Constructing a Horizontal Enlarger

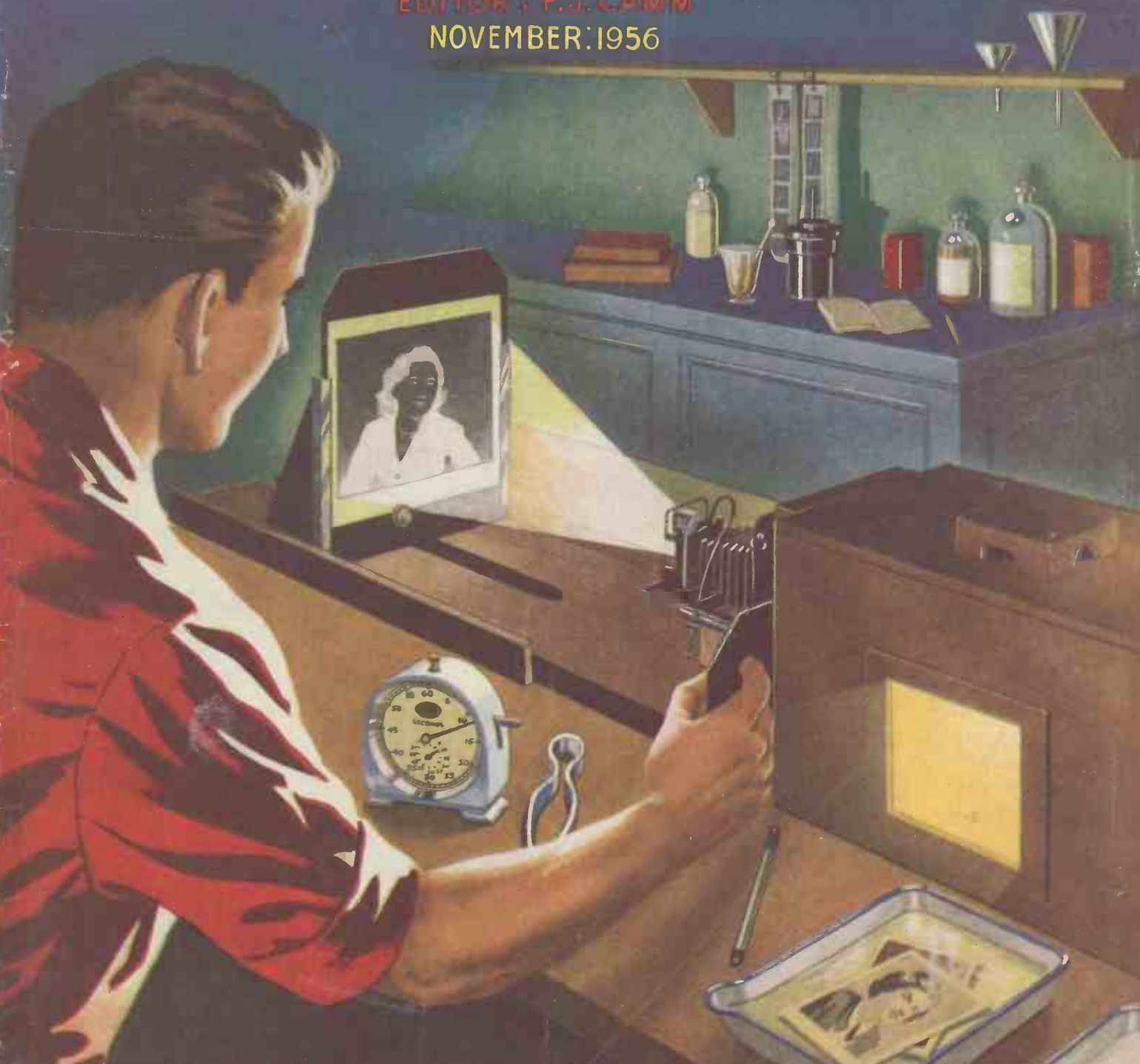
NEWNES

PRACTICAL MECHANICS

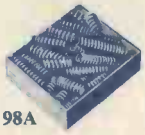
1/3

EDITOR : F. J. CAMM

NOVEMBER: 1956



No. 760



No. 98A

No. 757

No. 388.

No. 758.

No. 466.

No. 1013.

No. 753.

No. 1024.

No. 760. 3 doz. Assorted Light Compression Springs 1" to 4" long, 22 to 18 S.W.G., ¼" to ½" diam. 6/6. No. 98A. 3 doz. Assorted 1" to 4" long, ½" to ¾" diam., 19G to 15G. 5/6. No. 757. Extra Light Compression, 1 gross Assorted, ¼" to ⅜", ⅛" to 2" long, 27 to 20 S.W.G. 15/-. No. 388. ½ gross Assorted Small Expansion Springs, ½" to 1½", 18G to 21G. 9/6. No. 758. Fine Expansion Springs. 1 gross Assorted ½" to ⅞", ⅛" to 2" long, 27 to 20 S.W.G. 15/-. No. 466. ½ gross Assorted Small Expansion Springs ⅜" to 1¼" long, 3/32" to 3/16" diam., 21G to 24G, 6/6. No. 1013. 1 gross Small Coil Compression Springs, ⅜" to 1½" long, 3/32" to 7/16" diam., 24G to 19G 6/-. No. 753. 3 doz. Assorted Light Expansion ½" to ½" diam., 2" to 6" long, 22 to 18 S.W.G. 10/6. No. 1024. 20 Compression Springs 12" long, ¼" to ½" diam., 24G to 18G, suitable for cutting into shorter lengths; and 30 Expansions 1½" to 12" long, 5/32" to ⅜" diam., 22G to 16G. 24/-.

How are you off for Springs?

TERRY'S BOXES OF ASSORTED SPRINGS are just the job for your experimental department — a wonderful assortment of Compression and Expansion Springs ... all sorts of lengths, gauges, diameters. The nine boxes we show are just a few from our range. Why not let us send you a full list — free?

TERRY'S

ASSORTED SPRINGS

The prices quoted are subject to the usual trade discount.

HERBERT TERRY & SONS LTD.
REDDITCH, WORCS.

SPRING MAKERS FOR 100 YEARS

These Boxes of Springs can also be obtained at :
LONDON
27 Holborn Viaduct
MANCHESTER
279 Deansgate
BIRMINGHAM
210 Corporation Street

HT176(R)

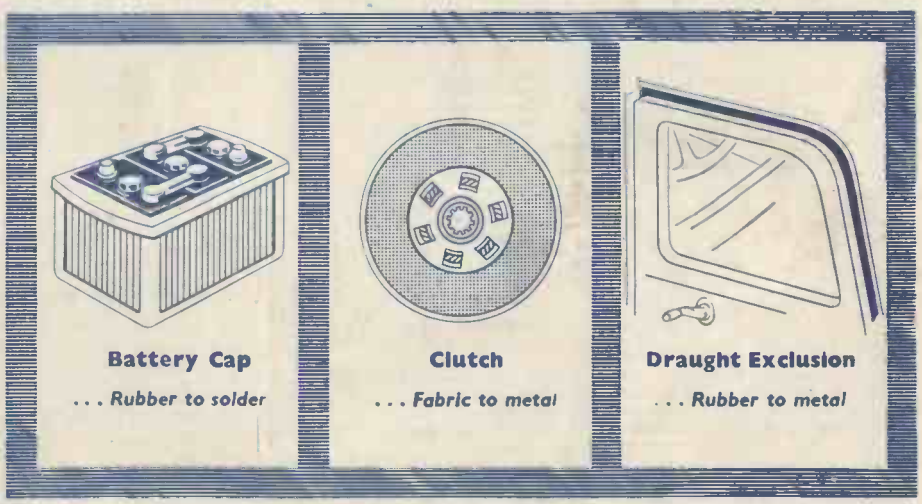
How to stick anything to anything . . .

Use quick-setting, easy-to-apply Pliobond, the new thermoplastic adhesive that sticks anything to anything permanently.

Whatever material you're using — wood, metal, plastic, fabric, rubber, leather, glass, paper, plaster or ceramics — Pliobond will join them to one another and to themselves.

And the resulting permanent yet flexible bonds are highly resistant to water, oils, greases and chemicals. Bond strength improves with age.

Supplied ready to use in tubes, bottles (with a handy brush in the lid) and tins, Pliobond is obtainable from ironmongers and garages. Use Pliobond for every sticking job.



Battery Cap
. . . Rubber to solder

Clutch
. . . Fabric to metal

Draught Exclusion
. . . Rubber to metal

USE *Pliobond*

Reg'd. Trade Mark

A GOODYEAR PRODUCT OBTAINABLE FROM GARAGES AND IRONMONGERS

"CHIMELITE"

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

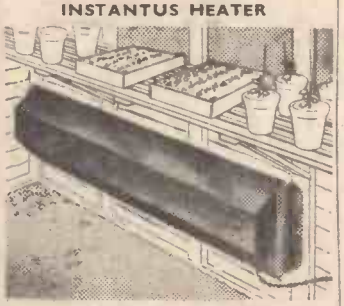
MAINS-MINI

Uses high-efficiency coils — covers long and medium wavebands and fits into the neat white or brown bakelite cabinet —limited quantity only. All the parts, including cabinet, valves, in fact, everything, £4.10.0, plus 3/6 post. Constructional data free with the parts, or available separately 1/6.

CONNECTING WIRE

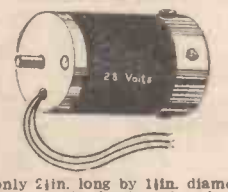
P.V.C. covered in 100ft. coils—2/9 a coil or four coils different colours, 10/-, post free.

INSTANTUS HEATER



Practical Convector heater, of 1kW. rating, 4ft. long, made from heavy gauge sheet steel (galvanised). Can be used for any size house, up to three heaters can be controlled by one thermostat. Price, £2.10.0 or with thermostat £4.5.0, carriage 5/-. Write for Horticultural list.

MINIATURE MOTOR



Size only 2¼in. long by 1¼in. diameter—American made—laminated poles and armature—intended for 28-volt D.C. but O.K. on lower D.C. voltages and A.C. mains, through step-down transformer —price 10/6, post, etc., 2/-.

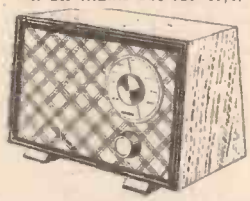
CLOCK CASE

Also suitable for barometer or other instrument. Nicely polished. Price 4/6, post and packing 1/6. Clock numerals to suit these cases etched on metal, 2/6.

ELECTRIC BLANKET WIRE

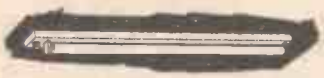
Waterproof P.V.C. covered, so blanket washable. 16¼ ohms per foot—1/6 per yard. 14 yards, ideal for average blanket, £1 post free.

THE SKYSEARCHER
An all mains set for 19/6.



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

THE REALITE



This is a complete fluorescent fitting, stove enamelled white, with starter and ballast all ready to install. Price 25/-, plus 4/6 carriage and packing. 40-watt tube, 10/-, no extra for packing if ordered with fitting.

BABY ALARM

Unlike most baby alarms, this not only enables you to hear baby but also to talk to him. Price complete with one microphone and 100ft. twin flex, £6.19.6, carriage 3/6, additional microphone, 19/6.

DON'T BE CAUGHT LIKE THIS

CAR STARTER CHARGER KIT

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

Mains transformer	19/6
5-amp. rectifier	17/6
Regulator Stud Switch	3/6
Resistance Wire	2/-
Resistance Former	2/6
Mains on/off Switch	1/-
0-5 amp. Moving Coil Meter	9/6
Constructional Data	1/6

or if bought all together price is 52/6, plus 2/- post and packing.

MULTI-METER KIT

Parts suitable for making a multi-meter to measure volts, milliamps and ohms. Kit containing all the essential items including moving-coil meter, resistors, range selector, calibrated scale, etc., etc., is only 15/-, plus 1/- post and packing.

12in. TV. CABINET—15/-

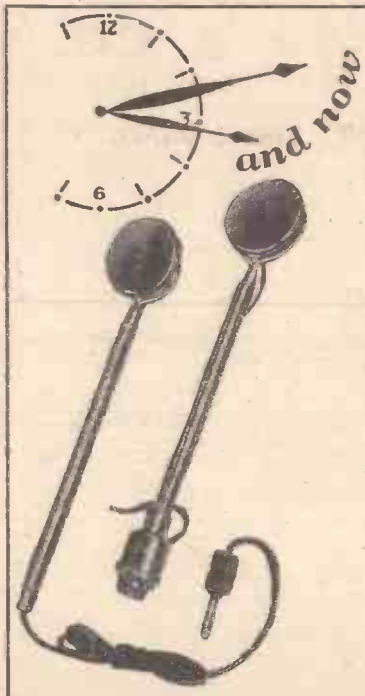
We are offering these at less than the cost of the plywood they contain. If not wanted for TV. many useful items can be made — record storage cabinet, H.F. loudspeaker case, book case, etc., etc. Price 15/-, carriage 3/6.

ELECTRONIC PRECISION EQUIPMENT LTD.

Post orders should be addressed to Dept. N, Sutton Road, Eastbourne.

Personal shoppers, however, please call at :

42-46, Windmill Hill, Ruislip, Middx.	152-3, Fleet Street, E.C.4.	29, Stroud Green Rd., Finsbury Park, N.4.	249, High Rd., Kilburn.
Phone : RUISLIP 5780	Phone : FLEet 2833	Phone : ARChway 1049	Phone : MAIda Vale 4921
Half day, Wednesday.	Half day, Saturday.	Half day, Thursday.	Half day, Thursday.



S.G.Brown AUDIO AIDS

Handphones with individual volume control. Ideal for use with church and cinema deaf aid installations or for individuals with impaired hearing. They provide the essential clarity of reception when listening to Radio and T.V.

Send for Brochure 'P' of all types available. If desired, advice is given on selection of type most suited to individual needs.

S. G. Brown provide Headphones and associated equipment for all known purposes.

S.G.Brown, Ltd.

SHAKESPEARE STREET, WATFORD, HERTS.

Telephone : Watford 7241.

(5)

Hobbies KITS MAKE DAD A HERO!

There's something lasting about a toy made from a Hobbies Kit. Besides being cheaper than a similar article bought in shops, a much stronger job can be made by the average handyman. Illustrated are two examples from a wide range which will last for years — and years—and years.

89/6

FOR A GIRL

Tudor Doll's House. 2ft. wide, 2ft. high. Kit includes all metal doors, windows, fireplaces, etc. 89/6

39/11

FOR A BOY

Modern Garage and Service Station. Base measures 24ins. x 18ins. Kit includes petrol pumps, 39/11.

Hundreds of kits detailed in **HOBBIES 1957 HANDBOOK**

152 pages, splendid articles. A "must" for all handymen.

From branches, stockists, etc., or post free. Ask for free 20-page booklet on Hobbies.

START RIGHT AWAY!

To Hobbies, Ltd., Dept. 072, Dereham, Norfolk.

Please send free 20-page booklet and items marked thus X.

- ☐ Garage Kit No. 3129, 39/11
- ☐ Tudor Doll's House Kit No. 237 Spcl., 89/6
- ☐ 1957 Handbook 2/3 (all post free).

Name .....

Address .....

.....

——FROM E.M.I. INSTITUTES

BROCHURE ON THE LATEST METHODS OF HOME TRAINING

CAREERS — HOBBIES — NEW INTERESTS

PRIVATE AND INDIVIDUAL TUITION IN YOUR OWN HOME

Over 150 Courses including :—

Accountancy
Advertising
Automobile Eng.
Banking
Book-keeping
Building
Business Management
Carpentry
Chemistry
Civil Service
Commercial Subjects
Commercial Art & Drawing
Customs & Excise Officer
Draughtsmanship
Economics
Electrical Engineering
Electrical Installations
Electronics
Engineering Drawing
Heating & Ventilation Engineering
High Speed Oil Engines
Industrial Admin.
Jig & Tool Design
Journalism
Languages
Marine Engineering
Mathematics
M.C.A. Licences
Mechanical Eng.
Metallurgy
Motor Engineering
Photography
P.M.G. Licences
Police
Production Eng.
Production Planning
Radar
Radio Amateurs Certificate
Radio & Television Servicing
Radio Engineering
Refrigeration
Retail Shop Management
Salesmanship
Secretaryship
Shorthand & Typing
Short Story Writing
Short Wave Radio
Sound Recording
Telecommunications
Television
Time & Motion Study
Tracing
Welding
Workshop Practice
Works Management
and many others.

Also courses for University Degrees, General Certificate of Education, B.Sc.Eng., A.M.I.Mech.E., I.I.O.B., A.C.C.A., A.C.I.S., A.M.Brit.I.R.E., A.M.I.I.A., A.F.R.Ae.S., A.M.I.M.I., A.C.W.A., A.M.I.E.D., City & Guilds Examinations, R.S.A. Certificates, R.T.E.B. Serv. Cert., etc.

OUR BACKGROUND!

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

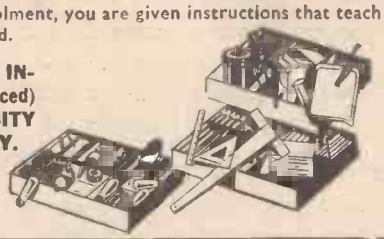
The only Home Study College operated by a world-wide manufacturing organisation

NEW! LEARN THE PRACTICAL WAY HOME COURSES — WITH EQUIPMENT

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.

With these outfits, which you receive upon enrolment, you are given instructions that teach you the basic principles in the subject concerned.

COURSES WITH PRACTICAL EQUIPMENT INCLUDE: RADIO (Elementary and Advanced) TELEVISION · MECHANICS · ELECTRICITY CHEMISTRY · PHOTOGRAPHY · CARPENTRY. Also Draughtsmanship · Commercial Art Amateur S.W. Radio Languages.



Courses from 15/- per month

EMI INSTITUTES

An Educational Establishment associated with the E.M.I. group of Companies including 'HIS MASTER'S VOICE', MARCONIPHONE, etc.

POST THIS COUPON TODAY

Please send without obligation your FREE brochure.
E.M.I. INSTITUTES, Dept. 144, 43 Grove Park Road, London, W.4.

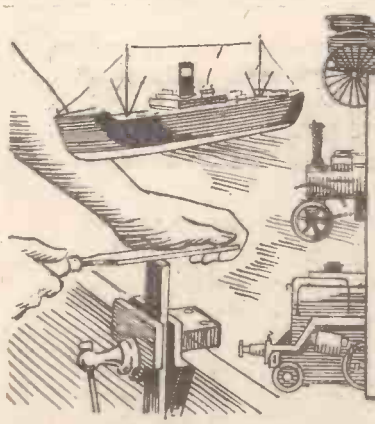
NAME..... [BLOCK CAPS PLEASE]

ADDRESS.....

.....

SUBJECT(S) OF INTEREST.....

NOVEMBER (We shall not worry you with personal visits) LC.75



Practical Mechanics

Vol. XXIV. No. 273 NOVEMBER, 1956

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

FAIR COMMENT *by the Editor*

Dangers of Static Electricity

NEARLY every kind of movement is accompanied by the generation of static electricity, and if conditions allow the charges to accumulate, there is a danger of their discharging in the form of a spark. Whitworth first demonstrated the existence of static electricity caused by steam escaping from road locomotives. There had been many cases of drivers suffering from shock. As a result a steel chain was connected to road locomotives and allowed to trail along the ground to earth the static electricity, which can be dangerous, for sparks from it may be sufficient to ignite flammable vapours, gases or dust and they present a considerable fire risk in many industrial processes. Static is caused by the disturbance of the surface electron structure arising from dissimilar molecular forces, liberated by the mutual contact and separation of the material involved and this appears in the form of equal charges of opposite polarity. These charges can build up on conducting and non-conducting surfaces alike and the external area affected is the measure of the capacity of the body for holding such charges. Thus, the tendency to retain a charge is dependent on the shape and insulation of the body, on the humidity present in the surrounding atmosphere, and on the proximity of other bodies. An instrument has been developed to indicate the voltage existing from any source of electrification and this instrument is based on the action of an electrometer valve, the grid of which is excited by the static; a simple indication of the presence of static electricity can often by obtained by the glow on a neon tube, held in the suspected area. The precaution, of course, is to ensure that all metal work is bonded together and earthed, as it is on an aeroplane, and any other metal work in the vicinity should also be earthed to prevent it being charged by induction. Risk of fire from this cause is most pronounced in such processes as dry cleaning, paint spraying and certain processes which involve the use of flammable liquids, while the manufacture of flammable dusts, such as magnesium and aluminium, is accompanied by risk of explosion.

People generate static electricity when moving about in their everyday jobs, and in a suitable environment the charges may build up to a dangerous level if the person is insulated from the ground by means of non-conducting rubber or leather soles.

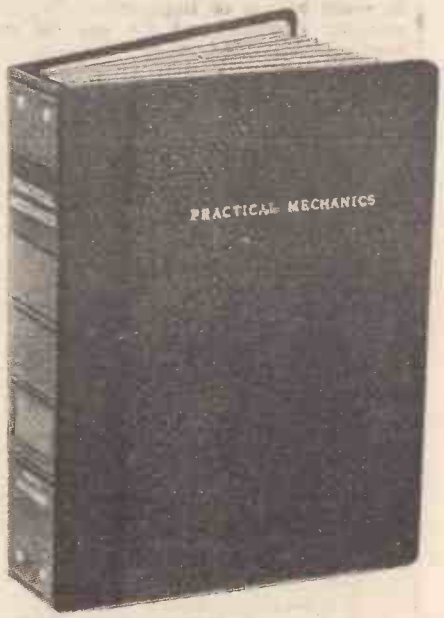
The Late E. W. Twining and Prof. A. M. Low

I GREATLY regret to record the deaths of two of our esteemed contributors since the last issue of this journal went to press—E. W. Twining and Prof. A. M. Low. Both had distinguished careers in their respective spheres and both were versatile. E. W. Twining had a sound knowledge of engineering, both mechanical and electrical, and science, and he was a keen model maker. He started his career as a telephone engineer with a company which later became the National Telephone Co. and finally became assistant engineer for underground railway construction. He was a fine artist, was an expert on stained glass windows, which he designed and made, and his pictures were hung at most of the exhibitions. He was an enthusiastic model maker, particularly of locomotives, but followed other hobbies, including model aeroplanes, photography and astronomy.

Prof. A. M. Low, on the other hand, was interested more in science and invention than in practical application. He had large numbers of inventions to his name and had been keenly associated for many years with the Institute of Patentees. He constructed the very first experimental radio-controlled guided missile, produced the audiometer for photographing sound and was well known as a lecturer on a wide variety of subjects.

Self-Binders for "Practical Mechanics"

AS a service to our readers we have arranged for self-binders to be supplied in which they may preserve the copies of this journal. Copies can be inserted as received, and you do not therefore have to wait for the completion



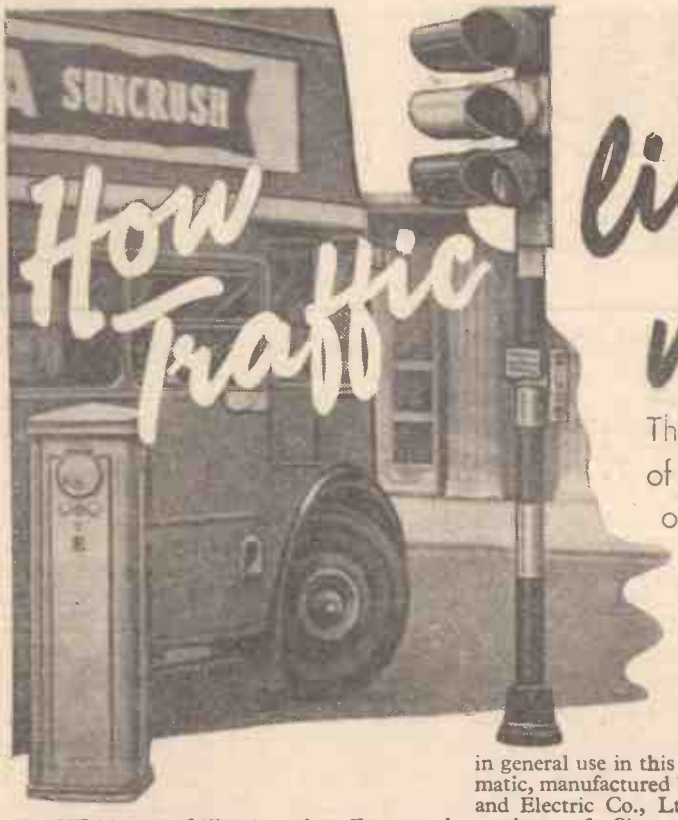
of the volume. You secure the same all-time protection as with ordinary binding. The self-binders are in black waterproof and greaseproof cloth, attractively lettered in gold. This system avoids copies becoming damaged or mislaid. The Easibinder opens flat at any page of any separate edition and gives quick reference facilities. When the volume is complete our annual index, published at 1s. 3d., should be inserted.

They cost 11s. 0d., post free. Orders should be sent to the Publisher (Binding Dept.), Geo. Newnes Ltd., Tower House, Southampton St., Strand, W.C.2.—F.J.C.

SUBSCRIPTION RATES
including postage for one year

Inland	18s. 6d.	per annum.
Overseas	17s.	per annum.
Canada	17s.	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.



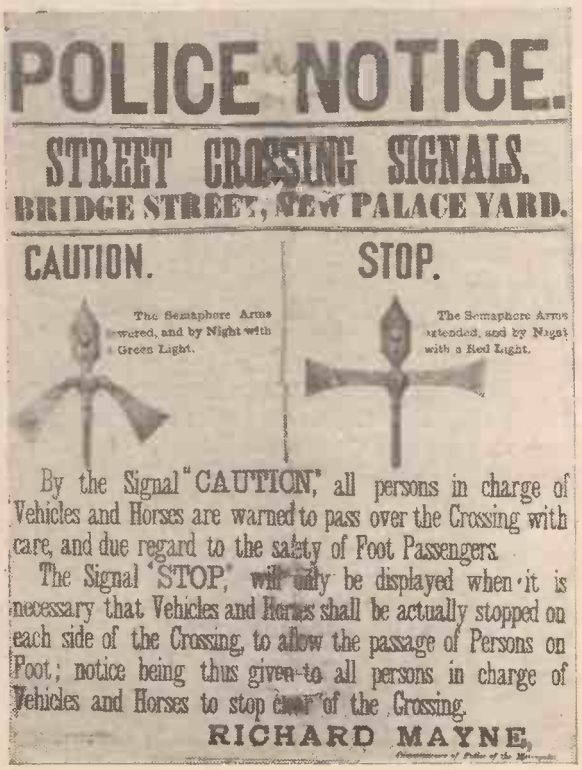
How traffic lights work

The Basic Principles of this Efficient Form of Traffic Control

By R. W. LARKMAN

THE history of illuminated traffic control signals in Britain seems to go back almost a century, for it is on record that as long ago as 1868 a signal involving semaphore arms and a two-colour gas lantern was erected at Bridge Street, New Palace Yard, in London. It was operated by a policeman, and the old poster shown in Fig. 1 gives an idea of its appearance.

How effective it might eventually have proved is a matter for conjecture, because after a little more than a week the contraption blew up and was never re-erected, although semaphore signals were used some years later at Brighton and one or two other places.



POLICE NOTICE.

STREET CROSSING SIGNALS.

BRIDGE STREET, NEW PALACE YARD.

CAUTION.

The Semaphore Arms lowered, and by Night with a Green Light.

STOP.

The Semaphore Arms extended, and by Night with a Red Light.

By the Signal "CAUTION," all persons in charge of Vehicles and Horses are warned to pass over the Crossing with care, and due regard to the safety of Foot Passengers.

The Signal "STOP," will only be displayed when it is necessary that Vehicles and Horses shall be actually stopped on each side of the Crossing, to allow the passage of Persons on Foot; notice being thus given to all persons in charge of Vehicles and Horses to stop clear of the Crossing.

RICHARD MAYNE,

Commissioner of Police of the Metropolis

Fig. 1 (Left).—The signal shown in this notice was erected in 1868 and lasted only a week.

Automatic signals play a vital part in keeping Britain's traffic moving in spite of completely inadequate roads and congested towns. Correctly set, they are an appreciable improvement on the point-duty policeman in efficiency.

Both the Electro-matic and the Autoflex systems, though differing in technical detail, operate on similar principles. Each consists of three main parts—the detector pads in the road, the control box—the brain of the system—and the signal heads themselves. A Siemens' Autoflex control box is shown in Fig. 3.

Basically, the modern vehicle-actuated system is designed to give right of way in turn to each phase or separate flow of traffic that demands it, for a period that is determined by the number of vehicles passing over the pneumatic detector pads, but which is subject to a minimum and a maximum time pre-set on the controller. The minimum can be anything from two to sixteen seconds, the maximum from five to fifty seconds.

The Function of the Detector Pad

The object of the detector pad in the road is not, as some people still suppose, to change

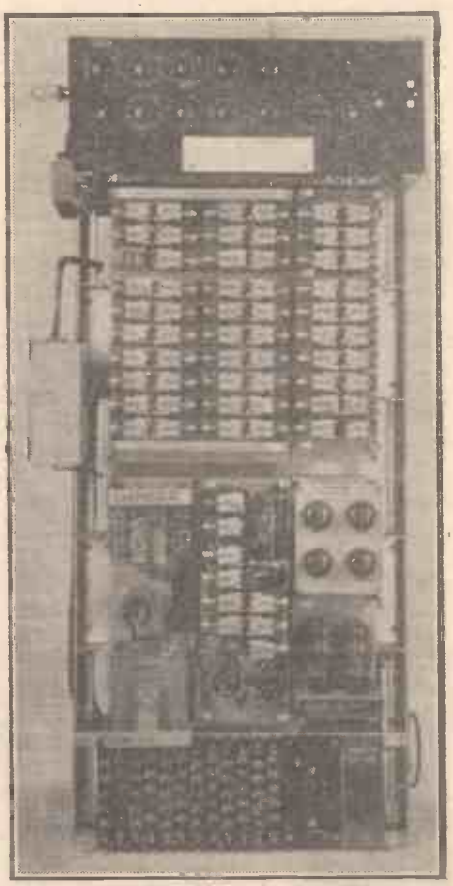


Fig. 3.—The interior of a Siemens' Autoflex control box.

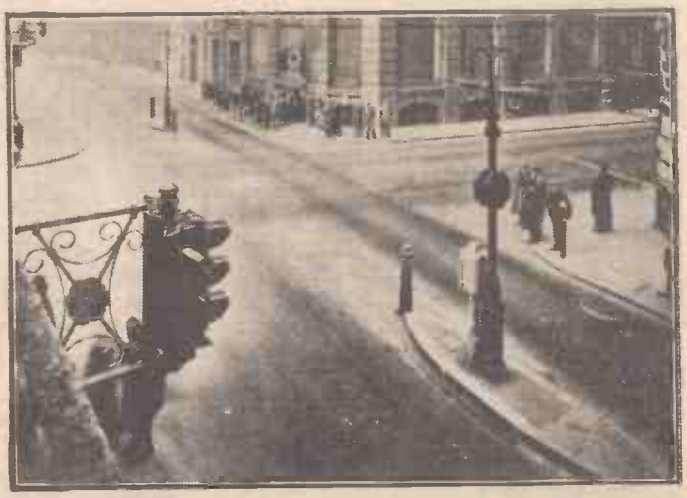


Fig. 2.—The first vehicle-actuated signal erected at the junction of Cornhill and Bishopsgate. The small crowd gathered to watch it in operation. Installation in 1932 was by Automatic Telephone and Electric Co., Ltd.

Fig. 5.—A junction of six roads at Swiss Cottage, Hampstead, where an Autoflex installation smoothly handles heavy traffic.

the signals from red to green. Its function is simply to "register a demand," and it seems a little hard that the fury of errand boys who stamp repeatedly on the detector pad in an effort to make the lights change and the impatience of other road users should be directed at what is the most reliable component of an extremely reliable system.

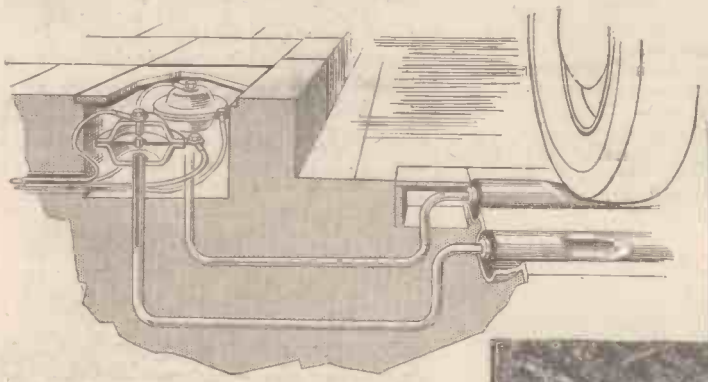


Fig. 4.—Diagrammatic layout of a vehicle-actuated system.

Contrary to popular belief, there are no electrical contacts under the pads, which are simply rubber tubes full of air. Under pressure they send a small air-pulse to a contact box at the kerbside, from where an electrical impulse is transmitted to the controller. This is shown diagrammatically in Fig. 4. The modern detector is so sensitive that it can literally be operated by the pressure of a finger-tip.

Nevertheless, jumping up and down on it will not achieve very much. Piling up the demands in this way will not produce a green signal any quicker. All it will do is to increase the length of the green period when it comes, which is of no advantage to the jumper.

In any case, detector pads are uni-directional in operation and need jumping on in the right way. In modern detectors there are two separate tubes visible in the road. In older types, these two tubes are enclosed under one rather wider pad, though they operate in the same way. It is the first tube that registers the demand. The second one, in effect, puts the detector out of operation for a fraction of a second, so that a vehicle running over the detector in the wrong direction (that is, having just crossed the intersection on the wrong side of the road) registers no demand.

The System in Practice

How the whole system operates can be seen by a consideration of a simple intersection of two roads, "A" and "B." A vehicle approaching on road A will register a demand as soon as it crosses the detector. If there is no traffic on road B it will immediately get the red-and-amber (the amber warning period in Great Britain is standardised at three seconds), followed by the green. The green signal will show for whatever minimum period has been set on the controller, even though opposing traffic has meanwhile registered a demand on road B; and if, before that minimum has expired, further traffic approaches on road A, then the green signal will be extended, if necessary, up to the maximum set on the controller.

This, of course, is an ultra-simple case. In practice all sorts of complications arise—slow-moving traffic from one direction which cannot clear the cross-roads before the opposing phase is given the green; a preponderance of traffic from another road which turns right, across the path of vehicles coming in the opposite direction; heavy pedestrian traffic requiring push-button detectors and a phase all to itself; and so on. The control box, however, has a good many tricks up its sleeve and can be set to cope with all these problems and many more besides. Even in our choked, ill-planned cities, there has yet to be found an intersection so complicated that signals cannot deal with it. The complex intersection at the Bank in the City of London (Fig. 6), where no fewer than seven busy streets meet, is a well-known example. In this case the traffic is dealt with in four phases by an Electro-matic system. The intersection at Swiss Cottage, shown in Fig. 5, where an Autoflex system copes with

Fig. 6.—The "Bank Complex" in the City of London, where traffic from seven busy thoroughfares converges. It is controlled by an Electro-matic installation. (Photo: Aero Films.)

traffic at the junction of six roads, is almost as familiar to road users.

