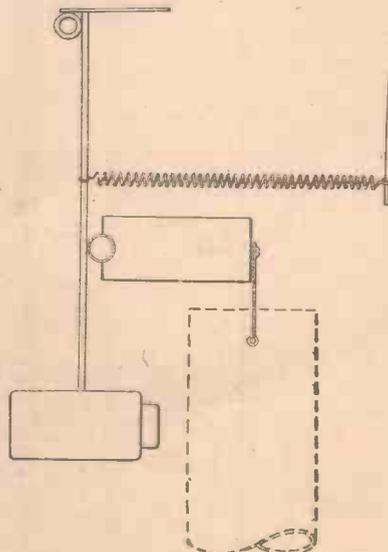


Fig. 4.—Details of striker rod and spring tension.

motor being connected to a 1/2in. pulley. The motor belt can either be an elastic band or a thin spiral spring if this can be obtained.

### Circuits

If the motor is battery driven then the circuit diagram is as shown in Fig. 5, but if driven from the mains then the circuit diagram is as shown in Fig. 6. The circuit shows two switches in parallel. Before the button (P) on the door is pressed both switches are open. When (P) is depressed (S) automatically closes and remains so until one revolution of the camshaft has been completed and it again opens. Switch (S) is the micro switch shown in Fig. 3 and is operated by a ratchet attached to the camshaft touching the switch strip and thus operating the switch. The strip is made from a piece of clock spring which gives

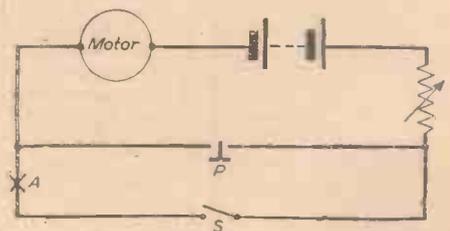


Fig. 5.—Circuit diagram if the motor is battery driven.

necessary flexibility and strength. If it were heavier the motor might not be strong enough to "break" the switch. Furthermore the heel of the ratchet is filed away in order to give a one point contact only.

A 10 ohms centre-tapped rheostat is shown in the circuit diagram and also in Fig. 2. This enables the rate of chiming to be adjusted to within fine limits after the rough adjustment on the grid bias battery.

If an extra kick in starting the chimes is needed or if the voltage drop in the push button circuit needs accounting for then break the circuit at A, putting the rheostat in at that point. This would enable a starting voltage of 6 volts and a motor working

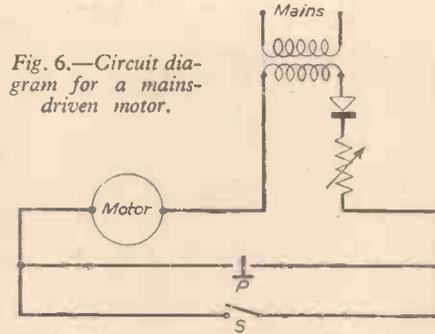


Fig. 6.—Circuit diagram for a mains-driven motor.

voltage of, say, 4½ to 5 volts.

The makers of the "Mighty Midget" do not recommend a current loading of greater than 300 milli-amps which would cause excessive wear and tear on the brushes and commutator. But this figure is not exceeded even on 6 volts and on 4½ volts the model has a load of about 230 milli-amps. If a mains unit is employed then the transformer is a radio filament transformer of 6.3 volts rating and the rectifier is ½ amp., 2-6 volt half-wave rectifier which works equally as well as the equivalent battery.

The transformer, rectifier and rheostat can be assembled in the one box and placed in a convenient place.

# A Mechanical Weather Vane

Design for a Novelty All-weather Garden Device

By A. WARNE

**T**HE weather vane described here is a robust appliance capable of withstanding rough weather, provided good materials are used.

The framework, a, b, and c, Fig. 1, is made up of metal strips ½ in. wide by ¼ in. thick, c being 1½ in. wide so as to form a good bearing for the sprocket wheel, e, Figs. 1 and 2. The top bearing, d, Fig. 1, could be made of stout brass and cut to shape shown.

## "Fan" Wheel

The fan wheel shown in Fig. 1 has twelve blades, and each blade has a metal strip secured to it by rivets as shown. The strips have a slight twist given to them of about 30 deg. as shown in the inset marked x; the other ends of these strips are riveted to a circular disc, f, Figs. 1, 2 and 3.

The disc is welded to one end of a piece of thick brass tube, g, and at the other end a sprocket wheel, h, is welded, which engages with a chain, such as a length of bicycle chain, to the other sprocket wheel, e,

Fig. 2. This wheel is omitted from Fig. 1 for clearness.

Through the tube, g, Figs. 2 and 3, a spindle is inserted to form a good bearing for g to revolve without shake. This spindle, when assembled, fits into the two bearing plates, d, but before this can be done, the whole of g, with fan blades and sprocket wheel attached, must be slid over the spindle, the latter being secured in some way so that it does not revolve with g. Spacers should be put in to keep the fan wheel in position, as indicated in Fig. 2.

The drawings are not drawn to scale, but are intended to give the reader some idea of a working basis. I suggest the diameter of the fan wheel should be at least 3ft., and if all other parts are made in proportion then a good working model should result.

The speed at which a fan wheel of this diameter revolves would make the figure of the "man" appear to be working with ease, and not as in the case of a smaller diameter where he would appear to be working as though "he" had not a moment to spare.

With regard to the base, details of this

are given in Fig. 4. It should be made of well-seasoned wood about 1 in. thick, and should have cross-pieces P screwed on the underside for preventing any warp; metal strips could also be used.

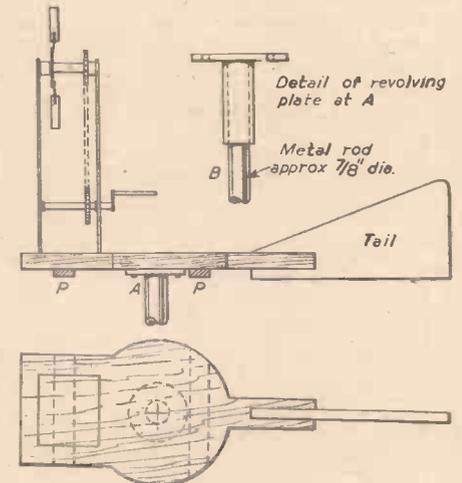


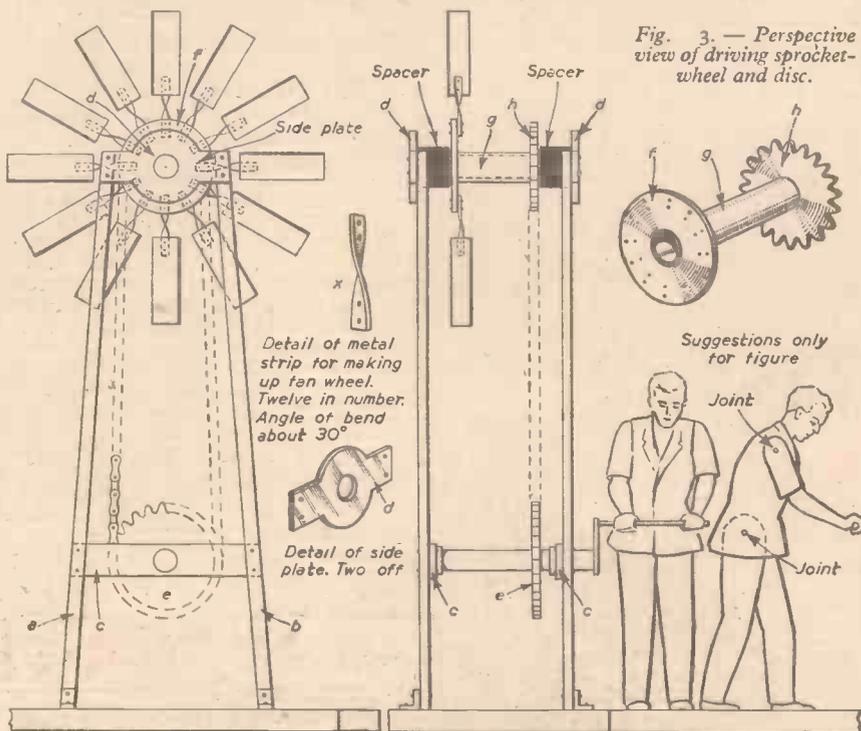
Fig. 4.—Elevation and plan of platform showing tail-piece.

Fixed to this base is a metal disc, A, Fig. 4, with a stout metal tube welded to it at right angles. This tube will revolve on a stout metal rod which is fixed into a pole or secured to a building.

## Tail-piece

Before the tube and disc are fixed to the base, the centre of gravity must be found otherwise the whole will not revolve correctly. A tail-piece cut to the shape shown should be fixed to the base.

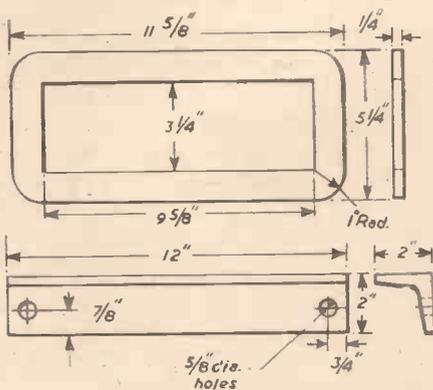
Finally, before fixing to the pole or building, find out which way the fan wheel will rotate, so that the "man" can be fixed as though winding and not unwinding. Also the whole structure should be painted with a good weather-resisting paint.



Figs. 1 and 2.—Front and side elevation, and details of side plate and vane fixing strip.

**REFRESHER COURSE**  
 IN  
**MATHEMATICS**  
 By F. J. CAMM  
 8/6, by post 9/-





Figs. 5 and 6.—Hardwood pieces and angle-steel clamps for transformer core.

the slots and then into the former again, leaving a loop about 30in. long outside the former. A piece of thin string is then passed through the grooves and wrapped round the coil. The third layer is then wound on; this layer has 20 turns, the end being insulated with sleeving, carried outside the former and cut off with about 18in. to spare.

**Finishing the Winding**

After completing the secondary coil strong thin string is passed through the slots in the former which is used to tie the coil firmly, as indicated in Fig. 3. The string which was wrapped over the second layer of the secondary should then be turned back and tied round the third layer. The flange of the former is then removed and the body of the former pushed through the coil so that the coil can be removed, as in Fig. 3. It is then advisable to dry the coil to remove

hour, during which period it should be turned round occasionally in order to avoid an accumulation of varnish at any point. The coil may then be suspended in the oven at a temperature of 180 deg. to 200 deg. F. for six to eight hours if stoving varnish is used. However, the instructions of the makers of the varnish should be studied and closely followed if they differ from the above. Naked lights should not be used near insulating varnish, however, as such varnishes contain inflammable solvents.

**Transformer Assembly**

The coil is next wrapped. One thickness of leatheroid about 0.010in. thick should be passed through the centre of the coil and round the coil, followed by a strip of 1/2in. empire tape half lapped round and through the coil so as to cover the coil. The tape may be secured with Chatterton's compound. The overall thickness of the coil must not exceed 6 1/2in.

The core can then be assembled by inserting the centre limbs of the stampings through the centre of the coil. When this is done care should be taken to ensure that the insulated sides of the stampings are all on one side. The second precaution to observe is that the joints in adjacent layers of stampings are covered by the stampings on the next layer. Thus a layer of stampings, as at (a) in Fig. 4, should be covered by a layer of stampings at (b), followed by a layer as at (a), and so on. It is also important that no air gaps should be left between the two stampings in any layer, as such air gaps tend to increase the magnetic reluctance of the core, with increase of magnetising current, transformer losses and heating, and reduce the secondary voltage. For the same reason, and also in order to avoid magnetic hum when the transformer is

any burrs which short-circuited the insulation. Such burrs might be formed by drilling holes in the stampings. The clamping bolts should therefore be outside the core. Two-inch angle steel pieces, as shown in Fig. 6, can be used to clamp the core; four such pieces being required. Two hardwood pieces, as shown in Fig. 5, may be slipped over the core before clamping by means of 1/2in. steel bolts, as shown in Fig. 7. The bolts should not touch the stampings. Holes should be drilled through the angle-iron and hardwood pieces for the coil leads.

A terminal panel may be fastened to one of the top clamping pieces, and this may be of bakelite or similar material about 3/8in. thick which is drilled for five 1/4in. dia. screwed brass rods which act as terminals. The terminals may be about 2in. apart. Two terminals, marked P<sub>1</sub> and P<sub>2</sub> (Fig. 12), should be connected to the ends of the primary coil. One terminal, marked A, should be connected to the start of the secondary coil, with a terminal B connected to the cut ends of the loop between the 80th and 81st turns. The fifth terminal, marked C, is connected to the 100th turn, i.e., to the finish of the coil. The ends of the wire should be cut off at suitable lengths and soldered into spade terminals which are clamped on the brass terminals by means of lock-nuts. The secondary terminals A and B are used to give about 80 volts, whilst a higher voltage may be obtainable from terminals A and C, if required, in order to obtain a high striking voltage and a fairly long arc.

**Winding the Choke Coil**

The core of the choke coil should be built of insulated Stalloy stampings, 0.014in. thick, to the dimensions given in Fig. 8. Sufficient stampings should be obtained to build up the core to 4in. thick. Thus, approximately 260 pairs of stampings will be required. A

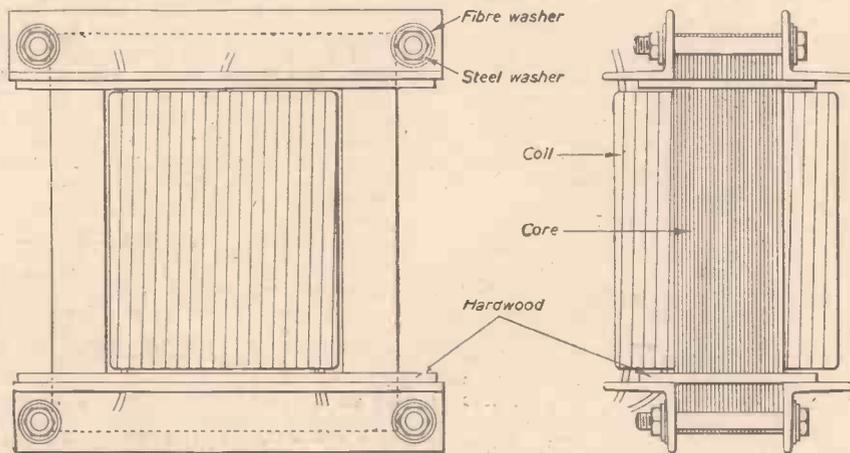


Fig. 7.—Side and end views showing transformer assembly.

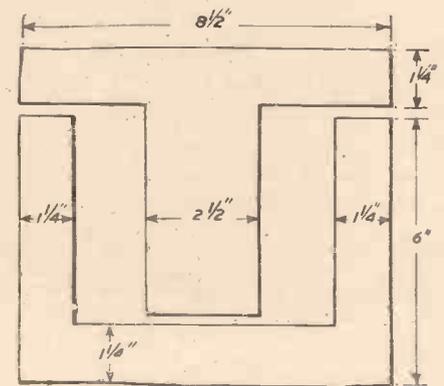


Fig. 8.—Choke coil stampings.

any moisture which may have been absorbed by the cotton insulation. This may be done by placing it, on a few strips of wood, in an oven for about two hours, during which period the temperature of the oven should be kept within about 180 to 200 deg. F. It is important that the oven temperature should not exceed about 200 deg. F. and a thermometer should be used to check the temperature periodically.

Whilst the coil is being dried a tin should be filled with sufficient insulating oil to immerse the windings. Immediately the coil is taken out of the oven it should be placed in the varnish; the cooling of the oil by its immersion in the cold varnish causes it to suck the varnish between the layers so that good penetration is assured. The coil should remain in the varnish for five or six hours. It should then be removed from the varnish and allowed to drain for about an

switched on, the stampings should be tightly packed together. If necessary, thin strips of wood may be used to wedge the windings on to the core.

The transformer core should be clamped together. If uninsulated bolts were passed through holes in the core these would tend to permit the passage of unwanted eddy currents and would defeat the object of the insulation on the stampings, as would also

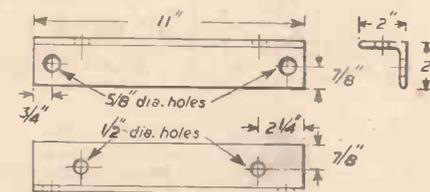


Fig. 10.—Angle steel clamps for choke.

hardwood former of the dimensions shown in Fig. 9 should be made, on which the coil is to be wound. The coil should be similarly wound to the transformer, with a layer of leatheroid about 0.010in. thick between each of the layers of wire. The coil should be wound with the same size of wire as the secondary winding of the transformer; 12lb. of wire should be sufficient for the choke coil.

Four layers of wire, each with 18 turns, should be wound on, the wire then being brought out of the coil and then taken back into the former, leaving a loop about 2ft. long outside the former, and the fifth layer continued. At the 82nd turn a connection should be made to the wire and brought out of the former at the same end as the 72nd turn. This connection may be made by cleaning the insulation from the wire and soldering along this for about 1in. the end of

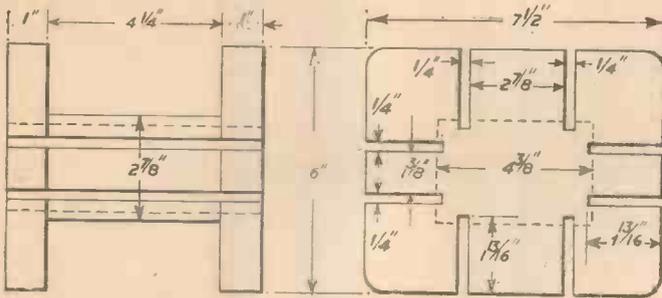
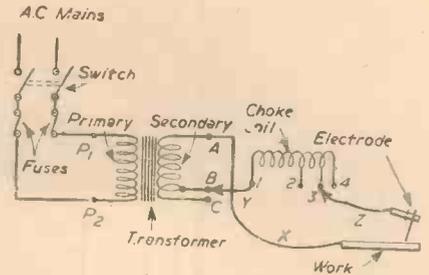


Fig. 9.—(Left) Side and end views of hardwood former for choke coil winding.

Fig. 12.—(Right) Diagram of connections of welding equipment.



a conductor of the same wire. A clip of thin copper may be placed round the connection before soldering, the copper wire first being tinned. The connection should be wrapped with empire tape before continuing the fifth layer to complete 90 turns. After wrapping leatheroid round the layer the sixth layer is wound; this layer has only seven turns, the wire then being secured, insulated with sleeving and brought out at the opposite end of the coil to the lead from the 82nd turn. All the leads should be brought out from the narrow side of the former. The coil should be securely tied together before

turns, terminal 3 to the tapping from the 82nd turn, and terminal 4 to the finish of the coil.

**Connections and Protection**

The connections of the equipment are shown in Fig. 12. A 15-amp double-pole combined switch and fuse box may be used in the primary circuit, flexible cables of 296/0.010in. may be used for the connections X, Y and Z. All connections between conductors and terminals should be made by soldering the leads into spade terminals. Permanent connections between the spade

The case of the switch-fuse box, the cores of the choke coil and transformer, and terminal A of the transformer should be connected to earth, using a conductor of 7/0.029in. This connection may be made to a mains cold water pipe by means of a suitable clip, the connection preferably being made as near as possible to the point of entry of the water pipe into the building.

**Base and Cover**

The apparatus may be mounted on a wooden base or iron frame with an expanded metal cover. The terminals P1 and P2 of the transformer should be provided with a cover so that they cannot accidentally be touched. If required these two terminals can be mounted inside the expanded metal cover with the other terminals on a separate panel outside the cover, together with the switch-fuse box.

**Electrode Holder**

The reader is advised to purchase or make a spring type of electrode holder, which does not impose a strain on the hand muscles of the operator. A spade terminal on the flexible cable X is to be connected to the workpiece by means of a substantial clamp. When it is required to operate with minimum welding current the flexible cable Z should be connected to the terminal 4, so that the welding current passes through all the turns of the choke coil. In order to obtain the same arc voltage with maximum welding current the cable Z should be connected to terminal 2; for intermediate current the cable should be connected to the terminal 3.

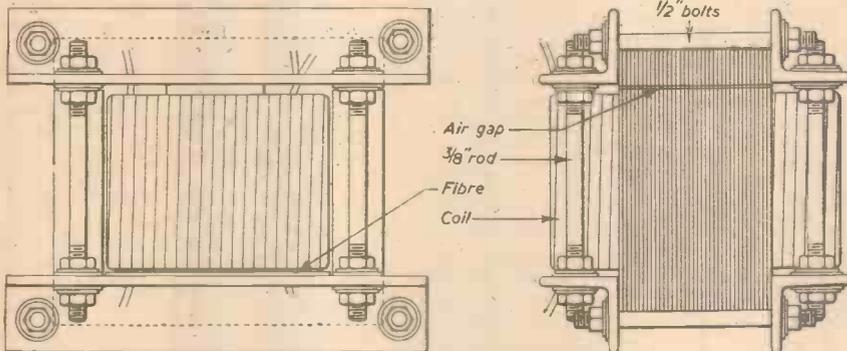


Fig. 11.—Choke coil assembly.

removing the former, and should then be taped up, doped with varnish, drained, baked and finished as for the transformer winding.

Four angle steel clamping pieces may then be prepared as shown in Fig. 10. The choke coil may then be assembled. When building up the core all the stampings of the same shape should be laid upon each other, with the insulated sides of the stampings facing the same way. The laminations should be threaded through the coil and the coil may be secured on the centre limb by means of thin wooden wedges, a piece of thin fibre being placed over the end of the coil before threading the centre limbs of the stampings through the coil. The two sections of the core stampings are clamped by means of 1/2 in. steel bolts, thin fibre bushes and washers being used to insulate these bolts from the angle pieces.

The two sections of the core are then clamped together by means of 3/8 in. screwed steel rod, insulated from the angle pieces by means of thin fibre bushes and washers, leaving an air gap of about 0.08 in. at each point where the two sets of stampings would normally come together. The choking effect of the coil will largely depend on the length of this gap, which is rather critical. An increased air gap will reduce the choking effect and thus increase the voltage across the arc. The gap may be filled with wood or fibre if required. A terminal panel may then be made as for the transformer, this having four terminals marked 1, 2, 3 and 4 (Fig. 12). Terminal 1 is to be connected to the start of the coil, terminal 2 to the cut ends of the loop between the 72nd and 73rd

terminals and screwed rod terminals should be made by means of lock-nuts, with a nut on both sides of the spade. The flexible leads may, however, be connected to the terminals B, C, 2, 3 or 4 by means of 1/4 in. brass wing-nuts.

# Moving a Complete House



In response to a request from an oil company operating in the Middle East, Messrs. Maycrete Ltd., in conjunction with G. H. Burgess & Co., have produced a fully mobile camp building for use in connection with oil prospecting. The illustration shows the building, known as the "Supalite" Mobile House, being tested on very rough ground at Heston, such as might be encountered in the Middle East.



Fig. 7.—A group of "heater" appliances.

# Electrical Repairs at Home

Useful Hints on the Upkeep and Repair of Domestic Electrical Appliances, and How to Avoid the Many Pitfalls That May be Encountered by the Home Electrician

By "HOME MECHANIC"

**I**N this country nearly all supplies are A.C. at about 230 volts. Now the peak voltage on A.C. is 230 multiplied by the square root of two, i.e.,  $230 \times 1.414$ , or something over 300. If you keep this point in mind you will avoid shocks from the mains. When making an examination of any apparatus, always disconnect from the supply, either by removing the plug or switching off at the mains. If you are doing

circuit, although it may be some accidental short, worn flexes, or cut wires. Remedy this and replace the fuse with the correct size of fuse wire. It is usual to employ 5-amp. wire for lighting circuits, and 10 or 15 for power. Switch off the mains, remove the fuse carrier, clean off all carbon and fused wires, put in the new wire and replace. Switch on. Remember to remove all the

The cover and terminal and the action spring can be removed and put into broken switches. You may not think this worth while, but the repairing of a switch is quite intricate and interesting work and the procedure is as follows. To "open up" remove the sealing wax from the heads of the screws at the back, undo these and the dolly will pull out. It may leave the movable contacts behind. If not, a slight pull will remove them, exposing the action spring. You now have the switch in pieces and it is easy, if you have a spare, to replace a broken part. Contacts may be tightened up by judicious pressure with the blade of a screw-driver. Always use good quality switches. It should not be possible to hold the contacts either just in or just out so that arcing occurs. The switch should open and close quickly with a snap, except in the case of the new silent switches for hospital work. Here the action is barely audible. (See Fig. 3.)

### The Distribution Point

Flex often gets worn and frayed when the lamp swings in a draught or when a portable appliance is used at that point. If you are doubtful about the condition of a flex, replace it—the cost is negligible. In the case of large and powerful lamps, the heat will cause the insulation to perish, and finally the rubber cracks away, causing a short or the holder to become "live." Never remove or replace a lamp with the switch on. When replacing a flex switch off at the mains and remove the fuses. Unscrew the cover of the ceiling rose and disconnect the flex. Now, in a more comfortable position, examine the holder. If the springs in the contacts are quite good, it may be replaced on a new length of flex. Slip the rose cover on the flex, climb the ladder and connect up. Make sure that the weight of the flex and fitting is taken by the little hooks or projections

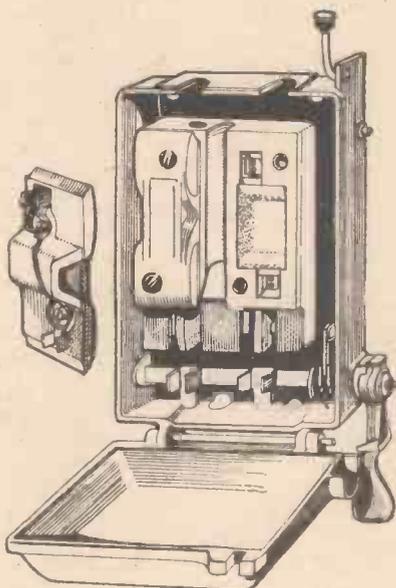


Fig. 1.—A fuse box and fuses.

any work on an installation, such as changing a fitting or plug, or anything connected with the permanent wiring, then switch off at the mains and pull the fuses. This is the only way to make certain that someone will not come along and switch on again.

### The Main Fuse

We will start with the point of entrance of the cable and follow it to the various points dealing with the possible faults as they arise. If a main fuse blows, you cannot replace it, but must telephone the supply company, who will send a man to do it. The main fuse box is sealed and it is an offence to break this. If a main goes, there must be some serious fault in the circuit.

### Replacing Local Fuse

If a local fuse blows, first find the reason. There is always a reason and a very good one. Generally, it is an overload on the

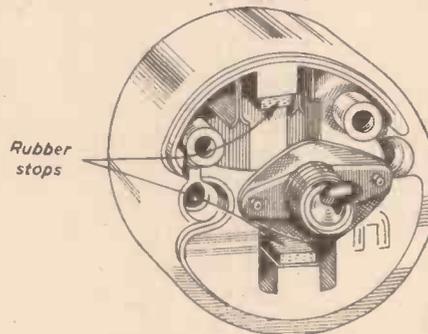


Fig. 2.—An efficient type of switch.

old wire. Make certain of good connections at the fuse clips. (See Fig. 1.)

### Replacing a Switch

Often a switch may need replacing, especially in such places as garages and work-rooms, etc. First obtain a good switch of the same type and pattern, i.e., 5- or 10-amp. sunk or surface mounting, etc. (See Fig. 2.) Switch off at the main and pull the fuses. Now slacken the connecting screws on the switch, remove the fixing screws, pull out the switch and then put in the new one. Take care to mount this the right way up and to put the wires on the same sides as before. It is quite possible to put the switch in so that the knob is down and the light off. Do not throw away the old switch, it may be kept as a useful spare for future repairs.

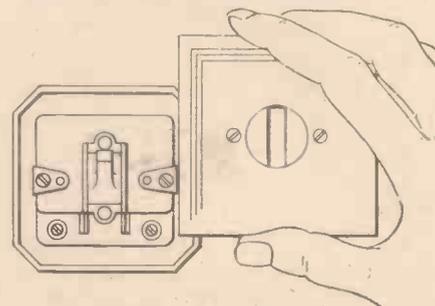


Fig. 3.—This type of switch fits flush to the wall.

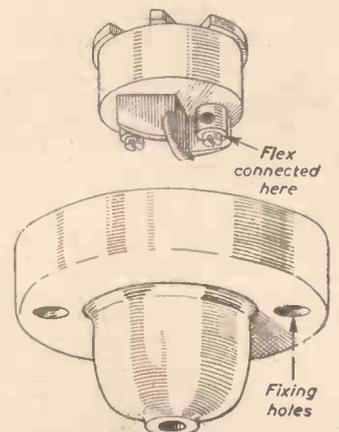


Fig. 4.—Details of a ceiling rose, showing the method of fixing.

on the rose base, and screw back the cover. (See Fig. 4.)

A word on using portable appliances from light points. The flex and holder are rated at 3 amps. You should not use anything taking more than 500 watts from a holder. All portable apparatus should be earthed. It cannot be earthed if used from the ordinary holder. Yet, you may say, why are irons, fires and vacuum cleaners all sold with adaptors for use on the light. This, of course, is to give them a universal appeal, but the day is not far off when all apparatus will be sold with a special plug of the three-pin type. Fig. 5 shows how easy it is to get a shock from a two-pin point of, say, a fire or iron. In our opinion, the iron is almost a lethal weapon when used from the lamp-holder. The housewife is there with damp hands in the kitchen ironing, in easy reach of gas and water taps and earthed

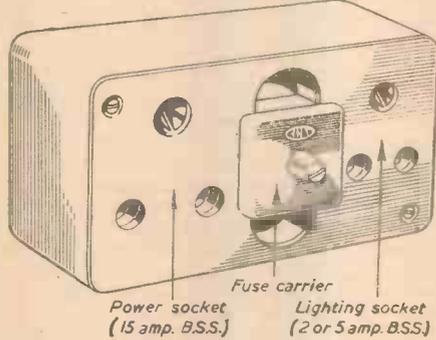


Fig. 6.—A safe socket for all appliances.

ironwork. A fault develops in the iron. With one hand she touches the water tap, and a very bad shock results. The same can happen with open fires of the bowl type. Also, with two-pin plugs and fires with switches incorporated, it is possible for the switches to be off and the plug in and yet the element "live." If you wish to test all these statements, get a lamp, holder and flex with crocodile clips as leads and use this as your subject or patient. Connect one lead to earth and the other to the iron or fire, as above, and observe that the lamp will light. Wherever possible, use only lamps at the lamp-holders and the proper apparatus at the two-pin point. These points are designed for use with reading lamps and wireless sets which, theoretically, may not require earthing. (See Fig. 6.)

**The Power Point**

This has an earth pin which must be used. You may feel tempted to connect up the iron to the plug with the original twin flex. Don't, it is safer to get a good quality triple cable and the extra safety will well repay the outlay. Braided cable has a nasty habit of fraying at the adaptor and then shorting. The wires in the cable each have their own colour, so that it is an easy matter to earth the correct one. The latest iron adaptor has a small spring tongue that touches the metal case of the iron. This is the earth contact. Bend it out so that it makes good contact. The same general remarks apply to frayed cables, etc., but one must use the cable of the correct size for the appliance. If you are using a 3-kilowatt fire from a plug, do not wire up with lighting flex. Use the correct cable (this is generally supplied with the appliance). On the other hand, if you are using a 750-watt fire from a 15-amp. point, thinner flex can be used, but to protect the circuit the 15-amp. fuse must be replaced with a 5-amp. one. This is very important, because the earth might burn before the fuse blows if a fault develops in the fire. Fig. 6 shows a socket from which any apparatus may be used with safety.

**Two Types**

All domestic appliances can be divided into two types, heating and motor-driven. Special notes will be given for the various types, but first a general survey of the heating



Fig. 5.—Showing how a housewife may obtain a shock from an unearthed iron.

type. Here are included irons, fires, toasters, hair dryers, kettles, hot plates, stoves and cookers, because in each case the element is a length of wire that becomes hot when in use.

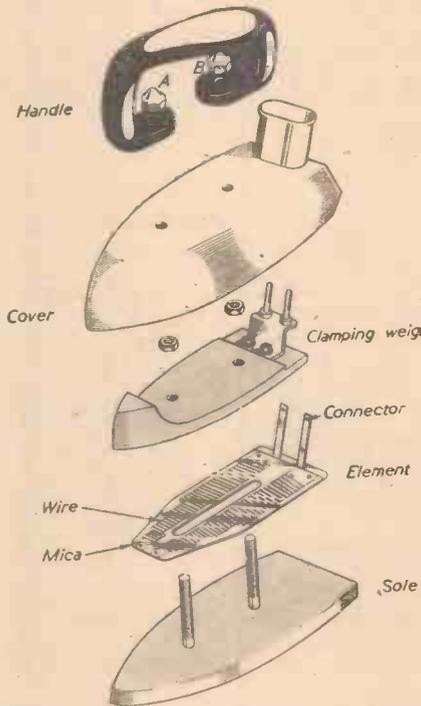


Fig. 8.—An exploded view of an electric iron.

A group of appliances is shown in Fig. 7. A combination of the two types is found in modern fires and hair dryers, etc. Nowadays all heating elements are standard, i.e., if your iron burns out a new element can be bought from the makers. The sketch (Fig. 8) shows a dismantled iron; we will deal with fitting a new element first. Remove the cable connector. The shell is fixed to the base by

two domed nuts, A and B. Unscrew these and gently lift the cover off. In some types connection is made by two springs from the adaptor to the element; in others it is a strip of metal. If by springs, the cover comes straight off; if by strips, unscrew these at the connector. The element is clamped to the base by a heavy iron stop and may now be removed. The element is wound of strip on a mica former and is completely insulated from the frame. When removed, take it to your testing bench and connect in series with a lamp. If it lights, then the element is not at fault and the connector must be to blame. A faulty element can generally be spotted by holding up to the light; the burnt spot shows as a black dot. Do not attempt to repair an element but put in a new one, lay it flat on the plate, put on the iron weight and the cover and tighten up the nuts. Make sure that the springs touch the element correctly, and warm up the iron. When hot, disconnect and put another half-turn on the clamping nuts.

**Repairing an Electric Kettle**

A kettle element is very similar to that of an iron, but is generally in two halves. The replacing of the element is carried out in the same way. First invert the kettle, then remove the cover plate exposing the elements. These are clamped under a thick copper disc by one screw passing through the centre. Remove this and the elements. Connections are made through copper flexibles insulated with porcelain beads. Preserve these as they must be put back on the new element. Observe the position of the old element and replace the new in exactly the same way. Connect up as before. Most kettles, sterilizers and similar appliances are fitted with a cut-out (see Fig. 9) that opens the circuit when the vessel boils dry. Some have a small fusible capsule, which has to be replaced each time it boils dry. The commonest method, which is found on all good-class apparatus, is the bimetal thermostat. The actual design varies with the maker, but the principle is the same. A bimetal strip forms part of the circuit and when this

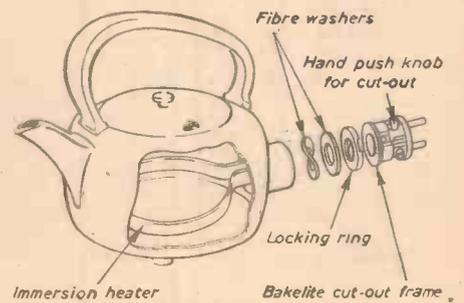


Fig. 9.—Details of an electric kettle.

is overheated it bends outwards and opens the circuit. Any repairs here consist of cleaning the contacts and perhaps bending the strip slightly so that a good contact is made. The contacts can be reset by a knob on the base of the kettle and need not be touched in the ordinary way.

(To be concluded)

**FOR THE MODEL MAKER**

**THE MODEL AEROPLANE HANDBOOK**

By F. J. CAMM

312 pages

303 illustrations

12/6 (13/- by post)

Construction and Principles of all Types

and

**MODEL BOAT BUILDING**

Constructional details of Model Sailing and Power Boats. 5/- (5/6 by post)

From GEORGE NEWNES, LTD., TOWER HOUSE, SOUTHAMPTON STREET, STRAND, W.C.2

# Making a Power-driven Nibbling Machine

Constructional Details of a Useful Machine for the Amateur's Workshop

By C. H. HALL

AT some time or other most model engineers are faced with the task of cutting out sheet metal in some more or less intricate pattern. There are numerous ways of doing this, hand shears can be used for certain light gauges, or the job can be done by sawing or drilling, both of which

Perhaps one of the most appealing features of the tool is the ability to accurately reproduce almost any shape without even marking out the workpiece simply by clamping a template or pattern piece upon the material to be worked (see Figs. 3 and 7), always providing that the combined thickness

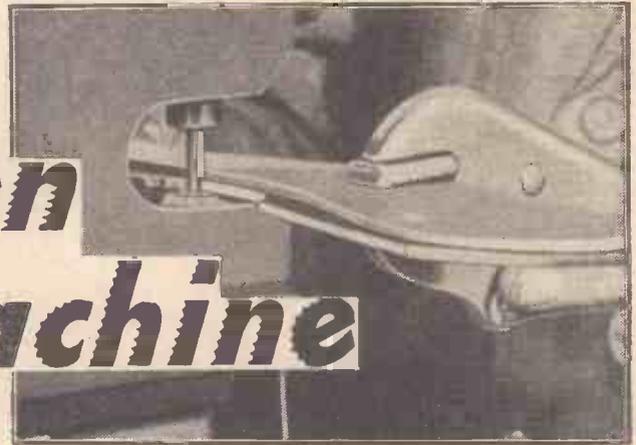


Fig. 3.—Showing how a template is clamped to the material to be worked.

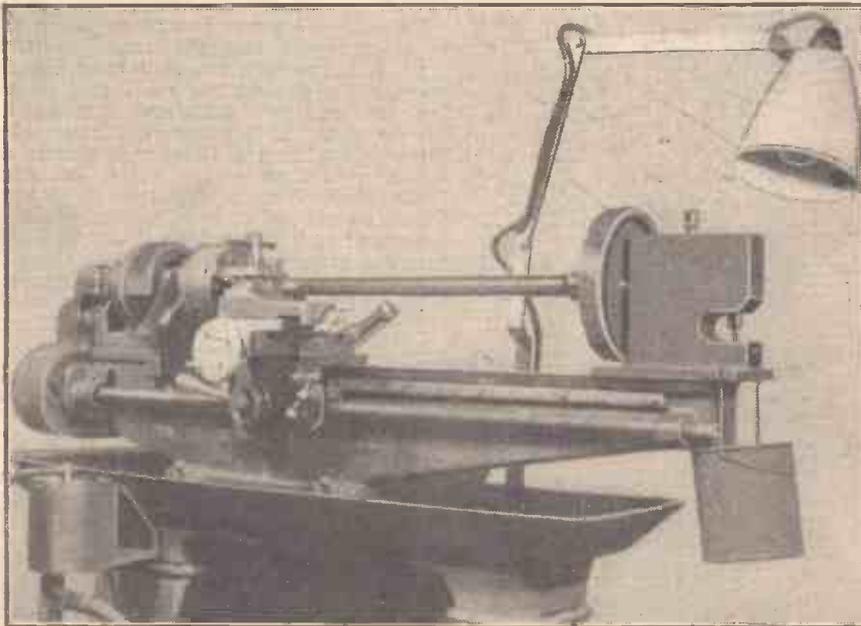


Fig. 1.—The nibbling machine mounted on a lathe bed.

methods are slow and laborious, and in the final resort there is the hammer and chisel method, with its consequent bruising and distortion.

The need of something rather better than these methods for the purpose of cutting out a number of awkwardly shaped blanks from 10 g. mild steel strip led the writer to the idea of a power-driven nibbling machine. As the main source of power available was the lathe, as is the case in most amateur workshops, it was decided that the tool would have to be driven by the lathe and mounted upon the same, and this, incidentally, had the added advantage of giving a number of varying speeds for driving.

In the illustration, Fig. 1, the nibbler is seen mounted on a standard ML4 lathe, and as the tool has now been in use for some considerable time and has tackled work upon material considerably heavier than that for which it was originally designed without ill-effect, it can be said to be most successful.

of the template and work-piece exceeds the stroke of the ram. The template will then act as an accurate guide by pressing up to the side of the punch in a similar manner to that used on wood routing machines. Another advantage is that the finish that can be obtained is so good that only a very little cleaning up is needed.

## Constructional Details

The main body of the job (Fig. 4) is cut from a piece of 1½ in. thick mild steel, and for this purpose a

pattern piece was made and the job profiled out by a local firm with an oxy-gas plant; this made a very clean job and little cleaning was needed. First of all it was drilled vertically for the ⅜ in. dia. ram, and this drilling was taken across the throat to accommodate the die for the punch. The bottom of the die hole was cleaned out with a flat-ended drill. The horizontal hole was then bored in the lathe, this being 1 in. dia., to take the camshaft and its bush (Fig. 2). As the bush retains the camshaft it is necessary for this unit to be pushed into position complete in assembly, the bush being located by two socket-head grub screws when pressed right home. This horizontal bore is carried nearly through the vertical bore for the ram, and the end of the bore is squared out to accommodate the cam.

## Camshaft and Ram

The camshaft and ram (Fig. 5) are both made from a well-known brand of non-shrinking die steel. This material was used simply because it was available, but, no doubt, any good quality case-hardening steel would be equally suitable. The end of the camshaft was hardened and tempered back very lightly to leave the actual eccentric nearly dead hard. The ram was treated the same way, with the exception that the rather thin strip connecting the upper and lower portions of the ram was tempered back fairly heavily by the application of local heat, leaving the working faces almost dead hard.

## Punch

The 3/16 in. dia. punch is made from silver steel, a material which is particularly suitable for this purpose, and is located in



Fig. 5.—The flywheel, camshaft, ram and driving shaft.

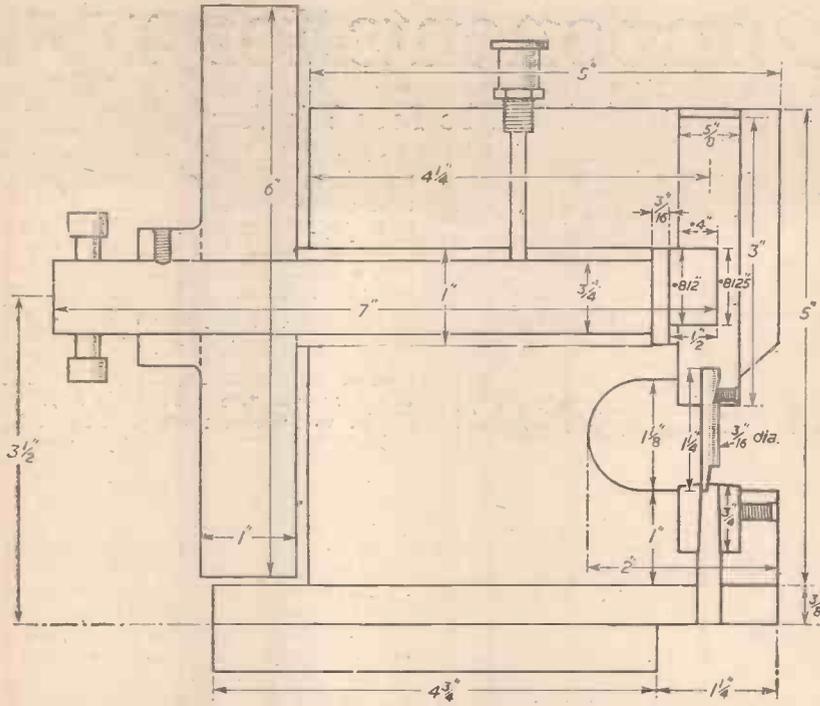


Fig. 2.—Sectional diagrammatic view of the nibbling machine.

the ram by a small socket-headed grub screw. The die is again of the same die steel as the ram and camshaft, and is made with only slight punch clearance to obtain as straight an edge to the work-piece as possible. It is important that a slight taper be given to the lead piece of the punch to prevent slugs being drawn up again by the punch in work. The stroke of the punch is 3/16 in. and it is set to enter the die by .020 in.; the bore of the die is very slightly tapered with a diemaker's reamer giving two degrees of taper. The die is located in its recess by another small grub screw as shown in Fig. 2.

**Flywheel**

The flywheel is a necessity for fast working, though the tool will work without this with the lathe suitably geared down. On 10 g. material the top speed is used with the flywheel, but the lowest of the plain speeds is needed without it. At this high speed the punch only nibbles out a series of small crescent-shaped pieces, giving a fine finish to the work and lightening the load upon both cam and ram faces.

It will be seen by reference to Fig. 2 that the flywheel is fixed to the camshaft by means of a grub screw through the boss. A small lubricator for the camshaft is screwed into the top of the body of the machine.

**The Base**

The base of the tool was separately fabricated from a piece of 3/8 in. M.S. plate. Under this on the front side a gib strip of 3/8 in. by 3/16 in. was welded in position, and on the back side, viewed from the front of the lathe, a similar strip was welded at one end only, for about 1 in. Outside this a nut was welded on to take the 5/16 in. dia. thumbscrew which, pressing upon the back gib strip, locks the machine in any position on the bed of the lathe.

It will be seen that the machine is mounted upon the end of the bed, and this is for two reasons. First, that the machine may be left in position without preventing the general use of the lathe and, secondly, that it is necessary to have an outlet from the base of the tool for the punchings, which drop past the end of the bed into the can, as shown in Fig. 6. This can is also shown in position in Fig. 1.

**Driving Shaft**

The driving shaft is made from a piece of 1 in. dia. mild steel bar, it being important that this member should not spring or whip; the little added weight is no disadvantage. On to the end of this bar a collar was welded and slotted to take the two driving pins in the end of the camshaft. Finally, the main body of the tool was located upon the base unit and then electrically welded (as are all the other welded parts) upon the base unit.

**Universal Movement**

The long driving shaft with its slotted ends has the double advantage of giving a small degree of universal movement if needed, and also can be quickly and simply slipped out of the way to leave the lathe free for other jobs without disturbing the nibbling machine.

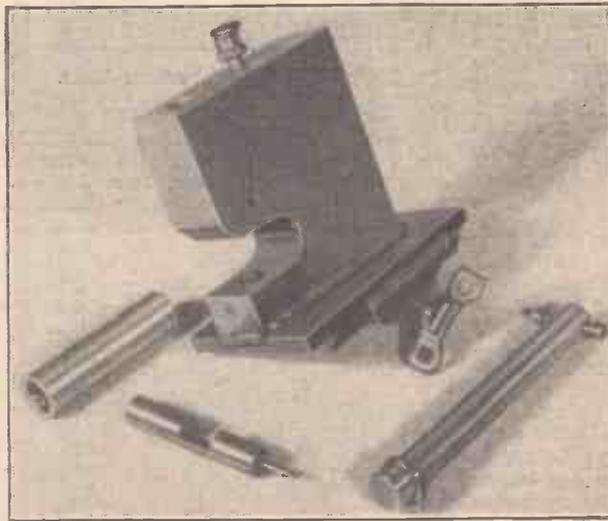


Fig. 4.—The main body, camshaft and bush.

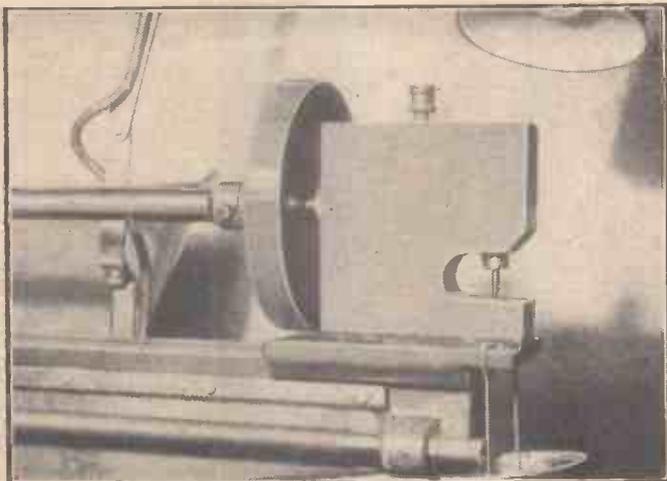


Fig. 6.—Enlarged view of the nibbling machine.

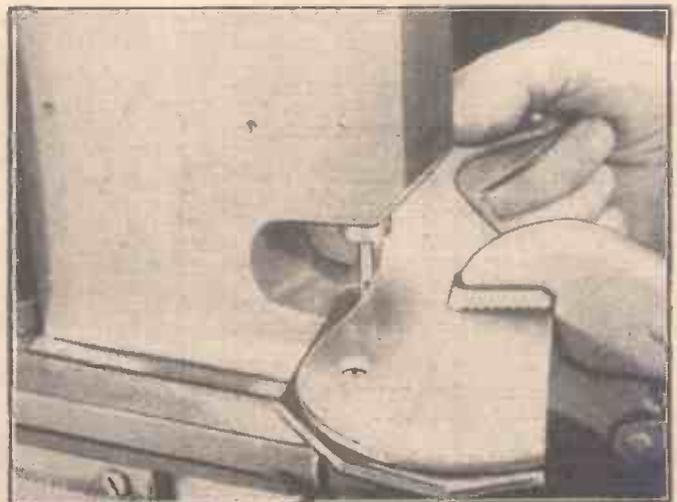


Fig. 7.—Another view showing how a template is used as a guide.

# Cycles and Components for 1954

A Review of the Cycling Equipment Which Will be Seen This Year

By R. L. JEFFERSON

ON my way to the Show last year I was amazed to see the following extract from an article in my morning paper. "But one of the biggest cycle exhibitors said: 'This is the last cycle show. From now on it will be all power-assisted bicycles and motor scooters. The bicycle apart from the racing enthusiast is finished.'"

In almost a lifetime of close connection with the sport and trade I cannot recall a statement so much at variance with the facts as the above.

Since the war the trade has brought into Britain £200 million, and at last year's Show one firm alone (B.S.A.) took orders for £357,000 from the U.S.A. There is no reason to believe that this state of affairs will not continue for a long time. The trade is sufficiently flexible to meet competition from any quarter.

## Armstrong Cycles

This year Armstrong Cycles are using silver brazing on the "Moth" and "Continental" model frames. The initial cost of silver brazing is much higher than brass, the result is a much cleaner frame, and the lower temperature at which the joints are brazed avoids distortion. The Model 33 has a frame of 531 tubing, B.H. large flange hubs, G.B. Coureur brakes, choice of either Cyclo Benelux or Simplex gears with double chainwheels. At £39 9s. 7d. this is a most attractive machine. Armstrongs have also reintroduced a range of touring and sports tandems.

## B.S.A. Group

This year the B.S.A., Sunbeam, New Hudson group have introduced a Safety Shopping Model for ladies—this model has a semi-upright frame of the loop type, and a substantial carrier is fitted to the head tube and holds a shopping basket fitted with a metal handle; the basket is instantly detachable and stands well away from the brake cables. At the basic price of £15 16s. 2d., this model should meet with a ready market.

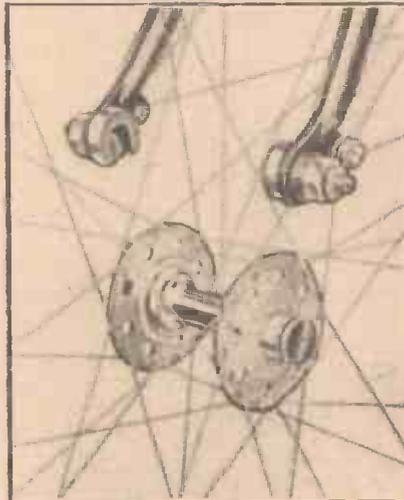
On the Gold Vase Special and Gold Vase models there is an entirely new drop-out to front and rear wheels, and by means of spring-loaded attachments the wheels can be removed or replaced almost instantaneously. One attractive New Hudson model is the Junior; it has standard-sized tubing and lugs, 20in. x 1½in. tyres on Westwood rims, and sells at the reasonable price of £11 2s. 8d.

On several of the Sunbeam tourist models the new B.S.A. 3-speed quick release hub is fitted—this consists of hardened steel dogs engaging together at the sprocket.

Mention must be made of B.S.A.'s new "Tour of Britain" sports model. The 70 deg. frame is available in either 2½in. or 2½in. sizes of 531 tubing with inserted head races; the forks are D to round section with 2½in rake, wheels are 27in. H.P. with double-butted spokes on new B.S.A. wide-flange hubs; c/w and cranks are 6½in. fluted 5-pin detachable type. The pedals are B.S.A. quill pattern, and with a Brooks B15 saddle and a choice of four flamboyant finishes this model represents outstanding value at £19 18s. 11d.

The well known and tried Amalgam system of frame jointing is being used this year on Dayton machines. The popular Roadmaster has been improved for the new

season by the fitting of a Nicklin 300 47-tooth chainwheel, which has bosses to enable an additional ring to be added if required.



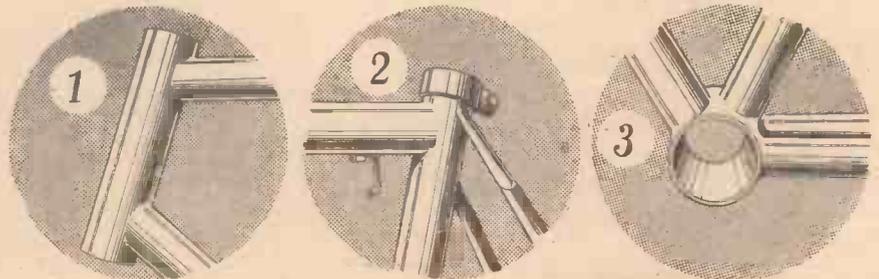
The new B.S.A. quick-release device.

## New Hercules Machines

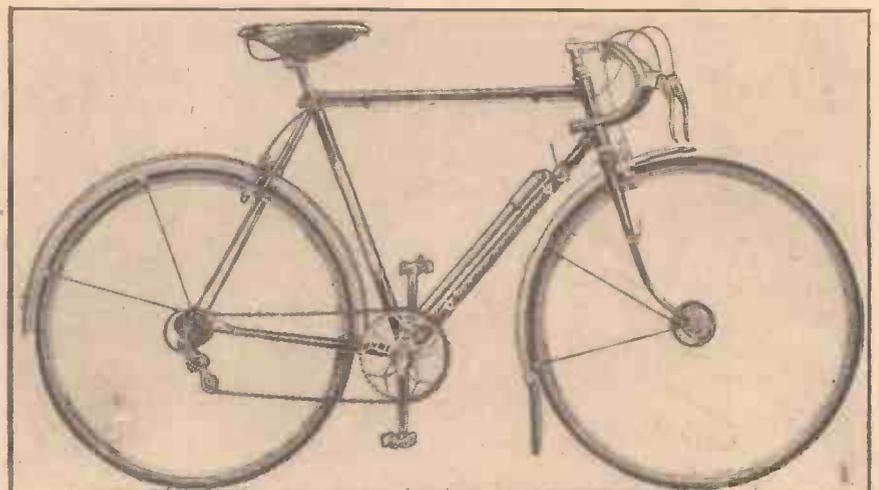
Hercules have introduced a new Glido model for juveniles. This is a pavement cycle with a 13in. frame, 13in. by ½in. cushion tyres, and an attractive finish, at £6 19s. 6d., or £7 13s. 10d. with pneumatics.

## The Raleigh Group

As last year, the Raleigh group of Raleigh, Rudge-Whitworth, Humber and Robin Hood, are marketing the complete range of low-priced Robin Hood cycles, eight models in all, and this range is now made in



The "Amalgam" system of frame jointing used by Dayton Cycles.



The B.S.A. "Tour of Britain" sports cycle.

At the other end of the scale is the Pullman Super Tourist of Tru-Wel 2030 tubing, with Dunlop translucent Fort tyres, fitted to 26in. x 1½in. Westwood rims, a Hercules 3-speed gear with handlebar control, a gearcase, North Road handlebars and roller lever brakes. A Brooks B 35/1 saddle, and rubber pedals complete a machine, finished in wine flamboyant with double gold lining, that is eminently suitable for a gentleman of the professional class. The price of this very attractive machine is £21.

The well-known range of Kestrel light-weights has been re-named this year to Aston. This is due to the firm's Aston factory being close to the spot where the former Aston track was, and where Aston Villa still play football.

This year it has been found possible by Hercules to make an average reduction of 5s. in 19 models of cycles and at the same time to improve the specifications.

The old-established firm of James is alive to the need for a special cycle to cope with the growing demand for auxiliary motors. Models 120 MBT and its feminine version 121 MBT have reinforced frames and forks, stout gauge spokes, roller lever hub-braked wheels enclosed by wide D-section mudguards. The machines are finished in black enamel with red/gold lining. The price of £19 10s. includes number plates.

the Nottingham factory of Raleigh Industries. There are two attractive juvenile models, one with a 15½ in. frame and 20 in. wheels, the other with 17 in. frame and 24 in. wheels.

In the Raleigh range of Sports light roadster and Dawn models, 19½ in. frames have been introduced to attract the youngster. The already established 19 in. junior model has been brought into line with modern practice by having normal-sized tubing and lugs.

There has been a reintroduction of the police models, which have 24 in. reinforced frames, 28 in. x 1½ in. wheels, and 4½ in. wide pedals. These models have the A.G. dynamo and D.B.V. lock, and are offered alternatively with a single gear and a front Dynohub.

Many of the roller-levered roadster models are fitted with a new anti-vibration brake shoe, and on these models there is also a welcome return to chromium-plated saddle frames and springs. On the sports models fitted with the Dynohub there is a new streamlined head-lamp finished in silver enamel with chromium-plated rim, an unbreakable focusing front lens and a visible means of ascertaining whether the light is on or off. Fixing of this lamp is by a single bolt; the total weight is seven ounces. There is a silver-grey tail lamp visible from all angles with a dome diameter of 1½ in.

**New Royal Enfields**

Royal Enfields have introduced a new range of juvenile and junior models, and in conjunction with these models they have launched a scheme called "the Gun Club." In the saddle bags of these machines the youngsters will find an entry form which only needs filling up and sending to Enfields. In return they will receive the Gun Club badge and will be enrolled as members. This scheme should help dealers to sell these machines; we all know how kiddies love badges. In this range the boy's model is a replica of the machine supplied last year to the Duke of Edinburgh for the use of his son, Prince Charles. Both boys' and girls' machines are priced at £11 17s. 6d. These

machines are designed for children between the ages of five and eight years.

**Tyres and Accessories**

A very neat cape or map carrier is being manufactured by Frank Ashby. The carrier of anodised aluminium fits below the head

designed to fit every nut—including the domed mudguard stay nuts—on the average cycle. All the well known range of celluloid and alloy guards are again available.

Noteworthy amongst a host of good things produced by Brampton Fittings is the Brampton No. 140A 3-speed hub, now released to the home market. This component was formerly available for export only.

The firm of Cyclo have introduced a new version of the Benelux four-speed gear, also a coaster deraillleur, and a range of standard freewheels in a range of sizes 16 to 28 (not including 27). This range is guaranteed for 50,000 miles.

This year, in addition to the well-known range, Dunlops have introduced the No. 5 massed start tubular. This stout tyre has a ribbed and file tread, and should take its place on the wheels of many cycles in 1954.

The Motorette tyre received a tremendous boost last year with the completion of Lee-Warner's world tour; the size is 26 in. x 1½ in., and it is recommended for use with all auxiliary motors.

A much needed fitment has been brought out by Gills Cables. This is a cable lubricator of the brass reservoir type; by the turn of a knurled dust shield a small hole is exposed into which an ordinary cycle oilcan can be screwed. An occasional treatment by the oilcan will ensure thorough lubrication of the cables—it has been my own experience that when a brake cable breaks it is nearly always at the lever end. These lubricators should go a long way towards eliminating cable breakages which are always annoying and sometimes dangerous. This fitment has the trade name of Permaflow.

Sporting riders will be pleased to see the reintroduction of the B17 Champion Flyer. In addition to Brooks' well-known range of saddles this firm are selling an attractive range of touring bags. Noteworthy is the Leabrook of grained material; this bag, suitable especially for low saddle fitting, measures 13 in. x 7 in. x 6½ in., and sells at £1 5s. 10d.

I was pleased to see that this year the Michelin sports tyre is available in both 26 in. and 27 in. x 1½ in., and 26 in. x 1¾ in. sizes. These covers have the well-known zigzag tread with translucent walls.

H. Miller and Co. Ltd. have put on the market a new dynamo set 6TM. This set is designed for motorised bicycles with incorporated lighting coils; finish is in silver grey, or black. The No. 596 tail lamp has a panel for illuminating the rear number plate; with cable and bulbs the set retails at 25s.

In addition to their large and very well-known range of dyno hubs and hub gears, Sturmeys Archers have introduced a new streamlined lamp.

A welcome note has been struck by Edward Williams. All their well-known range of C1200, C34 and C1000 chainwheel sets will now be available in 3/32 in. size as well as the standard width of ½ in.

The British Hub Co., Ltd., makers of Airlite and Solite hubs, have produced something new for the racing man—a quick-release hub. This component should be in great demand as for a long time the only quick-release hubs available have been of Continental manufacture.

Improvements have been made to the well-known G.B. "Coureur" brakes. Small bosses have been positioned on the back of forged stirrups to carry straight-shank springs, thus reducing friction, while maintaining efficient release of the stirrups. The use of a moulded nylon bush on the main brake pivot eliminates the need for lubrication; for improved efficiency in wet weather, new moulded studded brake-blocks have been introduced.



The new Palmer oad-racing tyre.



The new Michelin sports tyre.

of the handlebar expander bolt; at 2s. 6d. this fitment should find a ready market.

This year Bluemel Bros. are making a useful combination spanner and tyre lever



Peter Lee-Warner seen standing with Mr. H. K. H. Cook, outside Australia House before commencing a 23,000 mile bicycle trip to Australia and back, on a bicycle equipped with a synchromatic drive Power Pak ½ h.p. bicycle motor and a Dunlop "Motorette" tyre.

# JET AIRCRAFT FUELS

## The Fuel Requirements of Modern Jet Aircraft Engines

**I**N this country, the Whittle jet aircraft made its first flight in the spring of 1941. Since then, developments have been rapid and are still continuing. The fuel requirements of the ordinary jet engine (the turbo-jet) are in essence those of the gas turbine, for the turbo-jet produces the stream of high-velocity gases which make up the jet by burning a fuel in compressed air, while the air compressor is connected to a gas turbine. Part of the force in the jet of gases drives the turbine and the remaining force is the actual jet which drives the plane.

Also based on the gas turbine is the turbo-prop, or propeller-turbine engine, in which a gas turbine replaces the piston-engine of the older types. Virtually all the force in the stream of gases is used to drive the turbine, so that the aircraft is not jet-propelled at all. Nevertheless, its fuel requirements are similar to the turbo-jet.

Other modern engines such as the ram-jet and the rocket engine, which are not based on the gas turbine, and are used only for special purposes, are not discussed here.

Although it is not to be expected that piston-engined aircraft will, at least in the near future, be wholly replaced by gas-turbine types, the use of these modern engines will continue to increase, particularly in the United Kingdom which is recognised as leading the world in their development. Thus, the oil industry is faced with a steadily rising demand for fuels which are somewhat different from those used in a piston engine. Military needs for the new fuels would increase sharply in the event of a war.

Past experience has shown that the oil industry is fully capable of adjusting its output to meet new requirements—it is particularly flexible in its organisation and processes—and the aviation fuel situation is continually under review. Gas turbines are still in an early stage of their evolution and, as research continues, it is likely that they will become less selective in their fuel requirements. This is in sharp contrast to the piston-engine, which needed more highly specialised fuels as engine development progressed.

### Fuel for the Older Engines

Piston-engine fuel requirements depend on a number of factors, only a few of which can be briefly mentioned here to provide a comparison with aircraft turbine fuel needs.

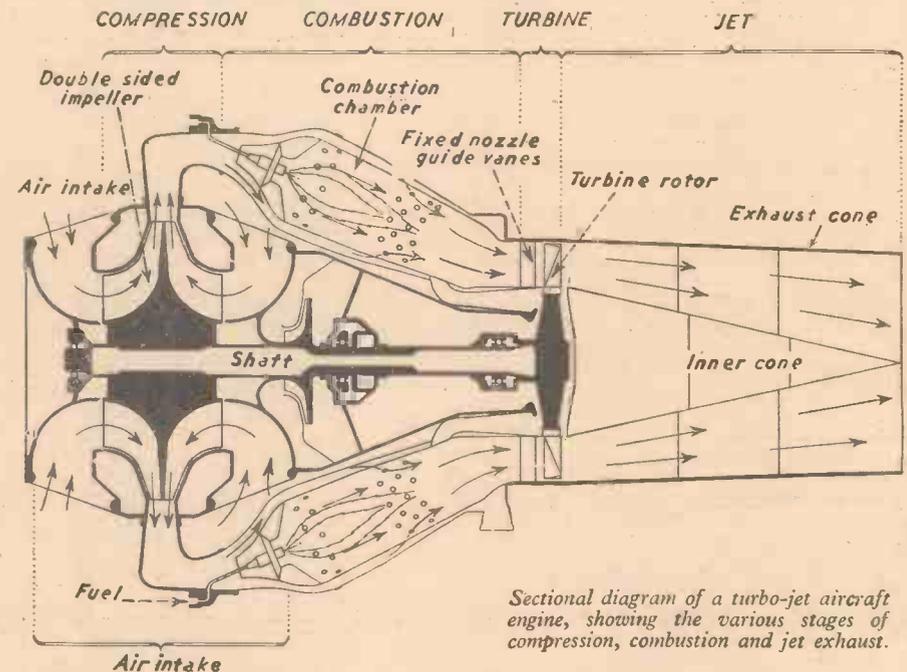
The aircraft piston-engine works on the same principle as the ordinary car engine, and its fuel is therefore basically similar, but the engine's very high power-output, the need for absolute reliability, and the more severe operating conditions call for more stringent specification in aviation gasoline (petrol) than in motor gasoline. Of primary importance are the anti-knock rating of the gasoline and its volatility, that is, the ease with which the gasoline evaporates and forms a vapour. Volatility must be high enough for easy ignition, yet not so high that, particularly under the influence of changes in temperature and atmospheric pressure, bubbles of vapour may form in the fuel pipes and restrict or even prevent the flow of gasoline.