Even more complicated is the installation in Oxford Street, which replaced a fixed time-cycle system at the end of 1953. The new system incorporates a master controller and a traffic integrator, which records changes in traffic density and periodically changes the "programme" of the individual controllers at each intersection. These controllers are interlinked through the master controller so that—in the absence of unpredictable delays—a vehicle entering Oxford Street from either end obtains a clear run through the successive sets of signals at an average speed of about 12 m.p.h.

Whatever the traffic problem, therefore, it can be solved by a carefully-planned installation and intelligent setting of the controller, which can also, at will, be switched over to hand-control for use by the police, or to a fixed time cycle.

Setting the Signals

Normally a careful traffic census is taken before traffic signals are installed. The initial "programme" of the controller is set accordingly, and adjusted later, if necessary, after a period of observation by the police and representatives of the Ministry of Transport and the local authority.

After that, control of traffic at that intersection, which may, for years past, have kept two or three policemen occupied all day, can safely be left to the little box of tricks that clicks away on the pavement and handles the most complex situations with an efficiency that (ill-informed criticism apart) has earned the praise and approval of motorists not only in Britain, but the world over.

(Reprinted by kind permission of the Editor of "The Vauxhall Motorist.")

Science and Observation

Notes of Interest on Current Progress

At the Dogs

ELECTRICALLY controlled hares chased by dogs are not, in my opinion, a very civilised form of amusement. Nor do I like the fact that live rabbits are sometimes chased by the dogs in order to help their owners to gamble effectively.

So important is it to obtain accuracy at the finishing point, when thousands of pounds are depending upon the childish result, that many tracks have installed photo-cameras. The human eye is not sufficiently quick to settle whether "Flying Fish" won by half a nose from "Creeping Jenny."

An amusing point is introduced. How much accuracy can we stand? I might, for instance, take a photo-finish film and magnify it 20 times only to see that a different nose was distinctly in the lead!

I remember once saying that if I thumped a table in London the shock, greatly reduced, would be felt in Australia. You can easily think of many examples of these infinitesimal effects, and you come to the conclusion that in all sport and many instances of daily life, too much accuracy would be an infernal nuisance. No doubt our descendants will find many snags of this nature and look upon us as being very crude—as we are!

The Machine Wins

NOUGHTS and crosses is a very old game, and a young scientist has now invented a machine which can play. But it always wins, and the inventor has incorporated a special switch which makes the machine not quite so clever and gives the human player a chance.

The machine is partly electronic. Each space is classified in order of strategic desirability and another circuit investigates these classes until it finds a square. If the human player tries to take two squares at once the machine refuses to operate.

If the human player tries to take an occupied square the machine cuts him off, and if one attempts to sneak in quickly the machine has meantime switched off while it is calculating its move. One hopes soon to be able to sleep soundly while the machine plays chess, billiards, poker or snap, waking up in time to hear the robot remark, "Please collect your winnings!"

Queer Things, Eyes

YOUR eyes have millions of tiny nerve endings at the back, some of which see colour better than those which are more sensitive to form. The sides of the eye are generally most sensitive to light, and that is why you can see the clock in a twilit room by not looking straight at the dial. Each colour of the rainbow dwells in the eye for a different period. All light takes time to die away in the eye and it is this "fault" which makes the cinema and TV practicable. If you spin the right kind of black and white drawing slowly on a pin, some of the colour nerves are affected. Try cutting out the disc in Fig. 1, sticking it on a card and then spinning it slowly in a bright light. You will be surprised at what you see.

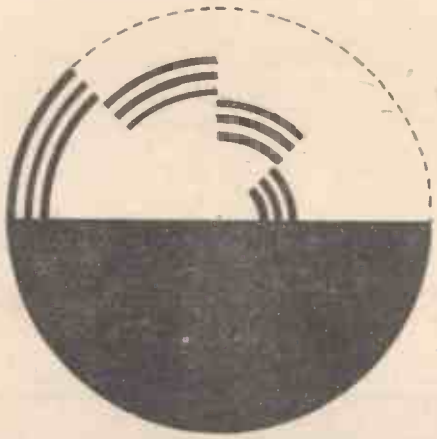


Fig. 1.—Disc for cutting out.

Metal Detectors

THE instruments sometimes used to detect the presence of hidden metals are often little more than sensitive wireless receivers. A broadcast set will sometimes buzz if you put your hand close to it. This is because the capacity of various parts is altered by the presence of an electrical conductor such as your hand. A very sensitive apparatus made on this principle will detect the nail of a boot several inches below the ground without any difficulty.

Another detector which actually picks up a reflected radio beam like radar is being used in America to help blind persons to walk without any other guidance. The sound of objects struck by the beam is heard in a pair of headphones worn by the user.

New Clothes

YOU will have heard of Terylene. It is a new plastic now being made in a £10m. factory. It can look like silk or be given a wool-like form. It makes satins, brocades and velvets. Terylene is strong, does not lose creases when wetted, resists heat and moth.

Plastics are wonderful. There are thermo-plastics which can be moulded by heat and thermo-setting plastics which are only soft until heated. Many of them are made by re-arranging the molecule particles which form all substances; the raw materials are simple things like acetylene, coal and various natural oils. Nowadays chemists build up new materials from their particles, arranging the "bricks" until they satisfy some particular demand. It is said that plastics were first discovered when a mouse upset a bottle of formaldehyde over a chemist's luncheon cheese. Plastic threads are squirted out of fine holes and the solidifying liquid is then twisted and spun as if it were silk.

Making Germs Strong

ON the subject of bacteriological warfare it has been pointed out that, by combining germs or by strengthening them, defence has become much more difficult.

There is now an enormously valuable lamp on sale which kills germs floating in the air. I believe that this is doubly interesting because the germs may, in time, learn how *not* to be killed, just as other animals in nature have learned how to produce strength. Just as seaweed learned to live on the land and became vegetation.

Have you observed that measles, which used not to keep a child away from school 60 years ago, is now quite an unpleasant disease and that smallpox, which was very dangerous, has now weakened in virulence?

I expect all kinds of new diseases will appear from time to time, and that is one reason why the germ content of the world does not fall away and why, in actual fact, they are very nearly the conquerors of mankind.

Be An Artist

HERE is a way in which you can demonstrate the reflection or absorption of light and at the same time achieve the reputation of being an excellent cartoonist at a party.

Arrange on a blackboard a pile of cheap, thin paper so that you can tear off each drawing as completed; obtain a few sticks of charcoal and two eggs, and you are ready.

Before the "show" prepare a weak solution of white of egg, and on each sheet of paper draw lightly the outline of what you wish finally to picture when the audience is present.

Now arrange the lighting at the side of the stage or room, so that as you stand in front of the drawing board the light from the lamps reflects from the slightly glossy surface of the white of egg. It strikes the paper at a different angle so far as the audience is concerned, the light being absorbed so that only you can readily see the outline.

All you have to do is rush up to the blackboard carrying the paper and dash off a few beautiful drawings of well-known people and an occasional scene, all of which, of course, will have been prepared carefully by you beforehand.

For Authors

IN the old days of motoring the hero used always to "throw in" the clutch. I think that authors ought to be more careful with their technical, medical and local colour. I have just read a book in which a boy moulds a piece of lead into a bullet with his fingers. The lead was soft as putty because it had not yet cooled. I am sorry for the boy.

Silver, by the way, has an interesting property called "spitting." Just before it solidifies, when molten, the occluded air escapes and it does seem to spit at you.

The Technique of Soft Soldering

By W. GROOME

Some Notes on Theory and Practice

SOFT soldering provides an easy method of uniting metals in the making and repair of domestic articles. The range of jobs is so varied, the scope so great, that a mere list of rules is hardly likely to be sufficiently adaptable. Instead, the following is a simple description of the action of the process.

Soldering is not just a way of "sticking" metals together; it is a union so complete that the molten solder penetrates the surface of the metal to molecular depth and merges with it as an alloy. The formation of this very thin layer of "intermetal," upon which the success of every joint depends, can take place only in conditions of chemical cleanliness and correct heating. Given these conditions the solder "wets" the metal (literally), spreads as a damp patch and penetrates into it.

Chemical cleanliness means not only the absence of dirt and grease, but freedom from the oxide layer that forms on the surface of metal exposed to the air. Solder cannot penetrate this barrier. Scraping the metal, although necessary for the removal of dirt, will not take care of the oxide because it forms very rapidly, particularly when heat is applied—a "flux" is necessary. This is a substance that can remove the oxide by chemical action or by dissolving it. The activated resin used in cored solder combines both actions and has the advantage that its residue is hard, dry and non-corrosive. This is a very convenient form of flux and solder for electrical work and, in fact, for most work in the "easy" metals such as brass, copper and tinplate, and surfaces that have been electro-plated with zinc, tin or silver. Suitable fluxes are available for use with solid solder, in the form of liquids and pastes, and can be used for most metals except aluminium. Among cored solders the recently introduced "Arax" brand contains a flux suitable for the difficult metals, again with the exception of aluminium, which stands out as the one that cannot be soldered under home conditions. Home-made "killed spirit" should not be used in any circumstances: its corrosive action continues long after the joint has been made and can result in eventual failure.

The Application of Heat

This is sometimes misunderstood by beginners, who at first imagine that molten solder will adhere to cold metal like glue. It will not. The alloying process (the formation of intermetal) requires that the work be heated to the same temperature as the molten solder. In many jobs where the mass of metal is not large, and particularly in the wire-to-wire and wire-to-tag joints that occur so often in radio and electrical work, it is generally sufficient to place the end of the cored solder on the work and then apply the bit to the solder. The instant collapse of the solder brings the bit down on to the work, which becomes heated, with the result that flux and solder flow rapidly into the joint. With a good electrical soldering iron joints of this kind can be made in a few seconds each. This technique, which is clearly illustrated in Fig. 1, is the one most commonly used in household work.

Examination of this photograph reveals another matter of technique, one that is often overlooked. For quick transfer of heat the largest possible area of the bit should be in contact with the work, and with the model shown this is presented by the flat side that tapers towards the point. With the bit used in this manner, heating is rapid, and the iron inclines at an angle that is quite comfortable for the user. The point of the bit can be usefully employed, however, when the solder has to be directed into a nick or groove, or when the joint presents an angle, as shown in Fig. 2.

When the mass of the work is large much solder would be wasted if it were melted from the first application of the iron, because of the longer time required to heat the work. In such a case the hot bit is applied to the work first and the solder is withheld until the heat has spread to the surrounding metal. The solder is then slipped under the bit. For a long joint the bit is moved slowly along, preheating the metal ahead of it; if solder is fed in front of it the iron will "chase" it along the work This is the tinman's technique.

Fig. 2.—Using the point of the bit to direct solder into an angled joint.

Never dab solder on to the hot bit and attempt to transfer it to the work. Most of it would drip off wastefully, and it is a painful experience to receive such a splash on the bare skin. The flux of a cored solder would be destroyed on the bit before it reached the work.

The Soldering Iron

Having established the basic conditions necessary for good soldering so far as the work is concerned, let us consider the iron. As its copper bit is subject to the action of heat and air the problem of oxidisation again arises. An oxidised bit cannot transfer its heat efficiently, nor can it direct the flow of solder. Flux alone cannot take care of the problem because its useful life in constant heat is too short, but a coating of solder can serve as a barrier between the air and the bit. "Tinning" the bit is a simple job which should be done whenever it shows signs of becoming discoloured. The whole of the tapered portion must be cleaned up bright, and if pitted by previous neglect it may have to be filed to make the surface even. Heat the bit and apply flux and solder to the cleaned portion. The solder will spread and give the bit a wet, glistening appearance. As the bare copper oxidises while heating up, the writer finds it helpful to keep it fluxed with paste all through the period until it is ready to receive the solder, rather than expect the flux to tackle the heavy oxide layer formed during the four or five minutes' wait. Other workers, however, withhold the flux until the iron is at melting temperature, and seem to tin successfully. Indeed, there is no alternative when tinning with cored solder.

From time to time the bit will collect from the work an accumulation of spent flux, oxide and denatured solder in the form of a scum, which should be removed by wiping the hot surface with clean rag, leaving it bright as before. This, and an occasional dab with the

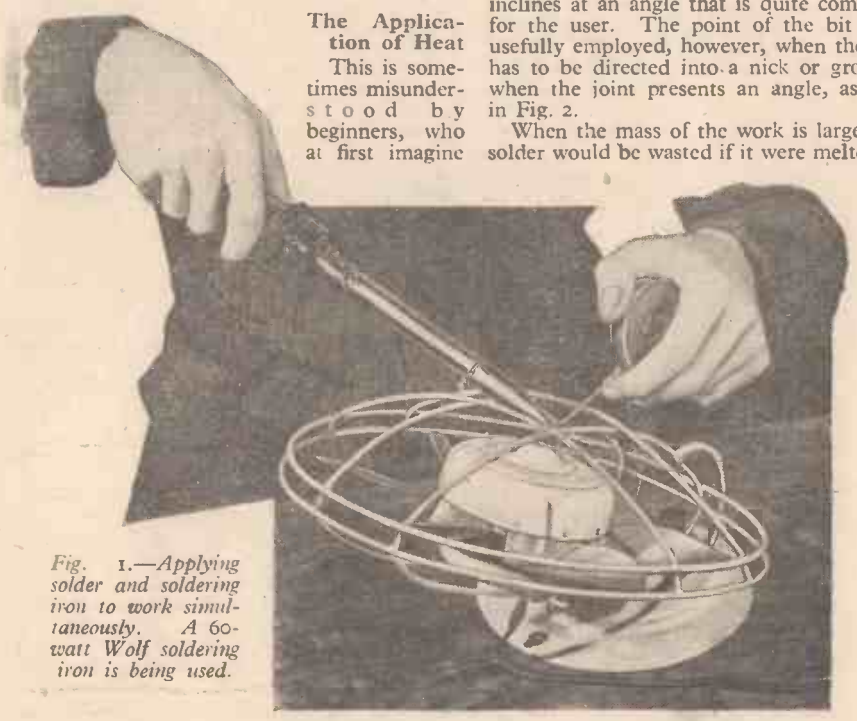


Fig. 1.—Applying solder and soldering iron to work simultaneously. A 60-watt Wolf soldering iron is being used.

solder to maintain the tinning, will keep the bit clean and silvery looking indefinitely, unless the iron becomes overheated.

With the modern electric soldering iron overheating occurs only when it is left switched on for long periods and unused, with nothing to absorb the necessary excess heat that is normally conducted into the work. To prevent the temperature from rising to a damaging level during idle periods lay the bit against a metal surface so that the heat may be dissipated harmlessly. Failure to take this precaution will cause the bit to become burnt, heavily oxidised and pitted. In the worst case the element may be destroyed.

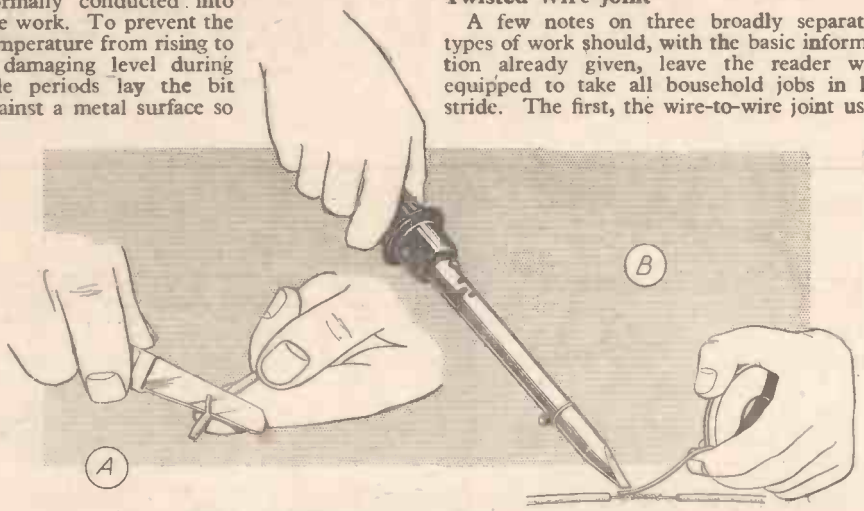


Fig. 3.—Two stages in making an electrical joint.

Underheating of the work is rarely the fault of the iron. Sometimes it is due to the operator's haste in attempting to use it before it has heated up sufficiently or it can be the result of advancing the bit along the work so quickly that heat cannot be transferred. A soldering iron that is too small for the mass of metal being treated will make the work difficult or impossible. The 25 watt instrument type, so useful to the radio man and others whose work is small and intricate, cannot be expected to deal with the larger domestic jobs. The 60-watt models illustrated in this article are capable of dealing with practically all household work. Weighing only 7½ ozs., they can be handled for long periods without fatigue, and although small enough to be manipulated in cramped spaces they have sufficient heating capacity to meet all normal demands.

When underheating does occur, the solder may melt partially to a pasty, plastic state; it cannot wet the metal and make a good joint. It will cool to a rough-textured, dull and lumpy deposit that will merely cling, whereas that which is melted properly flows like water, seeps into joints and cools with a bright smooth finish. The appearance of good soldering is unmistakable.

Once the necessity of cleanliness and correct heating is understood in relation to both the work and the soldering iron the knowledge can be applied to almost any class of work. Aluminium, pewter, chromium plated articles and certain kinds of iron cannot be soldered. By a suitable choice of flux, in which the advertisements in this journal will be found to be helpful, most other common metals can be soldered.

Twisted Wire Joint

A few notes on three broadly separated types of work should, with the basic information already given, leave the reader well equipped to take all household jobs in his stride. The first, the wire-to-wire joint used in electrical and radio work, is illustrated in Fig. 3. One sometimes sees this kind of joint made without solder, but the mere twisting of wires one upon the other is a most unsatisfactory method, and is positively dangerous at mains voltage. All mains wires should lead from point to point without breaks, tappings or joints. That, however, is a matter for the worker to decide in the planning of his job; here we are concerned with the making of good wire-to-wire joints where permissible in the regulations and in the light of good electrical engineering. With solder a wire-to-wire joint is of good conductivity and of greater stability than without it. The writer uses solder to reinforce all connections, including those to tags and screw terminals, the only exception being heating apparatus.

For the joint illustrated the insulation is stripped from the ends of the wires and the copper scraped bright. The bare ends are then twisted together and soldered by the method described already—the solder and the hot bit are applied simultaneously. Prevent movement of the wires until the joint has cooled by firm twisting or by fitting to their tags or terminals before soldering. The writer generally tins both parts before uniting them; this ensures that solder exists even in the hidden surfaces and guarantees good electrical continuity.

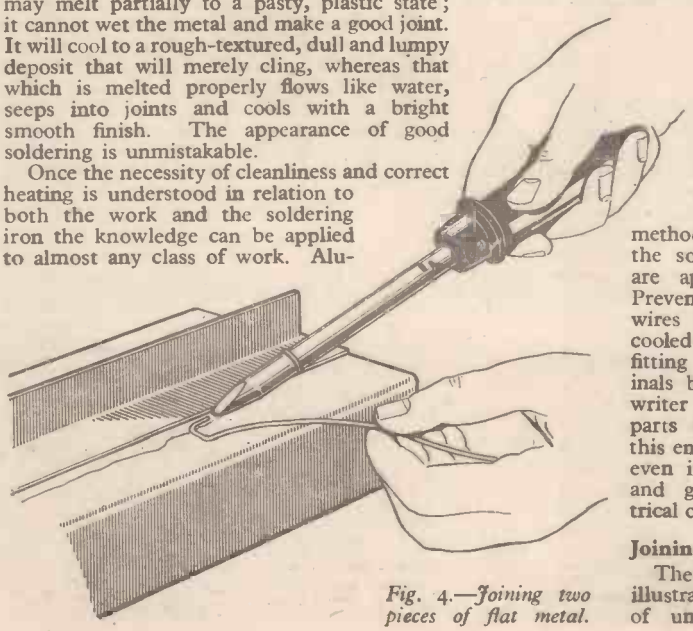


Fig. 4.—Joining two pieces of flat metal.

Joining Sheet Metal

The second type of job, illustrated in Fig. 4, is that of uniting two pieces of metal placed one over the other, such as a seam or patch in sheet metal work. Clean the surfaces and apply flux to them. Place them together so that they cannot move. Heat the seam with the flat side of the bit, then "chase" the solder along the joint. The solder follows the line of clean fluxed metal and disappears into the joint.

In the third example, with wide laps, capillary attraction may not be effective in drawing the solder right into the joint, and there is no visual check. We can ensure the presence of solder by the simple measure of tinning each part separately. Just clean the surfaces and flux them, and "chase" solder over them with the hot bit, leaving a thin and even coating. Bring the two tinned surfaces into close contact and run the bit slowly along the outside face. The heat, conducted through the metal, will melt the solder layers and they will merge in what could be described as a solder-to-solder weld. The bit should be applied, not to the edge of the joint, but along the middle area. In this way the heat is evenly distributed across the width. If the joint is very wide the distribution of heat can be improved by steering the bit in a zigzag course, as shown in Fig. 5.

In the example just given the solder exists on the inner surfaces and the heat to melt it is conducted through the metal from outside. As the outside is not involved in the joint it is correct to say that the application of the hot bit alone is generally sufficient to melt the hidden solder layers and that further solder would be wasted. However, there are circumstances in which this may be well worth while. The greatest transfer of heat depends upon intimate contact between bit and work, a state of affairs that exists only where both are of precision flatness. Generally, the surfaces have a microscopic "hill and dale" texture that reduces the effective contact area considerably. A rapid transfer of heat can be achieved in these conditions by introducing solder under the bit, even though it will contribute nothing to the strength of the joint. The liquid solder fills the troughs in the surfaces and establishes an uninterrupted conductive path for the heat. The increase in heating speed is very noticeable in some jobs.

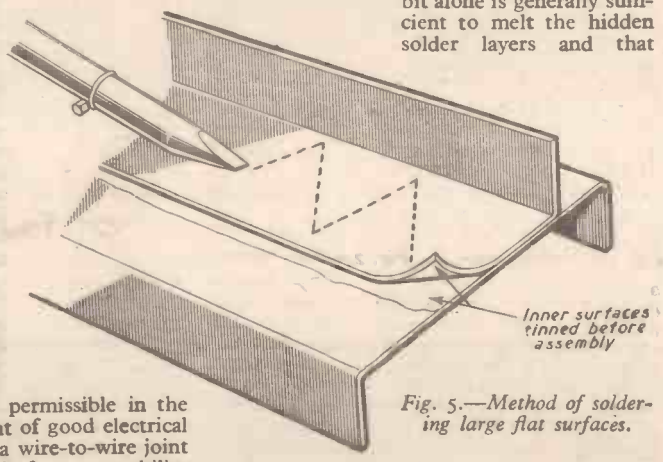
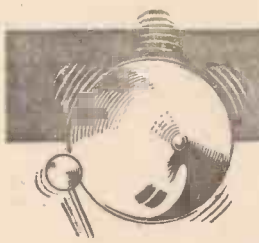
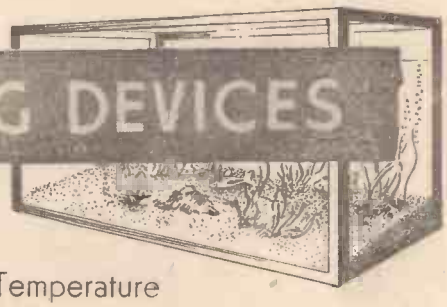


Fig. 5.—Method of soldering large flat surfaces.



AQUARIUM WARNING DEVICES



By P. MAGINNESS

Units Which Give Indication of Any Abnormal Temperature

ONE of the worries of a tropical aquarist is that in the middle of winter a fuse will blow and losses of valuable fish will follow if undetected in time. A simple way in which warning can be given is to wire an electric clock or neon light in the same circuit, one can then tell at a glance whether the current is on or not. This cannot help in the case of heater failure due to the element burning out, or in the event of the thermostat sticking. Of the two extremes of temperature resulting from these faults the second one, that of "boiling" the fish, is the most detrimental. In general the fish will stand a temperature much lower than normal far longer and with less after-effects than a temperature above normal. The effect of these faults is, of course, less pronounced in a large tank which heats up and cools down relatively slowly, giving the aquarist more opportunity to be on the spot to detect the failure.

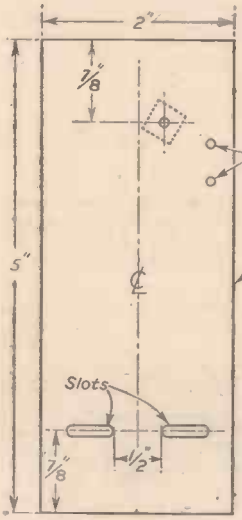


Fig. 1.—Drilling plan.

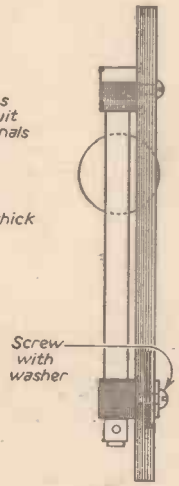


Fig. 2.—Side elevation.

The device described is an additional fitment to the aquarium cheaply made, which provides an audible warning, remote from the tank, of abnormal temperatures, no matter what the cause. It is of particular use for the aquarist whose tanks are situated some distance from the living quarters, and being independent of a mains electricity supply it can be used as a warning for tanks equipped with gas or oil heating. It should be noted that this device is *only for warning* the aquarist: it does not remedy the fault and consequently it should not be left on when the owner is away.

General Principle

The principle of the device is similar to the external thermostat described in a previous article, but the bimetal strip operates a contact on either side of it, one side when heated, the other side when cooled; these contacts are pre-set to cover the safe range over which the tank may operate. It is intended to be fitted to the outside of the glass at the side or back of the tank in a similar manner to the external thermostat. The power for operation of the warning system is a small pocket torch battery which should last indefinitely as no current is consumed except when the warning is actually sounding.

Construction

A piece of ¼in. wood, 5in. by 2in., is drilled as shown in Fig. 1, the two holes for the contact screws are then elongated with a fine file until they are approximately ½in. long. The bimetal strip, 4in. long, is drilled at one end for the contact rivet, and at the other for the fixing screw. The silver rivet is pushed through the hole and gently hammered to form a flat contact on both sides of the bimetal. The opposite end of the strip is now fixed to a block of wood approximately ½in. cube, with a small brass round-head woodscrew. This block is in turn fixed to the base with a further woodscrew through the hole previously drilled, as shown in Figs. 1 and 2. A spot of glue on the block will help to secure it against turning when the bimetal flexes. Note that the block should be fixed at a slight angle so that the bimetal is held towards one of the contact screws on the side on which the setting screw will be situated, so providing a form of tension against the setting screw.

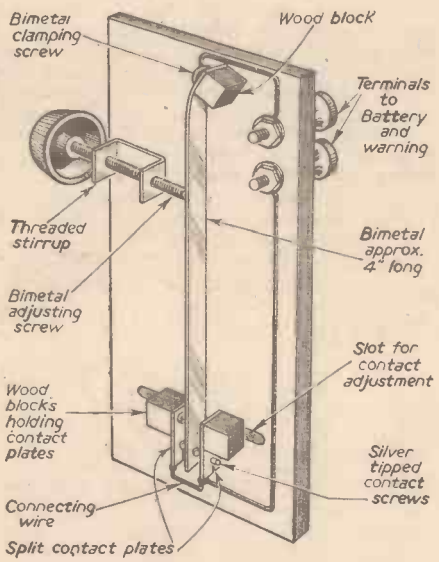


Fig. 3.—The completed aquarium warning device.

The two split contact plates are now screwed to two blocks of wood, again approximately ½in. cube, these being in turn fastened to the base from the reverse side by means of a round-head screw passing through a washer, through the slot, and into the block. These blocks should now be capable of a limited lateral movement by slackening the screws and sliding the blocks sideways.

The final part of the construction is the setting knob and spindle. This consists of a length of threaded rod, or a long bolt, threaded through a stirrup-shaped piece of metal and bearing on the bimetal strip approximately ½in. from the block. This portion is easily made from curtain fittings obtainable from a chain store. The opposite end of the threaded rod from the strip carries a small knob for ease of adjustment.

The now completed base, shown in Fig. 3, is fitted on to a frame of ½in. wood, ¾in. deep, a slot being cut for admission of the setting spindle and two small holes to allow adjustment of the contact screws with a small screwdriver when necessary. This frame is secured with "Bostik" to the aquarium glass and the base fastened with two small woodscrews to the frame, so making removal of the working parts only a moment's job. Two terminals should be mounted through the base for the leads to the alarm.

Wiring the Warning Device

Probably the most suitable warning is an audible one such as a small bell or buzzer, but if preferred these may be replaced by a small flashlamp bulb. The two contact plates are connected together and then to one of the terminals. The other terminal is connected to the fixed end of the bimetal; this completes the internal wiring. The bell, buzzer or lamp is mounted, together with a small battery, in a convenient place in the house and connected with bell wire to the two terminals on the warning device. A small switch may be inserted in the leads at a convenient point to switch off the battery when it is not required. The bell may be tested periodically by shorting the two terminals, when the bell should ring. The basic circuit is shown in Fig. 4.

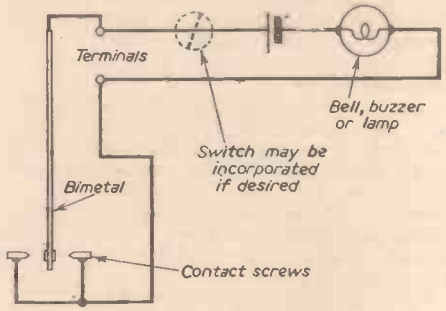


Fig. 4.—The basic circuit.

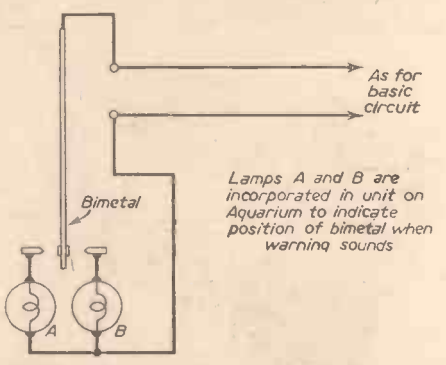


Fig. 5.—Circuit incorporating two torch bulbs.

Adjustment of Bimetal

The first thing to decide is the temperature range over which you wish the instrument to work. Supposing that the tank normally runs at 70 to 75 deg. F., then the warning device could operate at a temperature of 80 deg. F. at the upper end of the scale and at 65 deg. F. at the lower end. As constructed, the bimetal having been fixed off centre, it will be pressing against one of the contacts in the direction of the setting screw. This screw should now be gradually advanced until the bimetal is centred between the two contacts when the temperature is approximately 72 deg. F. (i.e., half-way on the temperature range). Warm up to 80 deg. F. and adjust the appropriate contact block by loosening the holding

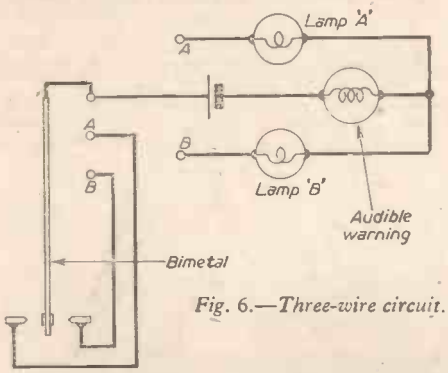


Fig. 6.—Three-wire circuit.

screw slightly and sliding the block until the contact screw almost touches the bimetal contact; tighten the screw firmly and make the final fine adjustment with the contact screw itself. Cool to 65 deg. F. and repeat for the other contact screw. The bimetal should now make contact with one or the other of the contact screws when the temperature is either 65 or 80 deg. The distance away from the centre line of the bimetal that the contact screws are set determines the temperature range of the instrument; the farther away the greater the range. For all the temperature ranges that the aquarist is likely to require, the bimetal may be considered as having proportional deflection, and therefore once the contacts are set for a suitable temperature range it is only necessary to move the control knob so that the bimetal is centred at the mean temperature required and the upper and lower points will be correct automatically.

Modifications

Although wood has been specified throughout for the construction, the case may be constructed of plastic if it is preferred, so adding the "professional" touch. The device may be pre-set for two temperatures and the external adjusting knob may then be dispensed with, its place being taken by a small set screw inside the case.

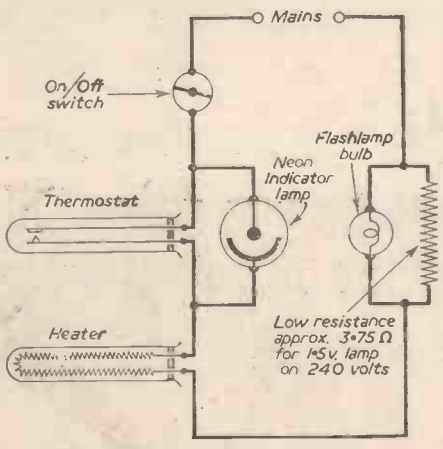


Fig. 7.—Fault-indicating circuit.

In order to facilitate the initial setting of the instrument and also the re-setting of it, one may extend the bimetal strip with a piece of wire so that it protrudes through the case as a pointer, thus giving a visual indication of the position of the bimetal and also, when the alarm sounds, whether the tank is too hot or too cold.

By placing two torch bulbs in the circuit, as shown in Fig. 5, an indication of the temperature is given. The bulbs must be carefully chosen so that when one of them is in series with the bell sufficient current is passed to operate it and also light the bulb. Fig. 6 is identical, but the signal lamps are placed with the bell and three wires are therefore necessary between the tank and the alarm.

A Fault-indicating Circuit

All the foregoing methods, while informing you of the state of the tank, suffer from the disadvantage that they do not indicate what is causing the trouble; the circuit shown in Fig. 7 gives an indication of exactly where the fault may be found. It consists of a small mains voltage half-watt neon indicator lamp wired across the thermostat controlling the tank, and a small torch bulb wired across a very low resistance in series with the heater windings. The neon indicator lamp will draw a very small current through the heater windings when the thermostat contacts are open, but due to its high resistance the current is too small to have any practical effect in heating, and also too little current is passed for the torch bulb to light up. This indicator unit is best built into a small box with only the lamps showing through two windows, on the lines shown in Fig. 8, and mounted at a convenient point adjacent to the tank. It will now be seen at a glance, when the alarm sounds, what is at fault. If both lights are off the heater has burnt out or the electricity supply has failed. (The indicator lamps may have failed, but the neon is practically everlasting and the torch bulb also if care is taken to under-run.) If the neon is out, the torch bulb lit and the

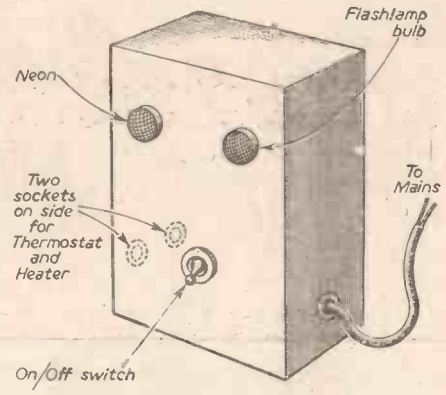


Fig. 8.—The fault indicator.

alarm sounds, then it is the thermostat which has stuck in the "on" position. A continuous check on the wiring is therefore possible by this means.

If the aquarist has a number of tanks he will need a warning device for each tank, but it is only necessary to have one alarm. All the instruments should be connected in parallel.

PARTS LIST AND SUPPLIERS

TECHNICAL SERVICES CO.
Bimetal 4in. long.
Split contact plates (2).
Silver-tipped contact screws for same (2).

ELECTRICAL STORE
Half-watt neon indicator lamp (mains voltage).
1.5 or 2.5 volt torch bulb.
Lampholders for above.
Alarm (buzzer, bell, etc.).
Bell wire.
Three-volt cycle-lamp battery.
Sundry screws and wood or plastic.

Who Owns the PATENT?

By W. J. WESTON

THE case of British Syphon Co., Ltd. *v.* Homewood, decided last June in the Chancery Court, concerned an often vexed question. When an employee perfects an invention relating to the employer's business, to whom does the benefit of the resulting patent belong? In this instance the company, as employer, claimed the benefit; and the claim succeeded.

The inventor was the company's technical adviser, in charge of their design and development. The coming of nylon and the ever-mounting price of tin raised problems for makers of soda-water syphons; for it became commercially desirable, if possible, to substitute nylon tops for metal tops. The inventor, doing what he was employed to do, solved the problems by evolving an effective plastic top. He was rewarded for that; and he never suggested that the patent taken out for it was in any sense his property. For, when one is engaged for the specific purpose of improving processes, then, unless there is an agreement otherwise, any subsequent patent is the employer's. It is different when, in his own time, an employee, not engaged for the purpose of technical development, make an invention. The benefit of a patent in respect of the invention belongs to the employee, and this though it should be in relation to the employer's business.

Some time after the invention of the plastic top, the company and the inventor made a new agreement under which he became entitled to keep for himself anything he invented. The trouble in the case arose over an invention before the date of this agreement. The patent was for a "liquid-dispensing device," described as "a low-pressure system of soda-water distribution." The inventor had entered the employment of a rival company; but he had filed his application for a patent while in the employment of the plaintiff company, and had not disclosed to them any details of the invention.

In his decision Mr. Justice Roxburgh puts the position in the clearest possible way: "The defendant was employed to give the plaintiffs technical advice in relation to the design or development of anything connected with the plaintiffs' business. Would it be consistent with good faith, as between master and servant, that he should be entitled in that position to make some invention in relation to the plaintiffs' business and either keep it from his employer, if and when asked about the problem, or even sell it to a rival and say: 'Well, yes, I know the answer to your problem, but I have already sold it to your rival'? That cannot be consistent with good faith between a master and a technical adviser. That makes it right and proper for me to decide that this invention (which, in my judgment, plainly relates to and concerns the business of the plaintiffs, namely, the distribution of soda-water to the public in containers of a satisfactory character), if made during a time when the chief technician is standing by under the terms of his employment, must be held to be in equity the property of the employer."

AN Indoor-Outdoor Miniature Golf Course

Part 2 Describes the Construction of the Remaining Six Hazards

(*Concluded from page 16, October issue*)

THE gates hazard is a tricky one to play. The gates are arranged so that a straight stroke is not possible, but by taking a cushion shot off the half-open gate the player can, after a little practice, hole out in one. The two gates are stood on the green opposite each other with the posts in alignment as shown in Fig. 13. The angle at which the supporting piece is positioned is shown in Fig. 14 at A. The two long pieces are made of ½in. thick wood, whilst the strut between is 1¼in. square and 5½in. long. The gate and the back piece are each 7in. high and the shorter part is fixed at an angle of 45 deg. from one end. It is put, as can be seen at A, slightly inwards, so that the end of the gate itself can be chamfered to a sharp point. The corresponding edge of the shorter piece has also to be chamfered to make the correct fitting. With the two parts of the gate fitted together they are stood on the square support strip and the actual angle marked on and then cut off with a tenon saw. The strut is slid into place in the angle formed by the two other parts and glued and nailed firmly, see B, Fig. 14. The second gate is formed in the same way.

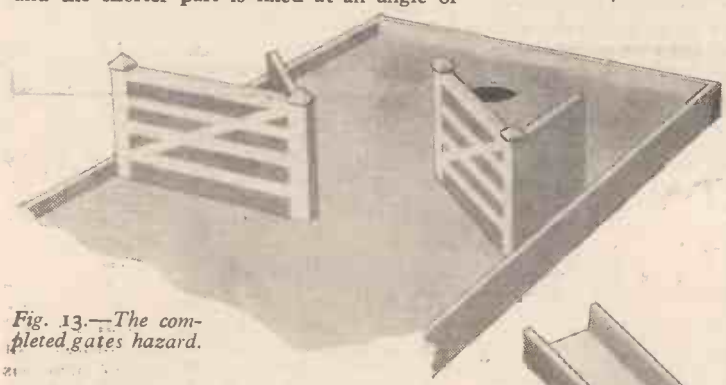


Fig. 13.—The completed gates hazard.

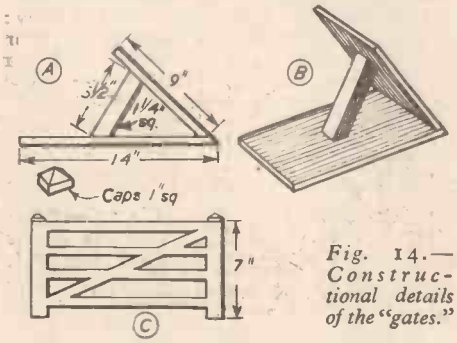


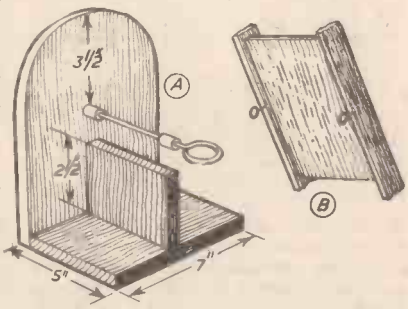
Fig. 14.—Constructional details of the "gates."

To make the hazard more realistic the four-barred gates are painted on in white and two caps are formed to the posts by cutting down 1in. cube blocks of wood so that they taper from a centre point to a line ½in. up from the bottom edges as shown in Fig. 14, C. The method of painting can also be seen in Fig. 13, the whole of the groundwork being in green, with the caps and rails marked on in white.

The See-saw Hazard

As can be seen from the picture of the see-saw in Fig. 15 it consists of a plank, pivoted in the centre, up which the ball has to trickle to weigh the other end of the see-saw down and run off to the hole.

The framework consists of a base and two round-topped pieces, all cut from ½in. wood. The sides are 7in. wide and 8in. high, cut with the fret saw to a semi-circle at the top edge. At the centre point from which the arc was described a hole is drilled through both pieces. This is to take the cross rod which holds the see-saw and should not be made until the thickness of the actual rod itself has been decided upon. The base is 7in. long and 5in. wide. It is glued and nailed between the two sides and in the centre of it is raised an upright support 5in. long and 2½in. high (see A, Fig. 16). Through the hole drilled in the two sides there has to be passed a rod, one end of which is the handle. Two loose collars ⅜in. long are required (see C, Fig. 16) to keep the see-saw in position when it is fitted. The see-saw itself is built in wood ¼in. thick. The base is 2ft. long × 4in. wide, and it fits between the two sides which are strips 2½in. wide and 2ft. long (D in Fig. 16). The ends in both instances will have to be chamfered on the underside so that when the see-saw drops, the ball will pass up the runway without any jump. When completed, measure half the length of the part and on the underside drive into the edges two small screw eyes (B, Fig. 16). Be careful to position these exactly central along the length in order to obtain the correct balance. The screw eyes must be large enough to act as a swivel for the rod, which is shown at C in Fig. 16.



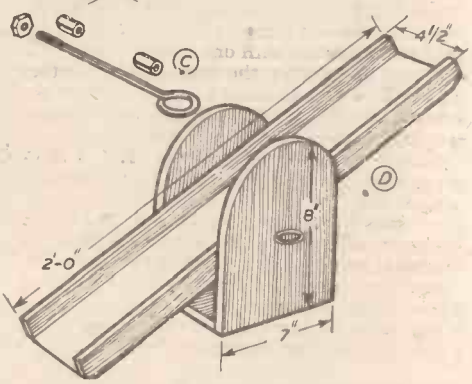


Fig. 16.—Constructional details of the see-saw hazard.

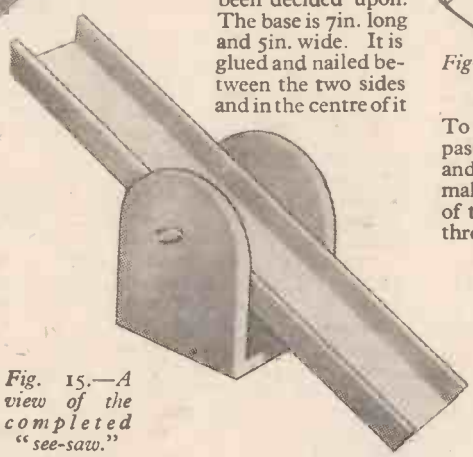


Fig. 15.—A view of the completed "see-saw."

To fit the see-saw in place, hold it in position, pass the spindle through the holes in the sides and the screw eyes beneath the roadway, making sure that the collars are on the outside of the screw eyes. The end of the rod can be threaded and held with a nut.

The hazard is now complete, except for painting; it can be treated with glue and sawdust, as described last month, and painted green and red.

The "Slope"

The completed hazard is shown in Fig. 17 and details are given in Fig. 18.

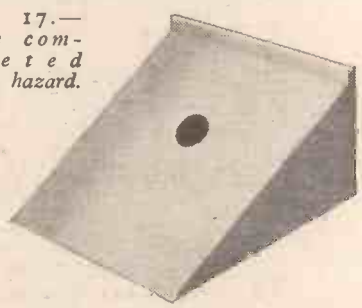


Fig. 17.—The completed slope hazard.

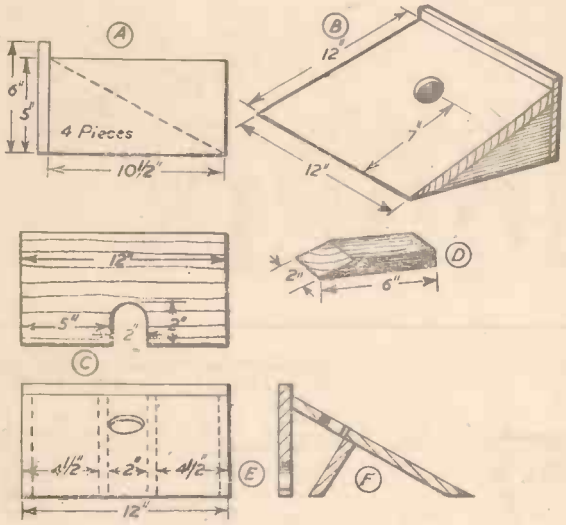


Fig. 18.—Details of the slope hazard.

It is a wide sloping roadway, in which a hole is cut. The ball is driven gently into this and falls through to come out of the back towards the hole in the green.

Wood ½in. thick is used for the construction. The top is 12in. square and a hole 2in. in diameter is cut in the position shown at B in Fig. 18. The triangular sides and the two supporting pieces are all the same and may be cut from two boards 10½in. long and 5in. high, as shown at A in Fig. 18. The two sides are glued and screwed in position as shown at B and the front edge of the square top piece must be chamfered to bring the edge close to the green, see B and F, Fig. 18.

The backboard measures 6in. × 12in. and when fitted will project slightly above the sloping top. A hole must be cut as shown at C to let the ball out when it drops through the hole in the slope.

Finally, the alleyway for the ball to run through must be made. For this the two pieces the same shape as the sides are utilised and must be glued in position 4½in. inwards from each side of the hazard. These pieces are shown dotted at E in Fig. 18. One more piece is needed and this is made to the dimensions given at D, and is fitted under the hole in the slope, between the two pieces forming the alleyway. It slopes towards the hole at the back, as shown at F, and its purpose is to guide the ball out. To make it fit flush with the ground, one edge must be chamfered.

The whole hazard must be painted some suitable colour; the original was green, with a lighter colour round the actual hole.

The "Chasm"

This is a versatile hazard consisting of two inclined planes, and to play the hole, the ball must be driven up one, over the gap and down the other. The difficulty of the hazard may be increased by spacing the two slopes farther apart. The completed hazard is shown in Fig. 19, and construction will be obvious from Fig. 20. Each half consists of a top piece measuring 12in. × 6in., and a back 12in. × 4in. The top of this latter piece must be bevelled so that it fits snugly under the top, as shown in Fig. 20. The best way of marking out the two triangular side pieces is, after glueing and screwing the top and back pieces together, to stand the resulting construction on end on top of the wood to be used. Mark round the inside of the angle and cut with a tenon saw. The sides should then fit exactly and can be glued and screwed into place. Each half of the hazard may be completed by painting in the usual way.

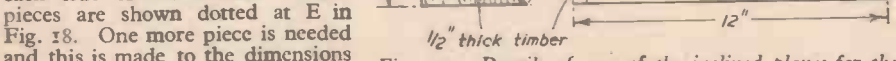


Fig. 20.—Details of one of the inclined planes for the chasm hazard.

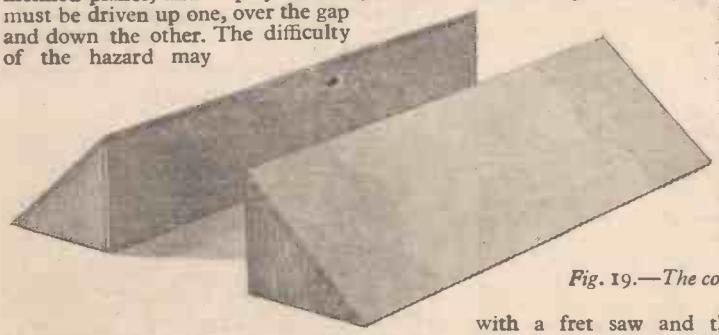


Fig. 19.—The completed "chasm."

The "Tunnel"

This is essentially a long box-like structure with an arch at either end. The ball is driven in one end, and small, shaped blocks will guide it out through the other, the ball then being holed out in the usual manner.

The tunnel, as shown in Fig. 21, consists of two sides 15in. × 6in. and a top of the same dimensions; these pieces are glued and screwed together to form an open-ended box. The ends are shaped, as shown at B, each one being cut from a piece of ½in. wood measuring 7½in. × 7in. The hole for the ball is cut out of each end with a fret saw and each end glued and screwed into position. Before fitting the exit end of the tunnel two blocks shaped as at C must be glued inside to guide the ball out through the hole. Treat the outside of the hazard with glue and sawdust, as already described, and paint green.

The Bell Hazard

This is the final hazard and some variation is provided in that, instead of holing out, the player must ring the bell. The completed hazard is shown in Fig. 22.

The bell house is a simple structure and details are given in Fig. 23. The four corner supports are made from 11in. square wood each being 10in. in length. The sides are made from 3/16in. plywood, two of them measuring 10in. × 7in. and the other two 10in. × 6⅛in. An arch 3in. wide and 5in. high is cut in each side with a fret saw and then the four sides and four corner supports assembled to form a 7in. square box. The top is a 7in. square of plywood and in the centre of this a small block of wood is screwed. This can support a screweye or the bell may be hung as in Fig. 23. The top is finally glued and screwed into place.

Almost any type of bell can be used provided it is of convenient size and to some extent the size of the bell house will depend on this. The clapper of the bell should be extended and a weight hung on the end, but the method of doing this will be left to the ingenuity of the individual constructor as details will depend on the type of bell used.

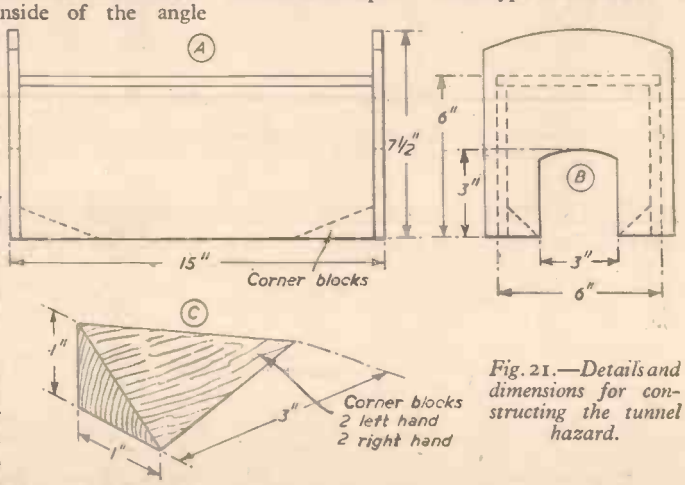


Fig. 21.—Details and dimensions for constructing the tunnel hazard.

The hazard details given in this article are intended mainly as a general guide and the inventive reader will, no doubt, be able to think of many more complicated hazards, as well as elaborating those already given.

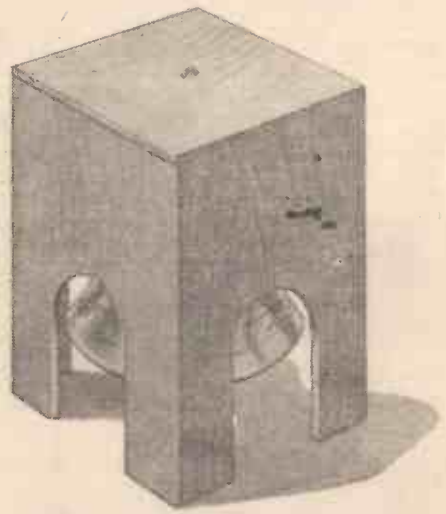


Fig. 22.—The completed bell hazard.

Readers will probably prefer to make up their own set of rules and it should be possible to vary the game, without making additional hazards.

The putters and balls necessary will be available from the local sports stores and putters and golf balls are often seen for sale in second-hand shops.

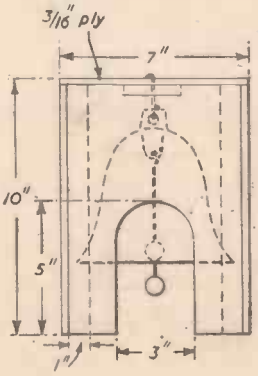


Fig. 23.—A side elevation of the bell hazard, showing constructional details and dimensions.

Making a PHONODEIK

A Device for Observing Sound Waves

By C. T. MASSEY

DEVISED about 1912 by D. C. Miller, the phonodeik is a mechanical/optical device enabling sound waves to be observed visually. A horn collects sound impulses and directs them on to a thin diaphragm causing it to vibrate in sympathy with the sounds. The diaphragm communicates these vibrations to a small mirror, and a narrow beam of light is hence made to vibrate. Miller moved a strip of light-sensitive film past this vibrating beam to obtain a wave trace, but the instrument described here uses a revolving system of mirrors to project the waveforms directly on to a translucent screen.

The instrument consists of four main units which will be dealt with in turn. These are the phonodeik itself, the beam projector, the mirror disc and the screen.

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

The Phonodeik

A 3½in. diam. hole is cut in the centre of a panel 8in. x 5in. of ¼in. ply. The edges of this hole are smoothed and then tissue paste is smeared on the wood around the hole. Model aeroplane covering tissue (lightweight) is stretched smoothly over the aperture and trimmed so that it covers the hole by a margin of at least ½in. all round. When the paste has dried, a scent spray is used to spray the tissue membrane with water. This shrinks the tissue, pulling it tight, and when the water has dried the tissue is given two coats of model aeroplane clear dope to further shrink and strengthen it. Two discs, about ½in. diameter, are cut from paper and doped, one on either side of the diaphragm at the centre to reinforce this area (see Figs. 1 and 2).

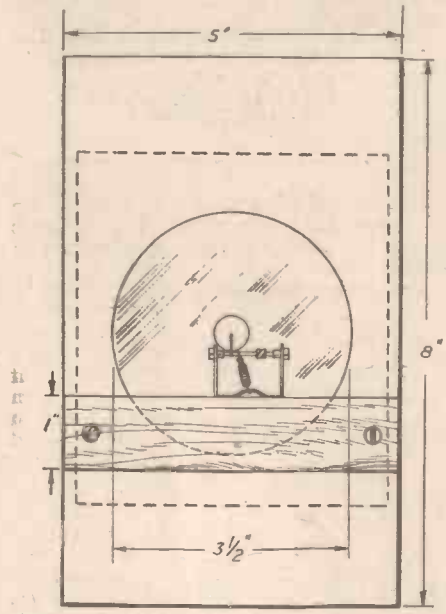


Fig. 2.—Construction of the diaphragm and panel.

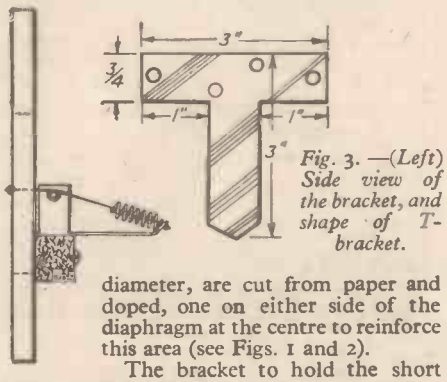


Fig. 3.—(Left) Side view of the bracket, and shape of T-bracket.

The bracket to hold the short steel spindle is cut from sheet metal of a reasonably stout gauge and formed as shown in Figs. 3 and 4. The two holes at the ends of the horizontal arms of the T are drilled and tapped to take the bolts that support the spindle. These bolts are hollowed at the ends to retain the spindle which is pointed at each end. When the bracket has been made up, it is screwed with its centre displaced ¼in. from the centre of a strip of wood 1in. x 1in. x 5in. This strip is then screwed to the diaphragm panel with its top edge 1in. below the centre of the diaphragm (Figs. 2 and 5).

A tiny fragment of mirror about ⅛in. square is fixed to the short steel spindle which is supported in the bracket. This mirror must be as thin as possible and a local photographic dealer will probably be able to help by supplying a small piece of mirror from a camera viewfinder. The mirror may be glued to the spindle or better may be glued to a small clip fashioned from shim steel, this being clipped to the spindle (Fig. 4).

A length of fine nylon thread is passed through the reinforced centre of the paper diaphragm, over the spindle twice, and is secured to a weak coil spring which is attached to the metal bracket (see Figs. 2 and 4) so that the diaphragm is under tension.

The Rotating Mirror Disc

This unit consists of eight mirror elements arranged round a regular octagon. Each mirror element should be about 1in. wide, and should be sufficiently long to accommodate the vibrating beam of light from the phonodeik. The elements of the original are about 1½in. long and were obtained by quartering two cheap pocket mirrors. The regular octagon around which the mirror strips are glued is cut from ¼in. plywood. Its form is not difficult to construct and is obvious from Fig. 6. The octagon is mounted on a circular base 4in. or 5in. in diameter, and a hole, 5/16in. in diameter is drilled through the centre of the disc. The mirror elements are glued to the octagon and each element is aligned by focusing the image of, say, a bulb on to a ground glass screen, through each mirrors trip in turn (Fig. 7). The completed mirror disc should appear as in Fig. 8. It is rotated by placing it on a gramophone turntable. If a gramophone is not available, it is usually possible to obtain a secondhand clockwork or electric gramophone motor quite cheaply. The writer obtained a Swiss motor, electrically driven, complete with turntable for 12s. 6d.

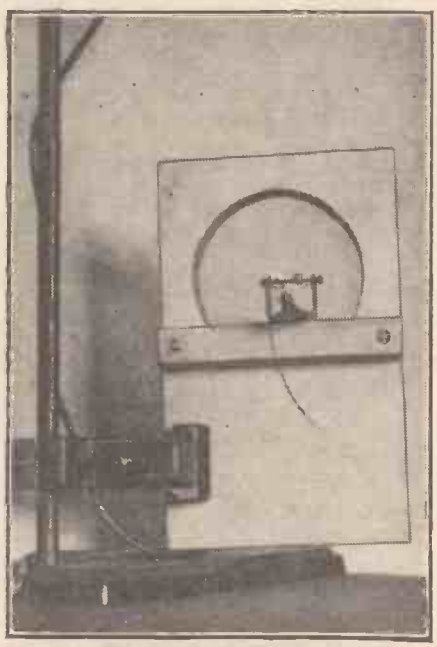


Fig. 5.—A photograph of the author's diaphragm panel.

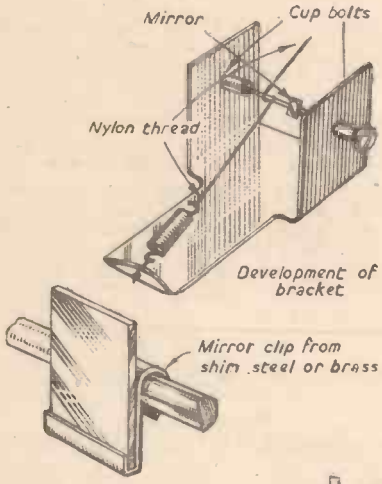


Fig. 4.—Development of the T-bracket and details of the mirror clip.

The Light Projector

Many different methods of obtaining the required small spot were tried. The one here described is probably not the best but has been chosen because it is simple, efficient, and requires the use of only one lens. I used a surplus parking light for the lamphouse but one may easily be made up from a cardboard tube. For convenience a m.e.s. cap 18 v. 3 w. bulb was used but the power of this could be increased to advantage. The bulb illuminates a ground glass window, cemented to which is a piece of foil pierced with a pin hole. The lamphouse is shown inverted in Fig. 10. Mounted between the lamp and phonodeik is the lens (see Fig. 9). This must have a focal length such that a clear image of the pin hole is projected on to the ground glass screen. The prototype uses a lens of 8in. focal length. The lens may alternatively be mounted immediately in front of the phonodeik mirror.

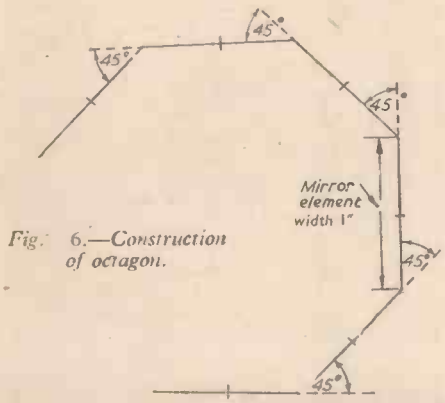


Fig. 6.—Construction of octagon.

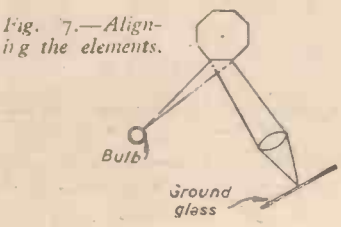


Fig. 7.—Aligning the elements.

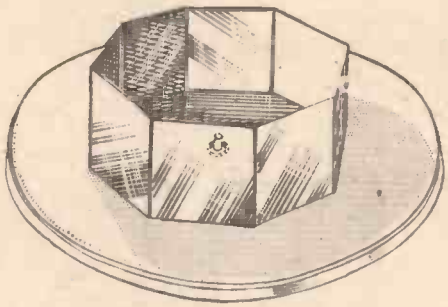


Fig. 8.—The assembled mirror disc.

The Image Screen

This is simply a piece of glass, finely ground. To render it more translucent it should be smeared with Vaseline and then wiped with a cloth.

Operation

When the units are set up as in Fig. 9, a clear bright spot should be obtained on the image screen. It will be necessary to turn the mirror disc slightly to bring this about. When the motor is started this spot will traverse the screen eight times per revolution producing a steady line. A portable radio set is an ideal and convenient sound generator for initial tests, and when this is brought close to the diaphragm the line should break into wave form. Some typical wave forms are shown in Fig. 11. Try altering the speed of the motor; the slower it is run, the closer together will be the waves. A cardboard horn may be used to collect the sound with advantage. When using the voice to generate the sound, care must be taken not to breathe heavily on the paper diaphragm. Miller's phonodeik used a thin glass diaphragm and this would remain unaffected, but the paper one tends to sag, deflecting the light beam off the mirror disc.

Working of the optical system is as follows. In Fig. 12, m is the phonodeik mirror and M represents an element of the mirror disc. The lens projects a pool of convergent light, part of which is reflected by m on to M and the viewing screen. m acts in much the same way as the diaphragm in a camera in that it restricts the amount of light which reaches the screen. If m could be made larger, more light would, of course, be passed and the spot of light on the screen would be correspondingly brighter. The size of m cannot, however, be satisfactorily increased because the greater moment of inertia of a larger mirror would prevent rapid response to sounds.

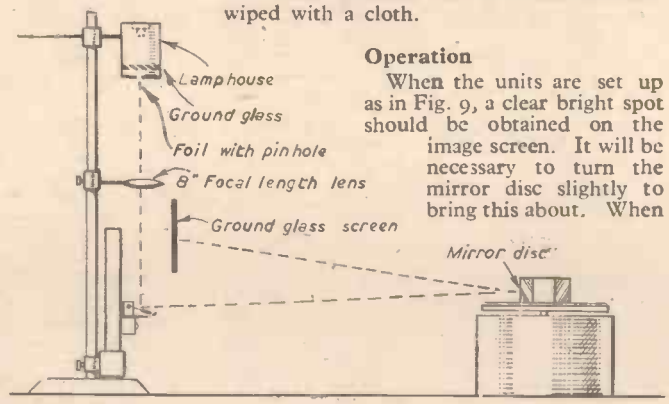


Fig. 9.—General arrangement of apparatus.

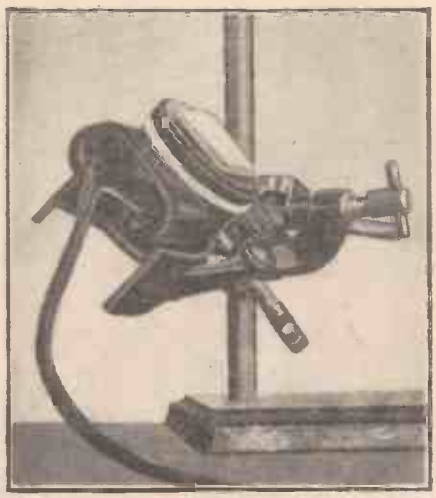


Fig. 10.—The lamphouse shown lowered and inverted.

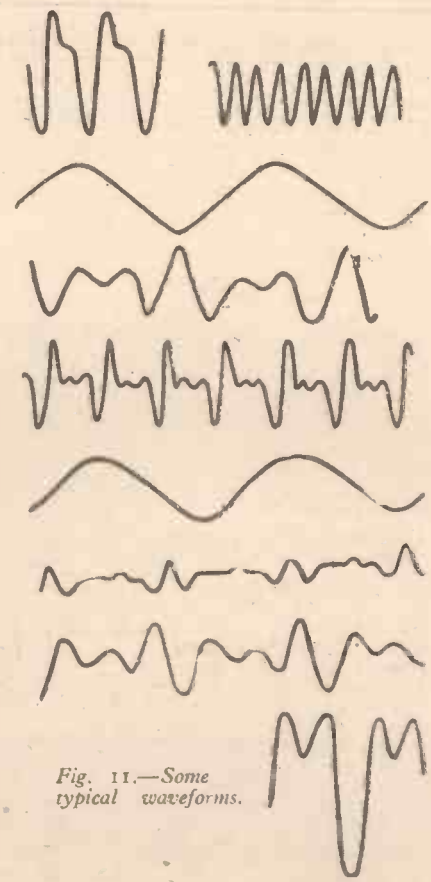


Fig. 11.—Some typical waveforms.

When the instrument is not in use, it is advisable to release the tension spring to avoid stretching the diaphragm.

Made with reasonable care this instrument works well. It projects sound waveforms with remarkable clarity and should be of great interest to anyone of scientific nature. You may notice that it responds more to certain notes than to others and, for complete sound analysis, this is one of the instrument's drawbacks. It is due to the fact that at certain frequencies the instrument resonates, effectively amplifying the sound.

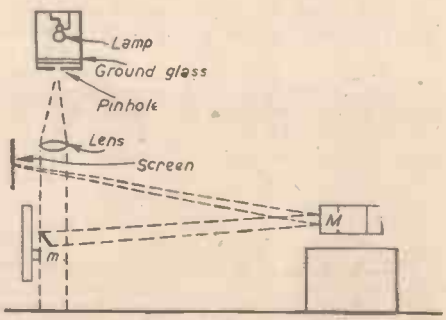


Fig. 12.—Working of the optical system.

An Electrified Organ Blower

Converting a Hand-blown Organ for Use with an Electric Blower Unit

By L. REID

IF a suitable electric blowing unit is available its attachment to the organ is straightforward, and a typical layout is as shown in Fig. 1.

Organ Wind Supply

In a hand-blown organ the handle is linked to several small bellows called feeders, and these pump air into the main reservoir—a large square bellows with iron weights on top. From the main reservoir the wind goes through wooden wind trunks to the various departments of the organ, each of which usually has its own small reservoir.

Conversion to Mechanical Blowing

It is only necessary to make an opening into the main reservoir and connect the new source of supply through a suitable control valve. Fig. 1 shows the arrangement.

The new wind trunk—which should be connected at the opposite end of the reservoir to the outlet trunk—is attached to the blower outlet by means of a flexible coupling to prevent motor hum and vibration reaching the woodwork.

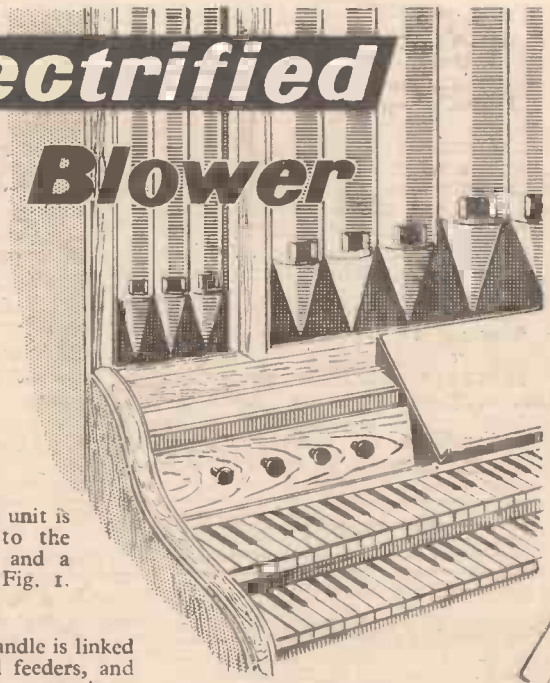
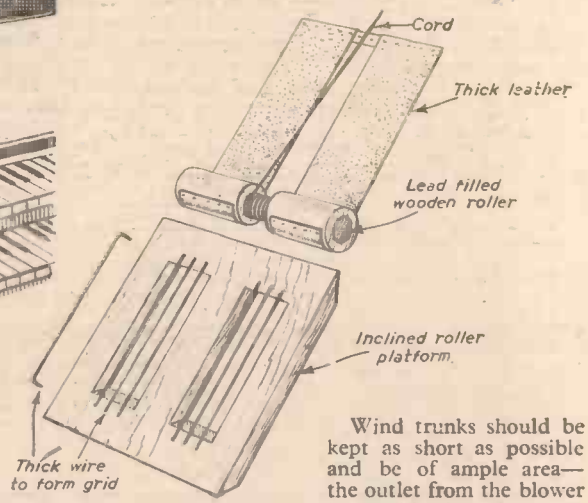


Fig. 3 (Right)—Details of the grilles, roller platform and the roller pallet.