The anti-knock rating denotes the ability of the fuel to burn smoothly in the cylinder without "knocking," which results both in loss of power and overheating, a potential cause of serious damage to the engine. The

high anti-knock rating required in aviation gasoline is secured by including a relatively high proportion of "aromatic" components (e.g. benzene) which are produced during petroleum cracking, or the use of anti-knock additives such as tetra-ethyl lead. New petroleum refining techniques have been developed to obtain components of high anti-knock quality for aviation gasoline, notably the "alkylation" process, which was of supreme importance during the last war.

### Fuel for the Newer Engines

It has already been explained that fuels for turbo-jet and turbo-prop engines must meet the needs of the aircraft gas turbine.



Sectional diagram of a turbo-jet aircraft engine, showing the various stages of compression, combustion and jet exhaust.

Gas turbine engines (not "jet" engines) are also being developed for many applications in industry, and inland and sea transport, so that the possible range of fuels for such engines is an unusually wide one, including not only petroleum products, but even such substances as pulverised peat, powdered coal and sewage gas. For use in aircraft, however, a considerably narrower range of fuels has to be considered but, compared with the piston-engine, the aircraft gas turbine is considerably less selective in its requirements.

Broadly it may be said that a petroleum fuel of the kerosene type appears to be best suited to the aircraft gas turbine. Lighter fuels such as aviation gasoline, and heavier petroleum products (even as heavy as "topped" crude oil) have been tried, but they are unsatisfactory for the reasons explained later. Kerosene (paraffin oil) was used in the first Whittle jet plane, and it seems likely that fuels with similar properties will remain the most popular for general use.

The needs of military and civil aircraft have certain important differences. Availability is more important to an air force than any other factor; in wartime, particularly, it must be fully assured of ample supplies. Civil airlines, on the other hand, are obliged to make cost the primary consideration, while a fuel which reduces fire hazards proves an additional attraction to them. These differences must be borne in

mind when considering the technical properties of the possible fuel.

### Main Technical Factors

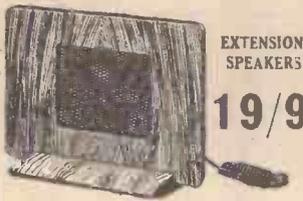
(a) *Specific Gravity.* The higher the specific gravity the greater is the calorific value of a given volume. The fuel capacity of aircraft is limited by volume rather than by weight (except in the case of very large planes which tend to be more restricted in the weight they can carry). Thus, for jet planes a high calorific value per gallon is desirable, and so a high specific gravity—a heavy petroleum fuel—is advantageous from this point of view, although, in fact, other considerations at present dictate the choice of fuel.

The consumption of a jet engine is appreciably greater per hour than a piston engine, so that for military use, where time in the air is often more important than distance covered, the highest calorific value compatible with other considerations is particularly desirable. In civil airlines, miles per gallon are of greater importance than hours per gallon (when covering a fixed route), and the greater speed of the jet plane helps to offset its higher consumption, since it operates at considerably higher altitudes than piston-engined craft, so that air drag is reduced. If, therefore, a turbine plane has to fly for any length of time at lower altitudes consumption increases substantially.

(b) *Volatility.* Volatility need not be as high as that of fuel for a piston-engine, but if it is too low, so that the fuel does not vaporise easily, difficulty may be experienced in starting the engine and unvaporised fuel may collect and cause overheating and damage. As the lighter fuels are normally the more volatile, this tends to limit the choice of a fuel with a high specific gravity.

Military aircraft are liable to operate in exceptionally cold climates and so easy starting under severe conditions is important, while, in certain cases, civil aircraft may find it an advantage to stop one or more engines temporarily while in flight, for economy

(Continued on page 217)



EXTENSION SPEAKERS

19/9

**P.M. SPEAKER** on Baffle or in Cabinet. Polished. With a gold fret ideal for kitchen or bedroom. Post 1/9. 37/6 Extension speaker in veneered walnut or oak cabinet. 8in. P.M. size 12in. x 10½in. x 6in.

**SPOT LIGHTS**, 8/9. Butlers New but X.W.D. 8in. dia., 6½in. deep. Post 1/3. **SIDE LIGHTS**, 1/9, fitted with infra-red glass, but easily changed for clear or red. Post 9d.

**CRYSTALS, GERMANIUM**, 1/9, with 3 FREE circuits. Brand new by B.T.H. Long wire ends, post 6d. Also crystal set coils at 1/-, drawings FREE. Make a set for the children.

**CAR RADIO TRANSFORMER**, 7/9. 6 or 12 v. Post 2/-.

**OP. TRANS.**, 1/9. Salvage, tested. Post 6d.

**MICROPHONE TRANSFORMERS**. X.W.D. new condition. In fully shielded case. 3/9. Post 9d.

**PICK-UP TRANSFORMERS**. New. X.W.D. Unused E.M.I. type. Fully shielded, 3/9. Post 1/-.

**MOTORS**, 17/6. 12-24 v., 18 ct. gold brushes. 2 boxable shafts, as new, X.W.D. Post 2/6.

**METERS**. New and boxed. Moving coil movement giving full and half scale deflection at 100 micro-amps. 2in. scale in 2½in. square mounting. SPECIAL PRICE, 12/9. Post 1/6.

**MICRO SWITCHES**. Latest American midgets. 250 volt 3 A., ½in. x ½in. x 1½ in., 3/6.

LATEST 1954 CATALOGUE NOW AVAILABLE

TV. TUBES

£5, 12in. £3, 9in., most makes. Picture shown to callers. Seconds. By post, and ins., 15/6 extra.



£5, 12"

£3, 9"

NOT X.W.D.

DUKE & CO.,

621, ROMFORD ROAD, LONDON, E.12

Money back guarantee

GRA 6677

10/9	8/9	6/9	5/9
10F1	1S4	1T4	1LD5
10P13	6BE6	1S5	1LN5
6F15	6BA6	3A4	GCH6
20P1	6BW6	6K7	6N7
ECL80	6D3	EL91	7H7
EY51	6V6	ECC91	210VPT
EF80	8D3	KTW61	CV188
SU61	U25	KTW63	EF50 X.W.D.
	X66	UF41	EB91
		UM4 (M.Eye)	UY41

OUR 1954 CATALOGUE WILL GIVE A COMPLETE LIST OF VALVES. CATALOGUE FREE. SEND 2½d. for post.

£5/9/6. 4 VALVE T.R.F. KIT. LOWEST-PRICED SET IN THIS MAGAZINE. OR Already assembled £1 extra. Post 3/6. Can be purchased with a white or walnut plastic cabinet or wooden cabinet. A.C. mains.

**PORTABLE AERIAL COILS**. Brand new. Wound on aluminium frame measuring 4 in. x 6 in. BARGAIN at 2/6. Post 6d.

**BURGLAR ALARMS**. Brand new self-contained unit, made by Truvox. Consists of bell, and trip device mounted in metal cover. Works off 4½ volt battery. SPECIAL OFFER, 5/9. Post 1/3.

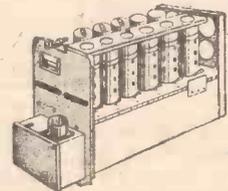
**MIC. & PHONE TRANSFORMERS**. Ex W.D. hand microphone and matching transformer for headphones (ratio 400-3), with standard Jack plug wired on. BARGAIN, 5/6. Post 9d.

**TELESCOPIC MASTS**. Ex W.D., but unused. Extends to 7ft. 6ins. Base diameter ½in., tip ¼in. Ideal aerials, etc. Price 7/9. Post 1/3.

**TUNING CONDENSERS**. Store soiled, tested .0005 mfd., standard size. 2/9. Post 6d.

**INSULATING TAPE**. Brand new and wrapped, ½lb. rolls, ½in. wide, list price, 3/6. Our price, 1/6.

**RECEIVERS**, 17/6, with FREE DRAWING, 6 valve V.H.F. Superhet Ex. W.D. (R1124), new condition, 6 channel. Tunes TV. sound, Fire, amateurs, etc. Convertible to mains. (A.C. or A.C./D.C.). Components include 30 ceramic trimmers, 30 small condensers, 30 resistances (½ to 1 watt), 6 valveholders, cans and covers, 2 transformers, 3 coils, etc. Post 2/6. Drawings available at 1/-. Or FREE WITH SET.



**NEW!**

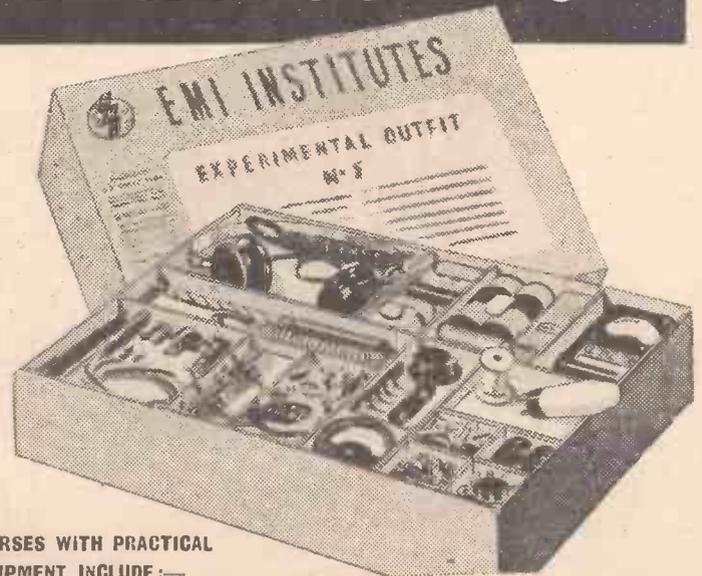
EXPERIMENTAL OUTFITS

LEARN THE PRACTICAL WAY

Whether you are a student for an examination; starting a new hobby; intent upon a career in industry or running your own business—these practical courses are intended for YOU and may be yours at a very moderate cost.

EASY TERMS FROM £1 A MONTH

With these outfits, which you receive upon enrolment, you are given instructions which teach you in easy stages the basic principles of the subject concerned. A tutor is available to give individual help and guidance throughout the Course. The specially prepared equipment remains your property.



POST THIS COUPON TODAY

Please send me your FREE book on Practical Courses :

I am interested in.....

To: E.M.I. INSTITUTES, Dept. 144X, 43 Grove Park Road, Chiswick, London, W.4.

NAME.....

ADDRESS.....  
IC.24

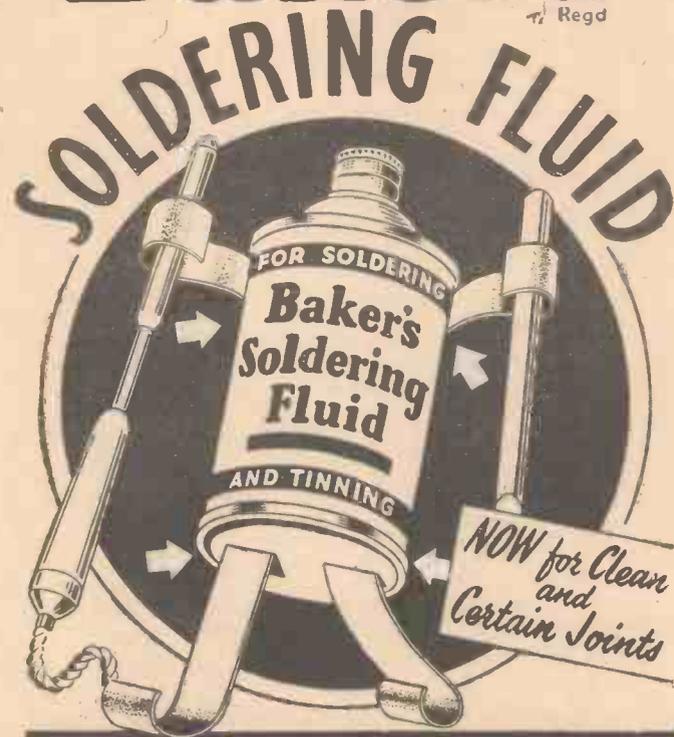
COURSES WITH PRACTICAL EQUIPMENT INCLUDE:—

RADIO (Elementary and Advanced) • TELEVISION • MECHANICS  
ELECTRICITY • CHEMISTRY • PHOTOGRAPHY • CARPENTRY  
ALSO DRAUGHTSMANSHIP • COMMERCIAL ART • AMATEUR S.W.  
RADIO • LANGUAGES • ETC.

E.M.I. INSTITUTES The only Postal College which is part of a world-wide Industrial organisation

# "Baker's"

Regd



**QUICK · CLEAN · CERTAIN · ECONOMICAL**

PRODUCT OF SIR Wm. BURNETT & CO. (Chemicals) LTD.  
GREAT WEST ROAD · ISLEWORTH · MIDDLESEX · ENGLAND

## Build these yourself!

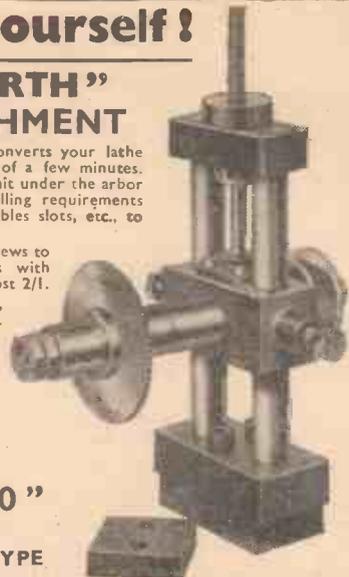
### The "KENILWORTH" MILLING ATTACHMENT

This simple and easily-made attachment converts your lathe into a small Horizontal Miller in the space of a few minutes. Driven from the lathe headstock it will admit under the arbor 4 1/2 in., enabling most of the model makers milling requirements adequate space. Graduated adjustment enables slots, etc., to be milled to exact depth required.

Set of six castings with all materials and screws to complete; two fully detailed blueprints with installation instructions, 30/- per set. Post 2/1.

Cutters 2 1/2 in. diam. available, also pulleys, standards and plunger blocks if required.

A 1/- stamp will bring you a copy of our comprehensive, illustrated catalogue with details of blueprints, castings and fittings for many "L.B.S.C." designed small steam loco's; workshop equipment, etc.



**BUILD THIS SUPERB MACHINE YOURSELF.**  
(A lathe is necessary.) Blueprints and full set of easily machined castings. **40/6**

Carriage extra 5/-.  
Centre column 11/6. Post 2/-.  
Belco (Jacobs type) 3 in. cap. drill chuck, 33/6. Cardinal Mk. 1 1/2 in. cap. drill chuck, 32/8.

### "REEVESCO" No. 2 SENSITIVE TYPE DRILLING MACHINE



Capacity...	3 in.
Spindle travel...	2 in.
Column to chuck...	31 in.
Diam. of column...	1 1/2 in.
Diam. of table...	5 in.
Height of column...	20 in.
Weight approx.	28 lb.

Now available machined and assembled. Price £8/12/6 complete with chuck. OUT OF INCOME TERMS, deposit £2 3s. 0d. and 12 monthly payments of 11/10. Carriage and packing 7/6 extra. (Mainland.)

## A. J. REEVES & CO.

416, MOSELEY ROAD, BIRMINGHAM, 12  
Grams: "Reevesco, Birmingham." Phone: CALthorpe 2554

Miniature Motors. U.S.A. make 2 1/2 x 1 1/2 in. 3/16 in. spindle with detachable worm drive, 12/24 volt, 10/-.

Time Delay Relays supplied to your requirements.

Powerful small Blower Motors, 24 v A.C./D.C., 14/6. As used for the Hedge Trimmer.

12/24 v. Blower Motors, as used for Car Heater, 22/6. Ref. 10 KB/115.

Transformers, Input 200/240 v. Sec. capped 3-4-5-6-8-9-10-12-15-18-20-24-30 volts at 2 amps., 21/6. 12 months' guarantee. This is ideal for use with Blower Motors.

Selenium Rectifiers F. W. 12-6 volt, 1 A., 8/6. 3 A., 14/6. 4 A., 23/6. 6 A., 30/- 24 v. 2 A., 30/-, 250 v. 100 mA. H.W., 9/-, 250 v. 80 mA., 6/6. 275 v. 250 mA., 17/6.

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

0-5 amp. 2 1/2" Square M/c Ammeters, 11/- Multimeter Kits with 2 1/2 in. calibrated M/C meter, reads volts 3, 30, 150, 300 and 600. MA 0-60. Ohms 0-5,000, 25/6.

Compass Mountings each contains 4 Brass Pistons and Cylinders 1 1/16 in. x 3 in. Ex. Dia. 3 in. Bore. 4/6.

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

Telephone Breast Plate Microphones. Ideal for Home Phone System, 3/6. Rheostats. 12 v. 1 A., 2/6.

Latest Car Lights Flasher Unit. 6 or 12 v., 17/6. STATE POLARITY.

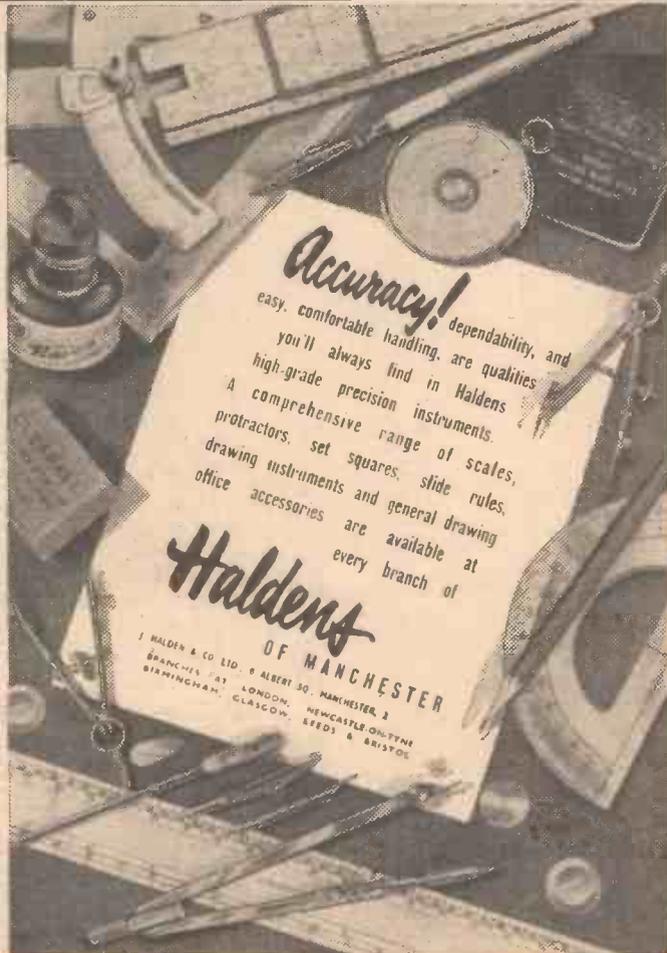
Fishing Rod Aerials. Set 3, 7/6. Base 3/6. 6 v. Vibrator Units, complete. Output 250 v. 60 mA., 22/6.

TR.1196. Transmitter Section. NEW and complete—less valves—4.3-6.7 Mc/s. Easily converted, 15/-. Valves are EF50, TT11, EL32, set 25/-.

All Carriage Paid in U.K.

### THE RADIO & ELECTRICAL MART

253, Portobello Rd., London, W.1  
Park 6026



Haldens OF MANCHESTER  
1 HALDEN & CO. LTD., 8 ALBERT SQ., MANCHESTER, 2  
BRANCHES AT LONDON, NEWCASTLE, OXFORD, BIRMINGHAM, GLASGOW, SEEDS & BRISTOL

### SURFACE GRINDER ELECTRIC A VERSATILE TOOL



Made by Black & Decker, Ltd. For removing Rust, preparing Woodwork, Buffing, Burnishing, polishing, 220/250v. A.C./D.C. Domestic or Power. **YOURS FOR 42/8** DEPOSIT Balance over 6 months.

Cash Price: £37.6. P/Pkg. 2/3 (with deposit or cash).

CHUCK for use with above, for Drilling purposes, 23/6 extra.



**ELECTRIC MOTORS EXPORT SURPLUS** Starting New Purchase **NEW 1/4th H.P.** by famous manufacturer. 200/220v or 230/250v. A.C. 50 cycles 1,425 r.p.m. Single phase. Self-starting. Continuous rating. Standard 2 1/2 in. shaft. On solid platform. Similar to illustration. Usual price £8. **89/6** car. /pkg 7/8.



**1 AMP BATTERY CHARGERS** Also useful as Eliminator New and fully guaranteed in leading maker's original carton. 200-250v. A.C. With Warning Indicator Light. Charges 6v. and 12v. batteries & maintains 1 amp. output at all voltages. **52/6** List price 95/-. P/Pkg. 1/9.

Also 2 AMP. DE LUXE MODEL **89/6** WITH AMMETER (Usually 129/6). Car. /Pkg. 2/6.

**VOLTMETERS** Ex-Govt. Moving Coil. 8/6 0-20v. 2 in. square dial. Post/Packing 1/-.

**EASY TERMS: Orders £5 and over.**

**NEW ILLUSTRATED CATALOGUE FREE.**

**PRIDE & CLARKE Ltd.** (Dept. P.M.), STOCKWELL ROAD, LONDON, S.W.9. BRI 6251.

reasons, and then restart them under low temperature conditions.

As in piston-engined aircraft, there are disadvantages in having a fuel with too high a volatility. Vapour locks may form in the fuel feed system, and on a rapid climb to high altitudes, which is an outstanding feature of a jet plane, the fuel may remain more or less at ground temperature, and, as the fall in atmospheric pressure due to the increase in altitude lowers the boiling-point of a liquid, a volatile fuel may be warm enough to boil or at least to evaporate rapidly. Another disadvantage of a volatile fuel is that the fire hazard is increased.

(c) *Freezing point.* A heavy fuel, or heavy constituents in a fuel with a wider range of components, might freeze at very cold altitudes or at least become so viscous as to be unable to flow easily along the feed pipes and through the fuel filters. This consideration favours a lighter and more volatile fuel.

ing, and other heavier components which by themselves would be unsatisfactory from this point of view.

(d) *Other factors.* High aromatic content of the fuel was mentioned as a feature of gasoline because of its anti-knock properties. There is no comparable "knock" problem in the gas turbine. It was earlier thought to be essential to keep the aromatic content of turbine fuel low, because these compounds are responsible for greater deposition of carbon during combustion, with a resultant overheating and possible damage, but improved combustion conditions have already reduced such dangers, and further improvement appears to be likely. Thus, quite a high proportion of aromatics can be tolerated, and this will increase the availability of suitable fuels.

The influence of sulphur compounds in the fuel has also been investigated. Under certain combustion conditions corrosive acids can be formed, but it does not appear that

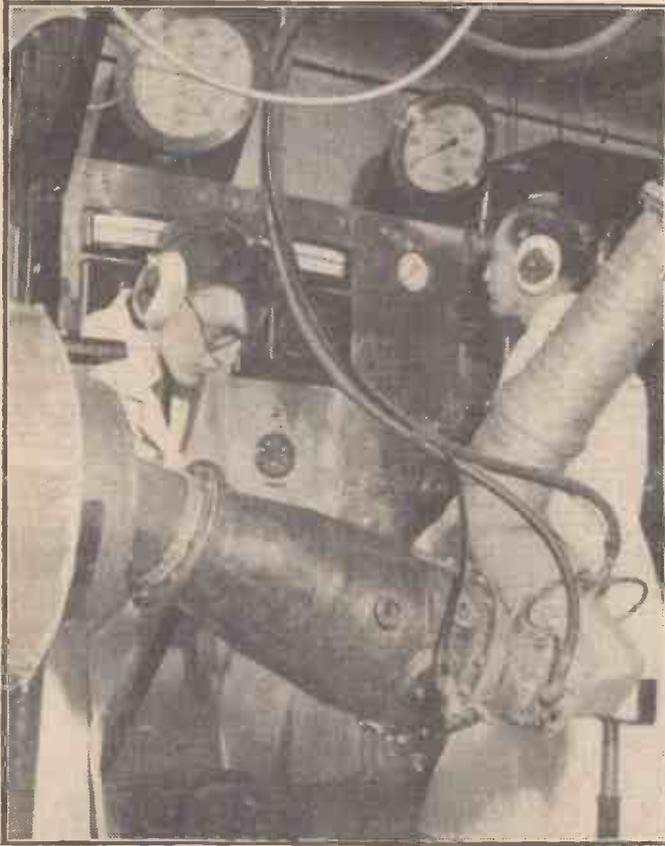
these conditions obtain in most of the combustion zones of a jet engine. Another possible danger is corrosion of the fuel tanks and pipes by sulphur compounds, but simple tests can ensure that the amount and type of these compounds are harmless.

#### Availability

The yield of kerosene from crude oil is not very large—recently in the U.S.A. it averaged 6 per cent. of a barrel of crude oil. Such a quantity would be quite insufficient to meet a military emergency, but in such a case it would be possible to use a fuel with a wider range of components, drawing on gasoline, kerosene and diesel oil. If cracked gasoline stocks were included, it has been estimated that the availability of such a "wide-range" turbine fuel might even be as high as 50 per cent. of crude oil supplies. This would only be possible at the expense of other users of petroleum products, but the significant fact is that the oil industry would be able to meet any emergency even to-day or to-morrow, if necessary.

The other uses to which kerosene is at present being put are mainly lighting and heating, and as a tractor fuel, particularly in agriculture. The use as tractor vaporising oil is likely to grow, but kerosene for lighting and heating is largely concentrated in undeveloped regions, and modernisation in such areas might result in a fall in kerosene demand which would help in counter-balance the rising needs of aviation turbines. Modification of "cracking" processes would always be possible to increase the yield of kerosene at the expense of other crude oil fractions, but any change to a more complex refining process would undoubtedly result in increased cost, and this would tell against its use, more especially by commercial airlines. Indeed, in the long run, as overall demand for turbine fuel outstrips the yield of kerosene, the "wide-range" type of fuel appears to be the easier

*The photo on the left is of a gas turbine research laboratory of an oil company's research station, where comprehensive testing of fuels for jet aircraft is carried out. A test is shown in progress using a Rolls-Royce Derwent V combustion chamber. The special ear pads worn by the operators are to protect their hearing from the high pitched whistle of the jet exhaust.*



The very low temperature of the air at high altitudes may appear to make serious freezing problems likely, but there are two mitigating factors: the fuel takes an appreciable time to cool down to the air temperature, and the friction of the air as it flows over the aircraft raises its temperature.

If we consider these three requirements, (a) to (c), it will be seen that they are to some extent contradictory. (b) and (c) favour a light fuel giving a satisfactory degree of volatility and a low freezing-point, while (a) points to the desirability of a heavier fuel, other things being equal, because of its greater calorific value per gallon. Thus, a petroleum product, or products, of the light/medium-distillate category is indicated, and kerosene has the desired properties. So also would a fuel containing a wider range of components (for example, a mixture of gasoline, kerosene and diesel oil) for this would include some components with high volatility, for easy start-

*Pictured on the right is the measuring of the characteristics of a jet fuel spray in a specially designed piece of equipment in an oil company's research station.*



and more likely alternative to increased kerosene production, particularly as turbo engines are expected to become less selective in their fuel requirements.

**Cost**

Just as considerations of availability are primarily concerned with military needs, so a discussion of cost is mainly related to commercial airline operations. Kerosene is relatively cheap (and, in the United Kingdom at present, carries no taxes, whereas the current tax on aviation gasoline for internal flights is 1s. 10½d. per gallon). When civil airlines reach the stage where turbine needs can no longer be met by kerosene, a wide-range fuel can probably be obtained at reasonable cost: it does not involve more complex refining processes, and so its manufacturing cost is not very high. Its initial distribution cost would probably be greater than kerosene, for it would represent a special grade, unsuitable for other uses, but if demand had reached reasonable proportions the fuel would soon be distributed in sufficient volume to displace one of the present grades of aviation gasoline at a similar cost.

A comparison of the operating costs of piston-engined, turbo-prop and turbo-jet aircraft, which was given last year by Mr. Masefield, chief executive of British European Airways, is of interest.

For a short flight of about 200 miles (London-Paris) the piston-engine proved still to be the cheapest.

Mr. Masefield explained that the differences in fixed annual costs are due to the fact that turbine planes are at present rather more expensive to build than piston-engined aircraft, while jets are in any case more expensive to manufacture, as they are appreciably larger than piston or turbo-prop aircraft for the same payload. Hourly cruising costs of the turbine planes are higher, in spite of the cheaper kerosene fuel, because of their greater consumption rate.

**GASOLINE KEROSENE**

	Piston-aircraft	Turbo-prop.	Turbo-jet
<b>Aircraft:</b>			
All-up weight, tons	26	26	39
Cruising speed, m.p.h. ...	260	310	450
Block Time, minutes ...	75	68	55
Block Speed, m.p.h. ...	160	180	225
<b>Costs:</b>			
Fixed annual costs, £	515,000	536,000	632,000
Hourly cruising costs, £	47	51	79
Landing costs, £	48	48	52
<b>Operating costs:</b>			
Per year, £	1,850,000	1,860,000	2,204,000
Per hour, £	120	132	198
Per aircraft-mile...	14s. 9d.	14s. 11d.	16s. 11d.

The operating cost of the turbo-prop is scarcely greater than the piston plane, and it is slightly faster. The turbo-jet is 19 per cent. more expensive to run than the piston-engine, with 25 per cent. reduction in flying time.

On longer flights the turbine aircraft starts to come into its own. For a London-Rome trip (about 900 miles) the jet's operating cost would be only 11 per cent. above the piston aircraft with 1½ hours less flying time. For 1,500 miles the jet would save 2½ hours in flight compared with the piston-prop, and 1½ hours compared with the turbo-prop. For distances such as these, passengers would be likely to show a strong preference for the rapid jet plane, if the price of the ticket was not much greater, and this would compensate for the higher operating cost. For still longer flights the jet would probably be an excellent proposition, even at a higher fare.

For distances of 500-1,000 miles the turbo-prop is likely to supersede the piston plane because the operating cost is similar—it is faster, and the absence of vibration and quieter flight are considerable attractions. If fuel consumption and maintenance cost of both the turbine types are reduced, their advantages over the older propeller planes will be even greater.

The present state of development of the gas turbine aircraft indicates that the kerosene fuel now in general use will, when demand makes it necessary, be replaced by a wider-range petroleum fuel.

Research into the engines and their fuels is continuing, and at present only part of the story of their evolution can be written.

*(Reproduced by courtesy of the Petroleum Information Bureau.)*

# An Open-flash Adaptor

An Easily Made Unit for Use With a Torch

By F. G. RAYER

THIS simple unit was made up to permit an ordinary torch or flash-lamp to be used for flash photography, and it is screwed in to replace the torch bulb. The general appearance of the completed flash-gun is shown by the photograph.

The diagram illustrates how the adaptor

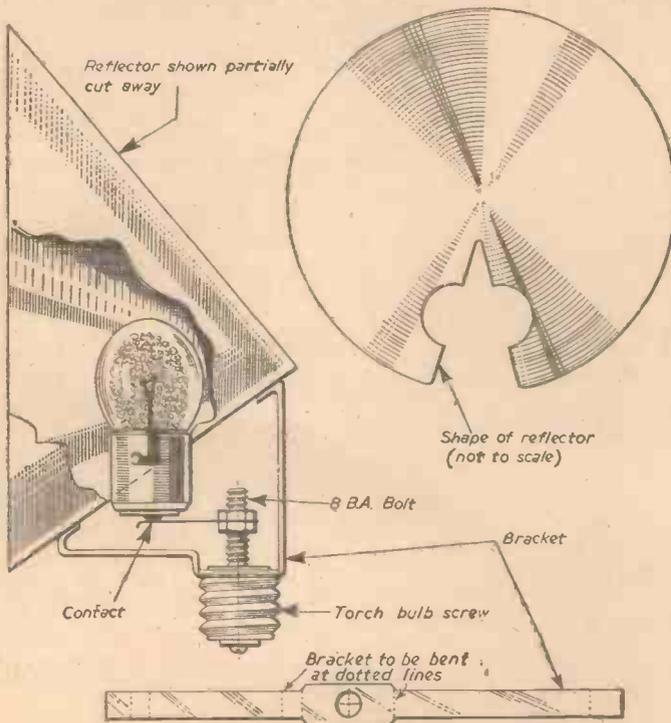
is made up, and the parts were cut from tin-plate, which is satisfactory for the reflector, and easy to solder. The reflector itself is about 6in. in diameter, and bent into a conical shape. It directs light on to the subject, and keeps it away from the camera lens, and should not be omitted.