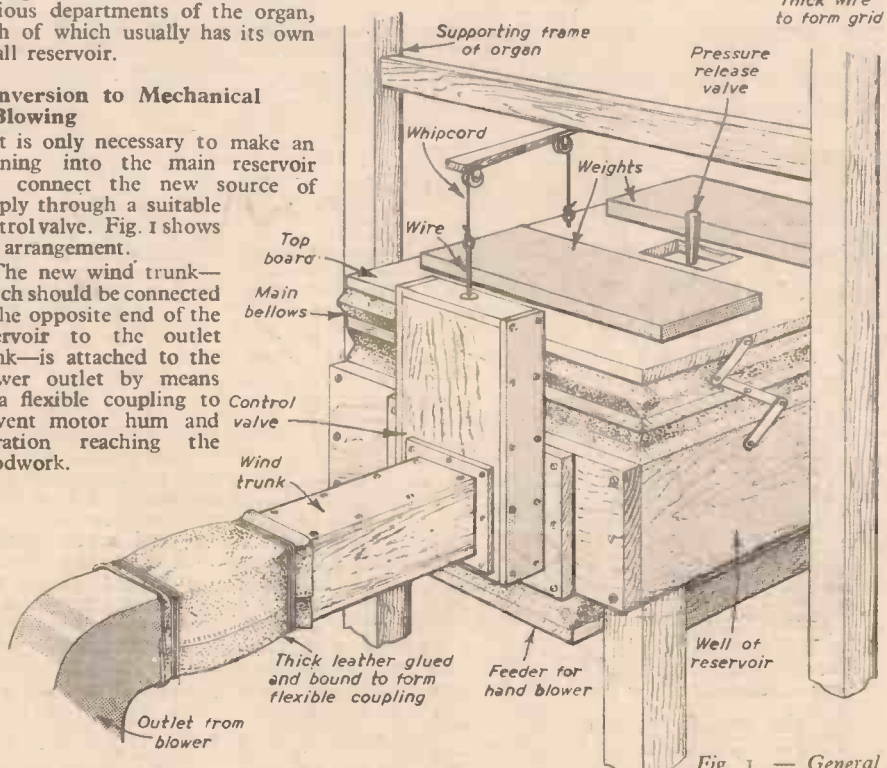


Fig. 1. — General layout and method of connecting up blower unit.

Fig. 2 shows the simple control valve, but no dimensions are given as these will depend on the layout of the particular instrument and the space available. The shape of the control box may vary, but the principle is the same. It does not matter if the wind trunk comes from either side or below so long as the wind strikes the roller pallet from the front.

Action of the Roller Pallet

The lead-cored roller, which is about 2in. diameter, rolls and unrolls a "blind" of thick flexible leather which covers the inclined grilles through which the wind passes to the reservoir. A string connects the roller, by way of pulleys, to the top of the reservoir, so that as the latter rises it lowers the roller and cuts off the wind. When wind is used the bellows top falls, pulling up the roller by means of the cord and admitting fresh wind.

Construction of the Control Box

Use knot-free seasoned timber of about ⅛in. thick for the attachment flanges and ¼in. for the box and trunking. All edges must be true before gluing and screwing. One panel of the box should be held by screws only to allow access to the interior. A strip of soft thin leather or felt is glued round the edges to form a sealing gasket.

Wind trunks should be kept as short as possible and be of ample area—the outlet from the blower is a guide, but the trunk can, with advantage, be rather larger.

The roller-pallet grilles are most easily made by using thick wire sunk flush with the wood surface; they should not be smaller in area than the blower output.

The roller (Fig. 3) has a reduced diameter at the centre, where the cord is attached, and the ends are bored to take lead cores. The roller should be fairly heavy to give prompt closing action. The cord from the roller passes over a small pulley, and is then attached to the lower end of a length of stiff wire, which passes up through the top of the box. This wire leaves the control box through a small hole in a brass disc, with felt underneath, and another length of cord connects the wire to a screw eye in the reservoir top. One or more small pulleys are usually required to carry the cord.

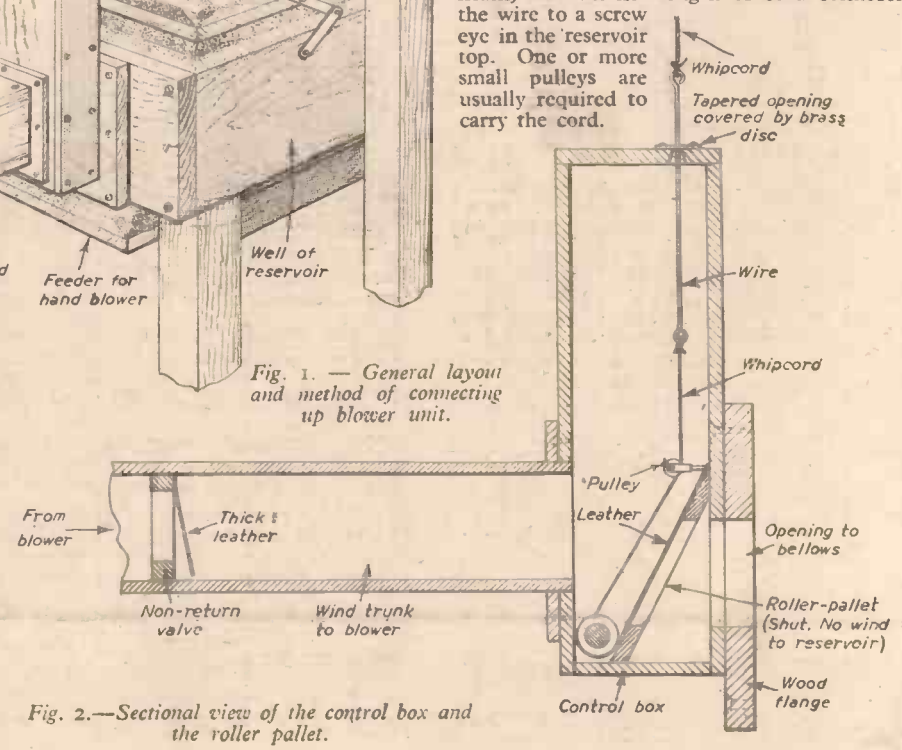


Fig. 2.—Sectional view of the control box and the roller pallet.

Attachment to the Reservoir

A square opening of sufficient area must be made in the well of the reservoir, and as the wood is very thick this means some laborious work with drilling bits and narrow saws. Every scrap of sawdust must be carefully removed from inside the reservoir before attaching the control box by means of the flange. It will be noted that the top screws must be inserted from the *inside* of the control box. This is done through the front opening cut for the wind trunk, and then the wind trunk is fitted into position. The trunk will probably require some support near the blower. Before fitting the removable panel to the control box it is necessary to set the roller pallet. To do this raise the stiff wire so that it is nearly all out of the box, and attach the cord from the roller, first raising the roller fully. The cord from the reservoir top is now attached to the upper end of the wire, and will hold the roller in position. A sleeve of thick flexible leather, or thick leathercloth, will make the connection to the blower, and the leather should be glued and bound with cord. A shoemaker will stitch the seam.

The feeders are no longer required, but need not be removed. They will still serve in emergency if a non-return valve is fitted in the wind trunk close to the blower connection.

It may be found that the blower is too noisy, in which case it must be fitted into a silencing cabinet, lined with slabs of some sound-proofing material. Air intake of such a cabinet is through a slot near the bottom with a "letter-box" flap which opens fully only when there is a large flow of wind. It is advisable to fit an air filter of gauze to prevent dirt from being sucked into the blower.

The Blowing Unit

It is essential that this provides not only the necessary pressure, but also sufficient *volume* of wind to supply the full organ. If the blower is not large enough it will not be able to lift the heavy weighted top of the reservoir.

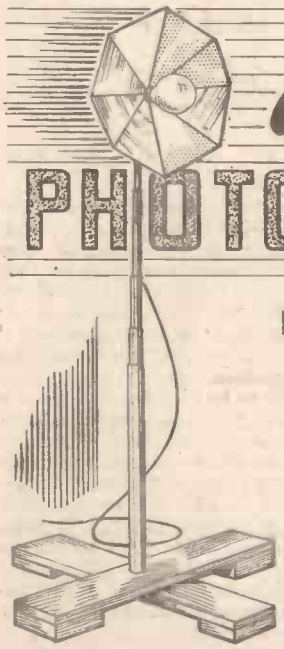
The power is usually provided by an induction motor, and at least ¾ h.p. (preferably 1 h.p.) will be needed to supply a small 2-manual pipe organ. An isolating switch must be fitted near the motor, which is started by a solenoid direct-on-line switch operated by push buttons from the console.

The pressure at which the organ is at present working can be roughly checked by removing a pipe and fitting a U-tube wind-gauge in its place; for a small organ pressure will probably be fairly low, say, 3in. of wind. Volume is not so easily arrived at as it depends on the number and type of stops employed, and might be as high as 400/500 cu. ft. per minute.

An Inexpensive PHOTOFLOOD UNIT

Details for Making a Useful Adjunct for the Photographer for Under £1

By RAYMOND GOODER



MAKE the base first. Plane two pieces of wood 18in. × 3in. × ½in. and then cut and plane two pieces 3in. × 2in. × ½in. and another two 3in. × 2in. × 1in. Drill and countersink a hole in each corner and then screw them to the cross pieces as in Fig. 1. A hole is now drilled in the centre of each of the cross pieces to take the upright. On the underside of the bottom cross-piece I screwed a square of wood to stop the upright dragging the floor.

The Upright

For this I obtained for a few shillings an ex-Government telescopic mast used in dinghies. This I placed in the hole in the base and found that the total hole depth of 11in. was quite sufficient support, provided it fits tightly.

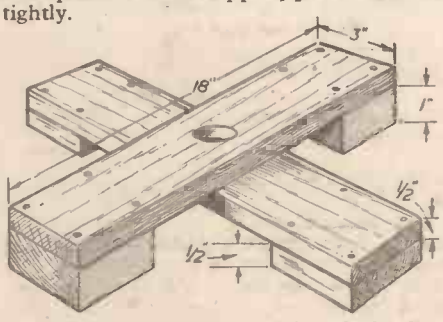
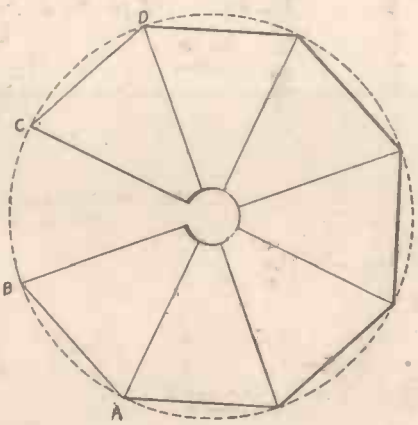


Fig. 1.—Constructional details of the base.

Fig. 2 (Right)—The reflector.



The Reflector

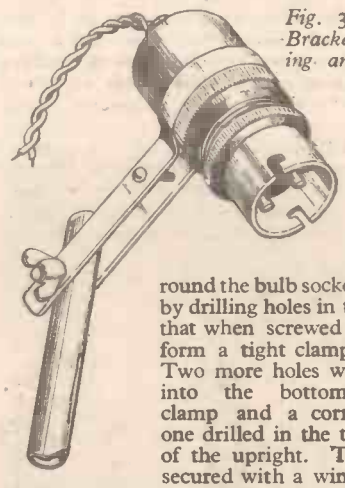
For the reflector purchase from a stationers a large cardboard cake stand which has one side silvered. Working on the back of the board find the centre of the circle, and divide it into eight sections. Cut one of these sections away completely and cut a hole in the middle to hold an adaptor. Now make each section triangular by cutting the edges as shown in Fig. 2. Overlap section A-B into CD and fasten these together with the aid of two paper clips.

Assembly

It is a simple matter to fix the bulb socket into the hole and retain it in the reflector by means of the retaining screw.

To attach the reflector to the telescopic upright cut a strip of heavy gauge tin sheet 8in. long by ½in. Shape this by wrapping it round the bulb socket and fix it by drilling holes in the strip so that when screwed up it will form a tight clamp (Fig. 3). Two more holes were drilled into the bottom of the clamp and a corresponding one drilled in the top section of the upright. These were secured with a wing nut and bolt to assist elevation.

Fig. 3 (Left)—Bracket for holding an adapter.



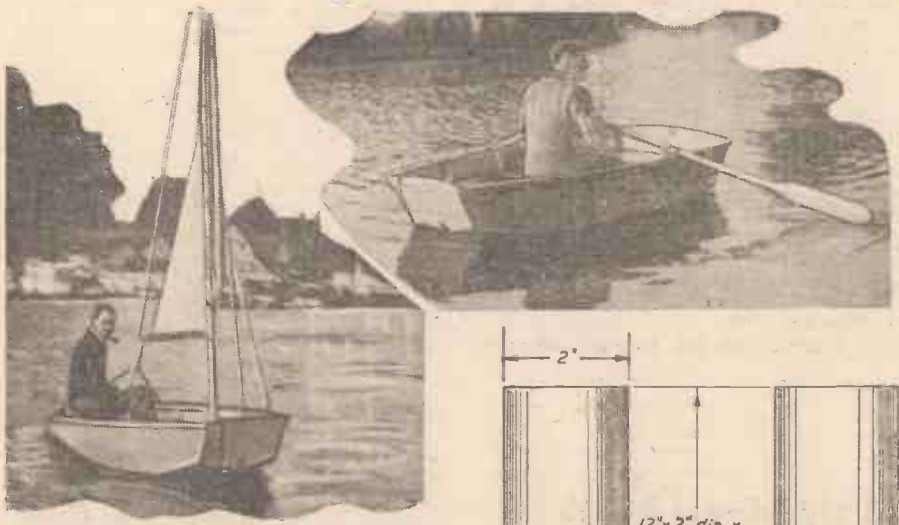
To give the unit a professional touch I painted the base, upright and clamp with a mat black paint. The whole unit can easily be folded.

Building an 8 FT. Sailing Dinghy

An All-wood Family Craft Which Can be Carried on the Car Top

By FRANCIS HOOK

(*Concluded from page 29, October issue.*)



HAVING had some experience with the rowing version of the little dinghy, the constructor will now wish to fit out the boat with a sail. Such items as fittings and sails are expensive, but the handiman can do much to reduce costs by fabricating a good many fitments. In this connection a perusal of a number of illustrated catalogues of dinghy fitments will be a great source of inspiration as will a stroll round the waterfront where light craft are moored. As for the sail, it might pay to get the first one made by a reputable sail maker, but some firms will provide kits of parts and full working instructions for making the sail. This will save money, and provide great satisfaction to the builder.

A single Bermudian type sail is suggested as shown in the general lay-out in Fig. 1, August issue. The area of sail shown is about 35 square feet which will be about adequate for a craft of this size. Arrangements are made for a simple type of roller reefing, so that by suitable adjustment of the reefing the sail area of the dinghy may be made safe in the strongest wind.

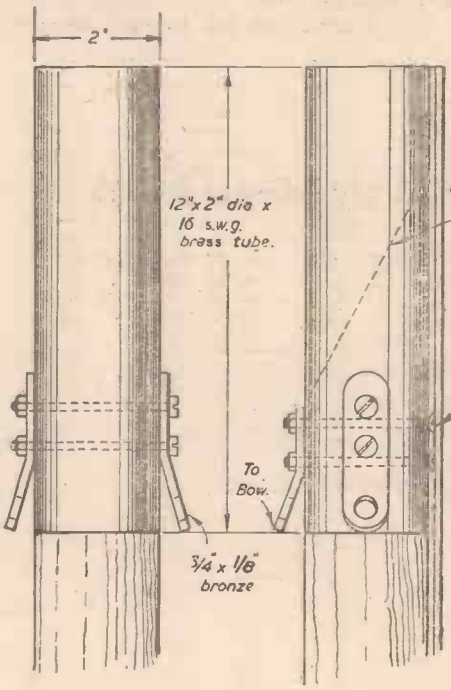


Fig. 26.—Arrangement for a jointed mast.

The mast is made from a single piece of Sitka Spruce, 15ft. long. It is 2½in. square at the bottom and tapers to 1½in. at the peak.

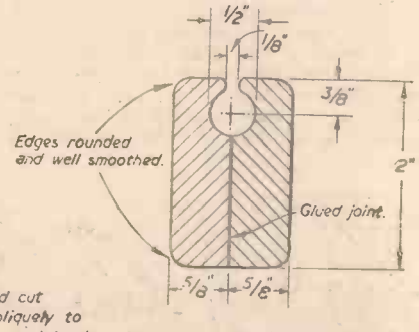


Fig. 27.—Section of the boom.

In order to give additional strength it is usual to saw this mast down the centre and to glue together again with waterproof glue before working the taper. If the builder feels that this is a task beyond his ability and the timber is sound throughout its whole length, it may be as well to omit this suggestion.

If the dinghy is to be kept in one place for sailing the length of 15ft. of the mast is of little concern, but if the constructor is a motorist who might wish to travel from place to place with the boat a spar of this length might well be a source of trouble. For such readers, suggestions are given for making the mast in two pieces, on a similar principle to the jointed tent pole. Such a method will necessitate the addition of an extra set of shrouds in order to keep the mast straight and steady as illustrated in Fig. 26.

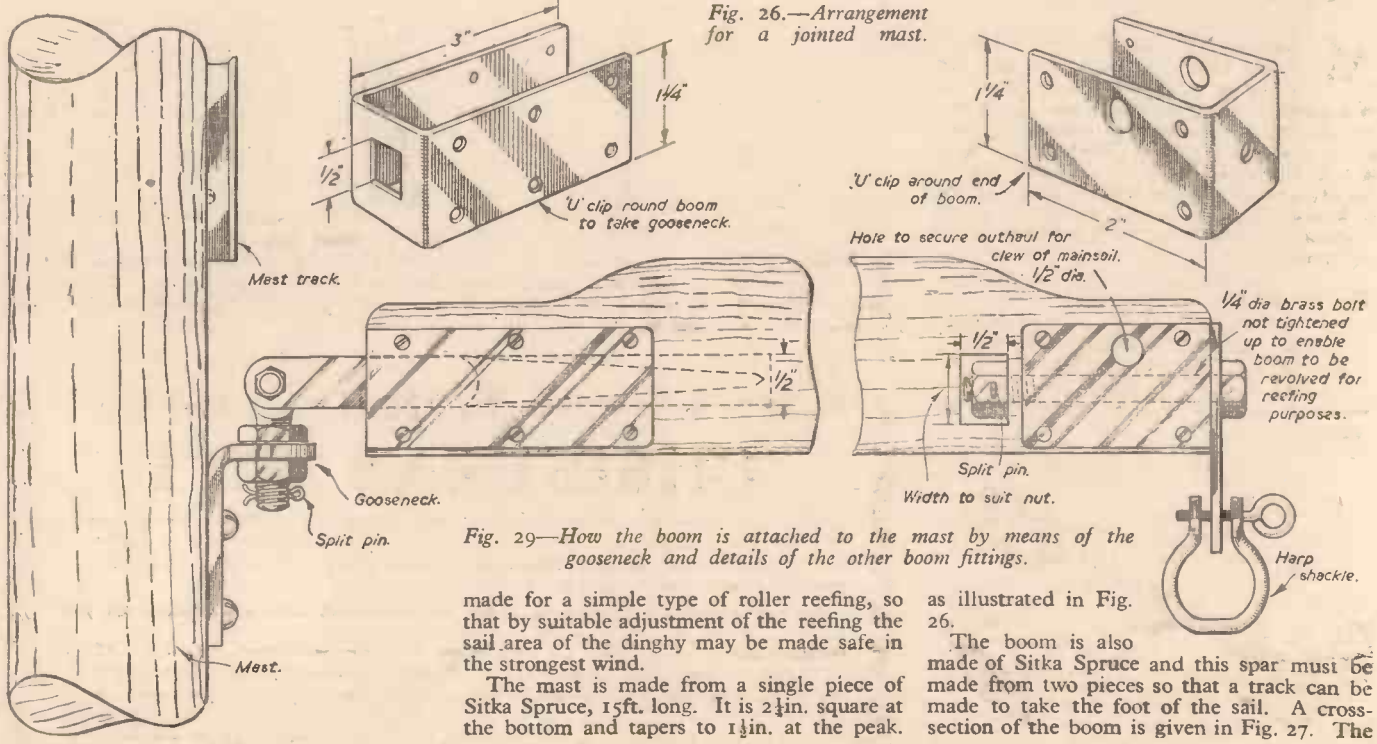


Fig. 29—How the boom is attached to the mast by means of the gooseneck and details of the other boom fittings.

The boom is also made of Sitka Spruce and this spar must be made from two pieces so that a track can be made to take the foot of the sail. A cross-section of the boom is given in Fig. 27. The

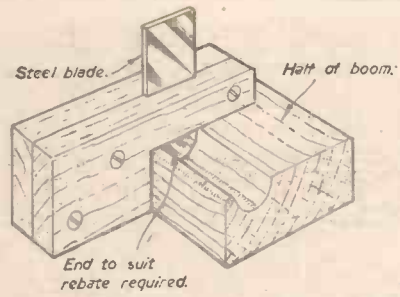


Fig. 28.—Scraper block used to rebate groove in boom members.

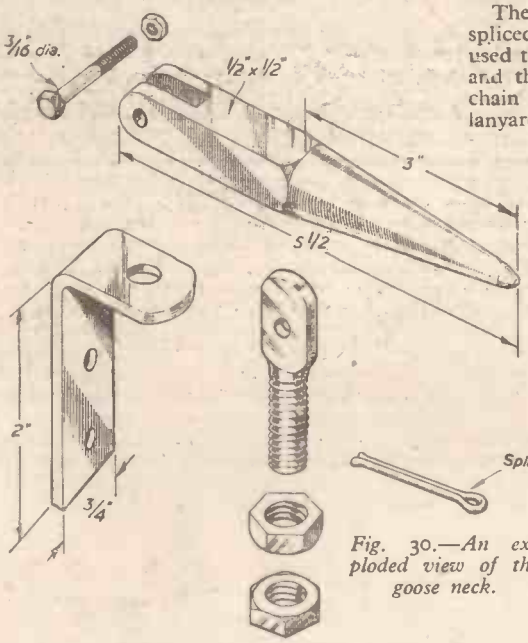


Fig. 30.—An exploded view of the goose neck.

groove in the two pieces can be worked in various ways but one of the simplest is to make a simple scraper block as shown in Fig. 28.

When the boom is glued together care must be taken to remove all surplus glue from the inside of the groove so that the roped edge of the sail can pass along freely. It will be of help to have the sail to hand before the mast and boom are made so that these items may be made to suit the sail.

The various fittings for the boom are shown in Fig. 29. Needless to say, these fittings must be made of brass or bronze. An exception might be made in the case of the gooseneck which could be made of steel and then galvanised. Exploded details of the gooseneck are given in in Fig. 30.

The mast track and runners are best purchased from one of the suppliers mentioned in the August issue. The ⅝in. track will be adequate for this small craft.

At the head of the mast is fitted a small sheave, running on a brass spindle. This spindle is held in the blind hole drilled in the mast by a wooden plug (Fig. 31).

Above the mast head sheave is the mast band. This, if bought, usually has four eyes. In this design only three are necessary—one for the bow and one for each of the chain plates. When using an unjointed mast, the mast band in Fig. 31 is replaced by one of 18 g. brass sheet, screwed to the mast 36in. from the top.

The three 10ft. shrouds have a thimble spliced at each end. Small harp shackles are used to secure the shrouds to the mast band, and the lower thimbles are attached to the chain plates and the bowsprit plates by lanyards. Two or three turns of thin cord are passed through the thimble and plate and the ends secured with a couple of hitches.

The mast step is made to the dimensions shown in Fig. 32, and the foot of the mast is tenoned to fit into the step as shown. It should be noted that the step will not be at right angles to the mast so that the mortise in the step must be out of the vertical by a similar amount.

A horse for the main sheet traveller can be made of a piece of flexible galvanised rope, as used for the shrouds. A pulley block with an eye is threaded on the wire and the ends of the wire are passed down through holes drilled in the stern knees and prevented from being pulled out by two stoppers screwed to the end. The arrangement of the main sheet and pulleys is shown in Fig. 33.

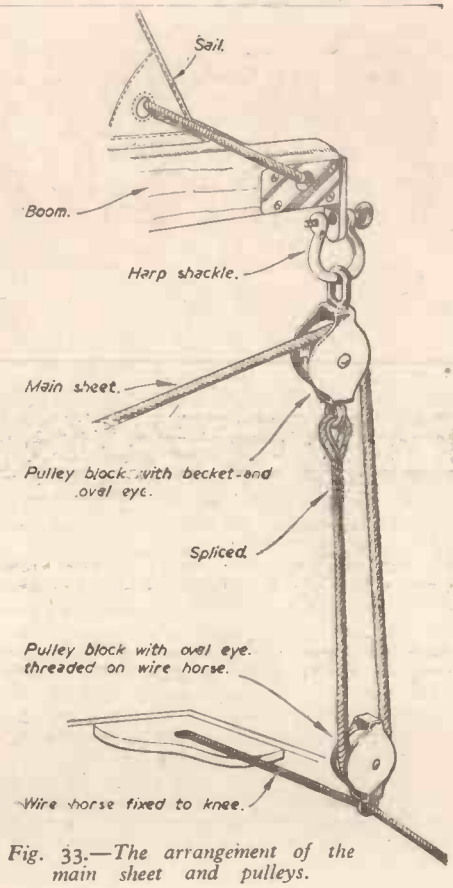


Fig. 33.—The arrangement of the main sheet and pulleys.

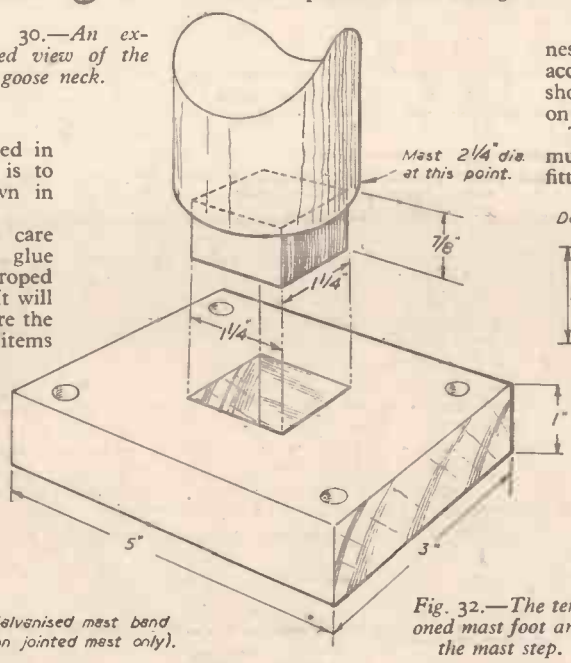


Fig. 32.—The tenoned mast foot and the mast step.

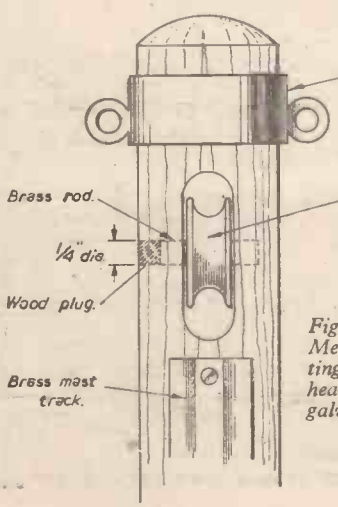


Fig. 31.—Method of fitting the mast-head sheave and galvanised mast band.

The Rudder

The rudder may be made from mahogany or resin-bonded plywood; the former will, of course, look much better but the latter will be stronger. Fittings for hanging the rudder may be purchased ready made. These are usually bronze castings and are fairly expensive. If one is buying a set of rudder fittings, it would be better to make the rudder after the fittings are to hand so that the thickness of the timber used may be arranged accordingly. The shape of the rudder is shown in Fig. 34; 2in. squares are set out on paper and the shape drawn in as indicated.

The practical mechanic will no doubt get much pleasure from making his own set of fittings, and this may be done from brass or

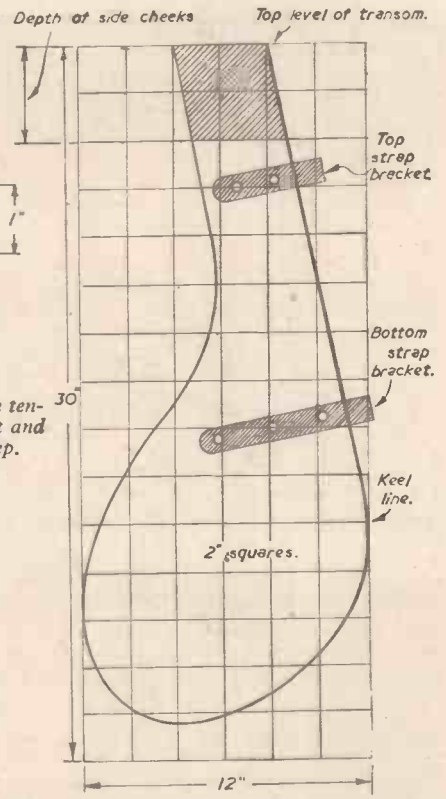


Fig. 34.—Dimensions and shape of the rudder and position of brackets.

mild steel. If the latter metal is used the fittings must be galvanised when completed.

An upper and lower strap bracket are required. They differ only in length, the upper being the shorter, see Fig. 35.

Two plate gudgeons are needed which are screwed to the transom. These could be made by using two heavy gauge brass screw-eyes or could be fabricated as in Fig. 36.

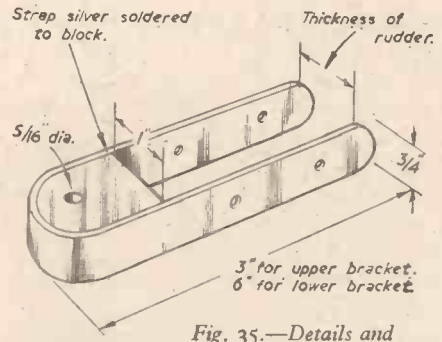


Fig. 35.—Details and dimensions of the rudder strap brackets.

A brass rod, ¼in. diameter, with a handle bent at right angles at the top end about 3in. long, passes down through the holes in the straps and gudgeons. The strap brackets must rest on top of the plate gudgeons, so that in the event of the rudder striking the ground there is, due also to the shape of the end of the rudder, a tendency for the rudder to rise up of its own accord. Alternatively, in such an emergency the rudder may be easily lifted up to become disengaged without coming adrift from its fixing. The complete rudder assembly is shown in Fig. 37.

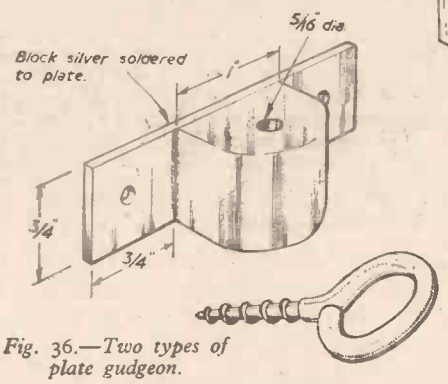


Fig. 36.—Two types of plate gudgeon.

The Tiller

The tiller is made of mahogany 1in. thick, cut to the dimensions shown in Fig. 39. It is attached to the rudder between two cheeks secured to the top of the rudder, as in Fig. 38.

A Ring Bolt

A ring bolt is necessary at the bow, to which is secured the painter used for mooring or towing the dinghy. It is usual to have the ring on the outside of the boat, which is especially useful when the dinghy is towed astern another boat. The bolt should pass right through the bow

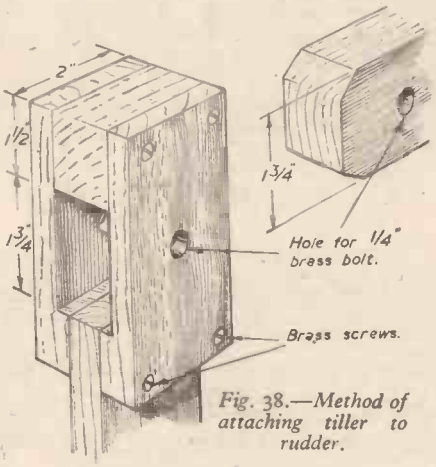


Fig. 38.—Method of attaching tiller to rudder.

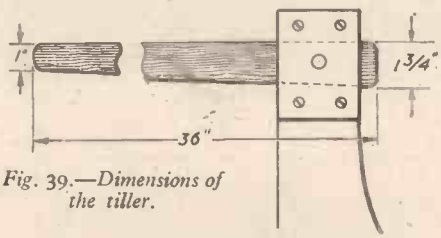


Fig. 39.—Dimensions of the tiller.

and the knee on the inside, as shown in Fig. 40. The nut should be well tightened, the surplus thread sawn off and the end of the bolt riveted over.

Draining Cocks

These are usually fitted when the dinghy is kept ashore so that rainwater may be drained out easily without having to upturn the boat. In fact, they serve as drains even in the absence of the owner if the bow is well propped up. Two ½in. holes are drilled in the transom on either side of the hog (see Fig. 41), and as near the bottom of the boat as possible. Two brass plates are fitted over the holes and ordinary corks are used to plug them when afloat. It should be noted that these are pushed into place from the outside so that the water pressure keeps them in position.

The heading photographs show the completed boat under sail and Fig. 42 is a view of the boat interior, giving an idea of size.

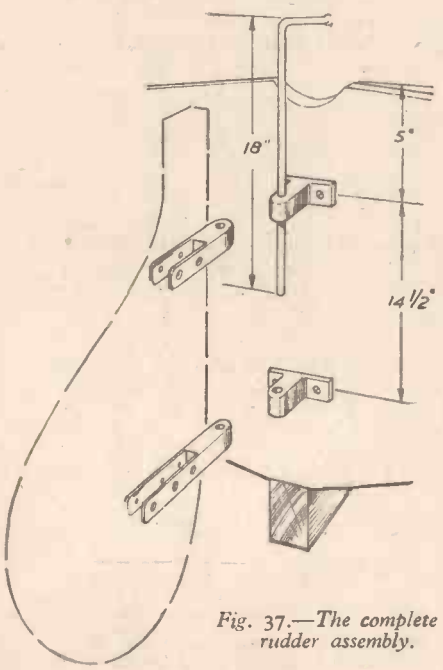


Fig. 37.—The complete rudder assembly.

Fig. 42.—The interior of the author's boat.

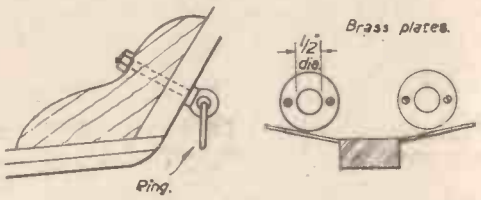
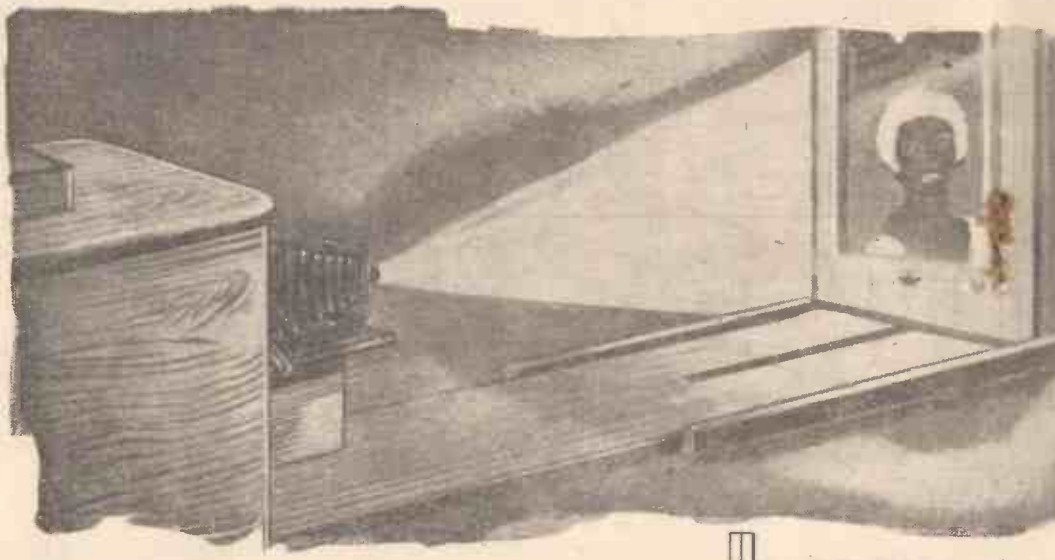


Fig. 40 (Left).—Method of fitting the ring bolt.
Fig. 41 (Right).—Details of the draining cocks.

MAKING A HORIZO



AN advantage of this enlarger is that it is constructed throughout in wood and, therefore, comes within the scope of any average handyman. It has been in continuous use for over 25 years and as there are no mechanical parts attached failure during use is practically impossible.

It was originally designed to serve in three capacities: first as a contact printer, by lifting the housing lid and exposing the sensitive paper and negative to direct light; second, as an enlarger and reducer; and third, as a dark-room lamp to give safe light whilst developing bromide prints. It was found advisable, however, to cut out the first requirement as the different exposure times for the same size of print varied considerably and tended to confuse the user when making bromide enlargements.

As will be seen from the photographs, Figs. 1 and 2, and drawing, Fig. 3, the enlarger consists simply of a wood base attached to which are the easel (for the bromide paper holder), lens and camera blocks with lamp housing and lid.

Base

The base is constructed from wood 1in. thick and is 7in. wide × 42½in. long. In one end is cut a ¼in. wide slot 17in. long to take the pan-head bolt and wing-nut that secures the stand for the bromide paper holder.

On each side of the base and at the same end are attached two strips of wood 19in. long and of 1½in. × ½in. section, these are fixed in position so that the base is lifted ½in. off the ground. (See the side elevation in Fig. 3.)

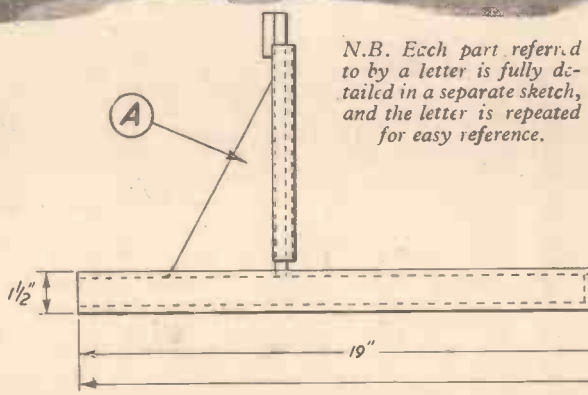
Through the end at which the lamp housing is situated is cut a central rectangular hole 2½in. × 3½in. wide. (See the sectional side elevation in Fig. 3.) This takes the detachable ventilator which is constructed from ¾in. × ½in. section wood and a piece of sheet tin plate 5in. × 3½in. tacked in position. Details are shown in Fig. 5 and at B in Fig. 3.

Lamp Housing

This housing is made from wood ¾in. thick, the front piece being 8½in. deep × 7in. wide, the sides 9¾in. deep × 14in. long and the back 9¾in. deep × 7in. wide. The front section is recessed 4¾in. diameter × ½in. deep with a hole cut centrally in this recess to sizes given in Fig. 9.

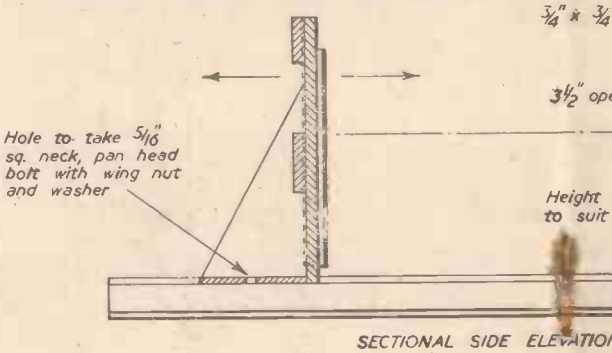
The sides are screwed on to the base with an overlap of ½in. below the base to match the opposite end, thus raising the whole enlarger ½in. above ground level for ventilation purposes.

Through one of the sides is cut a hole 5in. wide × 4in. deep over which are placed two sheets of photographic linen; the inner one being red and the outer one yellow. These sheets are cut larger than the hole so as the wood frame which surrounds the hole secures the linen to the housing side.



N.B. Each part referred to by a letter is fully detailed in a separate sketch, and the letter is repeated for easy reference.

The back has a ½in. diameter hole drilled through it at a distance of 6½in. up from the bottom and central in the width. This is to take the brass tube carrying the flex to the source of light. The whole housing is strengthened internally with ¾in. square



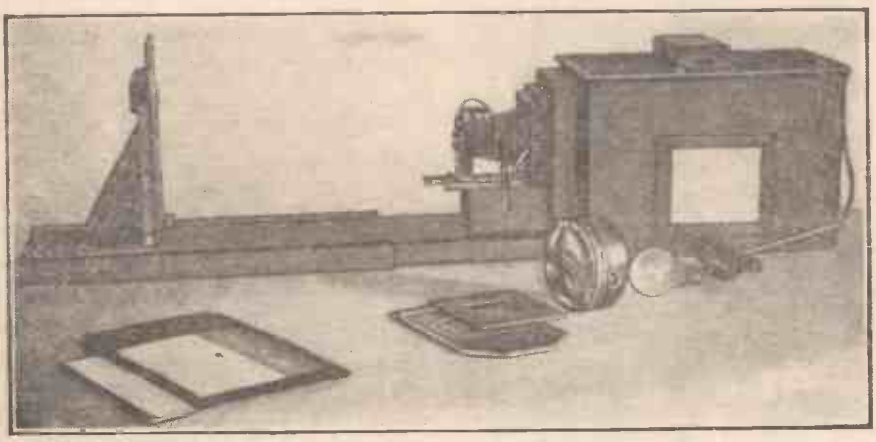


Fig. 1.—A side view of the author's completed enlarger and some of the components.

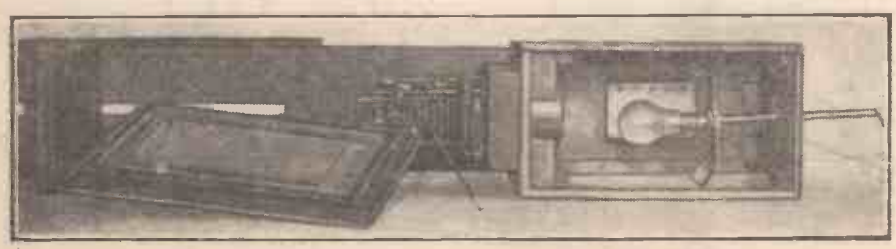
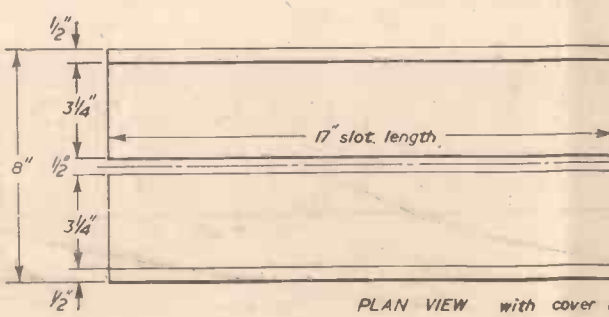


Fig. 2.—The enlarger turned on its side to show inside lamphouse.



ONTAL ENLARGER

A Design Mainly Using Wood and Utilising the Camera

By A. WOOLARD

section wood at each corner and round the base.

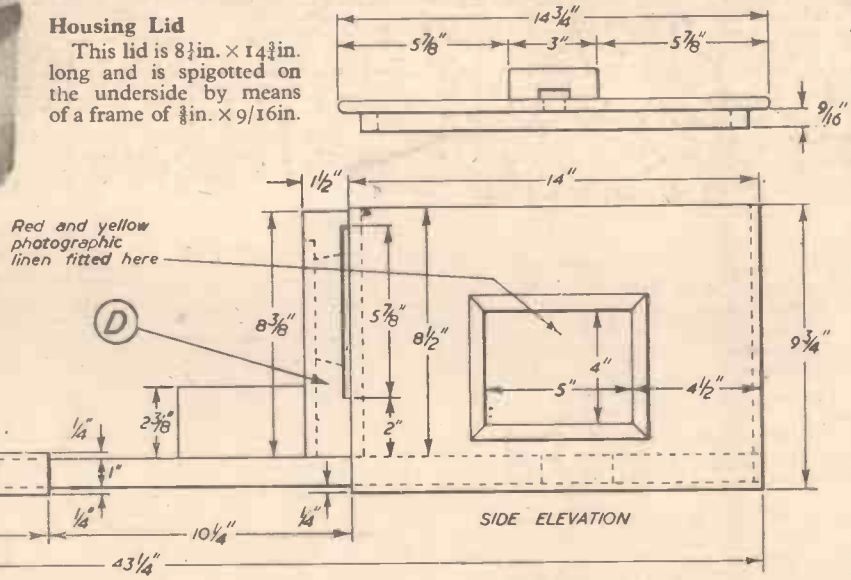
At a distance of 3½in. down the inside of the housing are fixed two horizontal rails of the same cross-section; these act as supports for the lamp guide. Note that the lens adaptor block must be in position inside the housing before the strengtheners are inserted as some of the latter are secured to this block (see Fig. 3).

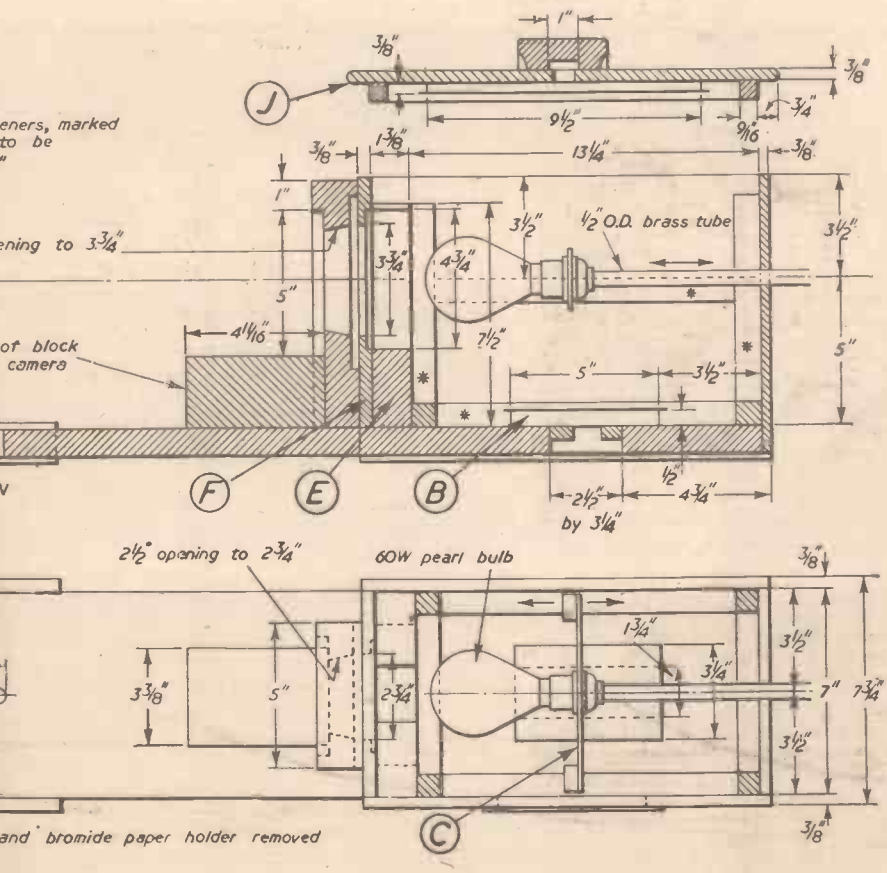
Housing Lid

This lid is 8¼in. × 14¾in. long and is spigotted on the underside by means of a frame of ⅜in. × 9/16in. section wood, fitting into the top of the lamp housing.

The handle which is recessed for finger grip is grooved on the underside as shown in Fig. 12 and screwed into position over a rectangular hole in the lid. This hole is covered underneath by means of a piece of tin raised clear of the lid with two strips of wood.

The ventilation of the enlarger is now complete, allowing a free passage of air to be admitted through the base, into the housing, and out via the lid and handle.





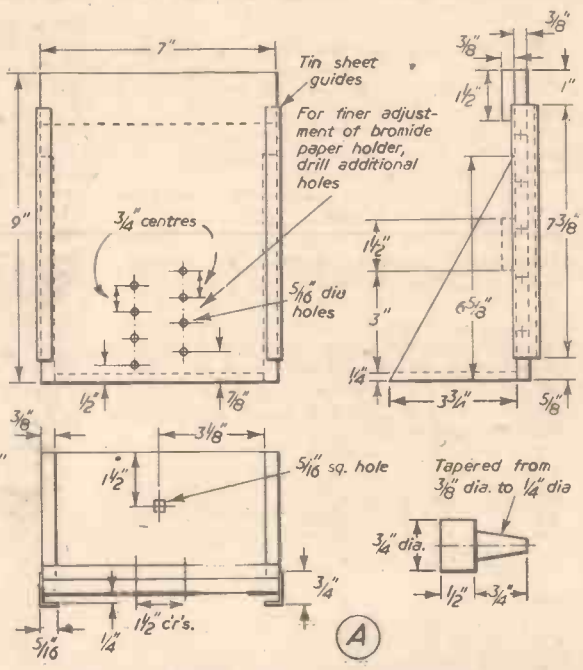


Fig. 4.—Details of the easel for the bromide paper.

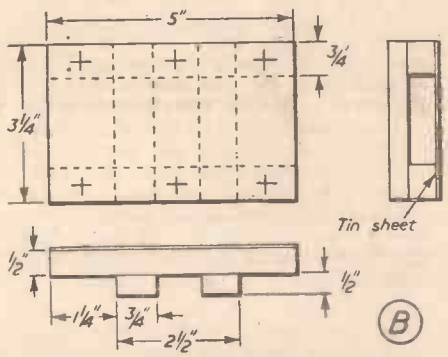


Fig. 5.—The detachable ventilator.

Lens Adaptor Block

As will be seen in Fig. 8, the hole is cut to suit the lens that is available. In the case of the enlarger shown a pair of convex condenser lenses were incorporated, both being housed in a metal container and a sliding fit in the adaptor block. Previous to this a piece of frosted glass together with a higher candle-power lamp was used which naturally required longer exposures during printing.

Within reasonable limits the size or number of condenser lenses used does not matter, though it must be noted that the diameter is dependent on the largest negative that is to be enlarged, and this diameter must equal the diagonal of the negative.

Whatever size lens is used the distance from its centre to the base of the block, a distance of 5in., must not be altered.

This block is attached to the inside of the

Fig. 3.—Side elevation, sectional side elevation and plan view of assembled enlarger. Cover and bromide paper holder are not shown in the plan view.

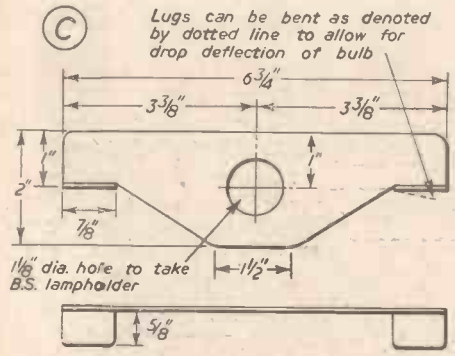


Fig. 6.—Lamp guide, constructed from tin or copper sheet.

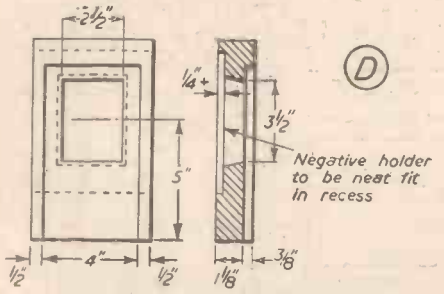


Fig. 7.—Camera adaptor block.

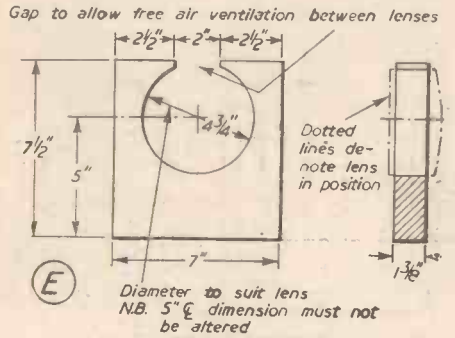


Fig. 8.—Lens adaptor block.

front section of the lamp housing as seen in the sectional elevation in Fig. 3.

Camera Adaptor Block

A great saving in the construction of this enlarger is made by using an ordinary plate camera (double extension preferred) which any enthusiast would naturally have for special jobs, including copying. The block shown in Fig. 7 will vary somewhat; mainly depending upon the focal length and shape of the camera which is proposed to be used, and the range of enlargement and reduction required.

Negative Holders

All these holders are constructed of 5-ply (5mm.) and recessed 5in. square to 2-ply thickness to receive the negative cover plate which is 5in. square and made of 3-ply from a 5-ply sheet.

The holder shown in Fig. 11 is for 3¼in. × 2¼in. negatives, but the same size of holder can have holes to take 2¼in. × 2¼in. negatives, etc. The centre of the negative when in position in the camera adaptor block must be on the centre-line of the camera.

Bromide Paper Holder Stand

This stand consists of a frontal upright piece of 9in. deep × 7in. wide strengthened at the top, two supporting side pieces (these being made from one piece of wood 3⅜in. × 6⅜in. long and cut diagonally) and a base through which is cut a 5/16in. square hole to take the pan head bolt, and screwed on to the stand face with countersunk screws. Care must be taken to see that the screw heads fall below the surface of the wood to ensure that the bromide paper holder slides smoothly in the stand.

The guides for the paper holder are made from tinplate, bent and tacked or screwed into position as shown in Fig. 4.

Through the front piece is drilled a series of staggered holes for the adjustment to the level of the paper holder. The tapered wooden peg is inserted into the appropriate hole when adjustment has been made. If a plate camera is used, finer adjustment may be made by controlling the rise and fall front of the camera.

Bromide Paper Holders

All holders are constructed of 3-ply with tinplate front; the outside dimensions being such that they are a sliding fit in the stand, and the inside hole dimensions being to suit the standard size of bromide paper. The holder shown in Fig. 10 is for standard half-plate paper, i.e., 6½in. × 4¾in.

The tinplate front has an aperture smaller than the standard size paper in order to give the white surround necessary on the final print. Into the aperture in the frame is fitted a 3-ply retainer that holds the bromide paper in place.

Various slides will, of course, be constructed on the same lines to suit other standard sizes of paper as required.

Lamp Guide

Fig. 6 shows the electric socket attachment for guiding the lamp which can move in a horizontal direction. The lamp can be moved nearer or further away from the condenser lens as required, simply by movement of the brass tube shown.

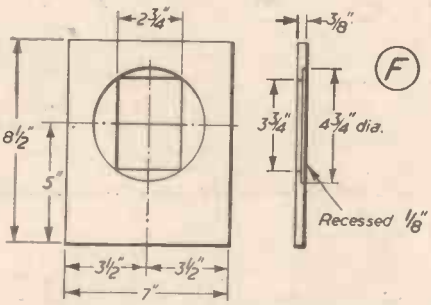


Fig. 9.—Front panel of lamp housing.

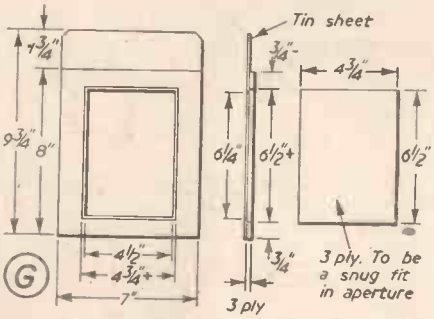


Fig. 10.—Details of bromide paper holder.

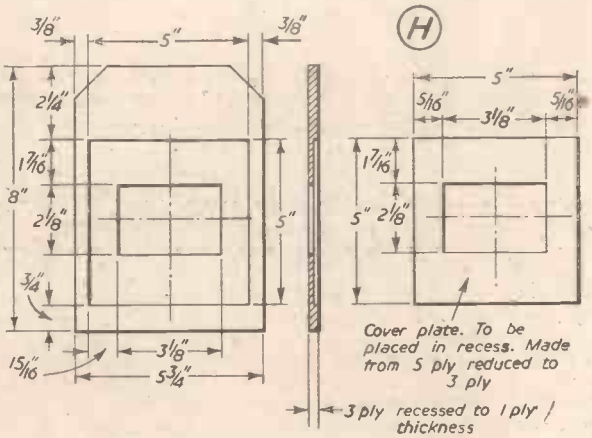


Fig. 11.—Details of negative holder.

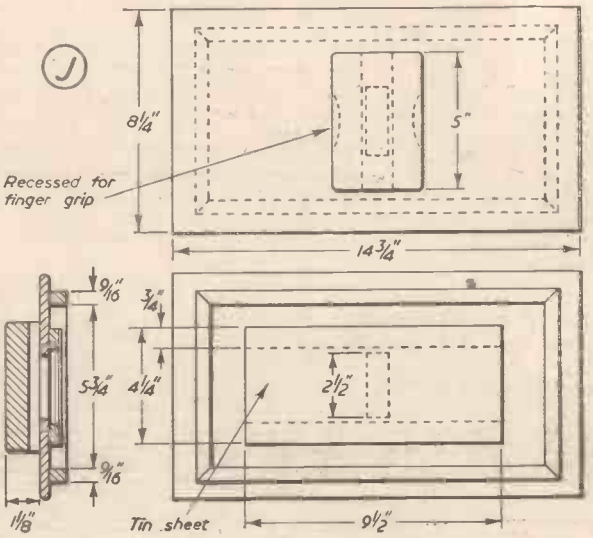


Fig. 12.—Details of cover (see also Fig. 3).

The lugs on the guide can be bent down or up to bring the centre of the lamp exactly in line with the centre of the condenser lens.

A point to note regarding the lamp for this enlarger is that it should be of the "pearl" type with all lettering removed from the end of it before using.

In conclusion, the range of this enlarger is such that a 2¼in. square negative can be enlarged to cover whole plate size, i.e., 8½in. × 6½in. or can be reduced to 1½in. square.

An additional degree of enlargement can be made by fixing an extension base on to the end of the enlarger, this being 7in. wide × 20in. long with a slot 16in. long and the same width as the one in the enlarger base, drilled and cut along the centre. With the addition of this extension, a portion 1in. square of the 2¼in. square negative can be enlarged to cover 8½in. × 6½in.

RADIO CONTROLLED MODELS

By Members of I.R.C.M.S.

12.—Tuned Reeds and Audio Control

(Concluding Article)

THIS series of articles on the radio control of models has so far concentrated on the Mark/Space system for model boat control and the sequence system for aircraft. Readers will have seen how these systems, with some of the embellishments detailed, can give several channels with easily made and very reliable gear giving consistently good results in contest work. The most serious challenger to these systems, however, namely reed control, has met with considerable success.

Reed System Principle

The basic idea behind the reed system is that each channel or control function is represented by an audio or musical note, thus on a boat starboard rudder might be obtained when one note (say middle C) is transmitted, whilst port rudder, and engine speed control, etc., use other notes. In the model, therefore, we must have a receiver, and this must feed some device which can recognise and separate the various notes received. This function of separation is carried out by the reed unit, which depends for its operation on the fact that a reed of say, steel of certain dimensions, will vibrate at one frequency only. If this steel reed is placed in a pulsating magnetic field it will not be affected by the magnetic forces until the frequency of pulsation of the field is identical with the frequency at which the reed can vibrate. Then, and only then, will the reed start to vibrate.

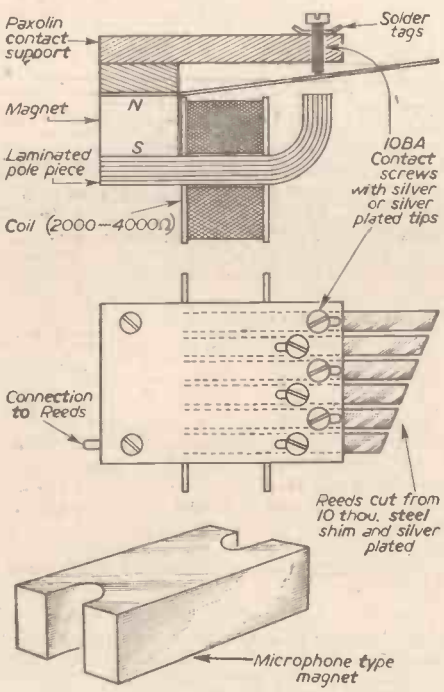


Fig. 1.—Construction of the reed unit.

The Six-reed Unit

A typical six-reed unit (six reeds are the normal maximum in general use at the present time) is shown in Fig. 1. The unit consists essentially of a coil to produce the field, a laminated pole piece, and a permanent magnet. This magnet is used to obtain a greater change in force with a given change in coil current. The reeds are arranged so that the field passes through them and when the coil is fed with current at the natural frequency of one reed, this will start to vibrate. In vibrating the reed touches an adjustable contact and makes a circuit to close a relay. The reeds are silver-plated and the contact screws silver-tipped to obtain better electrical contact. The latest practice is to use gold instead of silver and it is reported that this gives even better results. The intermittent contact between the reed and the screw contact is not used to operate servo mechanisms direct, but is simply used to close a relay, as in Fig. 2. The condenser across the relay holds its contact closed in spite of the interrupted current flowing through the coil. This relay then feeds the servo mechanism. The condenser size used can vary considerably with the type of reed relay used and with the relay voltage available. The values given are typical but the precise value should be obtained by experiment. The correct value is the smallest condenser which will hold the relay firmly in when the appropriate reed is vibrating.

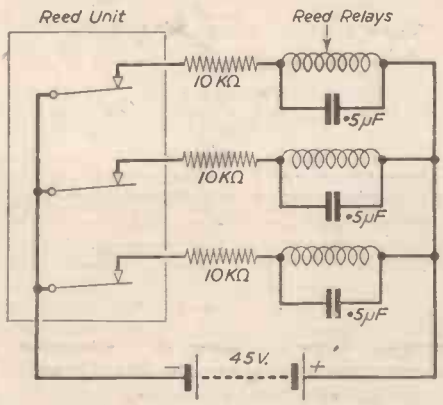


Fig. 2.—Wiring the reed unit.

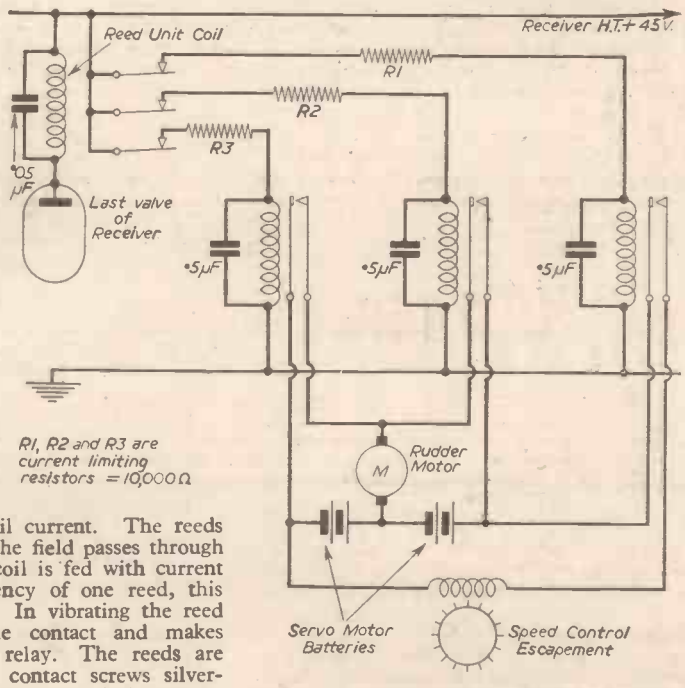


Fig. 3.—A typical reed installation using three reeds.

A typical reed installation using three reeds is shown in Fig. 3. Here it will be seen that two reeds are used for rudder control, whilst the third is used to operate a sequence switch to control the engine speed.

It will be apparent that many schemes can be devised for different controls using reeds, but all systems have the above mentioned reed relay arrangement.

The Radio Part of the System

This is a conventional transmitter to produce radio frequency power. It is connected to a modulator which is a means of producing the various audio tones required and impressing them on the R.F. signal. A separate control box may be used with push buttons for each tone. In the model there must be a receiver to pick up the signal, amplify it and feed it to the coil on the reed unit.

The transmitter circuit detailed in the article in October, 1955, is quite suitable for

reed work, except that the H.T. connection must be made via the modulator. The circuit of this transmitter is given in Fig. 4.

There are many types of modulator suitable for reed operation. They usually consist of a small valve arranged as an audio oscillator with part of the circuit so arranged that by pressing one of the buttons on the control box a steady note of the desired frequency is produced, and fed to the transmitter. An amplifying stage between the oscillator and the transmitter is sometimes needed. Two typical circuits are shown in Figs. 5 and 6.

Fig. 5 is known as a blocking oscillator type and the three tones are selected by pressing S1, S2 or S3 in the grid circuit. R1, R2 and R3 are adjustable so that the note can be altered until it causes the maximum vibration on the reed. It must be stressed that with all these simple modulators only one note at a time can be produced. The modulator in Fig. 5 is coupled to the transmitter via two output transformers back to back. With an audio modulator it is essential that adequate

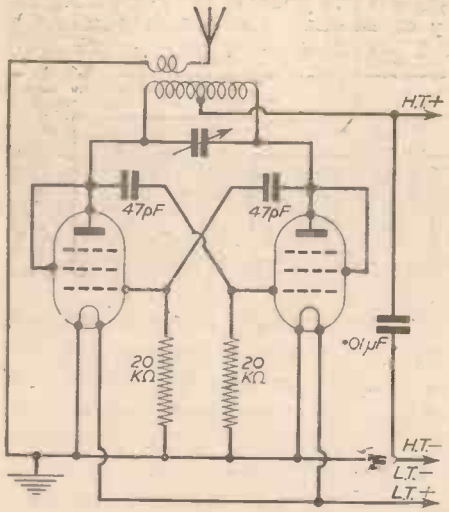


Fig. 4.—The two-valve transmitter circuit.

H.T. battery supply is available. If this is not watched carefully two faults can occur. The first is that if the H.T. voltage drops appreciably during a run the audio tone will change and the reeds will no longer be in tune. Secondly, when no signal is being sent the

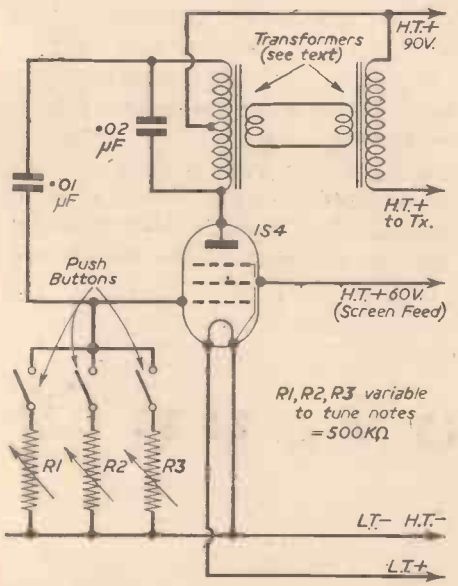
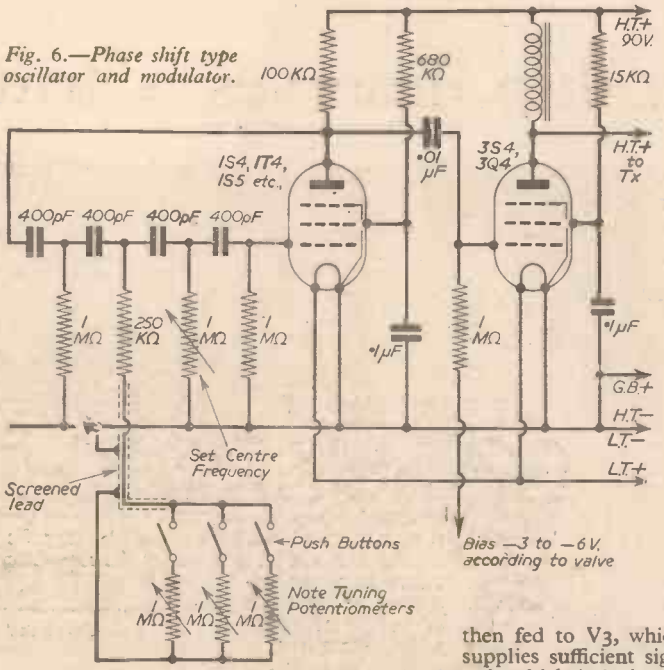


Fig. 5.—Blocking oscillator type of the generator and modulator.

Fig. 6.—Phase shift type oscillator and modulator.



H.T. voltage may stand at, say, 95 volts; when one button is pressed the H.T. current rises and this may pull the voltage down. The result is that the note starts on the correct tone but immediately falls a few cycles which can be sufficient to go out of tune with the reed.

The modulator shown in Fig. 6 uses what is known as a phase shift oscillator. Again, three tones can be produced and can be pre-set to tune to each reed. A separate control box is also shown coupled to the modulator via a screened lead. The second valve in this case is an amplifier and the transmitter H.T. line is coupled straight to the anode of this valve.

Some modellers have produced quite complex control boxes where, say, for an aircraft a "joy stick" type of mechanism is utilised to operate switches which will give the required audio note for the particular function wanted. There is possibly quite a lot of scope here, since the less the operator has to think out when controlling, the better. A well-designed control box can give a reasonable "feel" to the control of the model and makes the best use of the operator's automatic reactions. The big snag, however, is reliability, since a complex control box if not very well made, so as to be very reliable, can be very much of a "white elephant."