**Flash-bulb Holder**

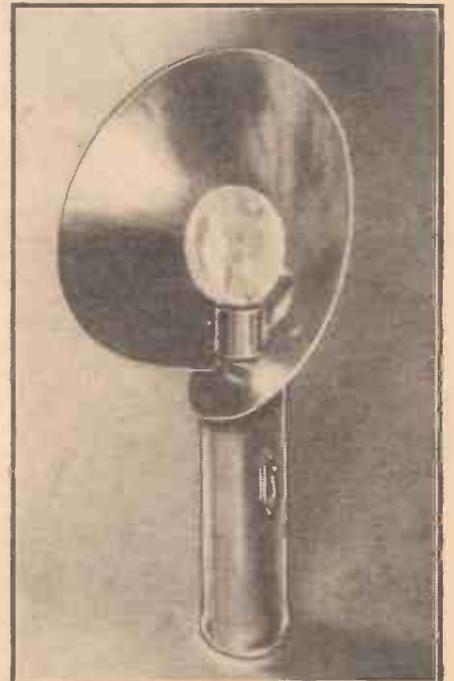
The flash-bulb holder was made by cutting a strip of metal, fashioning it into a tubular section, and soldering along the joint. Two "L" shaped notches are cut so that bayonet-cap type bulbs may be inserted. The pip of the bulb touches a contact secured to the 8 B.A. bolt. The latter passes through the torch-bulb screw, its head occupying the position normally taken up by the contact on the bottom of the bulb. An old bulb was carefully broken to obtain this screw, and subsequently filled with plastic wood, through which the 8 B.A. bolt passes. Other insulating compounds could be used.

The gun can be used in conjunction with any camera which has a "B" or "T" shutter setting. An aperture of about F11

at 8ft. is usually suitable, so that box cameras and similar cameras with small lenses may be used. The subject should be in fairly subdued light. The shutter is opened, the bulb fired, then the shutter closed. The subject need not be motionless, since the duration of the flash is sufficiently short to "freeze" all normal action. A range of flash-bulbs may be obtained from photographic dealers, and the various makers give exact details of the aperture which should be used, to obtain a correct exposure with various films, and at various distances. Indoor subjects may therefore be photographed with the minimum of trouble, and good results obtained.



Details of the flash-bulb holder and reflector.



The completed flash-gun ready for use.

# GALPIN'S

**ELECTRICAL STORES**  
408, HIGH ST., LEWISHAM, S.E.13  
Tel.: Lee Green 0309. Nr. Lewisham Hospital.  
TERMS: CASH WITH ORDER, NO C.O.D.  
All goods sent 7 days' approval against cash.  
EARLY CLOSING DAY THURSDAY.

**ELECTRIC LIGHT CHECK METERS**, useful for subletting, garages, etc., all for 200/250 volts A.C. mains, 5 amp load, 19/- each; 10 amps, 22/6; 20 amps, 27/-; 25 amps, 32/6; 40 amps, 38/6; 50 amps, 46/6; and 100 amps, 57/6 each, all carriage paid.

**MAINS TRANSFORMERS (NEW)**, 200/250 volts input in steps of 10 volts, output 0, 6, 12, 24 volts 6 amps, 42/6 each, post 1/6. Another, as above but 10-12 amps, 55/- each, post 1/6; another as above, but 25/30 amps, 75/- each, carriage 3/6; another, input as above, output 0/18/30/36 volts 6 amps, 47/6 each, post 1/6.

**METAL RECTIFIERS**, suitable for 6/12/24 volts at 10 amps charging with the correct transformer, complete with TX 97/6 each, or Rectifier only 35/- each.

**1,000 WATT AUTO WOUND VOLTAGE CHANGER TRANSFORMER** tapped 0/110/200/230/250 volts, £5/15/- each, carriage 4/6.

**Ex-W.D. U.S.A. HAND GENERATORS**, less winding handle, output 425 volts at 110 m/a., at 6.3 v., 2 1/2 amps, complete with smoothing, 30/- each, carriage 2/6.

**MAINS TRANSFORMERS**, input 180/250 volts, output 435/0/435 volts, 25 m/amps, 6.3 volts 10 amps, 6.3 volts 8 amps, 6.3 volts 8 amps, 5 volts 6 amps, 65/- each.

**Ex-U.S.A. ROTARY CONVERTERS**, 12 volts D.C. input, outputs 500 volts 50 m/a., 275 v. 100 m/a. Complete with smoothing, 32/6 each, carriage 2/6, as new.

**Ex-NAVAL ROTARY CONVERTERS**, 110 v. D.C. input, 230 volts A.C. 50 Cy, 1 ph 250 watts output. Weight approx. 100lbs., £12/10/-, c/forward.

**MAINS TRANSFORMERS (NEW)**, suitable for spot welding, input 200/250 volts, in steps of 10 volts, output suitably tapped for a combination of either 2/4/6/8/10 or 12 volts 50/70 amps, 95/- each, carr. 7/6. 6 or 12 VOLT RECTIFIERS at 4 amps output, complete with suitable transformer, 200/230 volts input, 45/- each, post 1/6.

**MAINS TRANSFORMERS (NEW)**, input 200/250 volts in steps of 10 volts, output 350/0/350 volts, 180 m/amps, 4 volts 4 amps, 5 volts 3 amps, 6.3 volts 4 amps, 45/- each, post 1/6; another 350/0/350 volts 180 m/amps, 6.3 volts 8 amps, 0/4/5 volts 4 amps, 45/- each, post 1/6; another 500/0/500 volts 150 amps, 4 volts 4 amps C.T., 6.3 volts 4 amps, C.T., 5 volts 3 amps, 47/6 each, post 1/6; another 425/0/425 volts 160 m/amps, 6.3 volts 4 amps, C.T. twice 5 volts 3 amps, 47/6 each, post 1/6.

**Ex-U.S.A. ROTARY TRANSFORMERS** 12 volts D.C. input, output smoothed 275 volts, 100 m/a and 500 volts 50 m/a, as new, 25/- each, carriage paid.

**MAINS TRANSFORMERS**, 200/250 volts input, output a combination of 6, 12, 18, 24, 30 and 36 volts at 6 amps, 45/- each, post 1/6.

**METERS**, Moving Coil, 0 to 14 amps, 18/6 each. Ditto. Moving Iron, suitable for A.C. 0 to 30 amps, 25/- each. Another moving coil, 100 to 250 amps. D.C., 35/- each, all 4in. scale.

**12/24 VOLT RECTIFIERS** at 4 amps, with suitable Mains Transformer, 200/230 volts input, 55/- each.

**WELDER TRANSFORMERS**, 200/250 volts 50 Cy 1 ph input, 0/60/80 volts 800 amps. Complete on Trolley, £32/10/-, carriage forward.

**3 KILOWATTS DOUBLE-WOUND VOLTAGE CHANGER TRANSFORMERS**, 110/230 volts or vice-versa, as new, weight approx. 100lbs., £12/10/- each, carriage forward.

**MAINS TRANSFORMERS**, 200-250 volts input, output 400/0/400 volts, 280 m/amps, 6.3 v. 8 a., 2 v. 3 a., 5 v. 3 a., 4 v. 2 a., 4 v. 2 a., the last two heaters insulated at 8,000 volts, 85/- each; another 200/230 volts input, output tapped 0, 9, 18 volts at 4 amps, 25/- each, post 1/6.

**MAINS TRANSFORMERS**, input 200/250 volts, output 45/50 volts, 70 amps, suitable for arc welding, £15 each; another 70 volts, 50 amps, £15 each.

**D.C. MOTORS**, 230 volts, 3 h.p., 3,000 r.p.m., in good condition, £3/5/- each; ditto Fan Motors, 230 volts D.C., 20/- each; 110 volts D.C., 17/6 each.

## CASTING SECRETS REVEALED

Make your spare time profitable pouring beautiful castings at home. We supply everything and show you how. Amazingly simple. Rapid production. Immediate results. Also other Novel Plastics. Good proposition for both women and men and younger generation. Send 2 1/2 d. stamp for exciting book and Market details. No obligation.



**QUALITY PLASTICS LTD., (Dept. P.M.5)**  
**BRENTWOOD, ESSEX.**



### MASO PLUGS

USE TOGETHER WITH MASON MASTER DRILLS

Manufactured by **JOHN M. PERKINS & SMITH LTD., BRAUNSTON, NR. RUGBY**

## ML7 OWNERS!

This Countershaft Clutch will save workshop time and bring added enjoyment to your lathe-work.

- Stopping or starting time reduced.
- Avoids unnecessary wear on motor and switch.
- Very easily fitted.
- Efficient but simple.



Can be fitted by you to your ML7 3 1/2 in. Lathe: is of the same high quality and value as all Myford products.  
Send now for Publication 706.

## USE THE MAINS

YOU CAN WORK ANY MODELS BATTERY-OPERATED at 1/10th of the Cost. Our illustrated free list is now available.

We supply complete Power Units or Kits of Parts, with all necessary diagrams.

S.A.E. with requirements, stating A.C. or D.C. Mains.

**LAWRENCE** Frankel, Mail Order,  
134, Cranley Gardens, N.10  
CLI 6641

## SPECIAL OFFERS

**SHOWCASES**.—Plate glass opening front, size 3ft. 3 in. x 2ft. 3 in. x 5 1/2 in. Perfectly made to Government specification. Ideal for wall or counter. Only 45/- each (carriage and packing 10/-).

**AUTO CABLE** for car wiring and all electrical purposes, waterproof. Single, 20/-; 3 core, 40/-; 5 core, 53/-; all per 100 yards.

**LAMP HOLDERS** with pushbar switch for standard lamps, 4in. thread, 3/- each.

**COMPASS**.—Type P10. Diam. 6in. Brand new. In transit case, ideal for Boat owners, Scouts, etc. Bargain Price, 17/6. P. & P. 2/6.

**VACUUM PUMPS or Rotary Blowers**.—Ex. R.A.F. Brand new. 7 cu. ft. per min. 10 lbs. per sq. inch at 1,200 r.p.m. Size 6in. x 4in. x 4 in. shaft. 22/6 each. Post 2/-.

**TERMINALS 4BA**.—Instrument type with captive head. 3 on board, 1/6. Post 6d.

**SLIDING RESISTANCES**.—7.5 ohms, 4 amps., 15/-; 10 ohms., 3.5 amps., 25/-, post 1/6.

**BIZZERS**.—3 to 8 volts. In mahogany case. Superior quality, 5/6 each, post 9d.

**SCOUT SIGNAL LAMPS**.—3 1/2 in. complete outfit in case, with Morse key, inspection lamp, spare bulbs, etc., only a few left, 15/6, post 2/-.

**METAL RECTIFIERS**.—Bridge types, 6 volt amp., 10/6; 12 volt, 1 amp., 12/6.

**DOUBLE READING AMMETER**.—In leather case, A.C./D.C. reading 3 and 15 amps., 2 1/2 in. dial, portable type, 22/6, post 1/-.

**AMMETER**.—2 1/2 in. Flush 0/25 amps., Moving Iron. D.C. 7/6, post 1/-.

**MILLIAMMETERS**.—Moving Coil, D.C. 2 1/2 in. Flush 0/30, 0/200, 0/250, 12/6; 3 1/2 in. Flush, reading 150-0-1,500, a very useful meter with a good open scale, 22/6, post 1/-.

**PORTABLE ELECTRIC BLOWER**.—This unit is a powerful 220 watts electric motor, operating on 220/230 volts. Enclosed type with handle. 8 ft. of metallic flexible hose and nozzle is included, also 7 yds. C.T.S. flex for connection to the mains. These units are brand new and offered at about half the usual price, they have many uses where clean, dry air is required. £7/10/-, complete.

**CLOCKWORK MECHANISM**.—Precision made movement with contacts making and breaking twice per second, can be used for switching on and off lamps, etc. Brand new in scout-proof cabinet, 12/6, post 1/6.

**INSPECTION LAMP**.—Complete with Battery Case. Fits on forehead. Leaves both hands free. 7/6, post 1/-.

**VEEDER COUNTER** 0-9999, 1 1/2 in. x 2 1/2 in. x 2 1/2 in. Very useful, 7/6, post 6d.

**ACFIL PUMPS**.—These pumps enable you to fill all accumulators on the bench with the carboy at floor-level. Brand new, only 30/-, post 2/-.

**P.M. SPEAKERS**.—In cases, ideal for extension speakers, 6in., 30/-; 5in., 17/6, postage 2/-.

**THERMOSTAT SWITCH**.—Bimetal type in sealed glass tube, 2 1/2 in. x 1 1/2 in. 30 deg. Cent. Ideal for Aquariums, Wax and Oil Baths, Gluepots, etc. Will control 1 amp. at 240 v., 6/- each, post 6d.

**FLYER**.—Batch-weld 12in. stem, 0/250 v. A.C., D.C. 15 amps. A.C., 1 amp. D.C. 10 to 90 deg. Cent., 35/-, post 1/6.

**"ELF" CIRCUIT BREAKER**, avoids blowing mains fuses if circuit is overloaded, Reset in an instant. Very useful on test bench, size 3in. x 1 1/2 in., post 1/-.

**LOW VOLTAGE CIRCUIT TESTER**.—A self-contained unit for making a complete and rapid check of the generator-battery circuit of a vehicle. Battery voltage, regulator and cut-out settings and generator performance can all be easily determined. American made. Complete with instruction book. £5/10/0, post 2/-.

**ACCUMULATOR TESTER**.—Complete in case with heavy current test prods. Plate selector switch with 7 positions, enabling the test to be made in accordance with the number of plates per cell. 70/-, post 2/-.

**HAND GENERATOR or Battery Charger**.—8 volts D.C. at 4 amps, contained in a strong metal case with automatic cut-out. Very useful where no mains are available, could be converted to a wind charger. Only 30/-, carriage 5/-.

**BALL RACES**.—No. EE2. 1 1/2 in. x 1 1/2 in. 3/-, 30/- doz., post free.

**THRUST RACES**.—13/16in. x 1 1/2 in. 15/- doz., post free.

**VOLTMETERS**.—0-300 Flush D.C. Moving Coil, 10/6; 0-20, 2in. Flush Moving Coil, 7/6; 0-40 2in. Flush M.C., 10/6, post 1/-.

**BATTERY CHARGER "WESTALITE"**. Input 100/250 v. A.C. Output 12 v. 16 amps., variable metered output, fused, worth 23d. Our price while they last, £15. Carr. and Pkg. 15/-.

**ACCUMULATOR CHARGERS**.—2.0 v. A.C. in black crackle case with fuses and meter, 6 and 12 volts at 4 amps. Bargain Price 24/19/6. Pkg. & carr. 5/-.

**RECTIFIER UNIT**.—P.O. type. Input 200/250 volts A.C. Output 50 volts 0.75 amps. D.C. Westinghouse, 55/-, carriage 10/-.

**SLIP MOTION DIALS**.—6in. Scaled 0-100, reduction 200 to 1 direct, ideal for wavemeters, signal generators, etc. Our price, while they last, 5/6, post 1/-.

**SWITCHES**.—A row of 5 in a flush mounting bakelite moulding 5 1/2 in. x 1 1/2 in. x 2 1/2 in. Ideal for model railways, etc., 5/6, post 9d.

**24-VOLT MOTOR** with reduction gear and cam-operated contacts, 15/6, post 1/-.

**24-VOLT D.C. MOTORS** with double ended shaft 2in. x 3in., 8/6, post 1/-.

**HAND TELEPHONE**.—Brand new with cord, 15/- each, post 1/6.

**CUTTER HEADS**.—Recording high impedance. A bargain at 55/- each, post 1/-.

**CUTTER STYLII**, 4/- per doz., large quantity available at special rates.

Comprehensive List Now Ready 6d.  
**WILCO ELECTRONICS**  
DEPT. P.M.,  
204, LOWER ADDISCOMBE ROAD,  
CROYDON.

All items carr. pd. (U.K. only)

Money back guarantee.

**EZEZ ELECTRIC ARC WELDER**  
Can be used for welding, brazing and soldering from normal 6 or 12 v. battery as in a car. Complete with spare carbon rod and welding iron. Unrepeatable at 25/-



**1,500ft. BEAM FOCUSING TORCH**

Highly polished nickel-plate finish, heavy duty, 14in. long, five standard U.2 batteries. Brand new. Complete with Ever-Ready batteries, 19/11

**400ft. BEAM TORCH**  
Fully focusing, nickel-plated. 7 1/2in. Complete with Ever-Ready batteries, 9/11

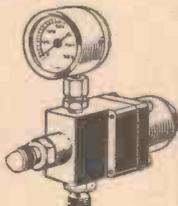
**TOOL BOX**

U.S.A. manufacture, size 18in. x 12in. x 5in. Strongly-made waterproof ply, all external edges reinforced. Subdivided as illustrated, leather carrying handle. Outside resprayed green 17/6



**HIGH PRESSURE REDUCING VALVE**

Complete with 0-3000 lbs. per sq. inch pressure gauge. Suitable for Compressors, cylinders of Gas, etc. Brand New 8/6



**AIR BOTTLE**

23in. x 5in. diam. Tested to 300lbs. per sq. in. Suitable for above valve or compressor. 25/-



**SPIRIT BLOW LAMP**

7in. o.a. x 1 1/2in. diam. Heavy duty brass. Brand new. Ideal for model making. 10/6

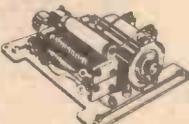
**SELENIUM METAL RECTIFIER**

Suitable for 2, 6, and 12 v. battery chargers, etc. Max. capacity 15 v. at 1 amp. New and boxed. 9/6

Set of **TWIST DRILLS**. 9 drills 1/16in. to 1/2in. complete with plastic case and stand. Brand new. 4/6

**FLASHER MOTOR UNITS.**

Containing small 24 v. D.C. motor approx. 2 1/2in. x 1 1/2in. and Reduction Gear Box, driving cam operated contact, made for flashing lights on aircraft. Ideal for Flashing Indicator, Illuminators, etc. Motor and Gear Box useful for all types of models. 25/-



**MODEL MAKER'S MAINS TRANSFORMER.** All purpose low voltage. Input 210/250 volts. Output 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24, 30 volts. Rating 2 amps. Brand new, fully guaranteed. 24/-

Send 3d. for Bargain List.

Cash With Order. C.O.D. 1/- extra. Phone orders accepted.

**SHERMAN'S SUPPLY COMPANY (PM5)**

479, HARROW ROAD, LONDON, W.10

LADbroke 1718

**MIDLAND INSTRUMENT CO. OFFER:—**

"HOTRIC" IMMERSION HEATERS, 220/230 v. 2,500 watts, requires 1 1/2in. dia. fixing hole, length from fixing nut 2 1/2in., complete with cover and cable entry, new, unused, fully guaranteed, fraction of original cost, 32/6, post 2/6. **IMMERSION HEATER THERMOSTATS** by "Sunvic" Controls, Ltd., 250 v. 15 amp., adjustable with scale to cut out from 100 to 190 deg. F., these are standard type, complete with tank sheath and fixing nut, less than half list price, 17/6, post 1/-; heater and thermostat, 50/-, post paid. **STABILIZING HEADS**, has vertical and horizontal action, micrometer knob control with graduated scales, fitted gyroscope, includes fine cut gears, worms, helical traverse, etc., weight 15lb., fraction of original cost, unused, 15/-, carriage 2/6. **AIR COMPRESSORS** (Domestic) rotary vane type, develops constant 40/50lb. sq. in., using a 1 h.p. motor, size (less shaft) 6in. long, 4in. x 3in. dia., fitted 2in. long 1in. dia. s.p.c. shaft, brand new in sealed cartons, cost £10, our price 20/-, post 2/-; **FLESSEY A.C. MAINS** shaded pole gram. motors, 200/250 v. as used on the 3-speed gram. unit, 3in. x 3in. x 2 1/2in., list price 36/-, our price, brand new, boxed, 12/6, post 1/2. **TELEPHONE SETS**, consists of 2 combined microphones and receivers, 20ft. twin connecting flex, provides perfect 2-way communication (up to 1 mile using extra flex), self-energised, no battery required, complete ready for use, brand new, boxed, 12/6, post 1/2. **TYPE CYLINDER LOCKS**, dead-locking and thief-proof, has 7 instead of the usual 5 tumblers, interchangeable with ordinary cylinder locks, for right- or left-hand doors, complete with 2 keys and all fittings, instruction booklet, brand new, boxed, list price 18/9, our price 5/-, post 1/-; 2 for 10/-, post paid. **LIGHTER PARTS**, cartons containing 80 brand new parts, enough to nearly complete 4 high-grade lighters, includes fine cut wheels, stems, springs, frames, bearings, size 4 1/2in. x 3 1/2in. x 3in., brand new, worth 85, our price 20/-, post 1/6. **RECEIVERS, TYPE 5C/2264**, consists of a combined optical, image converter, photo-electric unit, with lead to power supply, enables direct vision of otherwise invisible Infra-Red sources, further data to hand shortly, new, unused in wood transit cases, cost £33, our price 50/-, carriage 5/-; **FLASHER UNITS**, uses 2 slugged relays with platinum points, provides approx. 120 flashes per minute from a 12 v. car battery, fully radio suppressed, in diecast cases, size 4 1/2in. x 3 1/2in. x 3in., brand new, worth 85, our price 20/-, post 1/6. **THERMOSTATS**, close at low temperatures, adjustable 30/60 deg. F., ideal for greenhouses, car heaters, frost warning, etc., worth 10/-, our price, brand new, 2/6, post 4d.; 24/- doz., post 1/-; **T.R.S. FLEXIBLE**, rubber covered, twin, 16,012 circular, 1in. dia., 250 v. insulation, usual price 1/6 to 2/- per yd., our price, 25 yds. 15/-, post 1/8; 50 yds., 27/6, post 2/-; 100 yds., 50/-, carriage 5/-; **VEEDEL COUNTERS**, 0-999 fitted zero re-set, in black crackle cases, fitted pulley (detachable) drive, worth 30/-, our price 3/8, post 6d.; ditto, 0-9999 repeating, no re-set, in plated case, with in. drive, 2/6, post 4d.; **RECTIFIERS**, selenium full wave bridge, 12 v. 4 amps., A.C. input 16 v., new, boxed, 15/-, post 1/-; transformers to suit, 200/230/250 v., output 4-8-12-16-20 v. at 4 amps., new, boxed, 20/-, post 1/6. **VARIABLE RESISTORS**, wire wound on ceramic, laminated wiper, 50 ohms at 1 amp., or easily altered to 12.5 ohms at 2 amps., new, boxed, 5/-, post 1/-; **LENSES**, Dallmeyer Acharo, F. 3.5, 40 mm. dia. in black aluminium mounts 1in. deep, brand new, perfect, 7/6, post 6d.; **RELAY PANELS**, bakelite panels on which are mounted five 12 and 24 v. relays, each single pole make, well worth 20/-, our price, new, unused, 5/-, post 1/6. **IMPULSING MECHANISMS**, operates 4-position switch, 12/24 v., new, unused, 1/6, post 1/-; **BREECHES**, consists of revolving magazine to take 5 cartridges, lever operated with special oil hydraulic check, fitted electric firing mechanism, used as engine starters or for smoke signals, brand new in sealed cartons, cost £20/£30, our price 12/6, post 2/-; **T.R.S. CABLE**, single 1/0/4 rubber covered 250 v. grade, brand new, 25 yds., 5/-, post 1/2; 100 yds., 18/-, post 2/-; **BURGLAR ALARMS**, closed circuit type, 6/12 v. operation, uses 200 plus 4 ohm relay, with holding contacts and heavy alarm contacts, closed circuit indicator lamp, start press switch, with sockets for closed circuit and alarm circuit, in smart metal cases, size 7in. x 4 1/2in. x 3in., new, unused, with all instructions, 15/-, post 1/6. **CRYSTAL SET PARTS**, all new, boxed, dual-range M. & L.W. coils, with circuit for a crystal set, 2/8, post 4d.; small, .0005 mid. var. conds., fitted knob, 3/6, post 4d.; Germanium detectors, latest wire-ended type, 2/-, post 3d.; Browns headphones, fitted 8ft. leads, 7/6, post 1/-, the 4 items, 15/-, post 1/6. **SULLIVAN'S MAGNETOMETERS**, an instrument for measuring the strength of permanent magnets, new in wood cases, 2/6, post 6d. **PNEUMATIC DASHPOTS**, all brass, except piston, 3in. long, 1in. dia. plunger movement, 2in., brand new, 1/9, post 6d.; 18/- doz., post 1/6.

Many other bargains to offer. Send 6d. for 30-page list with supplements.

**MIDLAND INSTRUMENT CO.**  
MOORPOOL CIRCLE, BIRMINGHAM, 17. Tel. HAR-1308

**HANDYMEN—HERE'S THE SOLDER**

*professionals prefer*



For reliable, economical home repairs, Ersin Multicore is the solder to use. It cuts costs by avoiding wastage—the 3 cores of exclusive Ersin Flux ensure that there are no solder lengths without flux. It saves time because the 3-core construction means thinner solder walls, quicker melting and speedier soldering. It can be used for every soldering job, replacing stick solder, fluid and paste fluxes.

SIZE 1 CARTON  
PRICE 5/- EACH



THIS SIZE 2 (HANDYMAN'S) CARTON COSTS only 6d.

Contains approximately 3 ft. of 16 S.W.G. Ersin Multicore Solder, sufficient for 200 average joints.

**MULTICORE SOLDERS LTD.**

MULTICORE WORKS, MAYLANDS AVENUE, HEMEL HEMPSTEAD, HERTS.  
BOXMOOR 3636 (3 lines)

**RADIO SUPPLY CO. (LEEDS) LTD.**

(DEPT. S),  
32, THE CALLS,  
LEEDS, 2.

Terms: C.W.O. or C.O.D. over £1.  
Postage 1/1 extra under £1; 1/9 extra under £3.

All Goods guaranteed. Catalogue 6d. S.A.E. enquiries.

**CONVERT YOUR BATTERY RECEIVER TO A.C. MAINS.**

**R.S.C. BATTERY CONVERTER KIT.**—A complete kit of parts for the construction of a unit which will replace both H.T. Battery and L.T. Accumulator where 200-250 v. A.C. Mains supply is available. Outputs fully smoothed are 120 v., 90 v., 60 v., 40 mA, and 2 v. at 0.4 a. to 1 amp. for all normal Battery Receivers. Only 4/9. Or assembled ready for use 7/9 extra.

**R.S.C. BATTERY SUPERSEDER KIT.**—All parts to assemble a unit (housed in metal case approx. 5 1/2 x 4 x 1 1/2in.) to replace H.T. and L.T. Batteries in ALL DRY RECEIVERS when mains supply of 200-250 v. A.C. is available. Outputs fully smoothed 90 v. 10 mA., 1.4 v. 250 mA. For 4 valve sets only.

**COLLARO ELECTRIC GRAMOPHONE UNITS.**—For A.C. Mains, 200-250 v. input. Fitted with crystal Pick-up, plays standard 7, 10 or 12in. records. Standard 78 r.p.m. Brand New, cartoned. Limited number at only £3/19/6, plus 5/- carr.

**COLLARO 3-SPEED AUTO-MATIC RECORD CHANGERS.**—Type RC/3/521, with crystal pick-up (2 plug-in heads) for long playing or standard records. Plays ten 7, 10, or 12in. records, not intermixed. For A.C. Mains 200-250 v. input. Limited number at approx. half list price. Brand New, cartoned. 9 Gns., carr. 5/-.

**R.S.C. BATTERY CHARGER KITS.**—For A.C. mains, 200-230-250 v. operation. Kit comprises Mains Transformer, F.W. Selenium Rectifier, Fuses, Fuseholders, etc., and Louvred Black Crackle Case.  
6 v. 2 a. ... 26/9  
6 v. or 12 v. 2 a. ... 32/9  
6 v. or 12 v. 4 a. ... 49/9  
Supplied assembled and tested, 6/9 ex.

**SELENIUM RECTIFIERS**  
2/6 v. 1/2 a. H.W. ... 1/9  
6/12 v. 1/2 a. H.W. ... 2/9  
6/12 v. 1 a. F.W. (Bridge) ... 5/11  
6/12 v. 2 a. F.W. (Bridge) ... 9/9  
6/12 v. 4 a. F.W. (Bridge) ... 14/9  
6/12 v. 6 a. F.W. (Bridge) ... 19/9  
90 v. 40 mA. H.W. ... 3/9  
150 v. 40 mA. H.W. ... 3/9  
250 v. 50 mA. H.W. ... 5/9  
250 v. 100 mA. H.W. ... 8/9  
350 v. 50 mA. H.W. ... 7/9

**R.S.C. FILAMENT TRANSFORMERS.**—Primaries 200-250 v. A.C. 50 c/s. 6.3 v. 1.5 a., 5/9; 12 v. 1 a., 7/11; 6.3 v. 2 a., 7/6; 12 v. 3 a., 17/6; 6.3 v. 3 a., 9/9; 24 v. 1.5 a., 17/6; 0.4-6.3 v. 2 a., 7/9.

**R.S.C. CHARGER TRANSFORMERS.** Primaries 200-230-250 v. A.C. 50 c/s. 0-9-15 v. 1.5 a., 12/9; 0-9-15 v. 6 a., 22/9; 0-9-15 v. 3 a., 16/9; 0.4-9-15-24 v. 3 a., 22/9.

**EX GOV. ACCUMULATORS (NEW).**—2 v. 16 A.H. with Non-spill Vents, 5/9.

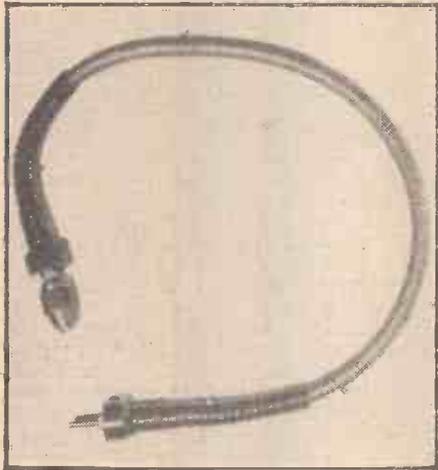
**EX GOV. AUTO-TRANSFORMERS.**—50 c/s. 15-10-5-0-215-235 v. 200 watts, 25/9. Double wound 10-0-10-210-230 v. to 5-0-115-125 v. or reverse 200 watts, 25/9. Double wound 10-0-200-220-240 v. to 10-0-270-290-310 v. or reverse 230 watts, 27/9.

# Trade Notes

## The "Mini" Flexible Shaft

MESSRS. E. C. HOPKINS, LTD., of Birmingham, had the owner of the small private workshop in mind when they produced the latest addition to their range—The Hopkins "Mini" Flexible Shaft, but its robust design has led to its use by large companies, including an important aircraft manufacturer.

This versatile lightweight tool can be driven from any type of motor available, and



The "Mini" Flexible Shaft.

will perform all the duties of a flexible shaft—drilling, filing, sanding, etc. The lightweight construction makes it an easy tool to operate in awkward positions.

The shaft rotates on ball bearings, an important refinement in models of this size.

Other details are as follows: Standard size, 3ft. long. Special lengths supplied to customers' own requirements.  $\frac{1}{4}$ in. diam. shaft;  $\frac{1}{2}$ in. diam. drill chuck;  $\frac{1}{2}$ in. diam. shank on driving end. Flexible inner cable is guarded by a substantial outer casing.

It is priced at £3 3s. 9d., and is available direct from the makers, plus 1s. 6d. postage, or through their showrooms at London, Birmingham and Manchester.

Note.—This shaft was recently advertised in PRACTICAL MECHANICS as being 5ft. long for the above price whereas the standard length is 3ft. Longer shafts are available on quotation.

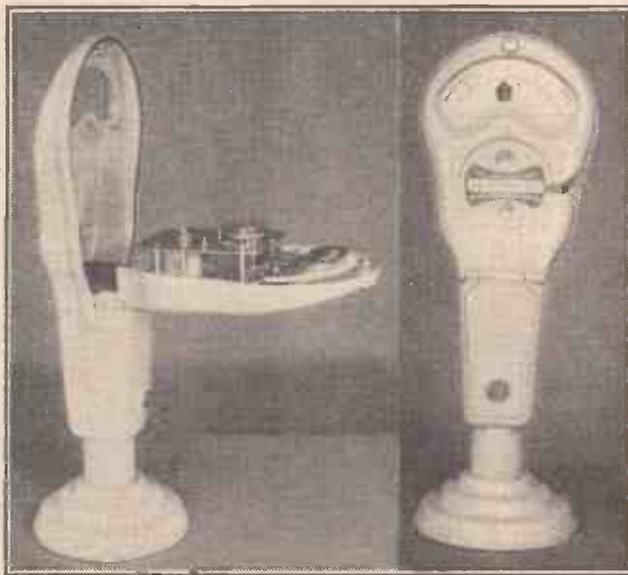
## Johnson's Photographic Competitions

IN addition to the usual autumn competition last year there was a competition especially for club members. The autumn competition was, as usual, divided into three classes. The first class was divided into three sections: Section A, Country Life; Section B, Town Life; and Section C, Portraits or Figure Studies. Class 2 was for novices and Class 3 for the under-eighteens. In each section of Class 1 the prizes awarded were one first prize of £10, two second prizes of £5 and three third prizes of £2. In Classes 2 and 3 the prizes were one first prize of £5, one second prize of £2, and four third prizes of £1.

In the club competition there were two classes, each divided into two sections. In Class 1, Section A was for A Picture Indicating Work, and Section B was for A Picture Indicating Pleasure. In Class 2, Section A was for Pictures of People, and Section B was for Any Other Subject. The

prizes in each section were one first prize of £10, two second prizes of £5, two third prizes of £2, and two fourth prizes of £1. In Class 1, no awards were given for 1st, 2nd and 3rd in Section A, or for 1st and 2nd in Section B. Eighteen consolation prizes were awarded for pictures taken from all classes.

A new competition, solely for flashlight photography, is announced for 1954, and entries will be judged on technique, quality and originality. Entries may be indoor, outdoor, day or night, and may be taken by any form of flash. The rules are similar to those of other Johnson competitions, and the prizes will be three first prizes of £10 each, five second prizes of £5, eight third prizes of £3



The Verner Park-O-Meter opened on left to show table position for easy maintenance.

and twenty fourth prizes of one guinea. Further particulars, if required, may be obtained from Messrs. Johnsons, of Hendon, Ltd., Hendon Way, London, N.W.4.

## First British-made Parking Meter

THERE is much speculation on how soon the first parking meters to be legalised for public highway parking will be operating in famous London thoroughfares. There have been reports that these meters will be imported at the expenditure of valuable dollars, but this may not be the case, as an enterprising company situated in the suburbs of London has been planning a parking meter to be produced entirely in this country. This is by arrangement with an American company which manufactures the most popular parking meter in existence.

This British parking meter is called the Verner Park-O-Meter, and is being manufactured by the company so well known for its time switch mechanisms, Verner Limited, New Malden, Surrey.

It is expected to be available in quantity early this year, and will cost about £30.

## The "Inca" Woodworking Machine

THIS precision-built woodworking machine, recently arrived from Switzerland, is the first universal woodworker of its type to be seen in this country, and is an important addition to the range of wood-

working machines available from A. G. Gamage Ltd., Holborn, E.C.1.

The machine will carry out the following operations quickly, precisely, and without effort: Ripping, bevelling, cross-cutting, mitring, grooving, rebating, sanding, drilling, long-hole boring and slotting.

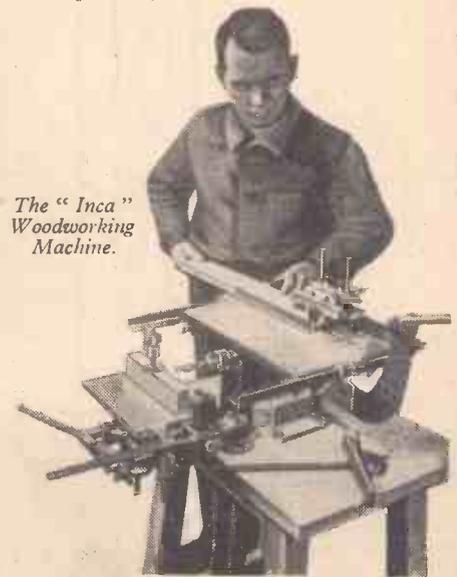
The "Inca" comprises a saw-bench unit, having alloy table and extension giving 16 $\frac{1}{2}$ in. x 25 $\frac{1}{2}$ in. area, with self-aligning rip-fence and special mitre gauge and guard. It will take up to a 7in. blade. Also incorporated is a rise-and-fall table which tilts 45 deg. The saw spindle, which accommodates also the moulding head, a wobble saw and corner-locking cutter-head, is extended to take the  $\frac{1}{2}$ in. capacity drill chuck, disc-sander, sanding drum and boring bits.

A special table, which is an independent unit, is bolted to the bench to provide for boring and slotting and sanding. The table elevation (2 $\frac{1}{2}$ in.) is controlled by hand knob, transverse movement 3 $\frac{1}{2}$ in. and depth-feed movement 4in. are by hand levers. Feed stop, series guide and clamping device are provided.

A protecting device for grooving and moulding operations is supplied, and incorporates sprung guides for horizontal and vertical clamping of work-piece, ensuring smooth and accurate operations in safety.

This multi-purpose machine is available for joiners, cabinet makers, light industries, maintenance departments, etc.

Various combinations of the "Inca" are available at prices between £45 and £65, or complete with  $\frac{3}{4}$  h.p. motor mounted on floor stand £64-£84. It is also possible to purchase just the saw-bench unit without extension tables or motor for as little as £24.



The "Inca" Woodworking Machine.

## Flash Photography—A Correction

In the article on Flash Photography, published in our November issue, reference was incorrectly made to a Mazda S.F.15 tube. This, of course, is the "Sieflash" flash-bulb, type S.F.15, made by Siemens Electric Lamps and Supplies Ltd.

# LETTERS TO THE EDITOR

*The Editor does not necessarily agree with the views of his correspondents.*

### Conservation of Energy

SIR,—May I answer the remarks made by S. R. Morgan in the November issue?

He appears to confuse energy used with the final effect of that usage. I am sure that he could not convince Sir Edmund Hilary that the energy used on his ascent and descent of Everest was nil, even though, except for a few small flags at the top, the final effect was the same as that before starting out. It should be quite clear that the nullification of the effect of output of energy does in no way nullify the fact that there has been an output of energy, except, of course, "algebraically." Furthermore your correspondent admits that stripping is done against the field, implying resistance and, therefore, reactive force. He also states that the amount of the original energising is irrelevant. I agree, though he seems to assume I thought otherwise. The force required to resolve pre-existing opposing and neutralising forces into useful power need be relatively very small, as in the tiller-work involved in sailing a ship almost into the eye of the wind, or in the detonating of a bomb.

His analogy of the stone is bad. I presume the stone did displace some soil or at least suffer a slight rise of temperature on impact. His furthering of the analogy is beyond my ken, since, though gravity and magnetism are akin, but not so as it seems to be to him,

is not unknown to me. I have also attended quite a lot of discussions on the subject, and I have made several attempts myself—unbalanced wheels, magnetic gadgets and capillary things. Needless to say, none of them worked.

To my mind, to say a perpetual machine is one that receives no power from outside and that will go for ever is somewhat egregious. Simply because there is no such thing as perpetuity. Let me try to illustrate my view.

No one could say that a peg top is perpetual motion. This I take it is because it received an impulse to start it and it will eventually run down. Carrying on from there the gyroscopes used in Brennen's monorail train would run for a very long time before they ran down. And, of course, they received an impulse to start. Carrying on still more, the world has been spinning for countless millions of years. Now let us talk *practical sense*. Never mind the view of the theorist who, to me, talks learned nonsense. The world is supposed to have received some impulse at the start of its life that caused it to spin, and one day it will stop. Thus, according to the No. 8 hats, this is not perpetual motion. So perpetual motion is non-existent! What on earth is the good of talking about something that never has, does not, and never will, exist. Let us get down to something practical. What I suggested in my previous letter *does*

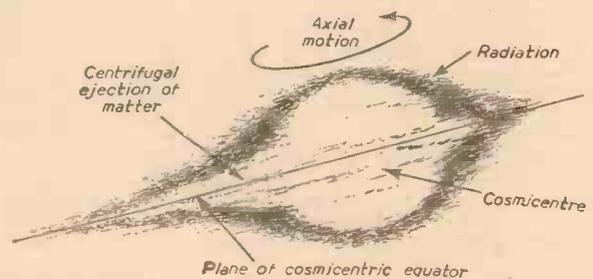
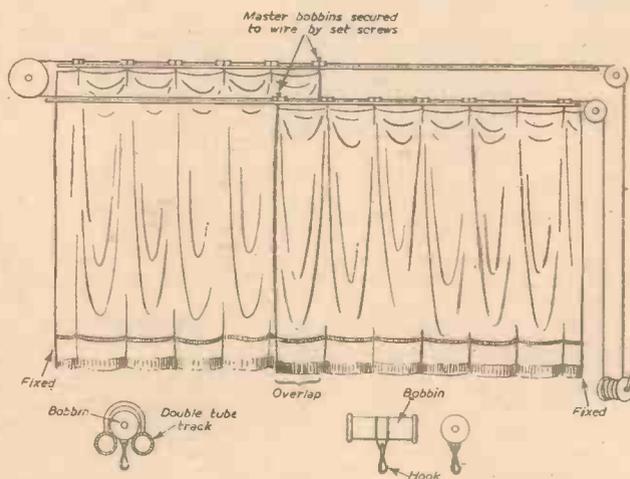
wound on a drum in the manner shown in the diagram. The two tracks, one for each curtain, are arranged one above and slightly behind the other. The arrangement is similar to that of a cinema curtain.—A. H. PAFFORD (Portsmouth).

### Orbital Cosmos

SIR,—In the December issue Mr. Cousins suggests that my theory of an orbital cosmos need not account for the shift towards the red end of the spectrum, as the shift is probably due to a radiation energy loss over the immense distances travelled. If this were the whole story, it would imply a static cosmos which is in contradiction to the Doppler principle of velocities. It cannot be denied that the shift is tied up very closely with the recession of a body—for example, the approaching and receding limbs of our rotating sun. The great velocities signified by the shift, and to which Mr. Cousins objects, must be accepted as approximately correct, if the Doppler principle is to hold. I have expressed doubts as to the validity of certain velocities and directions assessed at great distance, but believe in the principle as applicable to an accelerating and decelerating orbital cosmos.

A static cosmos is completely out of the question. A cosmos viewed as a single unit cannot be relatively static to anything else, as nothing else exists. It follows from this, that only integral parts of the cosmos can be relatively static to each other. This demands a stationary condition for every body in existence. Once the slightest movement of a body occurs, the cosmos possesses relative motion. As motion occurs within the solar system and our stellar world as a whole, we must assume that movement prevails throughout the cosmos. If this was not so, our present interpretation of physical laws would collapse.

It is agreed that the *known* cosmos appears



(Right).—Diagram representing the dawn of the Cosmos.

(Left).—Mr. A. H. Pafford's curtain arrangement.

gravity is dependent on and directly related to mass (density-volume), and naturally any addition to earth's mass would increase its gravity. I trust he does not presume I suggested contrariwise.

With regard to his reply to Mr. W. J. Land, I wonder if he has pondered on the possibility of the heating of meteors being partly due to relief from interspatial forces on reaching earth's damping field, or do his books (with all respect to recorded knowledge) tell him that such forces do not exist?—E. T. BAILEY (Barnsley).

### Perpetual Motion

SIR,—Replying to A. A. Tyler, who comments on my previous letter on perpetual motion, I can assure him that Prof. Andrades' book "Engines" (1928)

exist, and if something of the sort were accepted, inventors would be encouraged to make machines that, if they could not go on for ever, could go for a long time.

I am afraid I consider a frictionless, self-generating machine beyond the realm of common sense.—C. P. THOMPSON (London, W.14).

### Stage Curtains for Village Hall

SIR,—In reply to the query from G. C. Roberts in "Information Sought" in the December issue, regarding the operation of stage curtains for a village hall, the following may be of help.

The diagram above is almost self-explanatory. The curtain is hung from bobbins which slide on a track formed of two tubes. The bobbins are strung on an endless cable

spherical in form; but this may be due to the restricted range of present telescopes compared with the depth and width of the cosmic orbital bands. Cosmic dust would also become more prevalent when probing towards the cosmicentre, thus obscuring vision. We may assume that herein lies tremendous opportunity for future radio astronomy.

Even though there is at present no direct evidence of the ultimate cosmos being lenticular in form, it is difficult to envisage an orbital cosmos which conforms to any other shape. To postulate a cosmicentre it is reasonable to infer that it possesses axial motion, as no such gigantic centre of energy could be expected to remain quiescent. Given this motion, it becomes highly probable that matter would be flung into orbit round this centre on the plane of the cosmicentric equator. This is in keeping with planetary and galactic systems. For very definite reasons, which cannot be detailed here, the spiral nebulae would pursue *elliptical orbits*, with the cosmicentre at one of the foci. No truly circular orbit is possible.

I compliment Mr. Cousins on coining the

(Continued on page 225)

## READERS'

## SALES AND WANTS

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

## FOR SALE

**TWIST DRILL BARGAINS.** 16 Chrome Vanadium 1/64in. to 1/2in. x 1/16in., 12/6; 8 C/V Drills, 1/32in. to 1/2in. x 1/32in., 6/9; 8 Carbon Steel, 1/16in. to 3/16in., in plastic case, 4/6; all 3 offers 2/6; post free. H. Lockwood, 44 Disraeli Street, Burnley, Lancs.

**DRAUGHTY FLOORS MAKE A COLD HOUSE.** Cover your concrete and wood floors with 1/2in. thick Hardwood Ply Parquet; choice of 6 patterns from 11/2 sq. yard, delivered. Send 1/- for sample and booklet (refunded on first order). New-Een (PM), 101, Kings Cross Road, London, W.C.1.

**SHELBY TOOL & ENGINEERING CO., LTD.** have made a purchase of a large assortment of new tools for the woodworker, engineer, builder, etc., mostly in original wrappings; bargain prices to clear; send 6d. for lists. Shelby Tool & Engineering Co., Ltd., Annesley Woodhouse, Notts.

**COMPRESSOR EQUIPMENT.** Miscellaneous Items; catalogue, 11d. Pryce, 157, Malden Road, Cheam. **TRANSFORMERS,** Rectifiers, Volt and Ammeters, Controllers, Cut-outs, Battery Chargers, Power Units; lists; s.a.e. Harry Gilpin, Manufacturer, Portobello Works, Walton-on-Naze, Essex.

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

**HACKSAW BLADES,** genuine surplus by leading Sheffield manufacturer; 12 Blades, 10in. and 12in., 3/3; 24 blades, 6/-, post paid. Sawyers Ltd., 115, St. Sepulchre Gate, Doncaster.

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

**ELECTRIC BLANKET;** make your own in 5 minutes; we supply the interior element complete, 6ft. long, 2ft. 6in. wide, and 9ft. of flex attached; tested and guaranteed; 35/- Dept. E.L. Brace, Dairy Green, Thaxted, Essex.

**"PICADOR" ROTOSAW.** Portable circular saw attachment for your electric drill fitted with 4in. circular saw blade, adjustable fence to cut up to 1in. in depth, ideal for wood, plastic, or soft metals; 33/- each, post paid. Lambs-wool polishing Bonnets, 5in., 4/3 each; Rubber Backing Discs, 5in., complete with key, 4/6 each; Abrasive Discs, 5in., 6 assorted grades 2/-, Send 2d. for lists of Saw spindles, Vee Pulleys and Belts, Plummer Blocks, etc. Sawyers, Ltd., 115, St. Sepulchre Gate, Doncaster.

**CIRCULAR SAW BLADES,** superior quality, Sheffield made, 4in. 8/6, 6in. 13/6, 7in. 18/9, 8in. 18/9, 10in. 25/6, 12in. 31/6; all post paid. Please state size of bore and teeth per inch. Sawyers, Ltd., 115, St. Sepulchre Gate, Doncaster.

**ELECTRIC WELDING PLANT.** Large selection of new, surplus and secondhand plant. Arc Welders from £20; Portable Spot Gun Welders, £28; Carbon Brazing and Welding Sets (mainly operated), 45/15/-. Send stamp for catalogue with prices. Harnsworth, Townley & Co., 1, Brook Road, Manchester, 14. (RUSHMELE 3003.)

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

**WRINGER ROLLERS** to order, wood or rubber; s.a.e. for details; 1 week. Wringer Hospital, Sandgate, Burnley, Lancs. Est. 40 years.

**PLATED Nuts, Screws, Washers, Bolts, Soldering Tass, Hank-bushes, Self-tapping Screws, Grub-screws, Socket-screws, Wood-screws;** large quantities or gross cartons. List sent post free. Sinden Components Ltd., Dept. E., 117, Churchfield Road, Acton, W.3. (ACORN 8128.)

**CIRCULAR Wire Polishing Brushes,** used, but good, suit electric drill, 2in. diameter, 4 for 5/-; 4 B.A. Plain Nuts, 2/- gross; 4 B.A. Simmonds Half Nuts, 1/9 gross; 6 B.A. Simmonds Nuts, 1/6 gross, post extra. 9, Heathmoor Ave., Loughton, nr. Warrington, Lancs.

**40 POWER TOOLS** You can Make from scrap, pipe fittings, etc. This amazing book of plans for circular saws, lathes, band-saws, jigsaws, planes, tapping attachment, jigs, etc., has sold 250,000 copies, and is a "must" for every home workshop, 12/6 only; p.pd. Below:—

**AMAZING DEVICE,** cuts perfect A discs, wheels, etc., to 12in. diameter, with any circular saw, 10/6; p.p.d.; sample 6in. mahogany disc, photo, details, 1/6. Below:—

**HOW TO RE-WIND** and Service Electric Motors, Generators. Complete Practical Book only 3/-; p.p.d. Below:—

**HOW TO MAKE IT BOOKS:** How Whittling in Wood; Inlay Pictures, Marquetry; American Action Toys; 21 Lovely Lamps; 3/- each; p.p.d. Below:—

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

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

**CAR BODY REPAIRING.** Complete A B C course; illustrated; 7/6; p.p.d.; lists free. A.P.S. (P), Sedgford, Norfolk.

**HIGH-SPEED LATHE TOOLS,** set of 12, 1/2in. square, 40/-; p. and p., 1/-; 24 High-speed Drills up to 1/2in., 17/6; p. and p., 9d.; 5 pint Brazing Lamp, list 27/15/-, our price, 70/-; p. and p., 3/6; Surface Plates, 12in. x 8in., 40/-; p. and p., 4/-, Send 6d. for list of tool bargains. Mbro Equipments, 65, Knaresborough Rd., Harrogate.

**SYNCHRONOUS CLOCK MOTORS** 230v. A.C. S/Ph 50c., 12/6 each, plus 1/- postage. Universal Electrical, 217, City Road, London, E.C.1.

**REJUVENATE** your Water Softener, New Zeolite, 2/3 lb., 10lbs., post paid. C. G. Nelson, 119, Anchorway Rd., Coventry.

**AIR RECEIVERS,** 24in. x 12in. x 150lbs., £7; 15in. x 12in., £2. Cast iron Air Filters, with 150lbs. gauge, 20/-, C. G. Nelson, 119, Anchorway Rd., Coventry.

**STARLINE PLASTIC ENAMEL** PAINT in tubes, 1/4- each, covering approximately 8 sq. ft., or complete cycle frame; suitable all paintable surfaces. Colours: rich brown, bright red, pink, bright blue, maroon, turquoise, cream, yellow, black, deep green, bright green, mid-grey, white and clear; home trade and export. Obtainable from Handicraft, Hobbies and other shops, or send 1/3 for sample tube and colour card, post free, to sole manufacturers - Starline, Southend, Essex.

**COMPRESSORS** for sale, 21 CPM, 180lbs. sq. in., on metal base, with driving wheel and receiver, price £3; 1 h.p. Heavy Duty Motors, price £3; carriage forward. Wheelhouse, 1, The Grove, Isleworth. (Phone Hounslow 7558.)

**DYNAMOTOR UNITS,** input 28v. D.C., output 150-300v.; easily convertible without rewinding to 21lb. enclosed electric motor, with short 1/2in. drive shaft, 200-240v. A.C.; unit comprises heavy gauge steel box containing motor, solenoid switches, heavy silver contacts, coils, chokes, suppressors, terminals, plugs and wiring; weight, complete, 35lbs.; price 37/6, carriage 5/- extra; 6ft. Flexible Shaft for above motor, complete with special drive fittings and drill chuck, 27/6. George Wilton, 92, Toynbee Road, Wimbledon, S.W.20.

**SHIM STEEL,** hard bright cold rolled; ideal for model makers; sizes: .0015, 3/-; .002, 2/10; .003, 2/4; .004, 1/3; .005, 1/3; .008, 1/11; .010, 2/3, for sheet 24in. x 6in.; add 1/- per order for packing and postage. One sheet each size, 15/6; post paid. Bullers Products (Doncaster), Ltd., Printing Office St., Doncaster. (Phone: 2346.)

## ELECTRICAL

**BRAND NEW Brooks** 1/2 h.p. Motors, ball-bearing, 230v. A.C., single phase, 50 cycles, 2,800 r.p.m.; ideal for driving woodworking machines, grinders, etc.; latest type in maker's sealed box; £6/15/-; carriage paid. P. Blood & Co., Wolsley Bridge, near Stafford.

## BARGAINS FOR ELECTRICIANS.—

Brand new Cables in 25-100 yd. lengths; T.R.S. twin, 1/044, 42/-; 3/029, 60/-; 7/029, 95/-; 3/029 with earth, 72/6; 7/029 with earth, 117/6; P.V.C. twin, 1/044, 33/6; 3/029, 56/-; Transparent Flex, 14/36 twin, 17/6. All per 100yds.; carriage paid. Fully wired Ballast Units, 38/6; c.w.o.; request list. Jaylow Supplies Ltd., 93, Fairholt Road, London, N.16. (Tel.: Stamford Hill 4384.)

## MODEL DEALERS

**LONDON.** — Robson's Hackney's Model Shop, 149-151, Morning Lane, E.9. (Tel.: AMHERST 2989.)

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

## PHOTOGRAPHY

**LIQUID BROMIDE EMULSION** for photographing on paper, cloth, cellophane, metals, 8/6 bottle; c.w.o. Enquiries s.a.e. M. Dept., O. Bill, 17, Greenhill Rd., Birmingham, 13.

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

## HOBBIES

**CASTING MOULDS** for lead solders, animals, etc. Complete illustrated catalogue 6d. Sample mould 6/-. G. F. Rhead, Hardest, Suffolk.

**GROW** Valuable Living Miniature Trees; wonderfully decorative; terrific new hobby; send s.a.e. for details: Miniature Trees, Dept. 90, Room Two, 3, Bloomsbury Street, London, W.C.1.

**YOU** or your Children can make superlative non-fading daylight Prints at 1d. each from your favourite negatives; also your own greeting cards with miniatures, hand painted, price 14/6, or 1/6 for samples then 13s. for set. R. Smith, 66a, Walmgate, York.

**TOY CASTING MOULDS,** solders, sailers, airmen, etc.; moulds for casters, work, rubber moulding compound, granulated, ready for use, 8/6 per lb. Rubber Moulds from 2/- each; 9d. for catalogue; s.a.e. for list. F. W. Nuthall, 69, St. Mark's Road, Hanwell, London, W.7.

## DRAWING SERVICE

**PHOTOCOPYING;** 24-hour service; Plans, Drawings, printed extracts on Glossy, Whatman, Linen, etc. Ardua Photos, Castletown, I.O.M.

## WATCHMAKERS

**ALL INTERCHANGEABLE** Watch Materials, Tools, etc., at rock-bottom prices; return post. Your requirements quoted. J. H. Young & Son, Wholesalers, 133, London Road, Chippenham, Wilts.

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

## RADIO

**CAN YOU SOLDER?** That's all you need to make a really good Radio or Tape-recorder from guaranteed Osmor components; send 5d. (stamps) to-day for free circuits and lists. Dept. P.M.C.I., Osmor Radio Products Ltd., Borough Hill, Croydon, Surrey. (Croydon 5148-9.)

## WOODWORKING

**MYBLO** Ball-bearing Circular Saw, fall table, ripp, and mitre fences, riving knife and guard, 9in. and 6in. saws, grooving cutters, sanding plate and discs, 4 h.p., 230v. A.C. single-phase ball-bearing motor, pulley and endless V-belt; all brand new; £25/10/-. P. Blood & Co., Wolsley Bridge, near Stafford.

**WOODWORKING MACHINERY.** Send for latest catalogue of "Wilmac" Bandsaws and Circular Saws. These high-class machines can be supplied unassembled for home construction, at considerable price reduction. Band and Circular Saw Blades for wood or metal. Wilmac Products, Stirling, Scotland.

**WOODWORKING MACHINES.** Saw Benches, complete, 7in. £4/15/-; 8in. £5/10/-; Lathes, £7/10/-; Bowl Turning Heads, £7/10/-; Combination Lathes, £10/10/-; Planers, Saw Spindles, Motors, etc. 4d. stamp for illustrated booklet; h.p. available. James Inns (Engineers), Dept. P., Sherwood, Nottingham.

**MAHOGANY PLYWOOD,** new, any 4 at parcel £1 delivered; c.w.o. 4 at 36 x 30 x 4mm., 5 at 54 x 15 x 3/16in., 17 at 14 x 23 x 3/16in., 20 at 14 x 20 x 3/16in., 24 at 14 x 17 x 3/16in., 4 at 23 x 20 x 1/2in., 6 at 14 x 25 x 1/2in., 7 at 14 x 22 x 1/2in., 40 at 54 x 30 x 3/16in.; Birch, 30 at 54 x 78 x 4mm.; following one side slightly glue stained: 6 at 30 x 20 x 3/16in., 8 at 23 x 23 x 3/16in., 12 at 20 x 20 x 3/16in., 20 at 47 x 9 x 3/16in. Mixed sizes £1; 1/4 cwt. delivered. M. Leader (1920), Gosford Street, Middlesbrough.

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

## HANDICRAFTS

**MUSICAL MECHANISMS.** Swiss made, for fitting in cigarette boxes, etc., 22/6 each. Send s.a.e. for complete list of handicraft materials. Metwood Accessories, 65, Church Street, Wolverton, Bucks.

## EDUCATIONAL

**A.M.I.Mech.E., B.Sc., CITY & GUILDS,** Etc. Guaranteed postal courses for all Exams. and Technical Divisions from Elementary to Degree standard. Approximately 95% successes. 144-page prospectus free on request. B.I.E.T. (Dept. 967), 29, Wright's Lane, London, W.8.

**"FREE"** Brochure giving details of courses in Mechanical and Production Engineering, Draughtsmanship, etc., for the A.M.I.Mech.E., A.M.I.P.E., City and Guilds, and other professional examinations. Train with the Postal Training College operated by an industrial Organisation; moderate fees. E.M.I. Institutes, Postal Division, Dept. PM30, 43, Grove Park Road, London, W.4. (Associate of H.M.V.)

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

## WANTED

**WANTED,** Used Mercury (packing instructions sent), also Platinum Contacts, Sparking Plugs, Magneto Points, and waste materials containing gold, silver, platinum; immediate cash with offer; treated free. All types of non-ferrous scrap metals also purchased. Belgrave Buyers (P.M.), Refiners, 5, Belgrave Gardens, London, N.W.8. (MAI 7513.)

**WANTED** PRACTICAL MECHANICS, 1943-52, even odd issues; any reasonable price. Parsons, 61, Arran St., Roath, Cardiff.

## MISCELLANEOUS

**STEAM:** Dimension Drawings, Books, Magazine on small units for cars, launches and stationary use. S.A.E. for free lists. "Light Steam Power," Kirk Michael, Isle of Man.

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

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



## LETTERS TO THE EDITOR

(Continued from page 222)

very appropriate word—*pericosmion*. There remains the aphelic position to be named, which can scarcely be other than *apocosmion*.  
—WILLIAM ELLWOOD (Hatfield).

## Pedal Car Steering

SIR,—The accompanying diagrams illustrate a device which may interest some of your readers.

About twelve months ago I constructed a child's pedal car on the lines of the one described in your October, 1949, issue.

The author's method of steering the car was effected through the use of bevel gears, presumably from an old breast drill. As my model had assumed, through using sheet iron instead of aluminium, a somewhat weighty character, on nearing completion, I rejected the gears I had in my possession as being too heavy. Instead I used the method I describe, which I find after twelve months' usage to be quite satisfactory and obviously much lighter.

The main essential is a good strong V-belt, B. Mine was a car fan-belt, split down the middle with a jack knife, thus providing a spare.

This belt is anchored to the steering arms and passed round the steering column A (a length of  $\frac{3}{4}$  in. conduit tube) and anchored to it at G, as illustrated diagrammatically in Fig. 1.

At F, as shown in Fig. 2, the belt is doubled round the steering arm and the whole lot drilled  $\frac{1}{4}$  in. and bolted. Suitable washers are inserted and clipped over the belt to check spreading on tightening.

At G the bolt passes right through the tube and is made as unobtrusive as possible on the underside by limited countersinking,

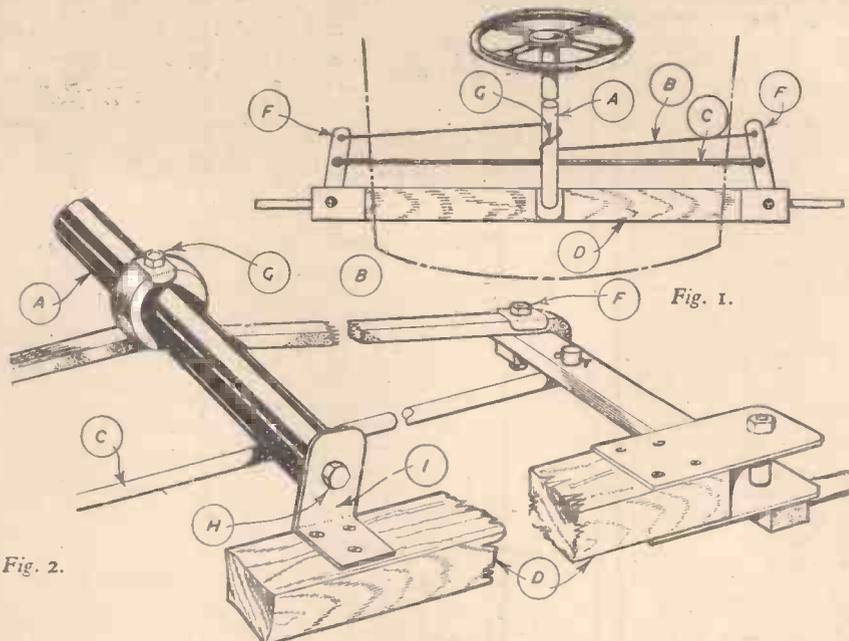


Fig. 2.

Mr. F. A. Crowther's pedal car steering device.

although its protrusion does not greatly impair efficiency. Again a washer is advisable as at F.

The track rod, C, ensures correct steering-arm positions, of course, and in my case the pivot at H for the steering column is simply an internal brass bush fitted to tube bore and bolted to bracket, I, which, in turn, is screwed to the wooden front axle, D.

The arrangement gives quite a low-g geared steering. A certain amount of lost motion in the steering, depending on the tightness of

the belt, is unavoidable but not detrimental.  
—F. A. CROWTHER (Lancs).

## "Measuring the Metre": A Correction

With reference to our paragraph entitled: "Measuring the Metre" on page 116 of our issue dated December, 1953, wherein it was stated that: "it was intended the metre should measure one ten-thousandth part of the quarter of the earth's meridian passing through Paris," this should, of course, have read "one ten-millionth" instead of "one ten-thousandth."


**BOOKS Received**

**Pioneer of the Air: The Life and Times of "Col." S. F. Cody.** By G. A. Broomfield. 164 pp., 10s. 6d. net. Published by Gale & Polden Ltd., Aldershot.

THIS book, written by one who assisted Cody in his flying experiments and was an intimate friend of both Cody and his family, deals with one of the most colourful characters in British aviation—"Col." S. F. Cody, erroneously referred to by many as Buffalo Bill. The latter was W. F. Cody. Confusion no doubt arose from the fact that Cody, with Kaiser moustache and goatee beard, modelled himself on the famous character bearing the same patronymic.

It is not generally known that S. F. Cody was the first man to fly in England, although Lord Brabazon holds Pilot's Certificate No. 1. The issuing of such certificates came long after men had flown in England. Cody was not, of course, a technician and believed in trial and error. He hated theorists and would not call in mathematicians to calculate stresses on his aircraft. He believed in inverting the plane and loading the underneath wings with bags of sand. Lamentably, it was due to this dislike of theory, engendered by an inferiority complex because he had had little schooling himself, that finally cost him his life when his plane disintegrated in the air.