Radio Gear Required in the Model

In Fig. 7 is shown a typical reed receiver. In this circuit B7G valves are shown, but for ultra-lightweight sets there is no reason why deaf-aid valves should not be used, at any rate for V1 and V2. It will be seen that V1 is the R.F. stage which tunes the signal and rectifies it. This is then passed to V2, which is an audio amplifier. The amplified signal is then fed to V3, which further amplifies and supplies sufficient signal to energise the reed unit which is in its anode circuit. The condenser C8 is shown as 0.05 μF. This should be considered as a typical value, since the optimum value can vary considerably with different reed units. When the set is being tested, various values should be tried and the one which gives the best reed vibration utilised.

The set shown in Fig. 7 would also operate

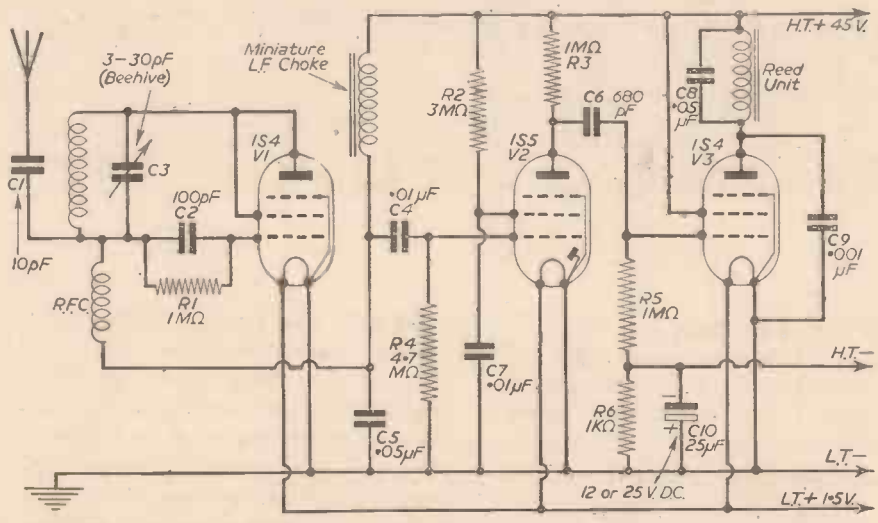


Fig. 7.—Three-valve receiver for reed control. Deaf-aid valves can be substituted for ultra-lightweight sets.

quite happily if the first stage, including V1, were replaced by the receiver detailed in the September, 1955, article of this series. The H.T. line for that receiver would have to be fed by an audio choke and an R.F. choke, and the output to V2 taken from the junction of these chokes just as in Fig. 7.

(*Concluded on page 93.*)

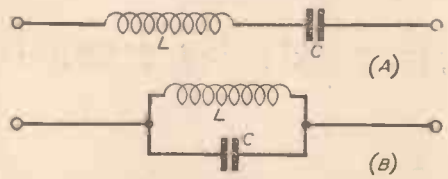


Fig. 8.—Circuits for "series" and "parallel" resonance.

The Audio System

As far as model control goes the audio systems owe their success to reed units, since these units provide a lightweight and relatively inexpensive method of separating the various notes received, and sending the signal down the correct channel. It must be mentioned, however, that this separation can be done by other means which are as yet not nearly so popular. Most of these methods depend on the fact that a circuit can be made to resonate to an audio frequency just as the tuning circuit of a radio receiver resonates to a radio frequency signal. In both cases a circuit such as Fig. 8A and 8B will resonate at a frequency found by the formula $f = \frac{1}{2\pi\sqrt{LC}}$

where f = frequency in cycles/sec.
L = inductance of coil in henries.
C = capacitance in farads.

In Fig. 8A the components are arranged for "series" resonance, and with such a circuit the maximum current will flow when the voltage applied across the circuit is at the frequency found by the above calculation. In Fig. 8B "parallel" resonance is shown, and in this case the resistance, or, in A.C. terms, the impedance of the circuit will reach a maximum at the resonant frequency.

At first glance this looks like a very promising means of separating audio frequencies, but a few calculations show up the snags. For R.F. work a condenser of a few micro-micro-farads and an inductance of a few micro-henries will produce resonance at, say, 27 Mc/sec. and our circuits use such components. For resonance at audio frequencies, however, we find that large condensers and huge inductances with iron cores are necessary. This was the position until special inductances wound on Ferroxcube cores were produced which give high values of inductance with light weight. These inductances then, together with suitable condensers, can be used to form frequency selective circuits so that although the receiver feeds all the circuits in parallel, the only one that passes any current is that in which the values of L and C are such that it will resonate at the frequency of the applied signal. This has led to some very elegant but necessarily complex systems, but it is certain that we shall hear more of this method in the future.

The foregoing article concludes the present series, but for readers who have missed any instalment, it will be reprinted, with other articles on radio control, in book form. A notice will appear in these pages on publication.

A Continuous ALARM

An Electric Bell Actuated By An Alarm Clock

By W. WALL

AN ordinary alarm clock which, at a set time, is capable of actuating an electric bell, makes a very efficient morning alarm. And when it is in no way wired to the bell, has no peculiar appearance, but causes the bell to ring continually until the clock is simply picked up and set down again, it is both neat and foolproof.

The details of such a contrivance vary slightly with different makes of alarm clocks to which it is to be adapted, but, in principle, they are as follows.

A light spring-brass arm (or a rigid arm with a light spring fixed at its far end) is secured by one end to the base front of the front plate of the movement of the clock and insulated from it.

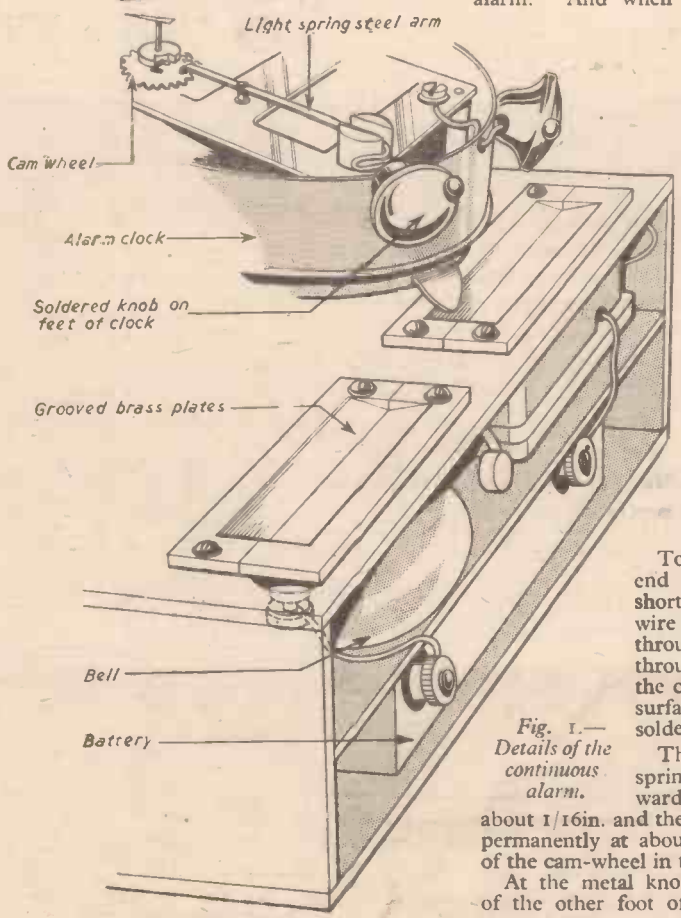


Fig. 1.—Details of the continuous alarm.

To a point near its attached end is bolted one end of a short piece of insulated bell-wire which passes outwards through the clock case and through the insulated foot of the clock and emerges on the surface of the foot as a small soldered knob.

The other end of the spring-arm is bent downwards at right-angles for about 1/16in. and the edge of the bent end set permanently at about 1/32in. above the face of the cam-wheel in the alarm-set position.

At the metal knob on the standing-point of the other foot of the clock ends a wire which is bolted at its other end to a convenient part of either plate of the movement.

It is not necessary to take any part of the movement apart to effect this.

An electric bell (shelved above, or lying upon, a battery) is now enclosed in a wooden box made to size and is connected by means of terminals to a pair of centrally-grooved brass plates about 3in. by 1in. by $\frac{1}{8}$in. fixed in line, a little apart and about $\frac{1}{4}$in. from the front edge on top of the box. These details are shown in Fig. 1.

Using the Alarm

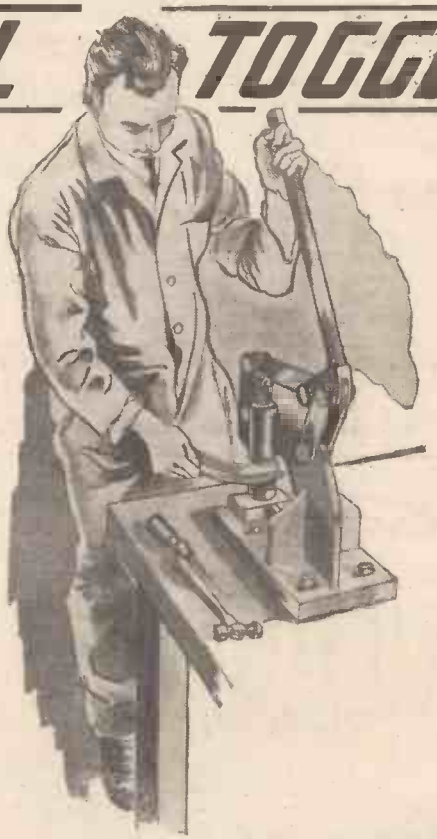
The alarm is set to the required time for sounding. Its spring need not be wound up.

The metal knobs on the standing points of the clock feet rest in the shallow grooves of the respective metal plates on the box top. At the appointed hour the cam wheel rises, contact is made between it and the end of the spring arm and the bell is set ringing. It will continue to ring until the clock is lifted from the brass plates or until, in about 50 minutes, the cam wheel is depressed out of contact with the spring arm.

In the bell box of my original model I incorporated a narrow chamber containing a pivoted and projecting brass lever to the fixed axle of which was looped the current from the battery. The lever, pushed below the level of its humped retaining spring, and allowed to lie with its suitably-shaped end resting on the alarm winder of an unadapted clock, would fall when the alarm spring of the clock was released and the winder began to turn. Falling instantly into a springy V-shaped terminal of a loop from the battery, it completed the circuit and the bell would operate until the lever was pulled up again past its spring catch.

With such a box, alarm clocks adapted or unadapted could be used and such a one has served me unfailingly for many years.

A USEFUL TOGGLE PRESS



A Practical Tool for the Home Workshop or Garage

(*Concluded from page 37, October issue*).

By K. VERDEN

AS a welded construction has been adopted for the main framework of this toggle press almost any garage can undertake the manufacture. The sizes indicated in these drawings give a reliable machine, but the dimensions may be modified a little in order to utilize existing material.

Some care, however, is necessary before embarking on a wholesale alteration of these figures otherwise a rather weak framework can result. In these circumstances the frame should be made heavier rather than lighter because the extra metal can do no harm, and tends to strengthen an already strong article. An attempt to lighten the members, particularly the base and vertical rib, can only lead to disappointing results.

The base is dealt with first and this is made from a piece of ⅞in. or 1in. mild steel. There is no need to cut the length and width to these dimensions—something a little larger will suit, but if the piece is cut from a large plate, then make it to approximately these figures. Mark the rectangle with a piece of chalk to act as a guide for cutting.

The Welding Drawing

To prevent any errors occurring through not allowing sufficient material on a surface for machining, Fig. 2 shows the dimensions for the unmachined frame. An ⅛in. on each facing is enough for the rough and finishing operations, but in the case of the two circular members—the ram sleeve and the die base, both pieces need facing prior to welding to ensure they are flat. If this process is omitted there is a risk of bad setting into position, and the subsequent lack of machining allowance which prevents the tools from cleaning them sufficiently and so making a good surface.

Bright mild steel is an excellent metal for such items, but if this is lacking, the black variety will serve. Drill the hole ¼in. dia. before welding if this is considered necessary, but take care to see that the top sleeve is perfectly vertical, otherwise the hole may not clean up when finish boring is attempted.

A simple way to prevent any errors due to the parts moving, perhaps through being knocked while welding is taking place, is to drive in small ¼in. dia. pins to locate them temporarily while work is going on. There is no need to ream the holes in which these pins fit, because the slight degree of movement that can arise is not sufficient to create such a wide error that the bore fails to machine correctly. Pins projecting about ¼in. are enough to ensure that all the details are in correct relationship to each other. The pins, of course, do not play any part in holding the frame together once the welding is completed, and when the frame is finally fabricated they are not visible.

Machining the Frame or Base

Rough machine all faces and edges if these are used for location while machining is going on, as this eliminates distortion.

Mill, plane or even face the bottom surface on a lathe, setting the frame up in a four-jaw chuck if one of sufficient capacity is available. Machine the edges while set up for this work (if the operation is performed on either the miller or shaper) because, if these are square, it assists the work of holding while boring the ram and die holes. Before attempting any finished work, decide on the method of attaching the frame to the bench or surface plate; four ⅜in. Whit. bolts are sufficient to hold it securely, so drill the holes in the base member 13/32in. or letter drill "Y" A local spot-facing operation for the nut is useful if the face on which it seats is very poor.

The final machining is a replica of the roughing processes, but the boring of the ram and die holes requires some comment because of the importance attached to them. The set-up will vary, according to the plant available and the reader can take his choice of carrying out the work while the frame is attached to an angle plate on the lathe faceplate, or on the boring table. Alternatively, the work is possible on the horizontal milling machine using a short stub bar in the tapered head.

Perfect alignment is essential for these holes and this is the reason for making them both the same size. If a long ⅜in. diameter reamer is available, this is a useful tool for finally achieving the specified diameter.

The Details

The most important feature of the links which operate the press is the centre distance between the holes. Close accuracy to the stated dimensions is not important, provided the holes in both the links match each other. The obvious way to secure this accuracy is to drill and ream them in pairs, and to avoid any tendency for them to move even a thousandth or so; if they are soldered together while this work is accomplished there is no risk of different centres. By adopting this method of manufacture, the pair of links become one item and if careful marking out is exercised, the resulting centres are close enough for the purpose they are required.

In last month's article, it was suggested that the holes be case-hardened as a way to avoid wear, and this should be done before putting the press into service. The centre distances on each pair of links varies but, in order to avoid using reamers of different sizes, all the holes are the same diameter. This means the fitting pins, though slightly modified as regards the length for each joint, are all made one standard size and preferably hardened and polished before assembly.

The ram sleeve needs turning and boring very carefully. Perfect concentricity between hole and outside diameter is essential, and in an endeavour to secure this quality in the work, both operations are carried out at a single setting. A tiny grub screw is inserted through the side wall to hold the punch while operating the press. This detail does not hold it against the pressure exerted on the handle, but is merely used to prevent the punch from falling out when not being operated. The latter item is angled to form a seating for the screw, and the direction of this angle should be carefully noted—it tends to push the punch back into the ram and not vice versa; if the angle is accidentally turned incorrectly, the punch is of no use at all.

The handle is built up from five pieces—three of steel and two (the hand grips) of either hard fibre or plastic. As a link fits between the two lower cheeks, bright mild steel should be used for the long member, then the distance between the above mentioned cheeks should slide over the link without undue slackness, rather than not entering because the gap is too small.

A longer handle is an asset and will enable a greater pressure to be exerted but it should be remembered that a long leverage can be just as much a disadvantage because it tends

(*Concluded on page 97*)

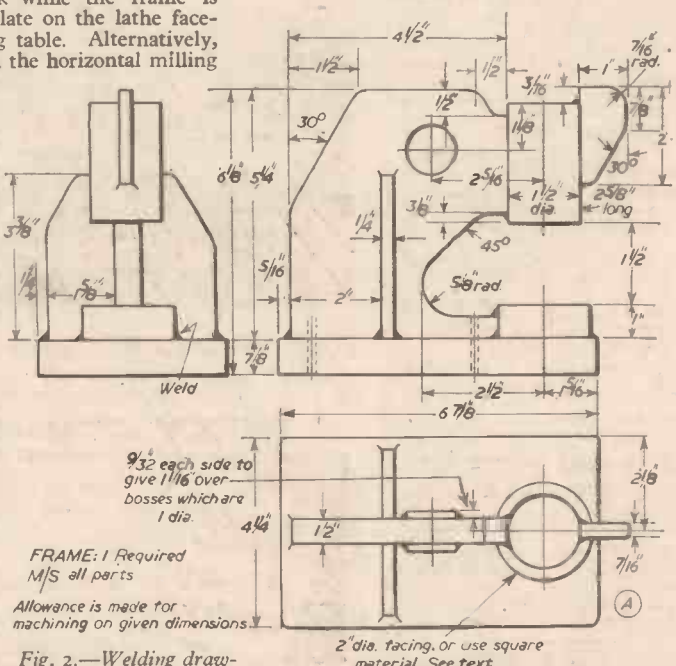


Fig. 2.—Welding drawing for the frame.

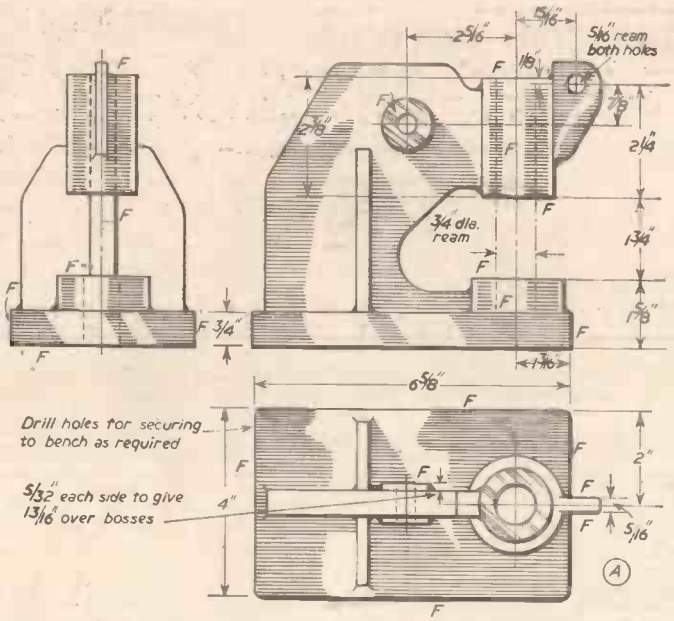


Fig. 3.—Machining drawing for frame. Finish machine where marked "F."

frame is painted a grey colour or a dark green. The latter is preferable because it does not show oil stains so much as grey or other colours. Make sure, however, the surfaces are free from oil and grease by washing the frame in petrol and leaving it to stand for a short period—say overnight to dry. Prior to this, file off all the sharp corners and remove unsightly welding scale which mars the appearance.

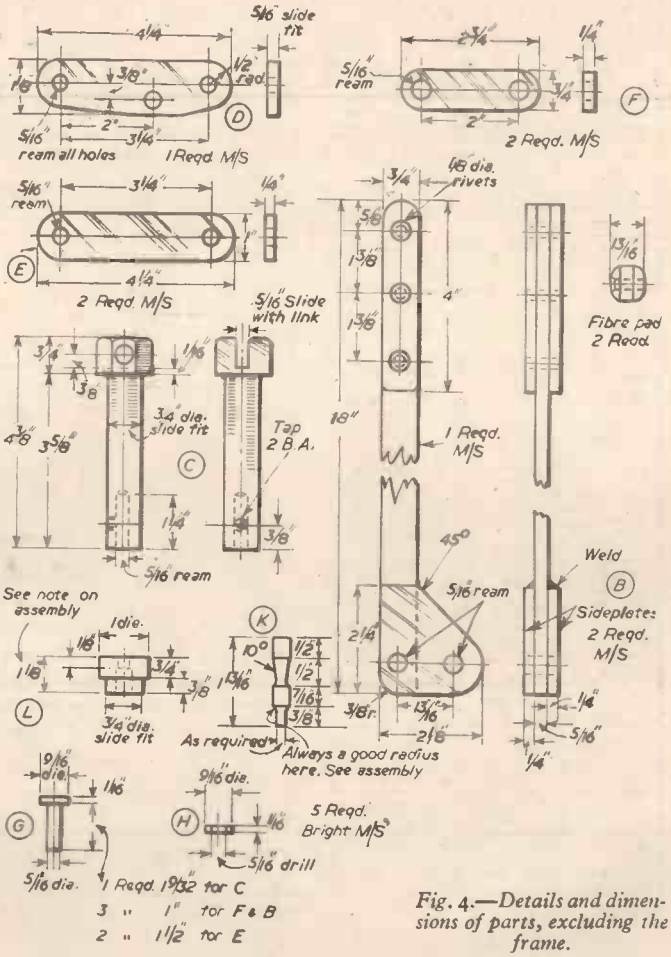


Fig. 4.—Details and dimensions of parts, excluding the frame.

to destroy the delicacy of feel which is essential for some articles or operations.

Finally, we come to the dies, which incidentally are made from cast steel and not the soft mild steel variety, and they are properly hardened in order to promote a keen cutting edge. A typical blank is shown with these details but without dimensions for the bore. This will vary, of course, according to the size of punch specified. Readers should remember that when the work of piercing is carried out, the diameter of a punch determines the hole size and not the die as some appear to imagine. A clearance is needed in the latter, and this is found by the following formula.

$$\text{Clearance} = \frac{\text{Material thickness}}{20}$$

Hole in die = Punch diameter + 2 (clearance).

Thus the die hole when piercing ¼in. dia. holes in .062in. thick plate is

$$\text{Clearance} = \frac{.062}{20} = .003\text{in.}$$

Hole in die = .125 + .006 = .131in. diameter.

Readers can observe that twice the clearance is added because, when calculating, the figures relate to only one side of a punch—thus twice the determined figure is added to the punch diameter.

General Notes

The assembly is straightforward and the only operation of note is the drilling of the cross-pin holes through which a small pin passes and so retains the links in position. The best way to do this simple job is to first sub-assemble each set of parts and drill the holes after making sure everything operates easily.

In order to give the completed machine the appearance of a professional article, the

DETAILS were announced recently by the Rover Car Co. of a prototype gas turbined engined car. The turbine unit is small enough to be stowed in the standard-sized boot and the car has four-wheel drive and a glass-reinforced plastic body. Running costs have been lowered by the introduction of a heat exchanger, which uses heat from the exhaust to heat compressed air before it enters the combustion chamber. The only controls are accelerator, foot brake, hand brake and reverse gear. The car has exceeded 100 m.p.h. on test.

Drilling for Oil in Britain

A NEW well is to be sunk at Upholland, near Wigan, in an endeavour to locate the oil reservoir believed to be there. The well will be sunk in an area described by geologists as being of complicated structure.

Output from Britain's oil wells is expected to increase this year from 54,000 to 60,000 tons. Since just pre-war some 500 wells have been sunk, 240 of which are producing.

An Anglo-American Phone Call

AN undersea telephone line to the U.S. has been completed and recently the first transatlantic phone call was made. The new line is said to be a vast improvement on the old radio telephone system, the fading and atmospheric disturbances which were one of its features being eliminated.

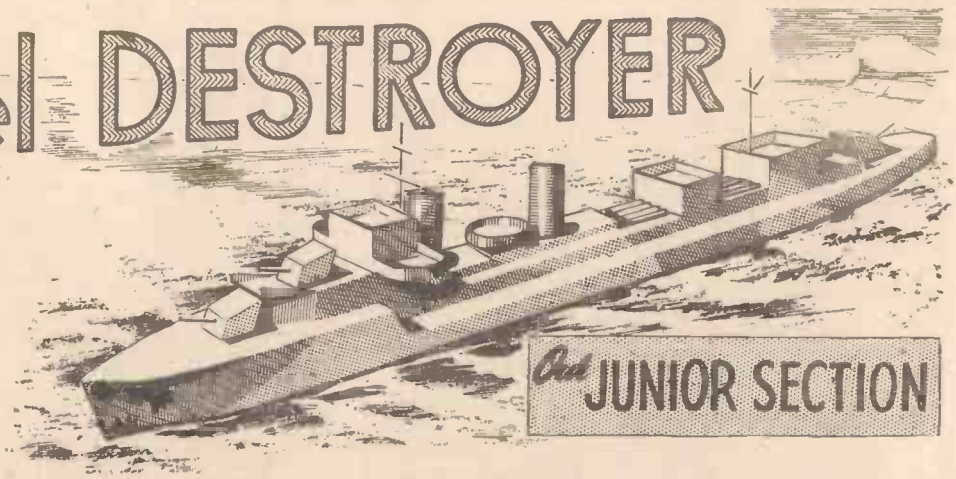
The cable cost nearly £15 million and took two years to lay. There are 35 lines and a call will cost £3 for the first three minutes and £1 for each additional minute.

Channel Island Traffic Lights

THE first set of traffic lights to be installed in the Channel Islands is to be erected at St. Helier, Jersey, and will cost £24,000.

A Model DESTROYER

An Experimental Design in Sheet Metal with a Novel Propulsion Unit



NEW tinplate sheeting is the metal suggested for use in constructing the hull and this should be of a thin grade. The plans for the sides, keel and bulkheads, given in Fig. 1, should be enlarged to full size and transferred to the tinplate. All of them should be cut out before assembly is started. All the joints must be carefully butt-soldered—a task which is easier than it sounds as the solder runs easily on the new tinplate. With the exception of the transom, none of the cross-members needs soldering tags, but this member can be made with a ¼in. of material on each side for bending over (see Fig. 2),

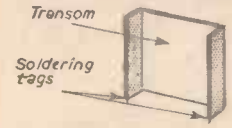


Fig. 2 (Above).—The transom with soldering tags.

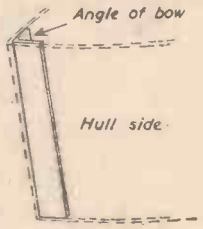


Fig. 3 (Right).—Bow construction.

unless a wooden quarter deck is decided upon. Readers will note that the plans show wood for decking the forecastle and the quarter deck, and in consequence the transom will not need a top tag. The stem may be formed up with a reinforcing piece of tinplate as shown in Fig. 3 and this joint should be soldered first. Fig. 4 shows the hull in course of construction.

The Propulsion Unit

The general principles of this will be apparent from the layout drawing in Fig. 5. The centre compartment of the hull is arranged to contain the methylated spirit which is fed to the wick tube in the boiler compartment, by passing outside the hull through a tube soldered on to the keel plate. This tube acts as a weighted keel and the piece of tube out of which it is made can be of heavy gauge. It should have both its ends plugged with metal secured with soft solder.

The Boiler

This is a self-feeding automatic device of the simplest character. It consists of a piece of light solid drawn copper tube, 3/16in. diameter with a double coil in the centre and the two ends arranged one above the other as in Fig. 6. The action of the "boiler"—so called for want of a better description—is due to water finding its way up the tubes and into the heated coil. When this happens it is flashed into steam and expelled at a great rate. The operation is automatically repeated and by virtue of the reaction of the expelled steam and water the boat is driven along.

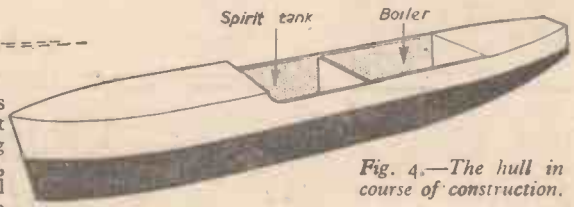


Fig. 4.—The hull in course of construction.

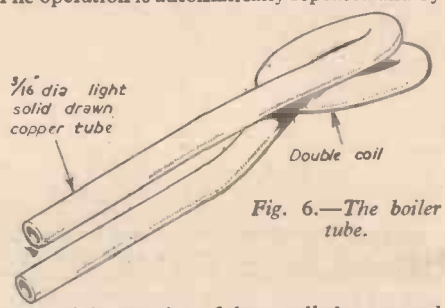


Fig. 6.—The boiler tube.

A metal hull is to be preferred to a wooden one, as the propulsion tubes can be soldered to the hull and a sharp line between the cooled and heated portions of the boiler obtained; this seems to help the action of the unit.

The boiler can be made and tried over a gas jet, with the ends of the tubes held in a saucer of cold water. It is essential that the tube out of which the boiler is formed should

(*Continued on page 101*)

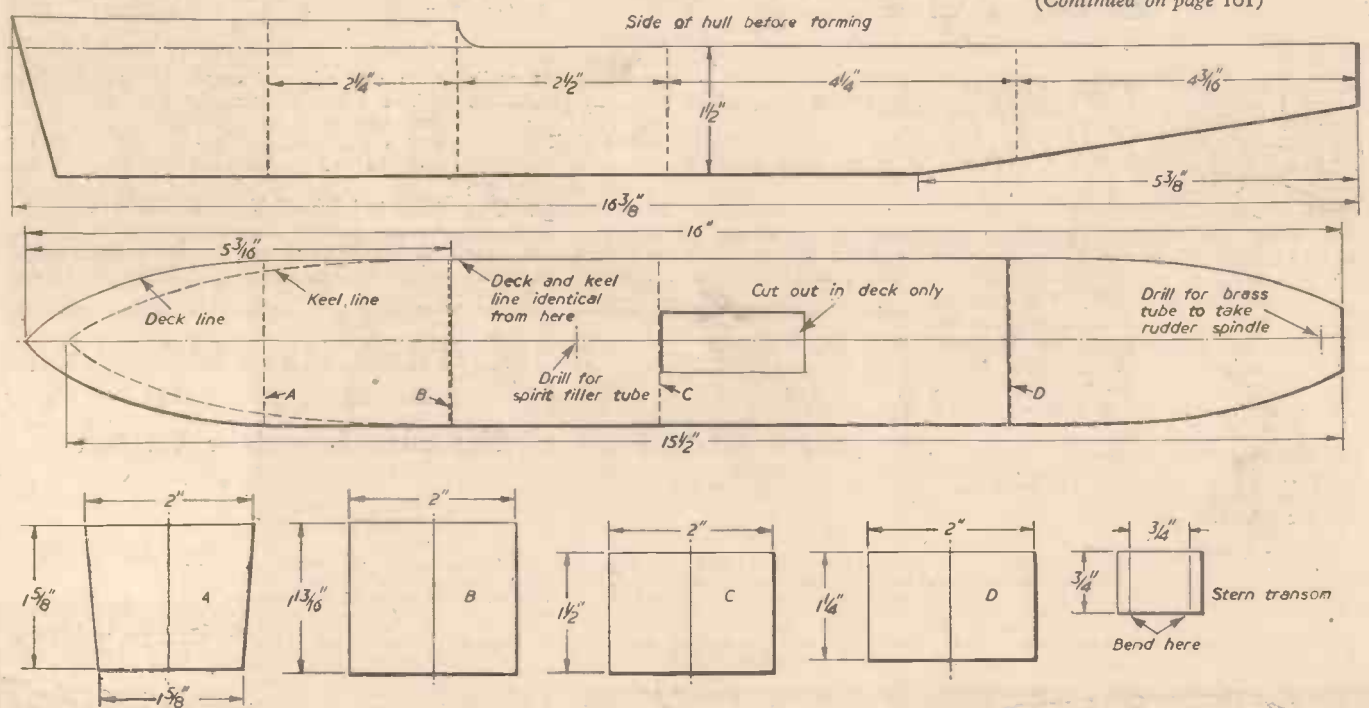


Fig. 1.—Dimensioned sketches of the sides, deck, keel and bulkheads.

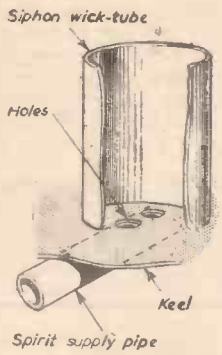


Fig. 7.—The siphon wick tube.

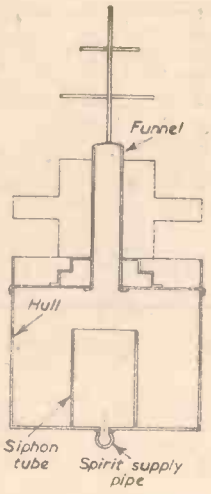


Fig. 8 (Right).—Section through the spirit reservoir compartment.

be of the lightest gauge of material and either copper or brass may be utilised. The tube must be of the solid drawn or brazed variety; a slit tube is not suitable.

The Lamp

The deck which forms the cover for the spirit reservoir must be a good fit, so as to be watertight, and the first funnel is arranged to mask the filler, which is a hole previously punched in the deck. This is sealed by a cork which fits inside the funnel, as shown in Fig. 5.

When the supply pipe has been made and fitted under the keel, two holes are drilled through into it from the spirit reservoir. These holes should be approximately ⅛in. in diameter, as shown in Fig. 7. This also shows the siphon wick tube which is approximately 1in. high. To feed the spirit to the lamp four or more strands of coarse worsted or darning cotton are placed in this siphon and allowed to trail over into the reservoir of spirit. The strands can be kept in position by twisting round a piece of wire. The spirit feeds over by capillary attraction and no overflowing of the spirit to the lamp wick can occur as long as the lamp remains lighted. The siphon tube is positioned as shown in Fig. 8.

The Lamp Wick

This is positioned in the boiler compartment directly underneath the boiler itself and below the second funnel as shown in Fig. 5. The wick tube should be made from a strip of tinplate about ⅜in. wide, bent and soldered in the shape of a flat oval 1in. long and ¼in. wide. It should carry a loose lamp wick and, as shown in Fig. 9, two or three holes should be drilled inside the wick case down through into the feed supply tube.

The Deck

This is best fitted in sections, but the general outline and dimensions will conform to Fig. 1. The forward part of the deck, over the first two bulkheads, is of wood and may be positioned permanently. The next section must be drilled for the spirit filler tube and the square hole cut to allow air into the siphon chamber

Fig. 9.—The wick tube.

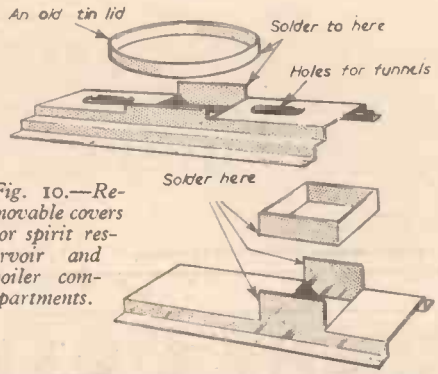


Fig. 10.—Removable covers for spirit reservoir and boiler compartments.

and the fumes to escape from the boiler compartment. The spirit filler tube (the front funnel) is fitted to the deck as shown in Fig. 5, while the after funnel is fitted to the small superstructure shown in Fig. 10. They must be fixed in such a way that they are not affected by heat, i.e., by riveting or by cutting tags on the base of the funnel and corresponding slots in the deck. If the lamp does not appear to be sufficiently ventilated—and this is entirely a matter for experiment—a few more holes may be punched in the deck.

The Rudder Compartment

The after compartment can be made watertight either with a wooden decking (about 5/32in. thickness light wood) or with a sheet of tinplate soldered on to the hull. For the rudder spindle, a piece of light tubing must be soldered into the keel plate to obtain the necessary watertightness. The boiler tubes must also be soldered into holes formed in the hull and the bulkhead marked D in Fig. 1.