He had led a most colourful existence and was something of a showman and a poseur. For example, whilst the original W. F. Cody was a colonel, as colonels went in the scratch armies of South America, S. F. Cody certainly was not and the impression is left that

he was anxious for the world to believe that he was the original Buffalo Bill. He was born in Texas and became a buffalo hunter and a remarkable horseman and crack shot. He was clever with ropes, wrote plays in which he and his family acted, a particularly notable one being "The Klondyke Nugget."

When he came to Europe he became interested in man-lifting kites and demonstrated their use for military observation purposes to the War Office. It was this interest which finally decided him to experiment with aircraft, and here in this book is a very complete, well documented and authenticated account of his life and his work written by one who knew him intimately for many years.

The author has been helped in his biography by the surviving members of Cody's family, who have paid tribute to the accuracy of the work. It is a fascinating book, amply illustrated with photographs and anecdotes. A data sheet giving the important dimensions and specification, together with dates of construction of Cody aircraft, is included. Moreover, the book is very adequately indexed.

Anyone interested in those fascinating early days of flying in this country should read this book and learn of the trials of those early pioneers and the apathy with which they were met by the governments of the day. However, he confounded all his critics by winning the Military Trials at Salisbury Plain in 1912.

Although Cody did not contribute very much to aeronautical science, he is worthy of greater recognition than he received. No monument has been erected to him, as would certainly have been done in other countries, nor has a plaque been affixed to his house. This is a case where the Aeronautical Society should study this book and act.—F. J. C.

**Cycling Manual.** 23rd Edition. By H. H. England. 180 pp., 3s. 6d. net. Published by Temple Press Ltd.

THE 23rd edition of this well-known manual is presented in a far more attractive and readable form than earlier editions. It is more durably bound, printed on a better quality paper, is freshly illustrated, contains a great amount of new matter and is adequately indexed.

Its chapters include: What is This Cycling? For Old and Young—and Delicate; Right Cycle—Right Position—Right Action; The Girl and the Mother Awheel; Business Riding and Dress; The Cycle Tour; Cycle Camping; Features of a Good Bicycle; Roadster or Lightweight?; Wheels, Chain-line and Gearing; Variable Gearing; Making the Bicycle Move; The Rear Fork-end & Types of Tyres; The Tyre Valve; Brakes; Cycle Lighting; The Saddle; Tandems; Tricycles; Some Rules of the Road; Time Trial Racing on the Road; Track Racing; Massed-start Racing; Training for Racing.

There are useful appendices on: Maintenance, Gear Tables, Railway Rates, Forming a Club, Speed and Record Tables.

Very good value for the money.

**THE PRACTICAL WIRELESS  
ENCYCLOPÆDIA**

By F. J. CAMM

The Entirely New 12th Edition of the famous  
Standard Work

Price 21/- or 21/10 by post from:

GEORGE NEWNES LTD., Tower House,  
Southampton Street, Strand, W.C.2

# QUERIES and ENQUIRIES

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.

## Papering Over Glossy Paint

I HAVE recently moved into a new property in which the front bedroom has all the walls painted white with a glossy paint. I intend to paper this room, and wish to know if ordinary paste will be successful, or will the paint have to be removed first?—Wm. H. Secker (Deal).

WE see no reason why you should go to the trouble of stripping off the white glossy paint from your bedroom wall in order to apply paper to the latter. You can, if you so desire, wash the gloss paint down with a solution of about 1 part of caustic soda in 15 parts of water, and this treatment will, to a large extent, remove much of the gloss. The same effect could be obtained by a washing down, and particularly by a scrubbing, with hot paraffin. Nevertheless, these treatments are messy and tedious ones and we think you would obtain quite satisfactory results merely by scratch brushing the gloss paint inch by inch over the wall surface. In this way, you would obtain a non-gloss surface which could, if desired, be given a finer texture by rubbing over with sandpaper. To the non-gloss surface thus prepared, the wallpaper should be applied carefully and pressed down firmly after being amply coated with a good heavy-body flour paste. The paper, thus secured, will probably take a longer time than usual to dry out, but once properly dry it will adhere well to the wall and there will be no danger of its "starting" and becoming loose in local areas and of thus becoming more generally detached. We assume, of course, that the wall in question is a normally dry one, otherwise the paper will never remain secure even on the most satisfactorily surfaced of walls.

## Blackening Microscope Scale

I HAVE an eye-piece scale (microscope) divisions 80 to 1cm. and the black colouring has disappeared. I have separated the cover glass and would like to know how to blacken the scale again which is engraved on the glass slip.—M. I. Newman (Shanklin).

FIRST clean the glass thoroughly with turpentine, then with methylated spirit and finally with amyl-acetate. Now with a soft camel hair brush apply a coat of dead-black cellulose lacquer covering all of the engraved lines completely. Let the lacquer dry—this will take only a few minutes. It is then necessary to clean off the lacquer from the raised surfaces between the lines. To do this nothing of a soft or fluffy nature can be used—no rags, cloths or blotting paper. The best wiper to use is a piece of clay-surfaced, highly glazed art paper. Lay a piece of this—a page from a good class catalogue or magazine will do—down on glass or other truly flat surface, moisten it slightly with

amyl-acetate and rub the engraved scale for a few moments backward and forward at right angles to the lines. There must be no liquid acetate on the surface of the paper; only the vapour is required to soften the lacquer between the lines, and the gentle rubbing will remove it, leaving the lines filled with black.

## Removing Acetone Adhesive

COULD you tell me how to get an adhesive off a black velvet dress; the gum smells like acetone.—S. Kelsey (London, S.W.19).

IT seems obvious from your letter that the adhesive which you have been using consists of an acetone solution of some natural or synthetic gum, or mixture of these compounds. Hence, you will be able to remove it from the black velvet by wiping over the latter with a clean cloth charged with acetone or, alternatively, by pouring acetone into a deep saucer or shallow basin and by immersing the affected portion of the dress in it, rubbing it

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

gently therein with the finger in order to redissolve the adhesive in the acetone.

If the acetone is found to evaporate too quickly it can advantageously contain about 10 per cent. of diacetone alcohol, which will slow down its rate of evaporation. Another good solvent mixture is one of about 30 parts

of amyl-acetate and 70 parts of acetone. One or other of these mixtures will remove the adhesive from the velvet material, but bear in mind the fact that all these liquid solvents are very highly inflammable and must, therefore, be treated with great respect and care in the presence of naked lights.

Note carefully that our instructions above apply to a genuine cotton or silk velvet. The modern artificial silk synthetic so-called "velvet" may possibly be injured by any acetone treatment, in which case there is little that can be done apart from gently scrubbing the fabric with hot water and soap.

## Silvering Mirror Queries

IN the article on making a mirror for a reflecting telescope in the April, 1948, issue the Brashear Lundins' method of surface silvering is described. I am definitely put off doing this by the caution given; that the explosive silver fulminate may be formed under favourable conditions.

Could you give me the name and address of any firm who would silver such a mirror for me and the approximate cost? Is the method of silvering ordinary plain mirrors (looking-glasses) suitable for surface silvering?—M. Rock (Staffs).

IF the instructions given in the article, "Making a Telescope Reflector," on silvering are followed carefully, a clean, opaque film of silver can be deposited on the glass surface without serious danger from exploding fulminating silver. The warning *must* be given, however, because explosions of ammoniated silver solutions have occurred from time to time; probably the chief danger lies in attempting to store the solutions—on two occasions, in our experience, bottles left in cupboards have been shattered overnight. As has been stressed on numerous occasions in PRACTICAL MECHANICS, glass silvering demands great care over each operation and scrupulous cleanliness; given these qualities, a mirror can be silvered successfully in the kitchen sink, although the operation is better carried out by a chemist in his laboratory.

A far more durable reflecting surface is given to the mirror by aluminising; this is a method of depositing a thin film of aluminium on the surface by evaporating the metal in a vacuum. This is an operation requiring high-vacuum technique and is beyond the scope of the amateur handyman. Several firms will, however, undertake to aluminise amateur's mirrors at quite a reasonable figure: Messrs. C. J. Whilems, Ltd., of Ilford Works, Barking-side, Essex, aluminised a 6in. mirror three years ago for less than £1, although since then prices have no doubt increased a little.

Both flat and concave mirrors are silvered by the same methods.

## Bubble Solution

I MADE up the solution given in your October issue in accordance with the directions given, but it did not come up to requirements; it was also thinner than that one purchases ready made. What do you suggest?—C. E. J. Middlemiss (Manchester, 20).

PURCHASE a 20 per cent. solution of Alkyl Sulphate from Irano Products, Ltd., Britannic House, Finsbury Circus, London, E.C.2. This solution is known as "Comprox A." The bubble solution comprises:

- 1 fluid oz. Comprox A.
- 1 saltspoon of Cerebos salt.
- ½ teaspoon glycerine.

(Continued on page 228)

## THE P.M. BLUE-PRINT SERVICE

12FT. ALL-WOOD CANOE. New Series. No. 1.  
3s. 6d.\*

10-WATT MOTOR. New Series. No. 2, 3s. 6d.\*  
COMPRESSED-AIR MODEL AERO ENGINE.  
New Series. No. 3, 5s.\*

AIR RESERVOIR FOR COMPRESSED-AIR  
AERO ENGINE. New Series. No. 3a, 1s.

"SPORTS" PEDAL CAR. New Series. No. 4, 5s.\*

F. J. CAMM'S FLASH STEAM PLANT. New  
Series. No. 5, 5s.\*

SYNCHRONOUS ELECTRIC CLOCK. New  
Series. No. 6, 5s.\*

ELECTRIC DOOR-CHIME. No. 7, 3s. 6d.\*

ASTRONOMICAL TELESCOPE. New Series.  
Refractor. Object glass 3in. diam  
Magnification x 80.  
No. 8 (2 sheets), 7s.\*

CANVAS CANOE. New Series. No. 9, 7s. 6d.\*

DIASCOPE. New Series. No. 10, 3s. 6d.\*

EPISCOPE. New Series. No. 11, 3s. 6d.\*

PANTOGRAPH. New Series. No. 12, 1s. 6d.\*

COMPRESSED-AIR PAINT SPRAYING  
PLANT. New Series. No. 13, 7s. 6d.\*

MASTER BATTERY CLOCK.\*  
Blue-prints (2 sheets), 3s. 6d.  
Art board dial for above clock, 1s.

OUTBOARD SPEEDBOAT.  
10s. 6d. per set of three sheets.

LIGHTWEIGHT MODEL MONOPLANE.  
Full-size blue-print, 3s. 6d.

P.M. TRAILER CARAVAN.  
Complete set, 10s. 6d.\*

P.M. BATTERY SLAVE CLOCK, 2s.  
"PRACTICAL TELEVISION" RECEIVER.  
(3 sheets), 10s. 6d.

P.M. CABIN HIGHWING MONOPLANE.  
1s.\*

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.

**HIGHSTONE UTILITIES**

**Soldering Irons.** Our new streamlined iron is fitted with a Penell Bit. 200/250 v. 50 watts, 11/6, post 6d. Standard Iron with adjustable bit. 200/250 v., 60 watts, 12/6, post 6d. Heavy Duty Iron, 150 watts, 16/6, post 8d. All parts replaceable and fully guaranteed. Small Soldering Irons, for use on gas, 1/4, post 4d. Resin-cored solder for easy soldering 6d. packets or large reels 5/-, post 9d.

**Bell Transformers.** These guaranteed transformers work from any A.C. Mains, giving 3, 5, or 8 volts output at 1 amp., operate bulb, buzzer or bell. Will supply light in bedroom or ladder, etc. PRICE 9/-, post 8d. Similar Transformer but with output of 4, 8 or 12 volts, 12/6, post 10d. Transformer with similar output, but with fused secondary and earth terminal, 13/-, post 1/- BELLs for use with either the above or batteries, 6 & 8, post 6d. "Big Ben" Chimes. Housed in Cream Plastic Case. Easily connected to give Two-Note Chime from Front Door, and Single Note from Rear. Operated from 6-9 volt Batteries or Transformer (shown above), 23/-, post 1/-.

**Ex-R.A.F. 2-valve (2-volt) Microphone Amplifiers** as used in plane inter-com. in self-contained metal case; can be used to make up a deaf-aid outfit, intercommunication system, or with crystal set; complete with valves and fitting instructions, 20/-, post 2/- Useful wooden box with partitions to hold amplifier, 2/- extra. Dito, less valves, 10/- One-valve amplifier, complete with valve, 10/6, post 1/6.

**Sparkling Plug Neon Testers** with vest-pocket clip, 3/6, and with gauge, 3/6, post 3d. S.B.C. Neon Indicator Lamps, for use on mains showing live side of switches, etc., 3/6, post 4d. Neon Indicator, complete with condenser (pencil type), with vest-pocket clip, indispensable for electricians, etc., 7/6, post 5d.

**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 8d. De Luxe Receiver in polished oak cabinet, 18/6, post 1/-.

**Spare Permanent Detectors,** 2/- each. When ordered separately, 2/6. With clips and screws, 2/10, post 3d. Headphones brand new, S. G. Brown, G.E.C. etc., 15/-, 23/-, and super-sensitive, 30/- a pair, post 1/- New Headphones, 10/- a pair. Balanced armature type (very sensitive), 12/6 a pair. Both post 1/- New Single Earpieces, 3/6. Bal. armature type, 4/6, post 1/- A.P. Earpiece, 2/6. Moving Coil Headphones in good order, 6/- (better quality, 7/6), all post 1/- Headphones with moving coil mike, 15/- Similar phones with throat mikes, 12/6, post 1/- Headphone Cords, 1/3 a pair, post 3d. Replacement Bands, 1/3, post 4d. Wire Bands, 6d. (All Headphones listed are suitable for use with our Crystal Sets.)

**Microphones.**—Just the thing for impromptu concerts, room-to-room communication, etc. Bakelite table model, 6/9. Suspension type, 3/6. Post 6d. Mike Buttons (carbon) 2/- Moving Coil, 4/8. Transformers, 5/- All post 4d, each.

**Hand Microphones,** with switch in handle and lead, 4/6. Tannoy, 6/- Similar instrument, moving coil, 7/6. All post 1/- Mask type with switch, 3/6, post 4d.

**Rotary Transformers,** 24 v. input; Output 1,200 v., 2 amp. in case with suppressors, etc., easily converted to run as a high voltage motor, 25/-, carr. 5/- Also 12 v. input; Output 6 v., 5 amp.; 150 v., 10 mA.; and 300 v., 20/240 mA., 22/6, carriage 5/- Morse Keys.—Standard size keys wired to work Buzzer or Lamp, 3/-, post 6d. Slightly smaller keys, 2/6, post 4d. BUZZERS, 3/8, or heavy duty, 4/6, post 5d.

**Terminals,** brass, 2BA, mounted on strip 6d. pair. 1005 irradco. Variable Condensers, 2/6, post 4d. 00093 twin gang with trimmers, 2/6, post 4d. 2 1/2 in. x 15 m.m.. M.E.S. Bulls for model railways, etc., 1/- each; 10/- doz., post 4d. Wander Phans, Brass, 1/6 doz., post 4d. Euses, 1 amp., 1 1/2 in. packet of 10, 2/6, post 3d. Also 150 mA. and 250 mA., same price. Hydrometers, Standard Type, 6/-, post 6d. Ex-G.P.O. Telephone Twin Bells, with box, 5/-, post 1/- Single Telephone Bell, 3/6, post 6d.

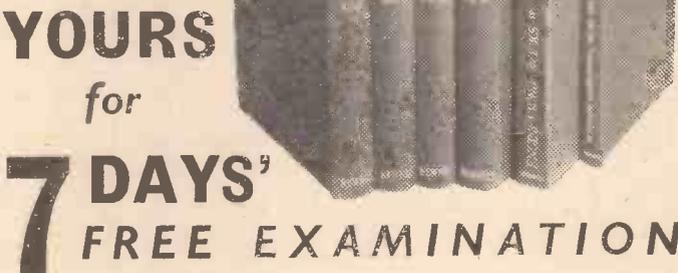
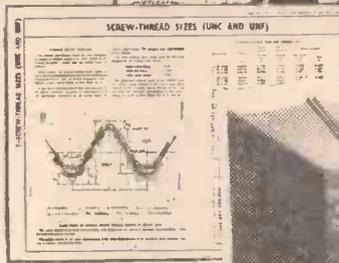
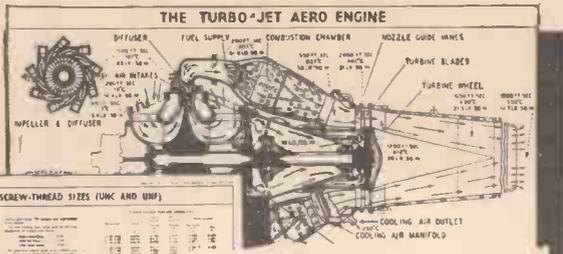
**Bargain Parcels,** of really useful equipment, containing Switches, Motors, Condensers, Resistances, Phones, etc., 10/- or double assortment, 17/6; treble 25/-, All carriage 2/- This country only.

**Meters,** 15 v., 2 1/2 in. m.c., 9/6; 150 v., 2 in. m.c., 10/-; 3.5 amp., 2 in. T.C., 6/-; 4 amp., 2 1/2 in. T.C. in case with switch, 9/6; 100 mA. 2 in. m.c., 7/6; Meter Units containing 2-50 microamp. movements, 7/-, post 1/-.

All meters post extra. Money refunded if not completely satisfied.

**HIGHSTONE UTILITIES**  
58, New Wanstead, London, E.11.

Letters only. New Illustrated List sent on request with 11d. stamp and S.A.E.



**YOURS for 7 DAYS' FREE EXAMINATION**

**NEWNES Engineering Works Practice**

You simply must see this latest Newnes technical work. Written by 50 Top-ranking specialists, it sets out to equip you with knowledge vitally necessary if you are to further your ambition and increase your earnings. 173 world-famous engineering firms and technical journals have co-operated to help you. Latest developments in all branches of engineering are fully described.

- Basic Processes and Machines  
Metallurgy, die-casting, pattern-making, lathework, drilling, gear production, grinding, etc.
- Modern Methods and Materials  
Includes welding and oxygen cutting, brazing and soldering. Mechanical and hydraulic presses, treating materials, etc.
- Production Engineering  
Quality and quantity production; methods illustrated by hundreds of specially taken works photographs. Loco and aero manufacture. Time and motion study. Export packing.
- Installation, Operation and Maintenance  
Instruments, electronics, fuels, testing, etc.

- YOU WILL RECEIVE:**
- 4 Volumes strongly bound in Rich Maroon Cloth. 9 1/2 in. x 6 1/2 in.
  - 2,022 pages written by 50 successful engineers.
  - 2,000 instructive "action" photographs, diagrams and drawings, etc.
  - 24 Unique Data Sheets, 1 1/2 in. x 8 1/2 in., containing facts, figures, drawings, etc.
  - 12 Instructive Wall Charts, 16 1/2 in. x 11 1/2 in., giving technical detail in convenient form.
  - 1 Strong Chart Case 9 1/2 in. x 6 1/2 in., for Data Sheets and Wall Charts. In Binding to match the volumes.
  - 2 Years' Technical Advisory Service on all subjects in Newnes ENGINEERING WORKS PRACTICE is included without cost.



This time-saving and work-saving pocket book is presented free to every purchaser of ENGINEERING WORKS PRACTICE. It contains 192 pages and 124 illustrations. Of vital service to you in the solution of your everyday engineering problems.

**SEND NOW—IT IS TO YOUR ADVANTAGE!**

To: **GEORGE NEWNES, Ltd.**, 66/69, Great Queen Street, London, W.C.2.  
Yes, send me ENGINEERING WORKS PRACTICE. It is understood that I may return the work within eight days. If I keep it I will send a first payment of 10s. 0d. eight days after delivery and 15s. 0d. monthly thereafter until £8 15s. 0d. has been paid. Cash price within eight days is £8 8s. 0d.

Name .....

Address .....

Occupation .....

Signature .....

(or your Parent's Signature if under 21)

Place X where it applies

Houseowner	<input type="checkbox"/>
Tenant	<input type="checkbox"/>
Living with Parents	<input type="checkbox"/>
Lodging Address	<input type="checkbox"/>

**EWP 35**

Telephone: MUSEUM 9594  
**H. FRANKS**

58-60, New Oxford St., London, W.C.1

- One Minute from Tottenham Court Rd. Station**
- 12/24 VOLTS HOOVER BLOWER MOTORS,** Ref. 10K3/115, as recommended for cut heaters in a recent issue. Price 27/6 each.
- RANGE FINDERS,** Type F.T.37, 80 centimetre. These are made under Barr & Stroud licence in Canada, as new in transit case less tripod, ideal for surveying, etc., 21/0.
- MINIATURE CLOCK - WORK TIMERS,** variable, 10 seconds to 3 minutes. Ideal for model work, photographic timing, etc. With slight modification will run 15 mins. full wind, size 1 1/2 in. x 1 1/2 in. x 9/16 in., 3/6 each.
- VARIABLE RHEOSTATS,** graduated 1-amp. to 2 amps., 45 ohms, ideal for chargers, voltage control, etc. Ref. 50/728. Fitted in bakelite case, 4 in. square, 1 1/2 in. deep, 12/6 each.
- SWITCH BOX UNITS,** fitted 200 ohm. 1-amp. and 80-ohm. 1/10-amp. dimmers, on/off switch, etc. Ideal for model control work, fitted on bakelite panel 6 in. x 4 1/2 in. Ref. 5C/2799, 5-BECK 3mm optical slits, slit variable, overall length 5 1/2 in., max. diam. 1 1/2 in., min. diam. 1/2 in., unused, 55/- each.
- "DALLMEYER" 16mm. 2 1/2 in. projector lenses, fitted in chrome barrel 2 1/2 in. long, 1 1/2 in. diam., new, unused, 47/6 each.
- TUFNOL PULLEYS,** Fitted ball races, external diam., 2 1/2 in., internal diam. 3/16 in., 2/9 each, 30/- per doz.
- DITO,** 4 1/2 in. external, 1 in. internal, 5/- each, 45/- per doz. 2,000 of both types available.
- MINIATURE IMPULSE MOTORS** made by "Gents" size 3 x 2 x 1 1/2 in., suitable for operating models, switches, etc., operates off 4/6v. a.c. d.c. and is very powerful for its size. Price 8/6 each, post paid.
- PORTABLE FIELD TELEPHONE SETS,** type D, fitted handset extra headset, tuned buzzer, etc., 25/10/- the pair.
- HIGH QUALITY ex-A.M. VACUUM PUMPS,** size 6 in. x 4 in. x 4 in. approx. Flange mounting, weight 5lb., spline shaft 2 in. long (in diameter); needs a 1 h.p. motor to drive same. Price 37/6 each.
- WESTINGHOUSE THERMISTOR SETS,** Style 298 G.P.O. input 200/250 volts A.C., 50 cycles, output 50 volts D.C., 1 1/2 amps. (carriage 10/-). 70/-
- SYNCHRONOUS CLOCK UNITS.** Self-storing 200/250 v. a.c. 50 cycle, fitted Sanzamo motors consumption 21 watts, size 2 1/2 in. diam., 2 in. deep, geared 1 rev. 60 mins. friction reset. Ideal movements for electric clocks. With gear train and 5 in. hands. Price 27/6 each, post paid.
- "BULL" 1 1/2 in. P. CAPACITATOR START INDUCTION MOTORS, 200/250 volt, a.c. 50 cys. Speed 1,425 r.p.m., 1/2 in. diam. spindle reversible. Ideal for projectors, etc. 23/12/6 each.
- SANGAMO MOTOR UNITS, MODEL 7,** final speed 1 rev. 24 hrs., 200/250 v. a.c. 50 cycles, 27/6 each.
- SANGAMO MOTOR UNITS, MODEL 7,** final speed 1 rev. per 7 days, 200/250 v. a.c. 50 cycles, 30/- each.
- Ex-Air Min. GAIR PUMPS, Type RFP 1,** made by Rolls-Royce, size approx. 6 x 5 1/2 x 5 1/2 in. Price 30/- each, post paid.
- STEP-DOWN TRANSFORMERS,** input 120/230 v. A.C., 50 cycles, output 4.2, 4.2 v., 10 amps., ideal for soil heating, spot welding, etc., 35/- each.
- SELECTORS,** Type 10K13045, fitted cam-operated contacts, 21 in. plastic gear, 12/24 volts D.C. operated, 8/6 each.
- AIR PRESSURE OPERATED CONTACTING UNITS,** housed in bakelite cases, Ref. No. 205/45, 9/- post paid.
- ROTARY RHEOSTATS,** 7/6 ohms, 6 1/2 amps., 25/- each.
- ALTIMETERS,** Ref. 6A1537. Ideal for conversion to barometers, etc., 7/6 each.
- AIR TEMPERATURE GAUGES,** Ref. No. 6A510, fitted Mercury in Ethel Capillary Tube, Transmuting type. Reading -30/0/50 + Centigrade. Suitable for greenhouses, etc., 18/6.
- SYNCHRONOUS MOTORS,** 200/250v. a.c. 50 cys. with gear-trains. Final speed 1 rev. per hour. Ex-Time Operated, by well-known makers, size 3 1/2 x 3 1/2 in. Price 21/6 post paid.
- "KLAXON" 24 Volts d.c. shunt wound 1 20th h.p. motors, 2,500 r.p.m. continuous rating, 40/- each.
- RETICULAR UNITS,** input 200/250 volts, a.c., 50 cycles, output 24 volts d.c. 31 amp., 24 each.
- PREDICTOR UNITS,** Fitted four variable speed gear-boxes, 115 volt A.C. motor, numerous worm gears, right-angle gears, approx. 78 ball-races, etc.; weight 78 lbs., cost £300 each to make. New in original cases. £11 each.
- TRIFLEX GLASS DISCS,** 9 1/2 in. diam., 3/16 in. thick, ideal for Port-holes, etc., 3/6 each, 40/- per doz.
- CLOCKWORK MOVEMENTS** fitted "VENNER" Escapement, runs 10 hours one full wind, final speed 1 rev. 75 secs. Price 9/- each, post paid.

**FULL MAILING LIST PRICE 6D.**

### Imitation Stained Glass

**I** WISH to paint a coat of arms on a 4ft. square piece of glass which is to be lit up from the back by electric light to show the colours, as in a stained glass window. The colours on this coat of arms are dark green, gold, brown and black. Can you help me, please?—S. A. Birch (Leics).

**W**HERE windows are of ordinary clear glass and such glass is already fixed, it is best to paint on thin tissue paper rendered partly transparent by, and stuck to the glass with, japan gold size; but, as in your case, where the glass is movable, the paper can be dispensed with and the painting done on the frosted side of ground glass. It is best not to put any paint on smooth, unroughened surfaces.

The paints to use are artists' tube colours, but care must be taken in selecting the tubes, for only transparent pigments are permissible for representing the coloured glasses. The following is a list of tubes which may be purchased:

Blues: French Ultramarine, Prussian Blue.  
Greens: Hookers Green, Viridian.  
Yellows: Indian Yellow, Aureolin, Roman Ochre or Raw Sienna.  
Reds: Alizarin Crimson, Rose Madder.

Any of the above may be intermixed for obtaining other colours, such as purples and violets, which can be obtained by variations in proportions of Fr. Ultramarine and Crimson.

For Browns: Vandyke Brown, Burnt Sienna.

All these colours are to be mixed and thinned out with japan gold size to such an extent that they are floated on to the glass with soft camel-haired brushes and by this means there will be no brush marks. If one coat does not yield sufficient depth of tone a second or third must be applied, but each coat must be allowed to dry perfectly before putting on another.

The foregoing refers to the colouring of the several pieces of glass which are supposed to make up the window or panel. The painting, which in real stained glass work is fired on, will, in the imitation, be done with a tube colour which is strongly opaque and for this I do not think that any pigment is better than Raw Umber, to which may be added a little Indian Red and a little Lamp Black. All the drawing of outlines should be done with this, adding japan gold size to give a working consistency with perhaps a little turpentine. A fine, long-haired sable pencil will be required for this drawing, which in real stained glass is known as "the tracing." If any shading is required on the heraldic "charges," this should be done, not by painting on, but by stippling, or the paint may be painted on and then shaded off by stippling with the ends of the hairs of a dry brush. The Raw Umber mixture should be used for shading.

Lastly, there are the lead lines to be painted in. These should be drawn about a quarter of an inch wide in dark grey, perfectly opaque paint. In other words, lead colour. A lead line should separate every colour from another and from white and, by the way, any white parts should be varnished over with japan gold size. The only instance in which a colour can be applied not separately "leaded" is in the case of small changes or decoration in yellow which would be, in the case of real work, obtained by "silver staining."

The querist would find it well worth his while to study real stained glass practice. There are two modern works:

"Stained Glass Work," by C. W. Whall.  
"The Art and Craft of Stained Glass," by E. W. Twining.

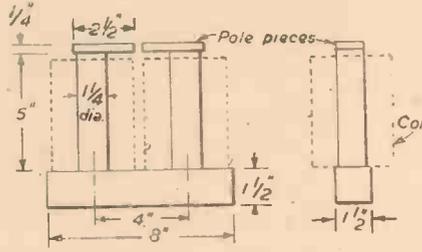
Both published by Pitman.

### Making a Magnetiser

**I** WISH to remagnetise magnets as used in voltmeters and similar instruments. Can you inform me as to how I can make such equipment or be able to purchase same at a reasonable price? I wish to saturate the magnet and use a de-magnetiser for calibration and "artificial ageing."—C. W. Woods (Westcliff).

**A** SUITABLE magnetiser could probably be obtained from Messrs. Runbaken Ltd., of Deansgate, Manchester 1, or from Industrial Electrical Co. Ltd., Offord Street Works, Offord Road, Barnsbury, London, N.1.

Alternatively, you could build a magnetiser for use from a car battery as indicated in the sketch below. The parts are made of soft



Magnetiser suitable for use with car battery.

iron or mild steel and are screwed together. The pole pieces may be secured by means of a screw through slots if required, so that the centre distances can be adjusted to the required value to suit the magnets. A coil on each pole should be wound with about 3 1/2 lb. of 16 s.w.g. D.C.C. copper wire, the two coils being connected in series for use from a 12 volt car battery, or in parallel for use from a 6 volt battery. In either case the coils should be connected so that they produce poles of opposite magnetic polarity.

### Blower for Ozoniser.

**I**N the July issue of PRACTICAL MECHANICS you described the construction of a Household Ozoniser and I should be glad if you would advise me of the names and types of blowers that would provide the slow air stream necessary.—W. J. Harvey (Bromley).

**I**N point of fact it is not necessary to induce a stream of air through a domestic ozonising cabinet such as you propose to construct. The slight rise in temperature within the cabinet caused by the brush discharge is sufficient to set up convection currents which will carry the ozone-air mixture into the room. The general air movement continually going on within the room will again disperse the mixture so that every corner is eventually reached. If you still wish to use an air stream, we suggest you buy an air-pump sold for tropical aquaria.

### Sight Testing Cabinet Panel

**I** HAVE been experimenting with new types of panels for my internally illuminated sight testing cabinet which require etching in black on white opal glass. Can you help me with the method generally used for this type of work?—H. W. Mullard (Witney).

**I**T is possible to purchase composite opaque glass sheets, either white on black or black on white. You should be able to obtain these from most firms of laboratory furnishers, such as Messrs. Griffin and Tatlock, Ltd., Kemble Street, Kingsway, London, W.C.2, Messrs. Townson & Mercer, Ltd., Croydon, Surrey, or Messrs. Philip Harris & Co., Ltd., Birmingham.

The upper sheet (either black or white) is coated with wax on which the characters

or figures are then inscribed by means of a stylus. Alternatively, a stencil is laid down on the upper sheet. The actual engraving is done by means of hydrofluoric acid of indefinite strength but of fairly high concentration. Hydrofluoric acid (not fluoric acid, as you state) is allowed to act for any time, according to its concentration, usually from twenty minutes to one hour forms a good average for a substantial acid concentration.

The etched parts are best filled in by means of the black wax which is used by instrument makers and clockmakers for filling in their dials. You can obtain this material fairly cheaply from any firm of clockmaking material supplies such as Messrs. Edward Gray & Son, Ltd., 12-14, Clerkenwell Road, London, E.C.1.

Another way of obtaining the figures on the glass surface is to engrave them by means of an electrical stylus which, as it were, carves them out on the glass surface. The equipment necessary for this process consists of an electrical engraving tool which is operated off the ordinary mains supply. It is not a very expensive article and it has the advantage of obviating the use of the rather dangerous hydrofluoric acid.

### Levelling a Floor

**I** LIVE in an old house which has a cracked and uneven stone floor.

I wish to level it off in the cheapest and most efficient way possible, and have tried cement of various mixtures (2-1, 3-1, 4-1) of cement and sand, but they all crumble away. Is it possible to use sawdust with a suitable binding compound?—R. Farnell (Halifax).

**T**HE best way to level up your stone floor is to lay a thin coating of asphalt mastic (black or coloured) on it. This is a rather skilled job for the asphalt would have to be laid hot and floated to a smooth surface whilst in the plastic condition. There are local firms which would do the job for you or supply you with the necessary asphalt.

If you wish to use sawdust in the new flooring composition, make up a mixture of about equal volumes of good quality sawdust and calcined magnesite. Moisten this mixture to mortar-consistency with a solution of 40 parts of magnesium chloride in 60 parts of water. This will give you a cement-like product which will lay readily by means of a steel float or even with the aid of a trowel and which will set hard within about 24 hours, thereby giving the well-known "magnesite" flooring. However, a mixture of 3 parts sharp sand (not sea sand) and 1 part of Portland cement slaked with ordinary water should give quite a satisfactory and lasting cement surface to your floor, provided that it is well keyed down and not allowed to dry out too quickly.

## Information Sought

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

**W. D. Barker** writes: "At one of the pre-war motor shows I saw a device which illuminated a car battery. The battery at first appeared quite normal, but the illumination around it gradually appeared to undergo some slight change and the battery showed all its interior; all the plates and separators, etc., became visible. The lighting gradually changed again and the battery appeared normal again.

"Could you please describe how this effect is produced? Is there any book on the subject? Can suitable materials be obtained for the home constructor?"

**MAIN SWITCHES** (Switch fuses). 15 amp. Iron clad, by famous maker. New. 7/6 each, post 1/-.

**AUGER TWIST DRILLS**. New. 1in. 1in. and 1in., 7/6 set of three, post 9d.

**KING DICK RING SPANNERS**. Size 1in. A.F. and 1in. New. 3/6 each, post 7d.

**King Dick Spanners**. Size 1in. W Ring one end open the other, weight 1 1/2 lbs., heavy duty, length 12in. 7/6 each, post 1/-.

**"K" LOCKS**. Similar standard front door type. Has many improved features. New boxed. Normal retail price 18/9 each. Our price 7/8 each, post 9d. Three for 20/-, post free.

**BATTERIES**. 2-volt 16 ampere-hour. Brand new and boxed. Three of these would make good standby for 8 H.P. car. Price 7/6 each, post 2/- . Three for 20/-, carriage 3/6. Real bargain.

**KING DICK SPANNERS**. 1in. Whitworth. New, heavy duty. Ring one end open at the other. Price 7/6, post 1/10.

**TRAIN SET TRANSFORMERS**. 230 volts input, 2 volts to 30 output at 2 amps., also suitable charging kits. 20/- each, post 1/2.

**WHANDA CABLE STRIPPERS**. New, has various fittings, different size cables. List price 15/-, our price 5/-, post 7d. 48/- dozen, post 2/-.

**GRINDSTONES. GENERAL PURPOSE**. New, boxed. Diameter 4 1/2in., grinding surface 1 1/2in. 3/6 each, post 9d. 36/- dozen, carriage 3/6.

**THOR HIDE HAMMERS**. New. Type No. 1. 3/6 each, post 1/- . 36/- dozen, carriage 3/6.

**SELENIUM RECTIFIERS**. New. 12 volt. 3 to 4 amps., full wave bridge connection make ideal charging unit. 15/- each, post 1/- . 12 volt at 1 amp. full wave, 7/6 each. Just the thing for train sets. Post 6d.

**ELECTRIC MOTORS. G.E.C. Single Phase Repulsion 1440 r.p.m.** New (point nine) 9 H.P., half list price £12.10.0, carriage 12/6 England. 1 H.P. as above £12.

**L. G. NORTHALL**

18, HOLLY ROAD, QUINTON.  
Phone: WOO 3166

Showrooms: 353, Bearwood Road, Smethwick. Phone: Bea 1458.

# A "Cold Customer" and "US"



- A Customer** is not a cold statistic—he is a warm flesh-and-blood human, with feelings and emotions like our own, with biases and prejudices as to his requirements, whatever they are.
- A Customer** is the most important person ever in our business—in person, by mail, or by telephone.
- A Customer** is not dependent on us—we are dependent on him.
- A Customer** is not an interruption of our work—he is the purpose of it. We are not doing him a favour by serving him, he is doing us a favour by giving us the opportunity to do so.
- A Customer** is not someone to argue and match wits with. Nobody ever won an argument with a customer.
- A Customer** is not an outsider to our business—he is a part of it.
- A Customer** is a person who brings us his wants. It is our job to handle them profitably to him and to ourselves. If you wish to Construct a Domestic Refrigerator whether "built in" or cabinet, send for our Free Hints Book and List. We shall be pleased to serve.

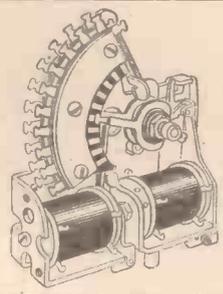
Send stamped addressed envelope to :—

## BRAID BROS.

For Home Refrigerator Construction

50, BIRCHWOOD AVENUE, HACKBRIDGE, SURREY.  
Tel.: WALLINGTON 9309.

We do not wish to be associated with Scrapped Second-hand Ice-cream Components



**UNISELECTORS**, Minor Type. 2 banks of 10 contacts, will operate from 24 v. or 12 v. with slight adjustment, has electro-magnetic release when wipers reach end of the bank. Resistance of drive coil 50 ohms, release coil 70 ohms. These are ideal for sequence switching, model radio control, telephone exchanges, etc. Used, but new condition. 25/- . Post 1/6.

**MAINS TRANSFORMERS**. 230 v. input, output tappings, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 18, 20, 24 and 30 volt at 2 amps. Brand new in maker's carton. Price, 22/6. Post 1/9. Not ex-Government.

**SELENIUM RECTIFIER TO SUIT ABOVE TRANSFORMER**. 12 v. 24 amp., 13/6. Post 1/-.

**ROTARY CONVERTER**. 24 v. in 200 v. at 50 m.a. and 13 v. at 3 a. out., will operate in reverse and will give 15 v. at 3 a. from 230 v. D.C. mains; ideal for model railways, battery charging, etc. Price 7/6. Post 2/-.

**MOTOR FLASHER UNIT**, contains small 24 v. motor coupled to a worm reduction gear running at about 60 r.p.m., and fitted with four sets of make and break contacts, connected to six coax. sockets; this unit is ideal for flashing signs, etc. Price 12/6. Post 1/6.

**BOOST GAUGES**. 2in. dial, scaled from minus 6 to plus 8. Luminous pointer. Brand new and boxed. Price 3/6. Post 1/- . (Suitable as pressure gauge.)

Our Large New List, No. 11, will be available at the end of the month, price 6d. Inland and 2/- Overseas Airmail.

We welcome all your enquiries. S.A.E. please

**A. T. SALLIS**,  
93, North Road, Brighton, Sussex.  
Tel.: Brighton 25806

### GOVERNMENT

### SURPLUS BARGAINS

**MOTORS with REDUCTION GEAR**. Designed to operate Aircraft Cowl Gills through 4-stage EPICYCLIC REDUCTION GEAR of 625/1 (5-25-125-625, one or more stages could easily be locked to give any of these ratios) on 24v. D.C. at approx. 5 amps, will operate on 12v. D.C. at approx. 4 amps or on 16/30v. A.C. at approx. 5/7 amps. Dimensions 12in. x 4in. dia. Each 25/-, post 1/9.

**BLOWER MOTORS** as described for CAR HEATER IN P.M. Feb. 1953. (Ref. No. 10KB/115) 12/24v. Dual Voltage. Each 21/-, post 1/9.

**HAND GENERATORS**, complete with handle and 72/1 gearbox. Output 28 volts and 300 volts. As described for WASHING MACHINE IN P.M. August issue. Each 25/-, post 1/9.

**IMMERSION PUMPS**. Suit most light liquids (not salt water). Ex-R.A.F. Designed for 24v. D.C. lifts about 200 galls per hour, approx. 10ft. taking approx. 2 amps., also operates on 12v. D.C. lifting about 5ft. at about 2 amps. Will also work on 24v. A.C. lifting approx. 10ft. at about 6 amps. Each 37/6, post 1/9.

**TRANSFORMERS**. Input 230v. A.C., Output 12v. A.C., 1 amp. Brand new. Each 7/6, post 1/-.

**METAL RECTIFIERS**. G.E.C. full wave. Max. output 15v. D.C. at 1 1/2 amp. Very suitable with above Transformer for model trains, etc., etc. Each 11/6, post 9d.

Hundreds of other bargains—Motors, Switches, Cable, Telephones, Lamps, Boxes, etc., etc.

Send 3d. stamps for list.

### MILLIGANS,

24, HARFORD STREET, LIVERPOOL, 3.

Money Back Guarantee.

# Plastics LTD

MANCHESTER

BRITAIN'S LEADING STOCKISTS OF

## "PERSPEX" SHEET - ROD - TUBE

11 WHITWORTH STREET · MANCHESTER, 1  
Telephones: CENTral 7081-2 and 1000

it's NEW and it's NEWS!



The most COMPACT & PORTABLE recorder of its type!

- ★ Three High grade motors.
- ★ Positive servo braking.
- ★ Twin track heads.
- ★ High fidelity recording.
- ★ Tape speed 7 1/2 in. per second.
- ★ Size only 16 1/2 in. x 12 in. x 7 in. (with lid).
- ★ For A.C. mains 200-250v. Weight 33lbs.

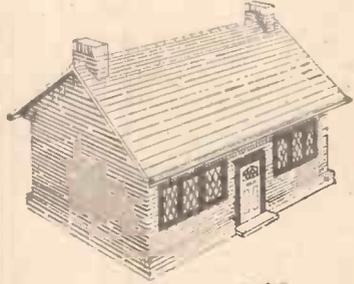
ONLY 45 gns.

H.P. TERMS.—£15/15/- Deposit, 12 monthly instalments of 60/-, or 18 monthly instalments of 42/-.

CREDIT TERMS.—Send only £6 to secure with 8 further payments of £6.

E. & G. MAIL ORDER SUPPLY CO., The Radio Centre, 33 Tottenham Court Road, W.1

## A DOLLS COTTAGE



Plan G.B. 108 for 2/6

Builds into a simple yet attractive cottage, with a floor area of 18in. by 14 1/2 in. Can be made of Plywood, Hardboard or Card. Designed for use with "Romsid" Dolls' House Fittings.

We also have plans for furniture and various period houses and can supply brick papers and wall-papers. Send for complete list, price 1/-; contains Refund Voucher.

### MODEL CRAFT

77 (L), Grosvenor Road, London, S.W.1



# BENNETT COLLEGE can help you to success through personal postal tuition

**T**HOUSANDS OF MEN in important positions were once students of The Bennett College. They owe their success to Personal Postal Tuition—The Bennett College way. You have the same chance to qualify for a fine career, higher pay and social standing.

One of these courses will lead to your advancement

- |                        |                           |                     |
|------------------------|---------------------------|---------------------|
| Agriculture            | Engineering Drawings      | Quantity Surveying  |
| Architecture           | Fire Engineering          | Radio Engineering   |
| Aircraft Maintenance   | Forestry                  | Road Making         |
| Building               | Locomotive Engineering    | Sanitation          |
| Carpentry              | Machine Design            | Steam Engineering   |
| Chemistry              | Mechanical Engineering    | Surveying           |
| Civil Engineering      | Mining                    | Telecommunications  |
| Commercial Art         | Motor Engineering         | Textiles            |
| Draughtsmanship        | Plumbing                  | Wireless Telegraphy |
| Electrical Engineering | Power Station Engineering | Works Management    |
| Electric Wiring        | Press Tool Work           | Workshop Practice   |



**SEND TODAY** for a free prospectus on your subject. Just choose your course, fill in the coupon and post it.

To THE BENNETT COLLEGE (Dept. B. 76), SHEFFIELD

Please send me free your prospectus on :

SUBJECT.....

NAME.....

ADDRESS.....

.....AGE (if under 21).....

PLEASE WRITE IN BLOCK LETTERS

- |                       |                         |                     |
|-----------------------|-------------------------|---------------------|
| Accountancy Exams.    | General Education       | Police Subjects     |
| Auditing              | Geography               | Salesmanship        |
| Book-keeping          | Journalism              | Secretarial Exams.  |
| Commercial Arithmetic | Languages               | Shorthand           |
| Costing               | Mathematics             | Short Story Writing |
| English               | Modern Business Methods | and many others     |

GENERAL CERTIFICATE OF EDUCATION : R.S.A. EXAMS.

## WATSON'S SPECIAL OFFERS

**WESTINGHOUSE.** Type R.G.C.12. Output 90v. 8 amps. Control switching gives 36 charge rates from one 6v. battery up to the maximum. Complete with ammeter. Costs to-day about £55. Our price £19/10/-.

**CHORE HORSE.** Generating sets, 12/15v. 300 w. Fine sets ready for operation. £17/10/- Carr. 12/6. **ALSO BRIGGS & STRATTON** to the same specification £17/10/- Both sets slightly used, tested and with "Three Months" Same-as-Makers' Guarantee.

**LYON ALCO J.A.P.** 300 w. 12/18v. 20 amp. Beautifully made sets complete with switch-board, cut-out and voltage regulator. Unused. £22/10/- Carr. 12/6.

**ROYAL ENFIELD.** Twin cylinder air-cooled industrial engines developing up to 5 h.p. at 3,000 r.p.m. Each in steel frame, complete with petrol tank, etc., ready for use. £16/10/- Carr. 17/6.

**ASTRO COMPASS.** Precision observation instruments. Optical sight, four scales, two spirit levels in transit case. 8/6. Post 1/8.

**SIGHTING TELESCOPES.** 24in. overall. Precision built. 24/6. Post 2/-.

**INDICATOR UNIT** contains 6in. CATHODE RAY TUBE, Nine valves, resistances, condensers, controls, etc. 75/- Carr. 5/-.

**R.F. UNITS.** Type 25. 7in. x 5in. x 8in. Containing three valves, resistances, condensers, etc. 10/6. Post 2/-.

**VACUUM PUMPS.** Beautifully made to A.M. Specification. Size approx. 6 1/2in. x 4in. Outlet 1/2in. 30/- Post 2/-.

**GEAR PUMPS.** 1in. suction and delivery, beautifully made and will deal with a large volume of liquid. Price 30/- each. Post 2/-.

**EX. R.A.F. TOOL BOXES.** Size 14in. x 9in. x 8in. Dovetailed and metal bound. Price 8/8 each. Carr. 2/6. Larger size 20in. x 12in. x 11in. Price 13/8. Carr. 3/6.

**STEEL STANDS.** Immensely strong, suitable for latho grinders, saw or other machine tools, bench, etc. 3ft. high, top 1ft. 8in. built in 3in. x 1 1/2in. channel. A most useful article. 55/6. Carr. 7/6.

**TELELIGHT OIL GUNS.** A very useful general purpose squirt gun. New in maker's cartons. 10/6. Post 1/6.

**SMALL TRANSFORMERS.** 200/250 1 ph. 50 cy. to 12v. 100 w., useful for domestic power purposes, model railways, low voltage handlamps, 25/- Post 2/-.

**L.T. CHOKES,** suitable for smoothing any L.T. circuits. Weight approx. 24 lbs. Size 4 1/2in. x 6in. x 7in., 12/8 each. Carr. 4/6.

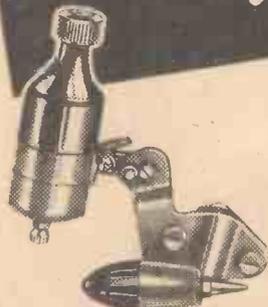
Hundreds of other Bargains available  
Send Stamp for List.

**EASTERN MOTORS,**  
ALDEBURGH, SUFFOLK. Phone 51.

Be in the lead



with a "King" Lighting Set



"King" Major, Minor, Sports and Ambassador. No other cycle dynamo sets have all these exclusive features: "Light Units" modelled on the famous Lucas car lighting equipment. Silver plated brass reflectors. Twin wiring eliminates earthing troubles and push-in sleeved cable connectors allow for variable cable lengths. Powerful 6 v. 3.3 w. generator with combined universal fixing bracket and rear light. Ask your local cycle dealer to show them to you or write for illustrated literature.

Prices: 32/6 to 90/-.  
(Major illus. 47/6).

## LUCAS "King of the Road" CYCLE DYNAMO SETS

JOSEPH LUCAS (CYCLE ACCESSORIES) LTD • CHESTER ST • BIRMINGHAM 6

## SPARKS' DATA SHEETS

are the Safest, Simplest and Finest Constructional Sheets of Guaranteed and Tested Radio Designs.

**ALL-DRY BATTERY DESIGNS**

**THE "POCKET PAK."** All-dry Pocket 1-valve Portable. Frame aerial. Good 'phone sigs. Med. Wave.

**THE "JUNIOR."** 1-valver M/L waves. Very compact. Good 'phone sigs.

**THE "CHUMMY."** 2-valve portable. Really good 'phone results M/L waves.

**THE "MIDDY."** 2-valver, M/L waves. Good speaker results. V/Popular.

**THE "BOSUN"** 3. A more powerful version of the above.

**THE "CRUISER"** 3-valver. T.R.F. circuit. For use with a short aerial, M/L waves.

**THE "SKIPPER."** 4-valver. High sensitivity T.R.F. circuit. Safe any area. M/L waves. Exceptionally good results.

**THE "CORVETTE."** 4 valve all-wave superhet. Great range and very selective. Ideal for a portable.

**MAINS OPERATED DESIGNS**  
(A=A.C. and D=A.C./D.C.)

**THE "CUR"** (D). 2-valver+Rect. M/L waves. Fine tone and power.

**THE "ENSIGN"** (A). An economy version of the above for A.C. mains.

**THE "EVERPRISE"** (A). 3-valve+Rect. T.R.F. high-gain circuit. 4 watts on radio and P.U. Economy design.

**THE "CADET"** (D) A.C./D.C. 4 watt Amplifier. 2 Valves, plus Rect.

**THE "UNIVERSAL 4"** (D) 3-valve+Rect. Fine M/L wave. T.R.F. circuit. Splendid power with quality.

Data Sheets for the above designs. 2/9.

**THE "MAINS PORTABLE"** (D). 3-valve+Rect. M/L waves. Self-contained aerial, etc. Radio-in-any-Room.

**THE "CONQUEST"** (D). All-wave superhet. 4 watts on radio and P.U.

Data Sheets for these designs. 3/3.

**THE "CRITERION"** (A). 8 valves+Rect. 2 H.F. stage, high-fidelity radiogram. M/L waves. 8 watts of good quality. 7/6 post free.

**AMPLIFIERS**  
A.C. 3-watt. 3/3; A.C. 10-watt. push-pull output. 3/9; A.C./D.C. 10-watt. push-pull output. 3/9. Post free.

Send 2d. stamp for Latest List. Components and Drilled Chassis Available.

**L. ORMOND SPARKS (M)**  
48A, HIGH ST., SWANAGE, DORSET



VOL. XXII

FEBRUARY, 1954

No. 381

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

Phone: Temple Bar 4363

Telegrams: Newnes, Rand, London

## COMMENTS OF THE MONTH

By F. J. C.

## The Last Cycle Show?

WE were astonished that the *News Chronicle* in its report of the Cycle Show should have printed a statement by what it termed "one of the biggest cycle exhibitors." The statement alleged to have been made by this manufacturer, whose identity is not stated, but who by no stretch of the imagination could be called "one of the biggest cycle exhibitors" runs: "This is the last Cycle Show. From now on it will be all power-assisted bicycles and motor scooters. The bicycle, apart from the racing enthusiast, is finished." It is the duty, of course, of newspapers faithfully to report the results of an interview, and we do not impugn this newspaper on that score. They should, however, in fairness to the cycle industry, or its cycling correspondent should have done, have checked up with the Cycle Manufacturers' Union and ascertained the facts, particularly as in its very next paragraph it says: "The industry isn't too busy looking after British riders to help the export drive. Since the war cycles and motor cycles have brought £200 millions into Britain."

The largest exhibitors of cycles would be B.S.A., Raleigh and J. and J. Phillips, who make for home trade and export hundreds of thousands of bicycles every year. None of these firms made the statement referred to. Readers of the *News Chronicle*, in the absence of any name, might have presumed that the statement came from them and we are happy to give this denial.

Of course, the cycle trade in its interesting career has had its ups and downs. The swing of the industrial pendulum creates booms and slumps. When trade is bad it is not because people have lost interest in cycling. Money may be scarce, and it may be a deliberate policy of the Government to restrict the spending power of the public by means of purchase tax.

Perhaps the best comment on this absurd statement is the announcement by the Council of the British Cycle and Motor Cycle Manufacturers' Union that it has decided to hold a Cycle and Motor Cycle Show next year from November 13th to 20th at Earls Court, London. We think the Manufacturers' Union, which organises an exhibition in the interests of expanding our trade, should impose a restriction on all its exhibitors not to make statements to the Press which are inimical to that very laudable object. We hope they will take heed of these comments.

## Signposting of London

WE are glad that the Minister of Transport has accepted recommendations made by a working party, consisting of representatives of Highway Authorities, Police and Motoring Organisations (it is noted that the C.T.C. was not represented; it still, of course, has power to erect notices warning cyclists of "dangerous" hills), which has been considering the better direction signposting of London.

The signposting will be of two kinds "through route" and "local." The through signs, which will be characterised by having a yellow background, will help drivers to find their way into and out of London or to avoid passing through Central London. The through route scheme is based on an inner "ring road" by way of Hyde Park Corner, Elephant and Castle, Tower Bridge and Marylebone Road; an outer circular route embracing the existing North and South Circular Roads and main radial routes leading to the trunk roads.

A feature of the signs will be that greater prominence is given to the place name in relation to the route number. Often more than one place name will be used, e.g. Guildford and Portsmouth for route A.3 and Oxford and South Wales for A.40.

A map prepared by the Minister of Transport and Civil Aviation showing the through routes is already available through booksellers at 4s. It is proposed to have enlarged copies of this erected at points on the periphery of London with directions to assist travellers to find any locality. Smaller copies of the map will also be posted at suitable sites inside London.

At a later date local signs, which will be distinguished from "through" signs by having a blue background, will be erected. These, which will help drivers to find their way to places in the London area, will bear the names of the local districts and mileages. The detailed preparation of this scheme, which will include special signs within the ring road, is still in hand.

## Stormy B.L.R.C. A.G.M.

THE annual general meeting of the British League of Racing Cyclists did not, as one might have expected as a result of its satisfactory year's working, take a peaceful routine course. The year 1953 had seen it obtain recognition by the U.C.I. and, therefore, assume a position of priority over the N.C.U. and the R.T.C.C., and another successful Tour. Stormy meetings and clashes of personalities seem inseparable in the cycling movement, and it is particularly deplorable on this occasion when a strong united front should have been presented to all of the other bodies, and to the cycling world in general, that dissension should continue within the ranks of the League and in a more virulent form. No sooner had the meeting started at 10 a.m. when accusations were levelled against the chairman concerning statements he had recently issued to the Press. The Minutes of the previous meeting were hotly debated and a vote of censure on the negotiating committee was proposed but defeated. The bone of contention was the failure of the League to take over all road racing. The League, however, was not in a position to do this in 1953. It had only recently obtained international recognition, and some time must elapse before it can install the machinery for

handling such a vast programme. In our view, therefore, it was wise for it to take *festina lente* as its motto—make haste slowly. It would seem that having fought and won its battle, there are those within its ranks who wish to destroy their own Frankenstein. No doubt in time, if the League survives this internecine conflict, it would eventually take over all forms of road racing, including Time Trials. It would simplify matters, both from a national and international point of view.

First, however, the League has to demonstrate that those responsible for guiding its fortunes are tacticians and diplomats. The A.G.M. did not exhibit these very necessary qualities. The League secretary very truly stated that the Ministry of Transport permitted road racing at present, but would reconsider this view if there was friction between the controlling bodies. Another speaker expressed the opinion that if the N.C.U. were allowed to promote as many races as the B.L.R.C. the League would become redundant. Another speaker urged members to let things remain as they are for the time being so that their position could be consolidated, and by increased efficiency prove their right and ability to control road races.

On the question of the tripartite agreement, a proposal calling on the negotiating committee to help form an over-all body consisting of three members each from the League, the R.T.T.C. and the N.C.U. was accepted, such a body to possess a title of its own and to be recognised by the U.C.I. We doubt, however, whether anything useful can emerge from such a proposition, desirable though it may be. Proposals to amalgamate the N.C.U. and the C.T.C. into a sort of condominium have been made for years. Vis-à-vis committees have examined the problem but have failed to reach agreement, each body refusing to submerge its identity to the other. No one could decide who took over which.

However, through the mists engendered by the heat of acrimonious controversy, it would seem that the League will stand by the tripartite agreement, but will continue to seek revisions of it to gain complete control of road racing.

Unfortunately, the agenda contained far too many items for satisfactory discussion in one day and many of the items had to be skipped. This is an unsatisfactory state of affairs which occurs in all the other bodies. It seems to us that when the secretary prepares the A.G.M. a sub-committee should be appointed to whittle down the agenda to reasonable proportions, so that each item can receive adequate discussions. Items known to be unpopular and unlikely to be carried, especially those which are contrary to policy, should be rejected, or referred to Standing Committee so they do not waste time at annual general meetings.

# Wayside Thoughts

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



Ladram Bay,  
Devon.

Great red sandstone cliffs,  
the home of innumerable sea birds.  
The bay lays seven miles from  
Sidmouth.

## Inland Tameness

**DURING** that Indian summer of October, I spent a week roaming Cornwall. It is many years since I first went riding over the Duchy, and I can remember now how disappointed I was with the inland scenery, bare and battered with old mines, and ghastly heaps of china clay. The coast-line, generally speaking, is grand, but the coast roads—the tracks with the coast in view—are few. On occasion I have spent holidays *en famille* in the areas of Newquay, Falmouth, St. Ives, etc., to explore the river valleys on odd days of release from the domestic circle. The beauty of the area is gathered mainly amid the wooded vales, the rivers, and, for a boat-wandering visitor, the magnificent harbour of Falmouth and its environs, but as a cycle-touring ground Cornwall is a trifle disappointing to me because it lacks the sweep, majesty and colour of Devon. Nor would one mistake the entry to that shire, for, almost in a mile, the scene changes, and you feel warmed by the sight of the moors and combes, even if the hill grades increase and much walking is the order of the day.

It was October and there was no difficulty in finding accommodation, but I confess I would not like to make a midsummer visit without having advance sleeping accommodation. From a cycling point of view I think the south-west corner of England is best visited in the spring or the fall, and left to the charabancs during the "season." It was good to see the year burning its beauty amid the bracken and the foliage, a riot of colour and misty visions sun-drenched that alone made the visit worth while. As I grow older I like to seek the quiet spots for my roaming, but I am beginning to wonder now where they are.

## The Quiet Places

**IT** used to be said that the Highlands were remote and made ideal touring ground for the cyclist. They are, but holiday invasion has cancelled that remoteness, and the main roads have become traffic laden of late years. This is all to the good I suppose, but I am afraid that this old cyclist is a very selfish person, who was brought up to visiting Great Britain before the conducted

tour became a fashion, and who finds it difficult to accept the present summer conditions of our roads with equanimity. Probably the S.W. corner of Scotland—Galloway—is one of the least modern tourist-travelled areas of Great Britain, and a very lovely district it is, particularly if the little hill roads that wind among those comely valleys are explored.

I like Galloway, for it has fine samples of highland and lowland, sea coast and rivers nicely mixed in its limited area, and always the wanderer is never far from that magnet to humanity, the sea, or the great estuary of the Solway.

The ideal place for cycle touring to-day is Ireland; Ireland off the main holiday routes. Sometimes the roads are rough, sometimes it rains, often you have to carry food to preserve energy, but always the land smiles at you between the showers, and you wonder why anyone leaves those wondrous scenes for city life, even though you know the answer from your own habits and custom. Holidays for the likes of me are becoming a problem of time and place, and maybe, that also happens to other old wanderers who have known and loved the lonely road, the road that now rumbles with traffic and is painted and decorated in an endeavour to curb the too reckless spirits. And yet, for all this nostalgic memory it is good to know so many other folk are more intimate with the beauty of their land, and the paid holiday is a joy to them.

## The New Emphasis

**AT** last year's Cycle Show the emphasis was on the tiny motor help to the bicycle, the "fliffer," that has been growing in popularity among the utilitarian, and has for many years been a feature of cycling on the Continent. The keen cyclists, some utilitarians, clubmen and tourists are inclined to look sideways at the motor-assisted bicycle, and I am bound to say I have a sneaking regard for that view, although I could not give any genuine reason for it except prejudice. We old riders had a similar feeling for the motor-car when it first appeared and we, in the pride of our youth, could leave it grunting awkwardly up any considerable incline. Indeed, the first car to outpace me on a hill was the old twin-cylinder tiller-steering Lanchester—whose designer

was a notable cyclist in his day—and wasn't I surprised!

Now I meet or pass on my daily journey to work quite a lot of these little "fliffers" which have given up the ghost, temporarily at any rate, and their owners are wearily pedalling them, presumably to the repair man; and moving quietly along under my own power, I feel slightly superior. I do not know why I should, but there it is. If the utility rider wants help of this kind, he has a perfect right to buy and use it, and who am I to feel a better man with a better method? Yet I do believe the bicycle—the good plain bicycle—is far and away the best travel instrument for a whole and happy man to pedal over his land. It is quiet, it is so enormously reliable, it is comfortable, it is so completely individual that to me it has almost become a part of my make-up, my three-league boots of romance, as it were.

## The "Hard Work" Bogy

**A** GREAT many people to-day think cycling is hard work because they observe young folk bending over handlebars and strenuously urging along their frail vehicles to the limit of their strength. That is cycling for them; the calmer and older advocates of the pastime go unnoticed, they are merely the potterers occupying a little bit of road so quietly and unobtrusively that they are unseen. There are many of them, but there would be many more if folk could be persuaded to try the pastime, not for an hour or a day, but for the month of steady riding needed to become sufficiently fit and saddle-worthy to enjoy the game. That is the point; so many borrow a bicycle which does not fit them, ride too far for a try-out, get saddle-sore and tired, and write cycling down as hard work, and for them—because of ignorance—the description sticks. It is not true, and it never was, even in the old times before air tyres and ball bearings, for the then fit man found his half-hundredweight of iron and solid rubber tyres easier to propel than footing it. What a difference now, what a change in my lifetime! Tyres and gears, saddles and bearings have been improved from the workable to the almost magic, and I make bold to say there is no piece of hard-worked machinery so perfect as the modern bicycle, and no land more delightfully adapted to cycling than these fair islands. What a theme for a crusade!

## Handy Desirability

**I** OFTEN think it is peculiar that the idea of travel is so closely related to distance, as if the farther one went the better would be the scenery. How seldom it turns out like that can only be assessed by the close application of truth to travel experiences; for few of us are prepared to admit disappointment in the chosen holiday area; we are too proud to admit error, yet how frequently we have said: "I'd rather be at home," or "I'm glad to get back." The fact is many of us know the faraway places better than we do our own immediate neighbourhood, yet still yearn to burn up the miles in speed.

Now I contend most areas where men live to work have beautiful stretches of countryside within easy cycling reach, and much of these districts are too little known to the wide wanderer who appears to be obsessed by the need for distance in order to reach beauty. Quiet cycling scores in the day or half-day spent in wandering the little ways of almost any area and knowing how easy it is to get home again. I like to go touring in the full and free sense of the term, which is only possible on special occasions, but I can and do find a constant pleasure amid the lanes of my own countryside.



*The Improved*  
**MOLE**  
TRADE MARK  
*Self-Grip*  
**WRENCH**

Give yourself that extra hand you are always wishing for — the Mole Self-Grip Wrench. This versatile tool can be used as a vice, wrench, clamp, super-pliers and so on. It locks on to work with tremendous power, leaving both hands free, yet can be released by just a flick of the centre lever. Sturdy and compact, the Mole Wrench is a MUST for all handymen and mechanics.

Obtainable from your local Ironmonger, Motor or Motorcycle Accessory Dealer.

**7"-12<sup>1</sup>/<sub>6</sub>**  
**10"-15<sup>1</sup>/<sub>2</sub>**

If any difficulty, write to:—

**M·MOLE & SON·LTD·BIRMINGHAM·3**



*Go...buy...BSA*

Don't be tied down to a time-table. Get about on your own B.S.A. Bicycle. Of course you can afford it, the fares you will save going to and from work will pay for your bicycle in no time.

Send for the illustrated catalogue and choose your own bicycle.

LEAD THE WAY  
ON YOUR



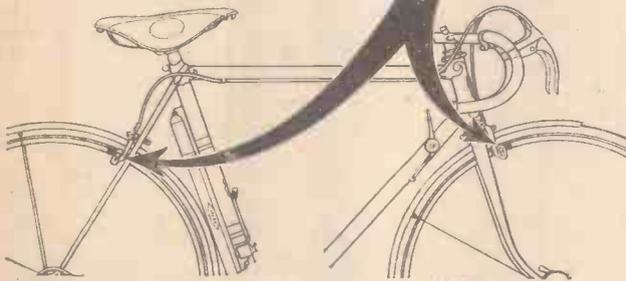
Post this COUPON TODAY

Name .....