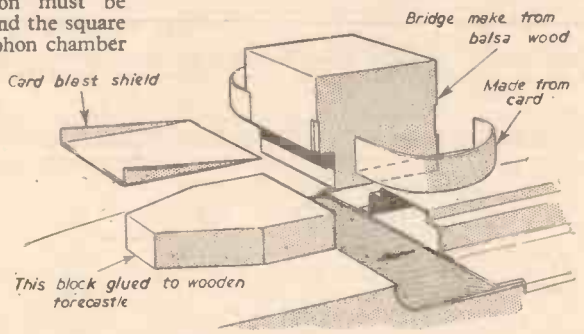


Fig. 11.—The deckhouse and bridge.

The tiller consists of a piece of brass wire bent at right angles above the deck and soldered to a shaped piece of metal sheet as shown in Fig. 5, to make a balanced rudder. The tiller handle can engage on a curved rack soldered on to the deck, so that it remains in any notch into which it is set.

Superstructure, Fittings, etc.

The forecastle deck may be made of 3/16in. pine or other light, close-grained wood and on it may be made and fixed the bridge and deckhouse, shown in Fig. 11. Deck fittings in addition to bridge, etc., may be added as desired, remembering that they should be as light as possible. Materials such as balsa wood, card and aluminium are recommended and a couple of guns, torpedo tubes and bollards are all that is necessary to obtain a realistic effect. The small raised deck fitted behind that which carries the funnels is of metal in the original and the one farthest aft of balsa and card.

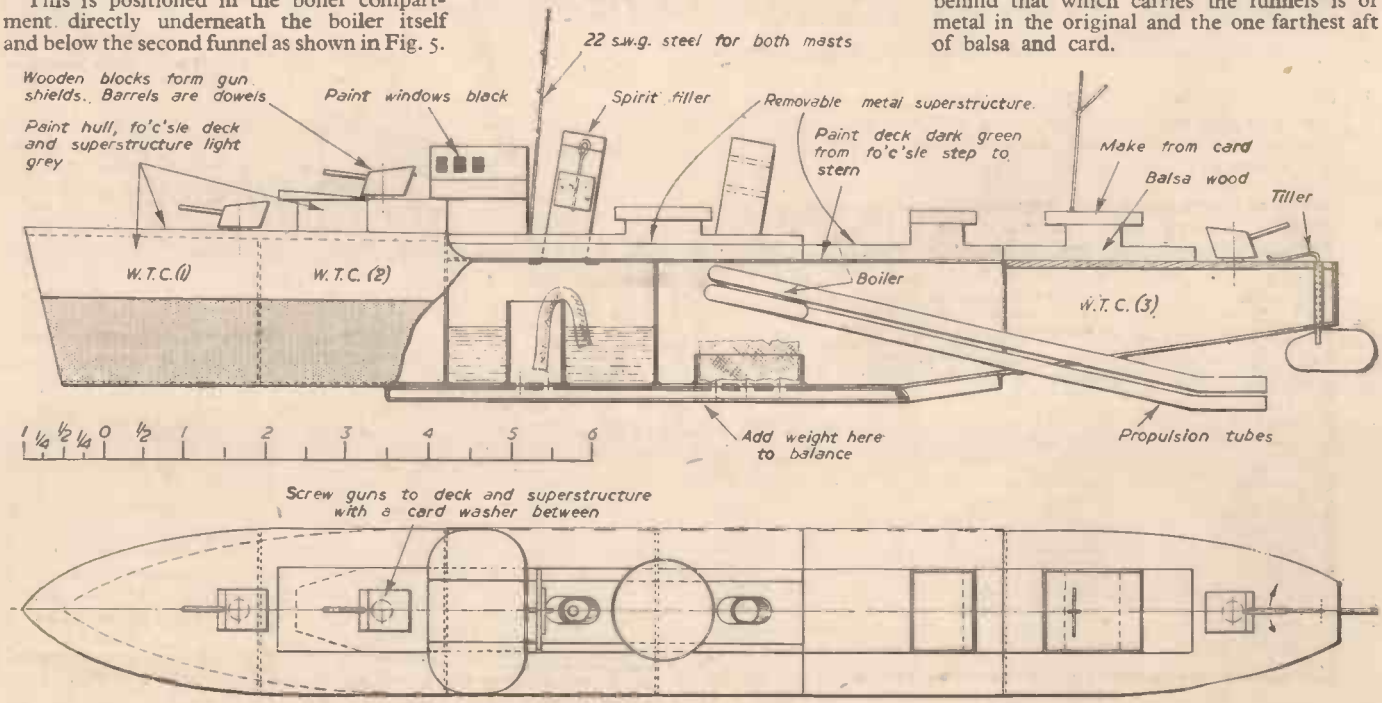


Fig. 5.—Side elevation and plan view of the boat, showing general arrangement.

A RESISTANCE BOX

A Home-made Variable Resistance for the Junior Experimenter

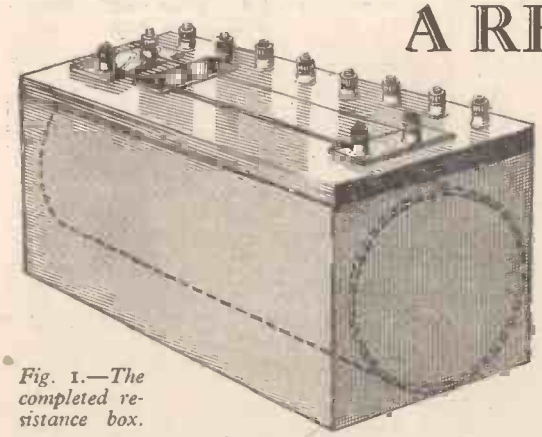


Fig. 1.—The completed resistance box.

MANY experiments in electricity need a resistance which can be adjusted to different values, and below is described a simple, cheap and efficient instrument for performing this duty. If made carefully it will give very accurate results. First procure a 2oz. reel of "Eureka" resistance wire, 22 gauge. Fig. 2 shows the top of the box, which is 1ft. 8in. by 4in. Mount two terminals with a space of exactly 17in. clear between them and stretch a piece of the resistance wire lightly from one to the other. The resistance wire must be bared by having the whole of its silk covering stripped off. Now mount a second pair of terminals 1in. away from these, and between them stretch a piece of thick copper wire (about 1/16in. thick). This, too, must be bared.

All four terminals must be raised ⅛in. above the board by placing thin pieces of wood under them as shown. The two parallel wires should be fastened under the base of each terminal, so leaving the upper part free for temporary connections.

The "jockey" is a piece of brass 1½in. × ½in. × ⅛in. File two grooves in it, so that it will ride nicely on the parallel wires.

Mount the eight terminals 3, 4, 5-10 at equal distances and join 2 and 3 by a stout copper wire, underneath the board.

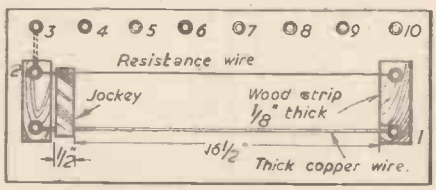


Fig. 2.—Lay-out of the top.

The Former

Fig. 3 shows the former upon which the resistance is wound. It is a cylinder of wood, cardboard or one of the many compositions used in wireless coil formers, with a circumference of exactly 11in. The accuracy of the instrument depends upon this being correct. The best way is to make or get one slightly smaller and wind on a sheet of thin paper until the exact size is obtained. Drive in a small brass screw (or bolt and nut), ½in. from edge A. Start winding the resistance wire from this screw. At the end of three complete turns twist the wire round a second screw B. After six more turns twist it round a third screw C; six more turns and round the fourth screw D; 15 more turns, round the screw E; 30 more turns, round the screw F; 30 more turns, round the screw G; 60 final turns round the screw H. This gives a total of 150 turns spacing them about 1/10in. apart.

Fix the former into the box and join each of the copper wires to the base of one of the terminals, as shown. The completed instrument will appear as in Fig. 1.

How to Work the Instrument

The resistance of the wire is 1 ohm per 33in., so three complete turns on the former give 1 ohm. The resistance of the entire coil at terminal 10 is thus 50 ohms. Suppose one terminal of a battery is connected to terminal 1 (Fig. 2) and the other to a terminal of a piece of apparatus. The other terminal of the piece of apparatus is joined to 10, and the jockey is pushed over to the left into contact with 2.

The current enters at 1, passes along the copper wire and jockey to 2, through the entire resistance to 10, through the apparatus to the battery again. If less resistance is required join the apparatus to another terminal.

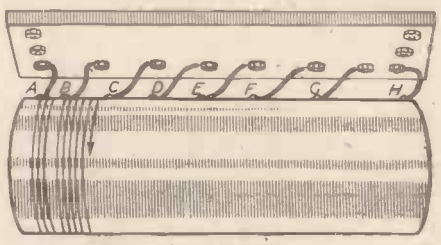


Fig. 3.—The former.

Making an ELECTROSCOPE

Apparatus for Detecting Electrostatic Charges

THE instrument that detects electrostatic charges, as produced by the Wimshurst machine, is called an electroscope. This instrument is quite easily constructed; all that is required is a length of thick copper wire, a bottle fitted with a cork, a piece of silver paper and a metal cap such as a cocoa tin lid.

The piece of copper wire is bent as shown in Fig. 1 and a loop at the end is made to prevent any possible leakage of the charge. The cork is prepared by boring a large hole in it, which is then filled with candle grease or any other wax. The wire is pushed through the wax, care being taken that the wire does not touch the cork (see Fig. 2). The wax insulates the conductor of the charge from the bottle and, as the wire is not covered, this precaution is necessary. The silver paper is cut into two equal strips about 1in. long by ¼in. wide, and the end of each piece is bent over so as to hang on the prepared copper wire (as in Fig. 2). The two pieces are hung side by side and must be free to swing with the slightest touch. The metal cap should now be soldered on to the top of the wire.

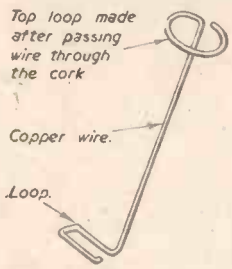


Fig. 1.—The bent wire.

All that remains to be done now is to encase the apparatus in a draught-proof case, such as the bottle shown in Fig. 3.

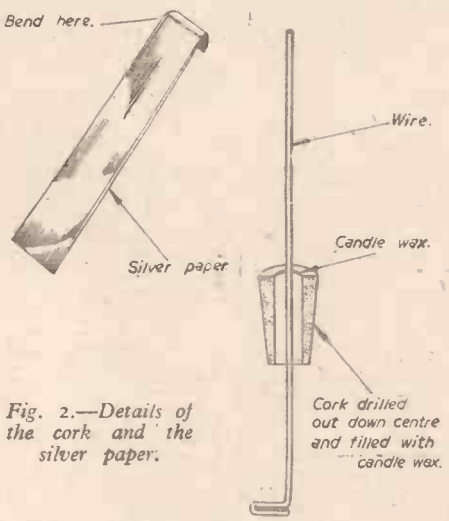


Fig. 2.—Details of the cork and the silver paper.

Testing the Electroscope

In order to test the instrument, bring a charged body near the cap and a divergence of the leaves will be noticed. The electrostatic charge may be obtained from a Wimshurst machine or, if this is not available, satisfactory charges can be obtained by rubbing ebonite with flannel, or glass with silk, the ebonite giving a negative charge and the glass positive.

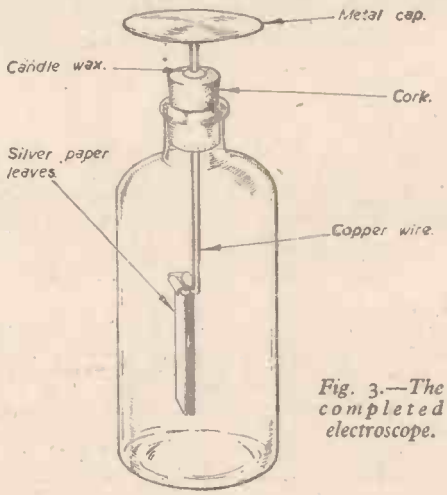


Fig. 3.—The completed electroscope.

To give the electroscope a negative charge one must commence with a positive charge, as is given by a piece of glass. Having charged the glass, bring it near to the electroscope so that the leaves diverge and, still keeping the charged glass near the electroscope, touch the metal cap with your fingers so that the leaves collapse. Withdraw your fingers from the charged glass and the instrument will be negatively charged. Now that it is charged many interesting experiments can be carried out. If a negative charge is brought near the cap an increased divergence will be noticed, whereas if a positive charge is brought near a collapse of the leaves will be noticed. As long as the cap is not touched the leaves will always return to their former position. If the electroscope were positively charged one would obtain opposite results.

READERS' SALES AND WANTS

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

FOR SALE

COMPRESSORS for sale, 2½ CFM, 180lbs. sq. in., on metal base, with driving wheel and receiver, price £3 ; ¼ h.p. Heavy Duty Motors, price £3 ; carriage forward. Wheelhouse, 13, Bell Road, Hounslow. (Phone: Hounslow 8749.)

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

BRAND NEW Brooks ¼ h.p. Motors (ball-bearing), 230 v. A.C., 50 c., 2,800 r.p.m. Ideal for driving woodworking machines, grinders, etc. Latest type fully guaranteed split phase, £8/17/6 ; Capacitor, £10/5/- ; carriage paid mainland. Approval against cash. P. Blood & Co., Arch Street, Rugeley, Staffs.

100,000,000 Nuts, Bolts, Screws, Washers, Rivets, etc., in stock. Engineers' Haberdashery. Send s.a.e. for latest list. Whiston (Dept. PMS), New Mills, Stockport.

RUBBER MOULDS for Plastic Ornaments from 1/- each. New illustrated catalogue 9d. Moulding compound for mould making 8/6 per lb. Metal toy casting moulds from 3/- each ; s.a.e. for list. F. W. Nuthall, 69, St. Mark's Road, Hanwell, London, W.7.

UNRIVALLED IN ITS CLASS. The "E.W." 2½in. x 10in. Lathe. Plain Lathe, £15/4/- ; fully convertible to back gear and screwcutting ; ideal for beginner and expert. The Lathe with the outstanding features. Send s.a.e. for illustrated particulars. Credit terms available. ½in. High-speed Sensitive Power Bench Drilling Machine, £6/10/-. Details s.a.e. Credit terms if required. Wanstead Supply Co., 48, High Street, London, E.11.

GRAINING BY TRANSFER, oak, walnut, etc. Samples 1/- ; complete range 3/- ; roll 17/4. P.M., Decano Co., 20, Clarendon Road, Jersey, C.I.

ASTRO. KITS AND TELESCOPES. 2in. dia. at 40ins. focus. Introducing our latest models incorporating brass telescopic fitting eyepiece, ½in. focus. Mag. 53 diameters (equivalent 2809 X area), price 59/6, p.p. 3/6. Telescopes made to order, superior stoved aluminium, black wrinkle finish, 117/6; carriage, including stowing cylinder 10/6. High power ½in. focus eyepiece, Mag. 80 diameters, 28/-, p.p. 2/-. Portable Altazimuth Clamp Stands. 32/6, p.p. 2/-. Photographs, 1/- set, returnable. Stamp full particulars. Numerous testimonials. Below:—

ASTRONOMICAL, Books, Charts, Guides, Planispheres, etc. Large Map of the Moon, 28 x 20ins., with index, 5/-, post 6d. Lists available. Below:—

EXPERIMENTAL KITS. Atomic Kits, reveals actual splitting of atoms, etc., with microscope. (Modified Crookes Spintharioscope.) Harmless, lasts for centuries ; 15/- box, p.p. 9d. Polarizing Kits, Assorted laboratory grade screens with optical exciters, etc., 10/6 box, p.p. 9d. Below:—

ELECTRIC MICROSCOPES. 50 to 150 diameters, fully adjustable, superior quality suitable for home or school laboratory, 126/-, p.p. 3/-. Terrestrial Telescopes, 20 diameters, lightweight, black anodised duralumin, beautifully finished : ideal bird watching, target spotting, etc., 97/6, p.p. 3/-. Below:—

SCHOOLS AND COLLEGES supplied ; delivery approx. 7-14 days. Terms c.w.o., c.o.d. 1/8 extra. Stamp for lists. J. K. M. Holmes, Wilson & Co., Scientific Instrument Makers (Dept. P.M. 19), Martins Bank Chambers, 33, Bedford Street, North Shields, Northumberland.

GENUINE BERNARD PLIERS. Black finish, perfect condition. No. 106, 5in. snipe nose, 6/9 pr., No. 105/5in. side cutting, 8/3 pr. Reduction for quantities. Tools & Equipment Ltd., 8, High St., Markyate, Herts.

MYFORD M.L.7 3½IN. LATHE, plus standard equipment ; ¼ h.p., 240v, resilient mounted motor ; 4in. chuck ; set of ½in. H.S. tools, unused: £50. 12, Riverview, Pitsea, Basildon, Essex.

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

GLASS FIBRE car bodies, sidecars, boats, models, trial unit, 13/9. Glass Cloth for wooden boat repairs, trial lot 26/3, or quotation for any surface area. Polyester Resin Embedments, biological, botanical and metallurgical mounts, beautiful water white castings, impregnate porous metal castings, trial unit 11/3. Epoxy Resin, the best resin for metal car body, mudguards, wheel-arch and frame repairs, trial unit 12/6. Burst pipes and tanks with glass cloth and tape 12/-. Trial Units for all purposes, each containing free mixing and dispensing equipment and information sheets. Epoxy Paint, waterproof, heat resistant porcelain finish for baths, kitchen walls, hardboard, etc., 14/- pint, with Catalyst, white, black or clear. Information Sheets on glass fibre technique, list with price list, stamp, please. "Business Man's Guide to the Glass Fibre Technique," 15/-, post free, 81 pages. Glass Fibre Experts with units for all purposes are Silver Dee Plastics, Desk A4/3, Hartington, Staveley, Chesterfield, Derbyshire. Part post 1/- on units, please.

CAR CIGARETTE LIGHTERS, 6 or 12 volt, 7/6, post free. Whitsam Electrical Products, 18, Woodrow Close, Perivale, Middlesex.

CHEAP GOVERNMENT WIRE ! ! ! Ideal for training fruit trees, peas, beans, roses, arches, greenhouses, tomatoes, raspberries, tying, etc.; strong, flexible, steel-stranded and waterproof covered; several thicknesses. Postcard to-day for free samples. Greens Government Stores, 511, Albert St., Lytham.

WATCHMAKERS

WATCH REPAIRERS, Hobbyists, etc. ; send s.a.e. for list of Watches, Movements, Lathes, Watch and Clock Spares, etc. Loader Bros., 36, Milestone Road, Carterton, Oxford.

ELECTRICAL

MODEL ELECTRIC MOTORS. Amazingly powerful and economical. "Minimo" 9/6, "Maximo" 13/6, post paid. 3 to 6v and 3 to 9v, speed 4/5,000 r.p.m., size 1¼in. x 1¼in. ; weight 1½oz. Drives: Boat Propellers, 1in. and 1¼in. ; Aeroplane, 5in. and 8in. Model Electric Motors (Dept. P.M.I.), "Highland," Alkrington, Middleton, Manchester.

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

TUITION OR TECHNICAL TRAINING

INCORPORATED Practical Radio Engineers home study courses of radio and TV engineering are recognised by the trade as outstanding and authoritative. Moderate fees to a limited number of students only. Syllabus of Instructional Text is free. "The Practical Radio Engineer" journal, sample copy 2/-. 6,000 Alignment Peaks for Superhets, 5/9. Membership and Entry Conditions Booklet, 1/-, all post free, from the Secretary, I.P.R.E., 20, Fairfield Road, London, N.8.

PHOTOGRAPHY

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

PHOTO-ENLARGER CASTINGS. Complete sets, including bellows, 35/-, for 35mm. 2¼in. x 2¼in., 2¼in. x 3¼in. Extremely good value. S.A.E. for details. V. J. Cottle, 84a, Chaplin Road, Easton, Bristol, 5.

EXPOSURE METERS. Build your own double range incident light photo-electric meter with 50 x 37 mm. selenium cell. Complete Kit, 47/6; s.a.e. details. All sizes of photo-cells in stock. G.R. Products, 22, Runnymead Avenue, Bristol, 4.

HOBBIES

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

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

FIBRE GLASS

BONDAGLASS TRIAL PACK, 9/6. Car Body Repair Kit, 15/-. Full instructions. S.A.E. for price list and gen sheet on car body repair and construction. Compare our prices. Buy what you want from the people who manufacture with fibreglass. Bondaglass, 40A, Parsons Mead, Croydon.

HANDICRAFTS

"MAKE YOUR OWN Musical Boxes." Swiss Movements and Novelty Mechanism, and Kits of Box Parts; s.a.e. for price and tune list. Mulco Ltd., 87, Cambridge Road, London, N.W.6.

SWISS MUSICAL BOX MOVEMENTS, only 14/9, post free. Wonderful selection of tunes. S.A.E. for tunes list. Swisscross, Dept. V.116, Winifred Rd., Coulsdon, Surrey.

WOODWORKING

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

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

WOOD LATHES, Motors, Jig Saws, Planers, Circular Saw Blades, Saw Spindles and Benches, Turning Tools, etc. New illustrated literature, price list, extended credit terms now available, price 6d. (stamps please). D. Arundel & Co., Mills Drive, Farndon Road, Newark, Notts.

SITUATIONS VACANT

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

EDUCATIONAL

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

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

LEARN IT AS YOU DO IT—we provide practical equipment combined with instruction in Radio, Television, Electricity, Mechanics, Chemistry, Photography, etc. Write for full details to E.M.I. Institutes, Dept. PM47, London, W.4.

PATENTS

PATENTS CONSULTANT. Qualified service. C. L. Browne, 114, Greenhayes Ave., Banstead, Surrey.

BOOKS

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

SMALL BOATS YOU CAN BUILD. 3/10, p.pd. Below:—

40 POWER TOOLS YOU CAN MAKE at low cost. Lathes, Saws, Drills, Polishers, Sanders, Presses, Planers, etc., etc. Only book of its kind. 12/6, p.pd. Below:—

MODERNISE YOUR KITCHEN. 2-colour plans, cabinets, fitments, everything. 3/10, p.pd. Below:—

BUILT-IN FURNITURE FOR YOUR HOME. Many 2-colour plans, modern designs. 3/10. Below:—

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

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

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

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

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

ARC AND SPOT WELDERS for the small shop. Easily, cheaply made. Full plans. 3/-, p.pd. Below:—

Lists free. American Publishers Service (P.), Sedgeford, Norfolk.

POLYESTER HANDBOOK.—This textbook for the glass fibre/polyester resin industry is now ready, and is the complete manual for the amateur and professional alike. Price 5/6, post free. We can supply any quantities of materials for moulding and fabricating. In addition we have a Field Kit available, F.P. Field Kit No. 5, for car repairs, etc., or just plain experiment. Price 17/6, post free. Fibrin Plastics Limited, Dobcross, Oldham, Lancs.

MODEL DEALERS

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

MISCELLANEOUS

THE BENDELLE CHART solves bend allowance problems and slide rule type calculations, 7/6, post free. Whittaker Enterprises, 233, Pear Tree Avenue, Bitterne, Southampton.

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

BUILD YOUR OWN REFRIGERATOR, all components available at reasonable prices. Frigidaire flowing cold units, £5 ; small units, Kelvinator, etc., £4; ¼ h.p. heavy duty Motors, £3 ; Chrome Cabinet fittings, new, £1 ; money back guarantee ; s.a.e. for list and schematic diagram. Wheelhouse, 13, Bell Road, Hounslow. (Phone: Hounslow 8749.)

(Continued on next page)

(Continued from previous page)

DRAWING DEVICE ensures skill without experience. Newbery, 245, Goldhawk Rd., W.12.

RUBBER MOULDS for Plaster Ornaments, Wallplaques, etc. Sample and list, 4/11; trade enquiries invited. Castmoulds (Dept. M), 43/45, Waller St., Hull.

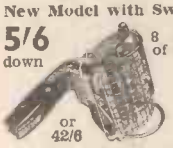
MULTI-PURPOSE SPINDLES. — Ball-bearing plumber blocks, pulleys, belts, motors, engines. Complete new range of Transmission Equipment. List free. Illustrated catalogue, 9d. Beverley Transmission, Sturton-le-Steeple, 4, Notts.

'2000' AUTOMATIC BLOWLAMP

A new entirely automatic miniature blowlamp is here. Burns methylated spirit. Compact and small, 5½in. high, weight 7 oz. Solid brass, chrome finished. Slips into pocket. Ideal, soft soldering (very hot flame 2,000 deg. F.). Silver sold., modelmaking, jewellery repairs, paint stripping, glass bending and drawing. Self-pressurising, no pumping. Nothing to go wrong.

14/7 Post Free

New Model with Switch!



5/6 down or 42/6 — 8 m'ly of 5/6

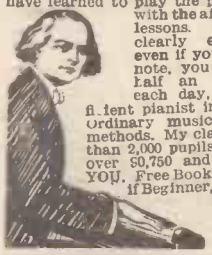
AC/DC PAINT STRIPPER

outdates all Blowlamps. Paint goes like magic. Cost ½d. per hour. **One Year Guarantee.**

John Bull (PM11), 246, High St., Harlesden, N.W.10.

90,000 PIANISTS

have learned to play the piano beautifully with the aid of my POSTAL lessons. Everything is so clearly explained that, even if you do not know a note, you will, with only half an hour's practice each day, become a proficient pianist in 9-12 months. Ordinary music; no freakish methods. My class is seldom less than 2,000 pupils. I have taught over 50,750 and I CAN TEACH YOU. Free Book and advice. Say if Beginner, Mod. or Adv.



Mr. H. BECKER, 658, The Hall, Centurion Road, Brighton, Sussex.

GOVERNMENT SURPLUS BARGAINS

GEARBOXES.—Similar to those described in "P.M." (Aug.) for Electric Mixer. Each 10/-, post free.

GEARBOXES.—As above but complete with 200/250 v. AC/DC Motor. Each 26/6, post free.

TRIPODS.—Unused. 38in. long, only 5 lb. wt. Immensely strong. Carrying sling. Brass cap easily adapted to camera, etc., etc. Each 12/6, post 2/6.

ASTRO COMPASS MK. II.—As described in "P.M." for Theodolite and Camera Pan/Tilt Head. Each 17/6, post 2/-.

LANDING LAMP MOTORS.—12/24v. D.C. 20/30 v. AC. 2 amps ¼in. shaft. Each 12/6, post 1/6. Similar type motor with gear and quadrant as described for SELF-OPENING GARAGE DOORS "Prac. Motorist" Aug. '54 (copy of article with motor if desired), 25/-, post 1/6.

TRANSFORMERS.—Input 200/250v. A.C. Output tapped for 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24, 30v. A.C. Max. 2 amps. Excellent for above motors. 21/-, post 1/-.

RECTIFIERS.—Full wave. Max D.C. output 30v. 2 amps., 21/-, post 1/-.

CAR HEADLAMP or SPOTLIGHT.—Brand new, 6in. dia. Double contact holder for "main/dip" or spot. Black finish. Normal single hole fixing. Each 25/-, post 2/-.

Send 3d. stamps for list of Motors, Telephones, Transformers, Pumps, Lamps, etc., etc. Hundreds of Bargains.

MILLIGANS

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

★ 'SOLASCOPE' ★

GIANT ROTARY GUIDE TO THE SOLAR SYSTEM

Showing PLANETS and ORBITS to scale and revealing over 1000 facts and figures when rotated. Everything you want to know about the . . . SUN, MERCURY, VENUS, EARTH, MOON, MARS, JUPITER, SATURN, URANUS, NEPTUNE, PLUTO. Diameters, Distances, Velocities. Space Travel computations, etc. Approx. 12" square. Beautifully illustrated in full colour on stout, fine-quality art and matt-surfaced printing boards. Double-side, 3-piece construction showing all planets 9/6 post free, or 2-piece single side showing Mercury to Mars 5/6, or Jupiter to Pluto 5/6. Send P.O. to—

"SOLASCOPE," Dept. J., 44 London Road, Kingston, Surrey.

This ELORA SOCKET SET

21/- DOWN

This giant set of ELORA ¼in. Sq. Drive Socket wrenches of Chrome-Vanadium Steel with bright Nickel finish and in a handy, blue crackle enamel metal case, it comprises a Reversible Ratchet, Speed Brace, T-Handle, 5in. and 10in. Extensions, Universal Joints, 7 Whit. Sockets 1/8in. to 1/2in., and 10 American Sockets 3/8in. to 7/8in. Cash £7.19.0 or 21/- dep. and 7 m'nthly pay's of 21/-. Also large set of 10 Whit. Sockets, 1/8in. to 3/4in., and 12 American Sockets, 3/8in. to 1in. Cash £9.9.9 or 25/- dep. and 7 monthly pay's of 26/6. List Free.

TOOL CABINET

Keeps tools safe and tidy

In heavy gauge steel, this Tool Cabinet has four graduated drawers, spring lock and key, carrying handle. Finished olive green. Overall size: 16½ x 8" x 10½". Front forms convenient tray when open. Strong, safe, good value at 60/-, or 9/- down and 4 monthly payments of 14/-.

Send for List of Other Bargains.

BARGAIN DISTRIBUTORS, Dept. 16, 5, SILVER STREET, LUTON

MAKE A RADIO

NO SOLDERING—only a screwdriver and pliers required. 10 designs to choose from—send S.A.E. for complete list.

"WINNER" crystal set. Only 6 screws to fit. Kit of parts with building instructions only 12/6 post free. Building instructions alone, 1/-.

"CONQUORER" 1-valve set. 15 screws to fit. Receives dozens of home and foreign stations. Kit, 22/6 post free, valve and batteries, 15/6 extra. Building instructions alone, 1/6.

Send P.O. 1/-, 1/6, 12/6, 22/6 or 38/- to

BLANCHARD'S RADIO

(Dept. M2),

13, Gainford Gardens, Manchester, 10.

GENERAL CERT. OF EDUCATION

THE KEY TO SUCCESS & SECURITY

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

SEND FOR FREE 136 PAGE BOOK

Full details of how you can obtain the General Cert. are given in our 136-page Guide—Free and without obligation. Personal advice on request. Write today, School of Careers, Dept. 160 29-31, Wright's Lane, London, W.8.

"NO PASS—NO FEE"

DO YOUR OWN ELECTRO-PLATING AND SAVE £'s

NEW INVENTION replates metals and gives a hard chrome finish.

Complete only **DuKROME 13/6** *Outfit*

(Large Outfits 25s. 0d.) Also **'DuSILVA'** Outfits at 15s. 0d. deposit genuine silver plating. Send P.O. now, or for details and plated sample send 4d. (stamps) to:-

A. DUTCH & CO.

Monkhams Lane, Woodford Green, Essex.

M.S. NORTHERN STAR

AS REVIEWED

Send 3d. for literature to:-

THF MODEL SHOP, 18, BLENHEIM STREET, NEWCASTLE UPON TYNE, 1.

MAKING A TELESCOPE?

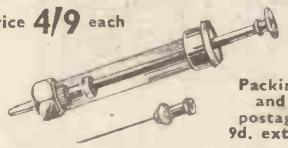
Reflecting mirrors from £4. 4in. and 6in. Achromatic objectives.

BRAND, Astro Works,

253, BRAMFORD RD., IPSWICH, Suffolk.

THE "HOLWAY" OILER

Price **4/9** each



Packing and postage 9d. extra.

An ideal tool for Engineers, Modelists and Handymen. Suitable for oiling intricate parts of clocks, sewing machines, typewriters, etc. Useful for applying flux when soldering and for the treatment of wood worm.

Send to HEGA PRODUCTS LTD., (Dept. 3), 2D, Holloway Road, London, N.7.

Trade supplied. Phone: North 5178.

ROGERS 31 NELSON ST., SOUTHPORT

Compressors. Ex W.D., 3 cu. ft.	55/6
Abrasive Discs. 5in. Ass'td. doz.	3/6
Terminal Blocks. 12 way ...	1/3
Generators. D.C., 6 v., 12 v., 250 v.,	12/6
Motorised Pumps	69/-
Thread Gauges. 28 arms ...	4/9
Whitworth Screws. 144 Ass'td.	5/9
H.S. Drills. 12 Assorted, to 48 ...	4/6
Fibre Washers. 144 Assorted	3/6
Meter Rectifiers. A.C. to D.C. ...	3/9
Self Tap Screws. 100 Assorted ...	3/-
Copper Rivets. 12 doz. Assorted	1/4
Saw Bench Tops, with ball race spindle, pulley, etc., 18in. x 10in.	52/6
Rectifiers. 6/12 v. at 1 amp. ...	7/6
Meters. 0-15 v. or 0-25 M/c... ...	10/6
Air Jacks. 6in. Stroke	14/6
Boost Gauges for Car Use ...	6/9
Winker Units. 6 or 12 volt ...	6/6

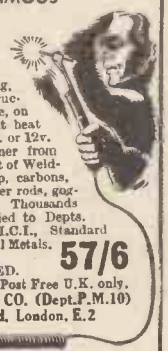
Circular Saws. 6in., 11/6; 7in., 13/8 etc. Races, Belts, Valves, Pulleys, Pumps, etc.

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

THE FAMOUS

HARRIS ELECTRIC WELDER

and Complete Kit



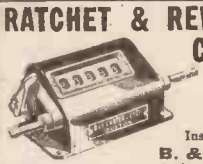
For Welding, Soldering, Brazing and metal construction & repairs in the home, on the car or cycle. Instant heat 6,000° F. Works from 6v. or 12v. car battery or transformer from A.C. mains. Complete kit of Welding Tool, 9 ft. cable, clip, carbons, cleansing fluid, fluxes, filler rods, goggles, instructions, hints. Thousands in daily use. As supplied to Depts. of H.M. Government, I.C.I., Standard Telephones, etc. Welds all Metals. Up to one-eighth inch.

57/6

C.O.D. IF REQUIRED.

Obtainable only from: Post Free U.K. only. HARRIS ENGINEERING CO. (Dept.P.M.10) 269 Kingsland Road, London, E.2

RATCHET & REVOLUTION COUNTERS



PLEASE ASK FOR CATALOGUE

Instrument Division

B. & F. CARTER & Co., Ltd., Bolton 5

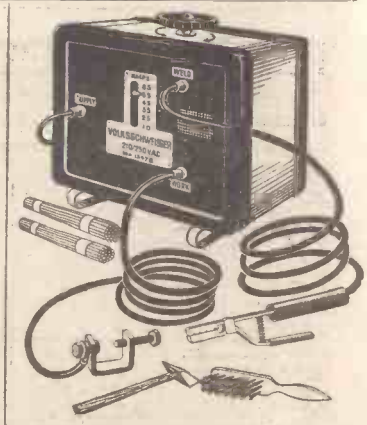
Patented Design

ACCURATE HARDHITTING

Webley AIR PISTOLS

AIR RIFLES · ACCESSORIES

Write for catalogue WEBLEY & SCOTT Ltd. 106, WEAMAN ST., BIRMINGHAM 4, ENGLAND



THE PEOPLE'S ARC WELDER £15.12.0

For the Motorist, Householder & Engineer. Heavy duty. Fully variable output by hand-wheel. Welds up to any thickness and down to 22G sheet. 210/250V. single phase. Consumes 10 amps. With all accessories shown, face-shield and electrodes. £15.12.0. Cash with order. Carriage approx. 7/- after delivery.