Address .....

Please send Bicycle Catalogue.  
B.S.A. CYCLES LTD, 12, WAVERLEY WORKS,  
BIRMINGHAM, 10

**Fibrax** **HERE**



**means safety**

You can depend upon your FIBRAX CYCLE BRAKE BLOCKS in emergency — you'll pull up faster, gently but firmly. For steel rims **Black Fibrax Brake Blocks**, for alloy rims **Soft Red Blocks** (specially designed for alloy). Fit a set *now* for the new season. From all good dealers.

**FIBRAX**  
**BRAKE BLOCKS**

FIBRAX LTD · 2 TUDOR STREET · LONDON · E.C.4  
F553

**FLUXITE**  
SOLDERING  
**FLUID**



*Full-filling  
the great  
demand for  
a perfect  
fluid flux*

The standard sizes are:—

- 4 fluid ozs.
- 8 fluid ozs.
- 20 fluid ozs.
- 1 Gall. Cans.

**FLUXITE LTD.,**  
DRAGON WORKS, BERMONDSEY ST., LONDON, S.E.1.

1/2 PER 7 1/2 oz. TIN



The oil that  
does so much  
and yet  
COSTS  
SO MUCH  
LESS!

# EXCELENE

LUBRICATING OIL

Next time, buy EXCELENE. It's made from the world's finest lubricants—yet costs less—1/2 for 7 1/2 oz. size, 10d. for 4 oz. In handy tins, guaranteed leakproof, with two-way spout. Super-refined, easy flowing. EXCELENE does every light lubricating job better.

THE HUMBER OIL CO. LTD. (Engineering Division), MARFLEET, HULL



## CLYDESDALE *Prices Slashed*



F24 AIRCRAFT CAMERA in Transit Case.

Full Details:

Lens 5in. f/4 with internal iris diaphragm stops to f/11, fixed focus set at infinity, screw-in housing projects 5 1/2in. Focal plane shutter, speeds 1/60th to 1/1,000th of a second and time, fitted in film magazine designed for 5 1/2in. wide film, picture size 5 1/2in. x 5 1/2in. Shutter release and rewind spindle for standard spanner. Hand operated as it stands. Nett. weight 17 lbs. Packed in fitted transit case 42lbs. Dimensions: body 6 1/2in. x 9 1/2in. x 9 1/2in. overall including lens housing 11 1/2in. x 9 1/2in. x 9 1/2in. Provision for external motor drive (not supplied). Lens housing grooved for fitting to aircraft camera port. A Precision Air Survey Camera, could be adapted for Laboratory, Industrial or Portrait use.

Ask for A/H302.

£4.19.6

Carriage Paid.

F24 AIRCRAFT CAMERA in Transit Case With 8in. f/2.9 lens, otherwise as H.302. Ask for A/H300. **£9.19.6** Carriage Paid.

14in. f/5.6 LENS FOR F24 CAMERA. Complete with Iris, Filter, Mount and Extension. In Transit Case. Ask for A/H563. **£6.19.6** Carriage Paid.

RECORDER MK.11 24 VOLTS This unit is an Auto Camera for 16mm. film, the shutter can be operated at single shot or one frame per half-second continuously. The Recorder requires a cassette, or Magazine (not supplied) to hold 25ft. of 16mm. film. The Optical Unit has an f/4.5 lens and Prism Reflector system, for right angle operation through the side of the case. There is also an Iris Control for Dull or Bright Exposures and a Film Footage Indicator. The whole unit is powered by a 24-volt Motor, which consumes only 0.5 of an amp. Dimensions: 4 1/2in. x 4 1/2in. x 1 1/2in. Contained in Transit Case. Dimensions: 9 1/2in. x 6 1/2in. x 2 1/2in. USED GOOD CONDITION.

Ask for A/H883.

27/- each

Post Paid.

RECORDER MK.11 24 VOLTS. As above. Less Transit Case. Ask for A/H883A. **22/6** each. Post Paid.

Ask for A/H883A.

ONLY AVAILABLE with Recorder Mk.11. Film cassette, 25ft. Capacity. Ask for A/H860. **10/-** each. Post Paid.

Ask for A/H860.

10/- each

Post Paid.

### MOTOR GENERATORS SUITABLE AS UNIVERSAL ELECTRIC MOTORS

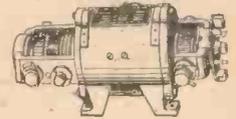
For 200-250v. A.C. or D.C. mains. By simple external wiring, full data supplied. New method gives better than 1/6th h.p. Using ex-R.A.F. Motor Generator dim.: 11in. x 5 1/2in. x 5 1/2in.

Type 2A. As generator: Input 24v. 16A. Output 1,200v. 200mA

Type 2B. As generator: Input 12v. 32A. Output 1,200v. 200mA.

Type 2C. Ask for A/E890.

Type 2D. Ask for A/E880A. **17/6** each Carriage Paid.

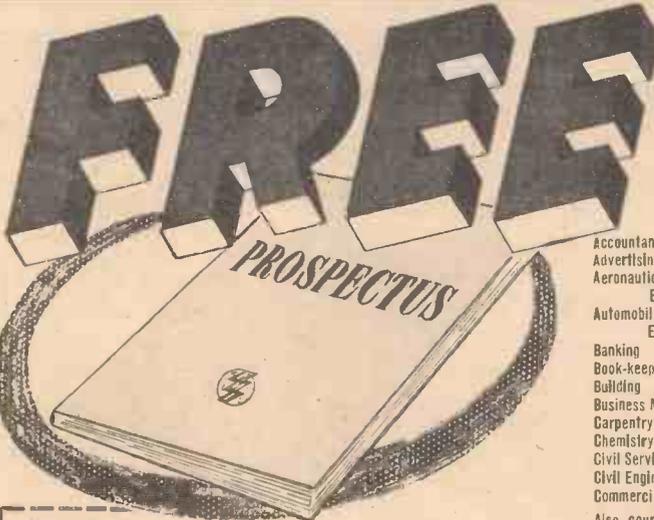


### MOTOR GENERATOR (Type 30)

Ref. 10K/21. Input 9.3 volts 23 amps. Output 7.2 volts 13 amps. 255 volts 110mA. Size 12in. x 5 1/2in. x 5 1/2in. Can also be connected as an A.C. or D.C. mains 200/250v. motor, data supplied.

Ask for A/H488 **15/-** each. Carriage Paid.

Order direct from —  
**CLYDESDALE SUPPLY CO. LTD.** 2, BRIDGE STREET GLASGOW - C.5  
Phone: South 2706/9 Branches in Scotland, England and Northern Ireland.



POST THE COUPON TODAY FOR OUR BROCHURE ON THE LATEST METHODS OF HOME TRAINING FOR OVER 150 CAREERS & HOBBIES

PRIVATE AND INDIVIDUAL TUITION IN YOUR OWN HOME

- |                     |                            |                        |                     |
|---------------------|----------------------------|------------------------|---------------------|
| Accountancy         | Commercial Art & Drawing   | M.C.A. Licences        | Sanitation          |
| Advertising         | Customs & Excise Officer   | Mechanical Engineering | Secretaryship       |
| Aeronautical        | Draughtsmanship            | Motor Engineering      | Sheet Metal Work    |
| Engineering         | Economics                  | Photography            | Shorthand & Typing  |
| Automobile          | Electrical Engineering     | P.M.G. Licences        | Sound Recording     |
| Engineering         | Electronics                | Police                 | Structural Eng.     |
| Banking             | Fashion Drawing            | Production Engineering | Telecommunications  |
| Book-keeping        | Heating & Ventilating Eng. | Public Speaking        | Television          |
| Building            | Industrial Administration  | RcJar                  | Time & Motion Study |
| Business Management | Journalism                 | Radio & Television     | Tracing             |
| Carpentry           | Languages                  | Service                | Welding             |
| Chemistry           | Marine Engineering         | Radio Engineering      | Writing             |
| Civil Service       | Mathematics                | Refrigeration          | Works Management    |
| Civil Engineering   |                            | Retail Shop Management | Workshop Practice   |
| Commercial Subjects |                            | Salesmanship           | and many others.    |

Also courses for University Degrees, General Certificate of Education, B.Sc.Eng., A.M.T.Mech.E., L.I.O.B., A.C.C.A., A.C.I.S., A.M.Brit.I.R.E., A.M.I.A., City & Guilds Examinations, R.S.A. Certificates, etc.

### THE ADVANTAGES OF E.M.I. TRAINING

★ The teaching methods are planned to meet modern industrial requirements. ★ We offer training in all subjects which provide lucrative jobs or interesting hobbies. ★ A tutor is personally allotted by name to ensure private and individual tuition. ★ Free advice

covering all aspects of training is given to students before and after enrolment with us.

COURSES FROM £1 PER MONTH

### POST THIS COUPON TODAY

Please send without obligation your FREE book.  
**E. M. I. INSTITUTES** (Dept. 144k)  
43 Grove Park Road, London, W.4 Phone: Chiswick 4417/8

NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
SUBJECT(S) OF INTEREST \_\_\_\_\_

# EMI INSTITUTES

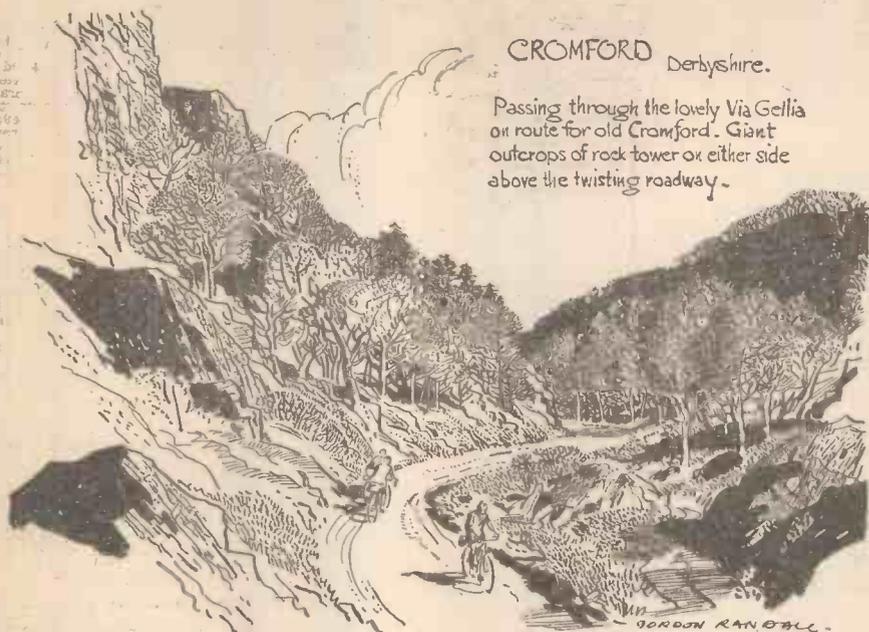
The only Postal College which is part of a world-wide Industrial Organisation

# Around the Wheelworld

By ICARUS

## CROMFORD Derbyshire.

Passing through the lovely Via Gallia on route for old Cromford. Giant outcrops of rock tower on either side above the twisting roadway.



GORDON RANDELL

### Inferior Bulbs

MY comments on frequent bulb failure seems to have stirred up a hornet's nest, for whilst the Electric Lamp Manufacturers Association insist that there is no drop in quality as compared with pre-war, only one correspondent out of a very large number received supports that statement. I am entitled, therefore, now to ask Elma what they propose to do about it. Bulbs are expensive enough in these expensive days, Mr. R. Williams, of Cambridge, in a reasoned letter admits that caps working loose does occur, but does not think that it is any more frequent now than it ever was. Regarding bulbs blown prematurely, one cause, he says, is that the bulb supplies are usually rated at 2.5 volts, whereas the battery voltage is 3 volts when the battery is new. Allowing for a small drop in battery voltage, on load a 2.5 bulb still tends to be overrun and does not last as long as it should. Precisely. That is the point I made—that bulb manufacturers do not take into consideration all of the factors involved, and that if they did the problem would disappear. Of course, one remedy is to fit a bulb rated at 3.5 volts, but, of course, this means a loss of illumination. It would seem that a 3-volt bulb, if obtainable, would be the answer.

With regard to dynamos, the fact that a bulb is rated at 6 volts does not imply, says my correspondent, that it will light satisfactorily on a 6-volt dynamo. It is not only the voltage but the current rating which must be considered.

When I referred to lack of voltage control I was, of course, referring to *satisfactory* voltage control, as on cars. Some cycle dynamos do incorporate a form of voltage control, but owing in some cases to poor workmanship it is often ineffective. A cycle dynamo has a falling voltage characteristic with increased load. Voltage does, however, increase with the speed of rotation. Design, therefore, is such that when the optimum load is applied, for which the dynamo is made, the terminal voltage will not exceed the given voltage, regardless of speed and rotation. Take, for example, a 6v. 3w. dynamo in series with a 6v. 0.5a. bulb. Voltage increases with speed until the ter-

минаl voltage reaches 6 volts and the current passing through the bulb and also the dynamo is 0.5 amps. A further increase in speed results in higher voltage being generated and more current tends to flow. However, when the current exceeds 0.5 amps. a voltage drop occurs in the dynamo coil, which means that the further increase in generated E.M.F. is lost in the dynamo itself. Voltage across the bulb will increase slightly, but at a decreasing rate until a maximum is reached—say, 7-7.5 volts.

Since voltage is related to the load, if a 6v. 0.3a. bulb is substituted in the above example, maximum voltage across the bulb will be excessive and the bulb will have a short life.

Regarding the expectation of life table I published for 6-volt bulbs, this, of course, referred to a constant voltage applied for the period tabled, whereas, of course, in practice the average voltage across a dynamo bulb is probably a nominal 6 volts or less with correct bulbs fitted.

I also said that if lamps are not of the same rating, that is of identical filament diameter and resistance, the tail lamp will burn out prematurely. I am aware, of course, that two lamps, one of 4 volts and one of 8 volts, can be run in series on a 12-volt supply, but such an example would not occur in connection with cycle lighting dynamos.

Another reader, Mr. Ernest White, of Ringwood, endorses my comments and encloses a catalogue issued by a certain bulb manufacturer in 1939. I can confirm his comments that such bulbs had extraordinary long life.

### Every Cyclist's Pocket Book

By F. J. Camm.

400 Pages. 84pp. Indexed Road Routes  
7/6 (by post, 7/10)

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

### Beating 21 M.P.H.

LAST year no fewer than 357 riders beat 21 miles an hour in the B.A.R. contest and therefore qualified for the R.T.T.C. certificate. Top of the list was V. Gibbons (Brentwood R.C.) at 23.578, followed by E. Britton (Yorkshire R.C.), 23.336; K. Whitmarsh (Southampton Wh.), 23.332; C. Horton (Mercury C.C.), 23.146; J. White (Leamington C. & A.C.), 23.095; H. Alford (Exe Valley R.C.), 23.079; D. Keeler (Vegetarian C. & A.C.), 22.982; A. Staje (Huddersfield R.C.), 22.917; D. Marsh (Shaftesbury C.C.), 22.827; D. Moss (Bournemouth Ar. C.C.), 22.794; F. White (Luton Arrow C.C.), 22.774; and R. Spanton (Brentwood R.C.), 22.735.

At the bottom of the list, but creditably, W. Rowley (Warwick C.C.), 21.022.

Twenty-six women did 21 m.p.h. or more starting with Joyce Harris (Apollo C.C.), 22.436; D. Franks (Apollo C.C.), 22.368; G. Tiley (Camberley Wheelers), 22.231; C. Brown (S. Shields Victoria), 21.963; J. Sutherland (Musselburgh R.C.), 21.871; J. Blow (S. Lancashire R.C.), 21.751; J. Simmons (Apollo C.C.), 21.682; D. Hackney (Mephisto C.C.), 21.636; B. Tingey (Harrow & Rickmansworth), 21.634, and O. House (Redhill C.C.), 21.595. At the bottom of the 21 m.p.h. list is M. Hinchcliffe (Monckton C.C.) with an average of 21.000.

Amongst the males the team race was won by the Brentwood Road Club (V. A. Gibbons, R. Spanton, B. L. Shaw), average speed 22.677 m.p.h., with the Yorkshire Road Club second (E. Britton, B. L. Smitin, S. Swaine); average speed 22.646, and the Rutland C.C. third (J. C. Leversidge, R. Lockwood, S. Thompson), average speed 22.464.

The women's team race was won by the Apollo C.C. (J. Harris, D. Franks, J. Simmons), average speed 22.162, with the Addiscombe C.C. second (C. Brooker, D. Stratford, B. Perry) at 21.178 m.p.h.

I am not, however, at all happy regarding the formula used for determining these best all-round performances, and I suggest that the time has now come when an expert mathematician, such as Professor W. A. Tuplin, of Manchester University, himself a keen cyclist, should be asked to prepare a formula which more accurately selects the best all-rounder. The present formula has not been arrived at by anyone having a mathematical training, and it is grossly unfair.



The "Eagle Eye" watching B.L.R.C.-N.C.U. moves in 1954. Beware!

# CYCLORAMA

By H. W. ELEY



Hollingbourne,  
Kent.

Fine brick and half-timber  
in this charming little Kentish  
village.

## "February Fill-dyke"

THIS was the name given to the second month of the year in my boyhood days, and more often than not, February lived up to its nick-name. The rains came, the water gurgled in the ditches and channels by the sides of the lanes; farmers greeted the rain with glee, and hoped that it would be followed by good drying winds in "mad March." Somehow, to-day, the seasons seem to have changed, and as like as not, February will be dry and dusty, and there will be prayers for rain—so topsy-turvy are the seasons in this atomic age! Some old folks attribute the changes to "they atom bombs"—but I hardly think that the scientists agree with that view! But come rain or fine, I shall look forward to many a good ride in February, and maybe I shall find the first shy virginal snowdrops in some green dell by the gorse-covered common.

## "The Load of Mischief"

KNOWING my keen interest in inns and inn signs, some of my good correspondents occasionally send me details of quaint and curious names of inns they have come across in their cycle touring. The other day, a rider from "Beechy Bucks" wrote to me about an inn called "The Load of Mischief" and informed me that the sign consisted of a picture of a weary, forlorn-looking man, bearing on his bent shoulders a bird, a monkey, and a woman. The sign bore the legend:

"A monkey, a magpie, and a wife—  
Is the truest emblem of strife."

I have certainly not come across this sign before, and I gladly add it to my growing collection of inn signs. Every English county has its quota of the quaint and curious in inn signs, and it is quite a fas-

inating hobby to look for them, and muse upon their meanings.

## Saint Valentine

FEBRUARY brings us St. Valentine's Day, and in recent years there has been quite a remarkable revival of interest in this "saint of lovers," and shop windows are again full of colourful cards, complete with true-lovers' knots, and romantic verses, and ardent vows of fidelity. I like this return to romance in a prosaic age! Greetings cards were never more popular, and there is much to be said for this happy way of cementing friendships and winging kindly messages. The story of Saint Valentine seems wrapped in mystery, but for long years he has been the patron saint of lovers, and his place in the gallery of saints is assured.

## In Superstition Land

SUPERSTITION dies hard in the remote countryside, and in my touring of the villages and hamlets of grey Derbyshire I have found that astonishing old beliefs still hold sway; even in this hard and materialistic age it is possible to find plenty of folk who have faith in old tales and legends, and who live in fear of the "Evil Eye." There is an "old crane" in an isolated village with whom I sometimes have a chat about her quaint beliefs, and recently she told me that as a girl she always carried a thistle-apple in her purse as a preventive of tooth-ache, and in her old age she carries a nutmeg suspended from her neck to keep away rheumatism. Her beliefs are not confined to cures for the weaknesses of the flesh; they range over a wide field, including courtship and marriage, birth and death, the weather, and flowers and animals and birds. All manner of strange tales and beliefs I have

heard in the tumble-down cottage where this wrinkled-face old woman lives. In the green days of spring last year, when the cuckoo sent out his monotonous note from every tree, this old soul told me that if, when one first hears the cuckoo, the sound comes from the right, it means good luck and prosperity; if from the left, then bad luck will be your lot for a month. The cold scientific mind may dismiss all these fancies as idle tales, but it is hard to shake the belief in them held by the aged folk who have lived their lives in solitude in the heart of the silent countryside. . . .

## Enchanting Essex

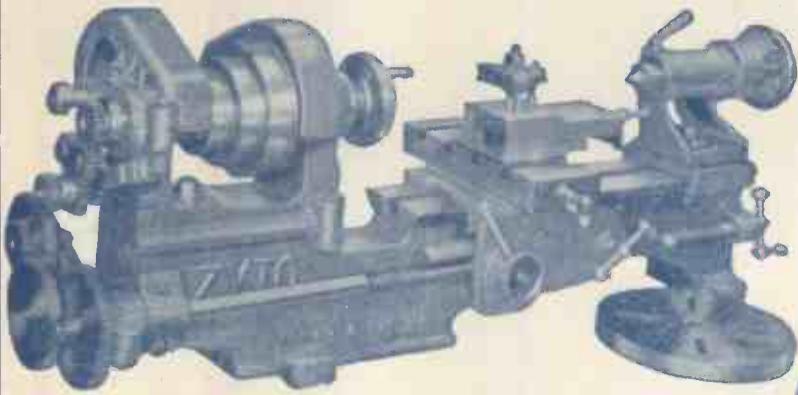
TO some cyclists, well up in the scenes and topography of this England of ours, Essex is a county flat and devoid of much interest, but to those who know it well, and have eyes to see and understand, Essex has much beauty, and a charm of its own. It is a many-sided county, and to some its name may conjure up pictures of Southend-on-Sea and the rollicking gaiety of a Bank Holiday; to others, Essex may mean the ancient history of Colchester which was, in Roman times, the third most important town in all Britain. The first Roman city was stormed and burnt by the British under the intrepid leadership of Queen Boadicea. When we cycle around Colchester to-day we may still see some remains of those massive walls which the Romans constructed with the idea of withstanding a further surprise attack. Some lovers of Essex hold it dear to their hearts because of the expanse of Epping Forest—beautiful in every season of the year, but, to me, loveliest in autumn, when the trees are putting on the garments of decay, and are all-glorious in browns, and russets and golds. Epping Forest is enchanted country to thousands of East End London folk, offering green glades and leafy glory in the place of the sunless streets of their East End homes.

I never think of Essex without musing upon the ancient rite of the "Dunmow Fitch." It was originally given to the married couple who could declare on oath that they had not repented of their marriage, sleeping or waking, for a year and a day. The custom goes back as far as the year 1244, when the "fitch" was first offered by one Robert Fitzwalter. Essex is rich in romantic and appealing place-names—Stanford-le-Hope, Hatfield Peverel and Tolleshunt D'Arcy come to the mind as being especially lovely. Yes! Essex may possess no rocky gorges or towering crags, but it has its own beauty, and I commend the cyclist to explore its lanes and by-ways.

## A Dunlop Veteran Goes Into Retirement

SOME month or two ago I was in correspondence with an old and valued Dunlop friend who has recently gone into retirement after 50 years of notable service with the Dunlop organisation. George Bourne, for many years the company's regional manager at Leeds, responsible for sales in the north region, was a colleague of mine at Aston Cross in 1911. He served the company with great distinction in many positions and for several years represented it in South America. "George" is a genial and lovable soul and he left the old company with the affection and good will of a host of friends. He tells me he does not intend to leave Yorkshire, where he is as popular as Len Hutton himself! A happy retirement George!

# "ZYTO" B.G.S.C. LATHES BRITAIN'S FINEST LATHE VALUE



★ Accurate & Dependable ★  
★ NOW MADE 12½" 16" BETWEEN CENTRES ★

Cash price 28/1/0 or first payment of £8/17/6  
balance payable over 12 months.

## THE "ZYTO 12" LATHE

Height of centres	3 3/8 in.
Distance between centres	12 1/2 in.
Height from gap	4 1/2 in.
Height from Saddle	2 in.
Guide Screw	8 T.P.I.
Headstock Mandrel Admit	3/8 in.
Tailstock Barrel Admit	3/8 in.
Headstock Pulley, 3-speed	3/4 in. flatbelt
Faceplate, dia.	6 in.
Overall length of Lathe	30 in.
Change Wheels	: 20, 25, 30, 35, 40, 45, 50, 55, 60, 65.

Back Geared Guards and Change Wheels, together with Catch Plate and Finished Back Plate for Chuck are all included.

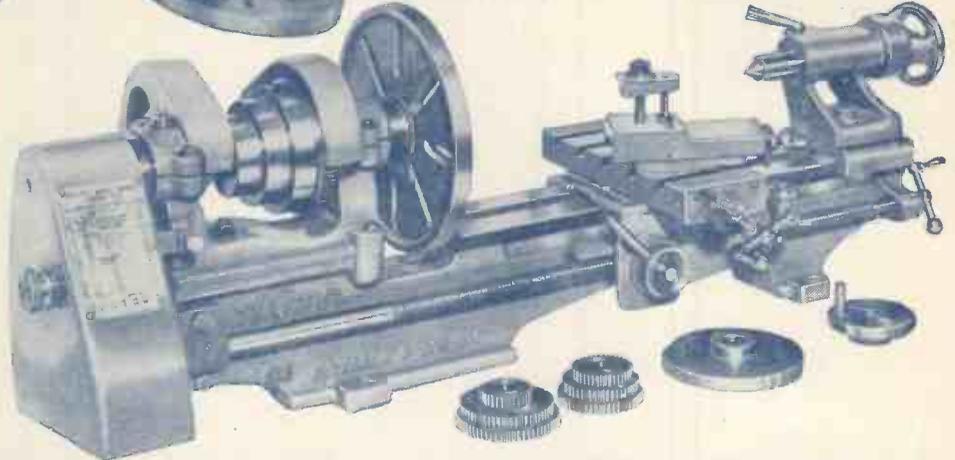
## THE "ZYTO 16" LATHE

Height of centres	3 3/8 in.
Distance between centres	16 in.
Height from gap	4 1/2 in.
Height from Saddle	2 in.
Guide Screw	8 T.P.I.
Headstock Mandrel Admit	3/8 in.
Tailstock Barrel Admit	3/8 in.
Headstock Pulley, 3-speed	3/4 in. flatbelt
Faceplate, dia.	8 in.
Overall length of Lathe	34 in.
Change Wheels	: 20, 25, 30, 35, 40, 45, 50, 55, 60, 65.

Complete Gear Guard. Extra long Compound Slide rest. Gear Chart included

Cash price 35/15/0

or first payment of £10/19/0  
balance payable over 12 months.



**S. TYZACK & SON LTD** 341, 343 & 345, OLD STREET, LONDON, E.C.1.  
Telephone: SHOREDITCH 8301 (10 lines)

## YOU CAN DEVELOP YOUR OWN SNAPS WITH THIS TRIAL SET



Doing the work yourself is half the fun of photography. You save money and have no end of a thrill in making the negatives and getting a few prints from them. It's quicker, too. You see the results within a few hours of taking the snaps. Start, right away, by sending for this five shilling trial set. It comprises:—

- \* 1-oz. (25 c.c.) bottle of AZOL developer.
- \* 4-oz. tin of Acid Fixing salts.
- \* M-Q Pactums, print developer.
- \* 1-oz. (25 c.c.) bottle of 142.
- \* 25 sheets of Contact paper, 2½ by 3½, and the easy-to-follow instruction book which tells you how it is all done.

Enclose P.O. Write your name and address in block capital letters and mark the front of the envelope PRACTICAL MECHANICS OFFER.

PRICE 5/6

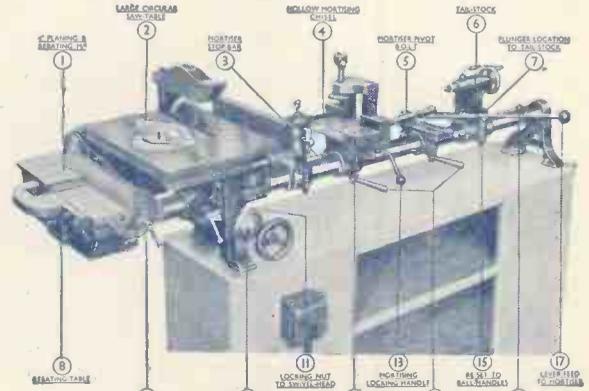
includes the packing and full postage.

### NEW HOME PHOTOGRAPHY

You should read this book. Nearly 100 pages, 130 illustrations. Packed with all sorts of useful hints and dodges for getting good results. Get a copy today. It will help you to make better snapshots. Your dealer sells it or a copy will be sent, post free for 2/6. Enclose P.O. Write name and address in capitals and mark envelope "Practical Mechanics" New Book Offer.

JOHNSONS OF HENDON, LTD., LONDON, N.W.4

**Send Now** for New Brochure detailing all points and interesting features; answered questions you would ask, showing machines in use and articles such as toys, patterns and turnery made on these machines. Ask also for details of fittings to the "Coronet" range and other makes. Is long hole drilling a problem to you? Send now for details of BORING ATTACHMENT and long drills, to suit any lathes.



### FITMENTS AND ACCESSORIES FOR ALL LATHES:

- CUP CENTRE No. 1 Morse Taper Shank.
- 4 Prong DRIVING CENTRE (Positive Drive for large or small work).
- GRINDING WHEEL ARBOR No. 1 Morse Taper—suit any machine with No. 1 Morse Taper.
- REVOLVING CENTRE.
- 5" WOBBLE SAW—Ploughs 1/8" to 5/8". Index for quick setting and fine adjustment.
- TURNING TOOLS, set of six 18" overall, beautifully handled.
- WOODSCREW CHUCK to suit any machine No. 1 or 2 Morse.
- 3 Jaw CHUCK and Self Centering 4 Jaw Independent Chuck.
- COMPOUND SLIDEREST—for wood and metal turning.
- ELECTRIC MOTORS, Brook 1/2 and 3/4 h.p.
- GRINDING WHEELS, SLIPTONES, etc.

Write, Dept. P.M., enclosing stamp, for Catalogues showing photographs and price, etc.

**CORONET TOOL CO.** 8, MANSFIELD ROAD, DERBY.

Also at CITY ROAD MILLS, DERBY.

"Practical Mechanics" Advice Bureau COUPON  
This coupon is available until February 27th, 1954, and must be attached to all letters containing queries, together with 3 penny stamps. A stamped addressed envelope must also be enclosed.  
Practical Mechanics. February, 1954.

18 Cumy

# 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.

**132-PAGE BOOK FREE!  
SEND FOR YOUR COPY**

## ENGINEERING, RADIO, AERO, ETC.

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

## BUILDING AND STRUCTURAL

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

## GENERAL, LOCAL GOVERNMENT, ETC.

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

## BECOME A DRAUGHTSMAN—LEARN AT HOME AND EARN BIG MONEY

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



★ OVER SIXTY YEARS OF CONTINUOUS SUCCESS ★

**NATIONAL INSTITUTE OF ENGINEERING**

(Dept. 29)

**148, HOLBORN, LONDON, E.C.1**

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

**FOUNDED 1885 - FOREMOST TODAY**

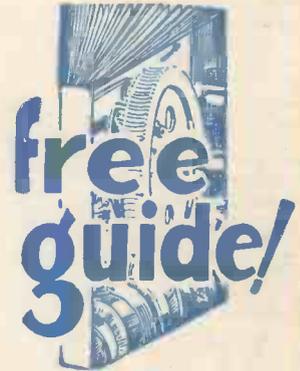
This remarkable FREE GUIDE explains :

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

## MANY INTERESTING COURSES TO SELECT FROM!

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

Fully guaranteed postal courses for all the above and many other examinations and careers. Fully described in the New Free Guide.



## THE ACID TEST OF TUTORIAL EFFICIENCY SUCCESS—OR NO FEE

We definitely guarantee that if you fail to pass the examination for which you are preparing under our guidance, or if you are not satisfied in every way with our tutorial service—then your Tuition Fee will be returned in full and without question. This is surely the acid test of tutorial efficiency.

If you have ambition you must investigate the Tutorial and Employment services we offer. Founded in 1885, our success record is unapproachable.

**ALL TEXTBOOKS ARE SUPPLIED FREE  
PROMPT TUTORIAL SERVICE GUARANTEED  
NO AGENTS OR TRAVELLERS EMPLOYED**



**Free Coupon**

To: NATIONAL INSTITUTE OF ENGINEERING  
(Dept. 29), 148-150, Holborn, London, E.C.1.

Please Forward your Free Guide to

NAME .....

ADDRESS .....

My general interest is in : (1) ENGINEERING  
(2) AERO (3) RADIO (4) BUILDING  
(5) MUNICIPAL WORK

**SEND OFF  
THIS COUPON  
NOW AND BE  
ALL SET FOR  
SUCCESS**

(Place a cross against the branches in which you are interested.)

The subject of examination in which I am especially interested is .....

To be filled in where you already have a special preference.  
(1½d. stamp only required if unsealed envelope used.)