MOTORISED BLOWERS

12v. or 24v. please state which. Fan enclosed in 7½" cowl with generous inlet and outlet. Make excellent CAR HEATERS. Useful for forges, brazing, etc. A.C./D.C. Consumption 1½ amps. Unused 28/-. P. & P. 2/7.

12 VOLT HAND DRILLS

12v. or 24v., please state which. Consumption 6 amps. With ¼in. chuck and length of flex. Speed 900 r.p.m. Weight 7 lbs. Ex-Civil Airline. Unused. 95/- each.

"POP" RIVET GUNS

(Lazy Tongs)

For motor body, sheet metal and fabrication work. With universal collet to take all sizes of rivets, £3.19.6. P. & P. 2/-.

"POP" RIVETS

1/8", 5/32" and 3/16", 7/9 per 250, 19/- per 1,000 of one and the same size. Mixed "Pop" rivets, 12/- per 500, 17- per 1,000. Send stamp for leaflet.

HARMSWORTH, TOWNLEY & CO.

Jordan St., Knott Mill, Manchester 15

CHEMISTRY APPARATUS

Send 2½d. stamp for

COMPLETE PRICE LIST

Booklets:
"Experiments" 10½d.
"Formulas" 10½d.
"Home Chemistry" 2/8
Post Paid.

BECK (Scientific Dept. A) **60 HIGH STREET, Stoke Newington, London, N.16**

CHROMIUM/SILVER ELECTROPLATING

at home, easily. Plating mat., silver and instruct. 11/6. Silver Mirrors Book 2/9: refunded: cost 6d. ft. Do not plate without trade goods. Chromium set 21/-. Bangle strip, many patterns. Expert plating inf., bangle sample, print 2/6. Plat. sam., print, S.A.E.

Mould rubber for plaster casting.

1-6 at 6/3. 7-14 at 6/-. Over 14 at 5/-. Prices per lb. Cheaper grade 5/- per lb.

Post 1/3 on 3lbs., 3d. each lb. over.

CANE & CO. (ARGENTA), BRIGHTLING, EAST SUSSEX.

Letters to the Editor

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

Converting Coke Fired Boilers to Oil Firing

SIR,—In the May issue of PRACTICAL MECHANICS a letter appeared under "Information Sought," and referred to "Converting Coke Fired Boilers to Oil Firing." The types of crude oil burners which have been mentioned from time to time in P.M. had a minimum capacity of about ½ gallon per hour, which would be costly and extravagant for the purpose required, i.e., the firing of small slow combustion stoves for hot water or small greenhouse stoves. Etna Products (Manchester) Ltd., 106, Harley Road, Sale, Manchester, are putting on the market a small atmospheric controlled oil burner, for use with waste sump oils, creosote, diesel, gas, T.V.O. or paraffin oils.

It will be one of the cheapest on the market, catering for the amateur. The burner has a minimum consumption of under ½ pint per hour of sump oils, and much less of the other oils.—A. H. MAYTUM (Manchester).

Wet and Dry Indicator

SIR,—Regarding the query in "Information Sought" (September issue) from P. A. Blake concerning a "Wet and Dry Indicator" I hope the following information will solve his problem.

The instrument to which he refers is usually to be found at the top of the antique "wheel barometer," which is probably what he purchased.

In this form of hygroscope an oatbeard, which is very sensitive to moisture, is the working element. The general appearance of the instrument is shown in the sketch.

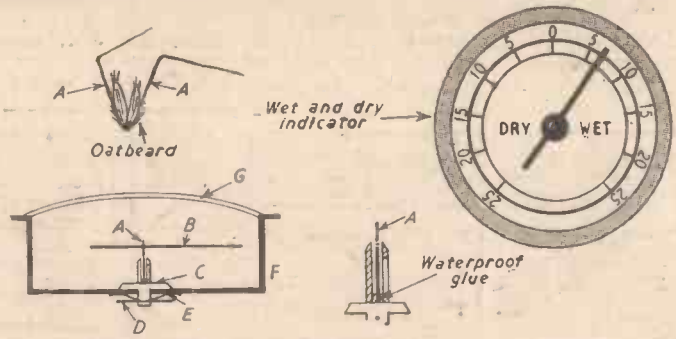
Repairing one, or even making one, is quite simple. First dismantle the instrument. The glass G in its bezel, unscrews at about the point F. The pointer B, now removed, may indeed be hollow since it is merely a length of thin grass stem slit through towards one end and pushed on to the free end of the oatbeard. Now it will be simple to pull out the pin D behind the dial plate, remove the brass spring E, and take out the central stem C. An enlarged diagram of this is shown and it will be seen to consist of a small disc, from the centre of which rises a hollow brass tube with part of its side cut away. This supports the oatbeard. All old wax should be removed.

A new oatbeard is required. At harvest time pick a dry and ripe stalk full of seeds. They hang in pairs, sometimes in threes, on delicate filaments. These seeds will each be seen to possess a long awn or "beard" that, if truly dry and ripe, will be bent in half at right angles as shown in the sketch. Breathing on these awns will cause them to turn in a clockwise direction. Carefully remove one and cut off the upper bent-over portion. Only the lower part A is used. Mount it upright in the brass tube, fixing it with waterproof glue (see sketch). When set reassemble the instrument and push on the pointer, fixing with a touch of the glue if necessary. The glass is finally screwed on.

By turning the central stem by means of the pin D it is easy to set the pointer so that it goes round to the "Wet" side of the dial at the approach of rain, and returns to "Dry" for fine weather. Being a simple hygroscope, nothing more accurate than this can be expected of it although it would be interesting to test the movements of an oatbeard against the readings of a wet-and-dry-bulb hygrometer.

The oatbeard's response to atmospheric changes would be quickened if several small holes were bored through the outer casing of the instrument.

M. M. DAWES (Margate).



Details of Mr. M. M. Dawes' Wet and Dry Indicator.

Stevenson Screen

SIR,—Reading the "Information Sought" page of PRACTICAL MECHANICS August, 1956, I notice that your correspondent, Mr. J. E. Catt, has been given some meteorological instruments which, I assume, are maximum, minimum, wet and dry bulb thermometers, which, if he wants to obtain correct readings, must be exposed in a Stevenson type screen.

This should be made to the exact specification laid down in the "Instructions for Making Thermometer Screens of the Stevenson Type" Form 63, price 1s. from H.M.S.O.

Your correspondent will no doubt want to know more about the instruments and weather observations in general. In this instance I recommend to him a little publication called "The Observer's Book of Weather" from the Observer series, price 5s. or, further, a more technical publication from H.M.S.O. "The Observer's Handbook" M.O. 554, price 12s. 6d.—G. WHITE (Streatham).

[*An article on making a Stevenson Screen is in hand for early publication.*]—ED.

Silvering Glass by Spray

SIR,—With reference to L. Oldham's query *re* silvering glass by spray method (September, 1956, issue), I think he may find the following formulæ more satisfactory:

Silvering solution:		
Silver nitrate	... ...	30z.
Aqueous ammonia	...	30z.
Water	... ...	1280z.
Reducing solution:		
Hydrazine sulphate	...	2.70z.
Glyoxal	... ...	20z.
Water	... ...	1000z.

These two solutions should be mixed immediately before use and diluted with water to make one gallon of liquid, which is then sprayed from a single nozzle.—D. E. CHALLIS (Enfield).

Refilling a Liquid Compass

SIR,—Your correspondent T. Allen Henderson ("Information Sought," September, 1956, issue), who is requesting advice on refilling a liquid compass, should use industrial methylated spirit and water, S.G. .93 at 60 deg. F., clean and free from sediment, etc. This will enable his compass to work efficiently between −10 deg. F. and +120 deg. F.—S. WALKER (Dundee).

SIR,—*Re* "Information Sought," September 1956, issue, surgical spirit is the liquid used. Fill the casing to overflow, all air being displaced by the alcohol. You can immerse the whole casing in a cup of surgical spirit if you find this easier.—H. GREGORY (Sheffield, 5).

Making Jewellers' Pads

SIR,—With reference to the request by Mr. D. Mitchell ("Information Sought," September issue), he may find the following method suitable. Cut one centre to suit requirements and from this make a flexible mould from any of the materials of this type advertised regularly in P.M. If the quantity required is large enough a number of moulds could be made. From the moulds Mr. Mitchell could cast as many centres as he wishes, using any of the commercial casting powders.—W. SCOTT MATTHEWS (Colne).

Making a Mirror Ball

SIR,—In reply to Brian McAuley, whose request appeared in "Information Sought" in the June, 1956 issue, make a wire mesh ball 15in. diameter and cover this with papier-mâché until it is ¼in. thick, then cover with pieces of a special mirror glass which can be obtained from any good hardware shop. This glass is about ¼in. by 2in., and can be stuck on with a good adhesive.—P. BAGNALL (Stockport).

A Radio-controlled Model Aircraft

SIR,—Regarding my article, title as above, which appeared in the September and October issues, I should like to correct an error which appears on page 518 of the September instalment, in the third column near the bottom. This reads, "A rectangular shaped wing stalls last at the centre." It should read "wingtips" instead of "centre.") —C. E. BOWDEN.

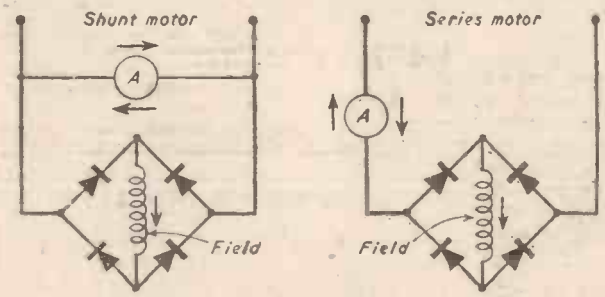
Model Motor Circuits

SIR,—As a regular reader of PRACTICAL MECHANICS I have frequently used many of the ingenious electrical circuits shown and I would like to contribute one myself, which I first used some five years ago and which is still working perfectly. The circuit relates to the use of small D.C. model motors in model trains, cars, etc.

If a motor has a wound field a rather complicated switching device is required to reverse the motor, but I have devised a circuit whereby the motor may be reversed simply by reversing the polarity of the supply, just the same as for a permanent magnet motor. The circuit is shown in the sketch below.

It will be seen that no matter how the supply is flowing through the armature it will always be flowing through the field in the same direction.

In the case of the shunt motor (most Government surplus motors are of this type), where the field is across the armature, the A.C. input of the rectifier goes across the armature and the D.C. output across the field. The reason for this is that the field current is usually smaller than the armature current, therefore the rectifier may be one of a lower current rating. The voltage rating of the rectifier in this case is the normal working voltage of the motor.



Mr. H. A. Mitchell's model motor circuits

In the case of the series motor, where the field is in series with the armature, the A.C. input of the rectifier goes in series with the armature and the field goes across the D.C. output of the rectifier. The current rating of the rectifier is the normal current rating of the motor, and the voltage rating is the normal voltage dropped across the series field. —H. A. MITCHELL (Lewisham, S.E.13).

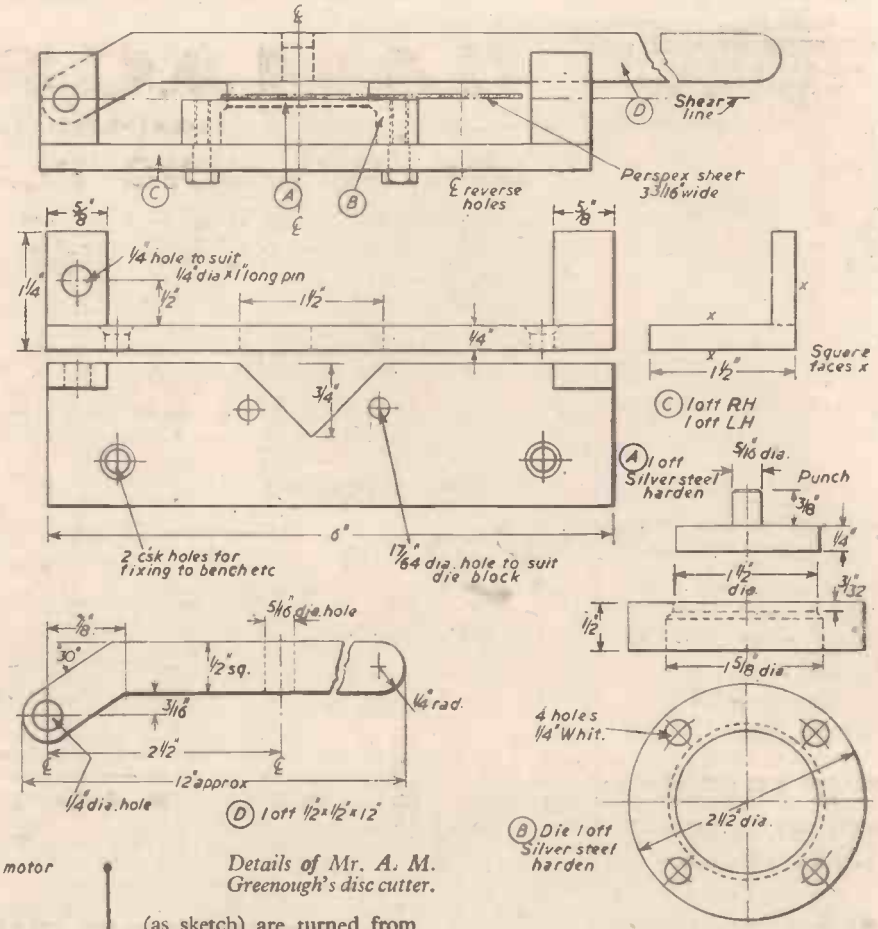
Cutting Perspex Discs

SIR—*Re* the query by J. A. Scott in "Information Sought," September issue, on a tool to cut out 1½in. diameter discs from 1/16in. thick Perspex, the following may meet his need.

This tool is on the hand punch and die method and the Perspex sheet should be cut into strips about 3 3/16in. wide. The strip is run through once, then reversed and returned, giving little waste material.

To make the tool obtain two pieces of angle iron 6in. long of the 1 ½in. × 1½in. size, square faces up and mark off as part (C) in sketch. It is important that the ¼in. diameter hole be the same distance from top face as the die block (B) is thick—this gives 1/16in. shear on the punch (A) line.

Remember that one side is right hand and the other left hand. The punch and disc (as sketch) are turned from 1½in. diameter silver steel and 2½in. diameter silver steel, which should be hardened when *fully completed*. The 1½in. diameter hole should be 1.500in. and its backing off 1⅝in. diameter for easy removal of the discs.



Details of Mr. A. M. Greenough's disc cutter.

The 5/16in. dia. should be a drive fit into handle (D). This handle is made from a piece of ⅜in. square × 12in. long cold rolled steel, bent at one end at 30 deg. (as sketch) and drilled accordingly. The important dimension here is the 3/16in. from under face to centre of ¼in. slide fit hole; this ensures shearing line is held. Also important is the 2½in. centre—if die is bolted before this assembly is made. The best plan would be to assemble parts (A), (C), (D) and allow (A) to enter (B) and mark off the clearance holes in (C) from the four tapped holes in (B).

No handle stop is shown, but a block of wood between the guide ends will be sufficient. The only addition necessary is ¼in. diameter × 1in. long hinge pin.—A. M. GREENOUGH (Oxford).

BOOKS RECEIVED

The Elements of Mechanics and Mechanisms. By F. J. Camm. 423 pages. 481 illustrations. Crown octavo. 30s. net (31s. by post). Published by George Newnes, Ltd.

THIS important new work is a valuable contribution to technical literature, for there are very few books on the subject of mechanics and the principles of mechanisms. This book gets down to first principles and gives a large number of illustrated examples of the practical application of those principles. It is a book suitable not only for teachers, students, draughtsmen and designers, but also for anyone who is interested in making things and who wishes to know how a particular mechanism works or how to obtain a particular mechanical movement. The early chapters deal with the natural forces and methods of using them, the laws of motion, friction, mass and momentum, horsepower, force energy and power, conduction, convection, radiation and heat, the lever, the wheel and axle, pulleys, the inclined plane, wedge and screw, hydraulics, the hydrometer, viscosimeter and syphon, pumps and water wheels, etc., etc., whilst the final chapter gives a large number of illustrated examples of mechanical movements as used on a wide variety of machines. The work is written in a style which even the non-technical can understand. This will become a standard work.

The Home Electrician. By F. J. Camm. 206 pages. 149 illustrations. Crown Octavo. 12s. 6d. net (13s. 3d. by post). Published by C. Arthur Pearson, Ltd., Tower House, Southampton Street, Strand, W.C.2.

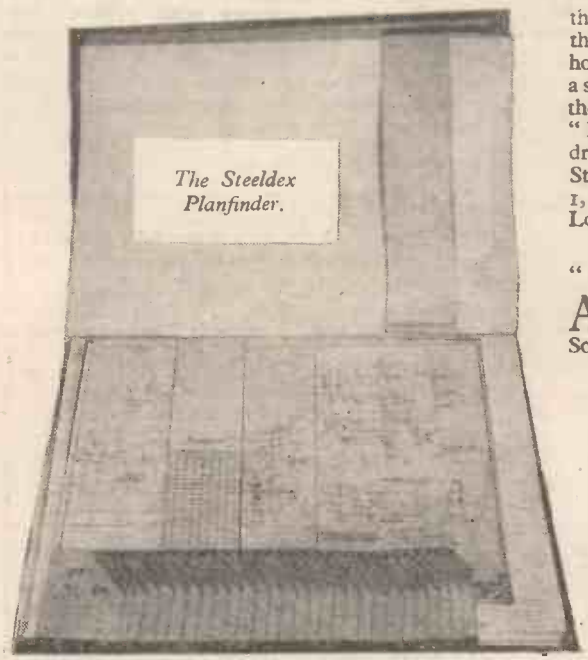
IN view of the great Do-It-Yourself movement which has now reached national proportions, this book provides a timely addition to the handyman's library and it is indeed a handy book for handy men, forming a guide to the installation, upkeep, overhaul and repair of all electrical apparatus used in the home, including lighting and power, vacuum cleaners, electric bells, burglar alarms, fires, hair driers, cookers, kettles, electric fans, gramophone motors, washing machines, refrigerators, water heating and models. The chapters dealing with repairs of electrical apparatus are especially valuable.

Trade Notes

New Dexion Slotted Angles

DEXION LTD., 65, Maygrove Road, London, N.W.6, manufacturers of the ubiquitous Dexion Slotted Angle, have introduced two additions to their range, these are Dexion 140 and 112. The sizes of the two new angles are 140 (1⅜in. x 1⅜in.) and 112 (1⅛in. x ⅜in.) and they are both available in either steel or aluminium alloy. Both are smaller than the existing sizes of Dexion Angle.

One of the new Dexion angles.



The Steeldex Planfinder.

Also new from Dexion Ltd. is a range of shelves 12in. x 36in. to 36in. square, which are bolted to lengths of angle to form racks. They are simple and speedy to erect and the racks so far as shelf height and area are concerned may be designed to suit individual circumstances. Prices of these shelves range from £3 9s. for six shelves 12in. x 36in. to £5 4s. for four shelves 36in. square.

Hobbies 1957 Handbook

THE latest edition of this 152-page handbook is now available and there should be something in it to interest everyone with a hobby. With the book is given a design for making a model motor-powered trawler and also a design for an attractive marquetry picture. Ideas in the book range from toys and novelties to home and garden furniture. The price is 2s. and the address of Hobbies, is Dereham, Norfolk.

Advanced Plan-filing System

A NEW system of plan filing for drawings, tracings and prints is being introduced, which the makers claim will eliminate searching, mis-filing, thumbing, curling, creasing and rubbing, and introduce an organised system of permanent record. It is called the "Plan-finder," and general details of its appearance will be seen in the photograph.

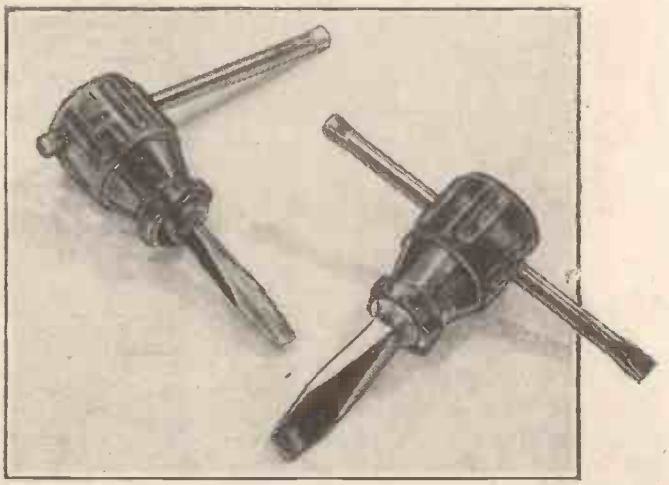
Nine models of the "Plan-finder" are produced, three types accommodating Double Elephant, three types taking Imperial and three Half Imperial. All can be housed in existing filing chests, but a special metal rack is available called the "Plan-houser." This houses 20 "Plan-finders," representing 1,000 drawings. The manufacturers are Steeldex Ltd. (Plan-finder Division), 1, Castle Court, Birchin Lane, London, E.C.4.

"Gumption"

A CLEANSER known as "Gumption," marketed by Multicore Solders, Ltd., Multicore Works, Hemel Hempstead, now being sold in 1s. tins, is a most effective household cleanser for baths, paints, cookers and floors. Its glycerine content keeps the hands soft. It lathers freely, cannot scratch and removes grime from the hands. It is particularly effective in cleaning chromium-plated articles, such as letter boxes.

New Screwdriver

THIS new tool is being manufactured by J. Stead and Co. Ltd., a subsidiary of Darwins Ltd., Tinsley, Sheffield, 9. Part of the existing amber-handled "Screwmaster" range, it incorporates a tommy bar which is movable, running through the tough amber handle, thus giving greater leverage. Where space is restricted its usefulness will be obvious.



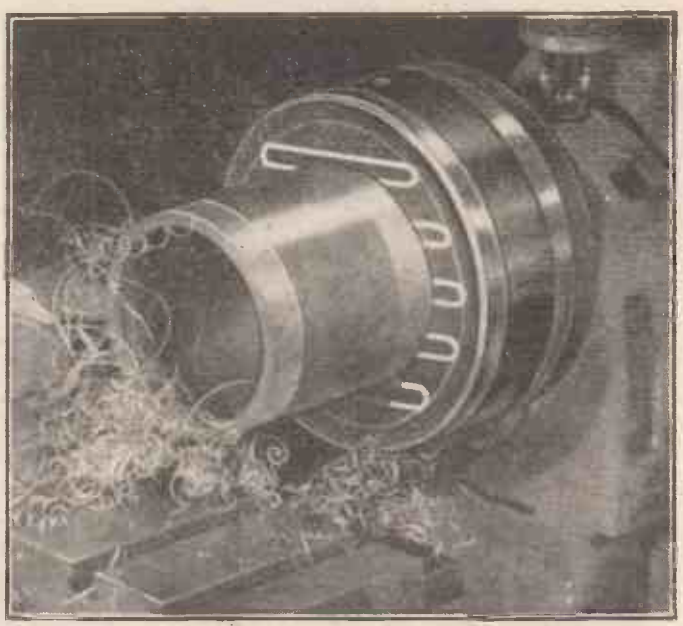
The new screw-driver by J. Stead & Co., Ltd.

Handicraft Materials Price List

THE full range of materials supplied by the well-known firm of Atlas Handicrafts is listed in the latest edition of their price list, which costs 6d. Complete kits, tools and materials are supplied for most of the popular hobbies, including basket work, marquetry, pewter work, ornamental jewellery, etc. The address of Atlas Handicrafts is Spring Alley, Manchester, 4.

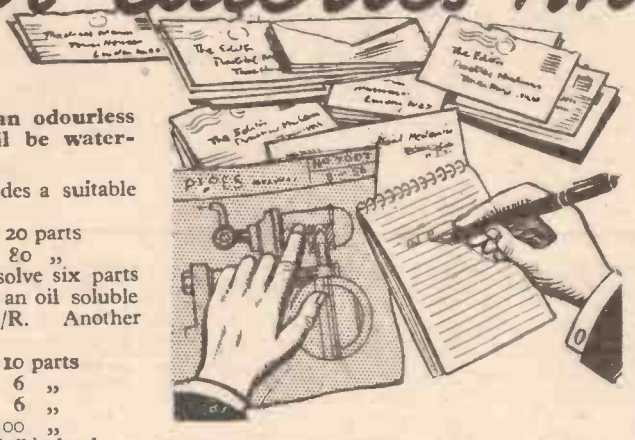
Permanent Magnet Chucks

FROM Messrs. James Neill & Co. (Sheffield) Ltd., Napier Street, Sheffield, 11, we have received a brochure describing and illustrating the permanent magnet chucks they produce. The 4½in. chuck is shown in the photograph on this page, being used on the Myford Lathe for turning a thin-walled cylinder of mild steel. Full details of the range of chucks and other accessories may be had from the above address.



One of the James Neil & Co. magnetic chucks.

Your Queries Answered



Dye for Leather

CAN you inform me of an odourless leather dye which will be waterproof ?—J. Byrne (Dublin).

THE following formula provides a suitable dye for leather :

White spirit	... ...	20 parts
Benzene or toluene	...	80 „

In the above mixed liquids dissolve six parts of dye. The dye used must be an oil soluble one, such as Bismarck Brown/R. Another formula is :

(a)	Dye (oil soluble)	...	10 parts
	Oleic acid ...	...	6 „
(b)	Acetone ...	...	6 „
	Petrol ...	...	100 „

Stir (a) until uniform, then add (b) slowly.

In both the above instances the dye solutions are slightly odorous, but not unpleasantly so, and the odour quickly disappears after the dye has been used.

Anti-moth Spray

COULD you let me have a formula for a mixture which I could spray (spray-gun) on to carpets, chairs and curtains to kill any moth eggs or larvæ ? The mixture must not be harmful to the fabrics.—R. Charles (Essex).

A SPRAY of the type to which you refer is based on ortho-dichlorbenzene as its "active" material. White spirit can be used as a diluent. Mix together about 20 parts ortho-dichlorbenzene and 80 parts white spirit. The ortho-dichlorbenzene, of course, is very effective in dealing with all forms of insect life, particularly in eradicating wood-boring beetles and their larvæ.

An alternative fluid for spraying would be five parts of pure DDT dissolved in 95 parts of paraffin. DDT is obtainable from Geigy Pharmaceuticals, Ltd., The Parsonage, Deansgate, Manchester.

I.C.I., Ltd., also produce a Gamexhane "Concentrate," which is a colourless, odourless liquid. This can be diluted with paraffin and various other liquids for spraying uses, and it is a potent contact insecticide.

Chlorinating Plant for Swimming Bath

PLEASE send me particulars of a small chlorinating plant for a swimming bath.

The bath is 75ft. x 25ft. x 4ft. (average) and is filled from the local water mains. At present the bath is kept fit for use by adding chlorine, but it rapidly becomes green and dirty.

I had in mind a pump taking water from the bath, passing it through a small filter bed, and allowing it to flow back.—J. K. Rust (Oxfordshire).

WE are unable to trace any manufacturers of small chlorinating plants on the scale which you indicate. It is possible, however, that Messrs. Townson and Mercer, Ltd., Croydon, Surrey, may be able to offer you a small plant for swimming water chlorination on the scale which you yourself indicate. Normally, such a plant would operate on the lines which you outline. The water would be pumped slowly through a special chlorinating cell or compartment into which chlorine gas would be bubbled at a controlled rate as the water flowed through. By this means the whole of the bath water would be kept continuously under chlorination. Chlorine gas is readily obtainable in cylinders from I.C.I., Ltd., London, S.W.1. If you write to this firm they will, we think, be pleased to give you the benefit of their advice on the use of chlorine for the purpose and on the scale which you indicate. Chlorine itself is a relatively cheap commodity, and the amount of gas which you would use would be very small. It is, of course, quite useless to bubble chlorine into a swimming bath as a whole for, under such circumstances, the necessary uniform solution of the chlorine in the water is not achieved.

Given a chlorine cylinder and a small motor pump, together with a suitable chlorinating compartment for the water, the cost of building and working a small plant of this nature would be relatively low.

Balsa Wood Cement

CAN you give me a formula for a quick-drying balsa wood cement ? I have tried celluloid in acetone and amyl acetate, but this is very slow drying.—J. Spencer (Leeds).

DISSOLVE scrap celluloid in a mixture of two parts of acetone and one part of amyl acetate until you get a thick solution. Afterwards dilute one part of this solution with an equal part of ether. This will give you the quick-drying cement which you require.

Another quick-drying cement can be made by dissolving nitrocotton (guncotton) in a mixture of equal parts of ether and alcohol (rectified spirit). This solution is exceptionally quick drying, its drying time being merely a matter of seconds. Please note, however, that all liquids containing ether are extremely inflammable and should, therefore, be treated with care.

For most purposes scrap celluloid dissolved in a mixture of four parts of acetone and one part of amyl (or butyl) acetate is sufficiently quick drying for constructional work.

Limed Oak Finish

I SHOULD like to know the correct method of achieving a "limed oak" finish on an electric light fitting made of prime seasoned oak in its natural state. —W. Pigram (London, N.W.2).

DISSOLVE one part of caustic soda in six parts of hot water, using a non-metallic container for the purpose, and, with a wire brush, scrub this solution vigorously over the wooden surface to be "limed." Repeat the process once or twice until the wood surface and grain have been visibly opened. Give the wood a good washing in warm water to remove every trace of the caustic and then allow it to dry slowly in air without heat. The "liming" is effected by making a paste of common whiting and water and then smearing this over the wood surface by means of a blunt steel edge and by pressing the paste into the open grain of the wood as far as possible. The surplus paste is next lightly scraped away from the surface by means of a blunt edge. The wood is then allowed to dry and the remaining whiting is gently shaken, rubbed or dusted off. Finally, the whole surface is given a light layer of a clear cellulose lacquer in order to bind down the whiting which has been filled into the open grain and to add a slight lustre to the woodwork itself.

Running a Small Aquarium

I HAVE made a glass aquarium 2ft. x 1ft. x 1ft. and wish to stock this with goldfish. How many fish could I keep in this tank and what plants, etc., will keep the water oxygenated ? Would an air pump be required and is it neces-

QUERY SERVICE RULES

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

sary to have a floodlight on top of the tank ?

How many water snails would be required to keep the tank free from algæ ?—V. W. G. Hughes (Beds).

THE number of goldfish which you can safely keep in an aquarium tank obviously depends on the average size (or length) of the fish. Assuming, however, that your fish are young ones and rather on the small side, say, about 1½in. in length, we think that your tank would accommodate four or five of them. You could, perhaps, even double this number, but it would be bad for the fish and for the general appearance of the tank. Also, it would not give the fish sufficient room to grow.

Almost any small water plants will suffice to keep the water of the tank sufficiently oxygenated and "balanced." You have a good choice here. You can use the tall-growing plants, such as *Vallisneria spiralis* or the smaller varieties of *Elodea*, the water starwort or the water hyacinth, all of which can be obtained from any good firm of aquarists, such as Messrs. B. T. Child & Co., 113, Pentonville Road, King's Cross, London, N.1. Do not overcrowd the plants. They, too, will require room to grow. Three or four smallish plants will be quite sufficient. With such plants an air pump will not be necessary to oxygenate the water. Snails will not keep down algal growths entirely, although three or four snails would be very useful in the tank. Light is the great eradicator of algal growths, and you will not be troubled with such growths if you contrive to give the tank as much natural light as possible. It will not be necessary to equip the tank with top floodlighting. All through the year the water in the tank should be kept at as even a temperature as possible. Nothing is worse for the fish than sudden and abrupt changes of temperature. Aim at an average water temperature throughout the year of 60-65 deg. F.

Preventing Smell from a Paraffin Stove

WHEN burning paraffin in the normal heaters a distinctive smell is given off even though the wick has been trimmed and cleaned properly.

As it makes one member of the family feel sick, is there any chemical I can add to the paraffin that would get rid of this smell ?—J. R. Williams (Hants).

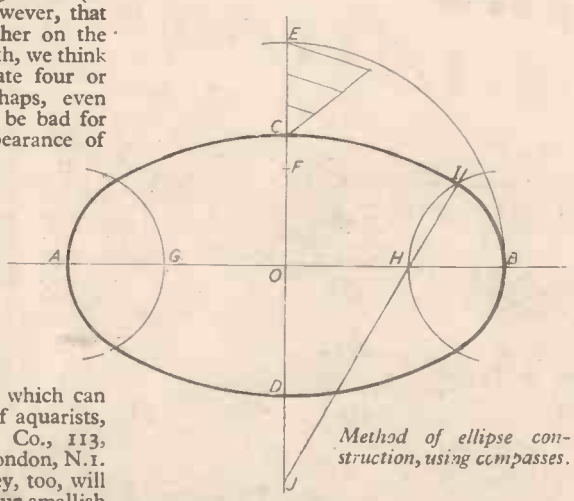
THE smell which is often characteristic of a paraffin flame heater is due to one (or more) of three causes, i.e., low quality and impure oil, dirty burners, incomplete combustion of the oil. The latter cause is the most operative.

To get rid of the smell completely you must use a paraffin heater of the blue-flame type. This completely combusts the oil and, if kept clean, it does not produce any smell whatever. Even the best of the luminous flame paraffin heaters will give rise to a smell just as much as any ordinary oil lamp will produce a smell. There is no chemical whatsoever which you can add to the paraffin in order to prevent the smell arising from incomplete combustion of the oil.

Constructing an Ellipse

PLEASE tell me how to construct an ellipse using only compasses and ruler.—A. L. Sallis (Gloucester).

TO construct an approximate ellipse, using compasses, let A B be the major axis and C D the minor axis. With O as centre, draw a quarter circle B E. Divide E C into three equal parts—then set off C F equal to one of these parts. With A and B as centres and O-F as radius, describe circular arcs and with G and H as centres and the same radius, describe arcs. Through I and H draw a line until it cuts the minor axis J, then with J as centre and J C as radius complete the arc. The bottom arc is constructed in exactly the same way.



Method of ellipse construction, using compasses.

Flexible Paste

PLEASE tell me the ingredients and process of making a flexible paste for use in bookbinding. Such a paste is now used instead of stitching books, and when dry, binds in the back of the book in a flexible state. It is also apparently soluble in water.—T. Ednering (Redcar).

MAKE up a medium-thin solution of a good quality glue in hot water and to this add about 6 per cent. of its volume of glycerine, together, with a few drops of Lysol to act as a preservative. This will make quite a satisfactory paste for bookbinding purposes, particularly for the backs of books. The London Telephone Directory is produced by the use of a similar adhesive.

A good adhesive may also be prepared by dissolving about 25 parts of polyvinyl acetate in 75 parts of warm methylated spirit. To this should be added about 5 or 6 parts of dibutyl phthalate in order to act as a plasticiser and to render the resin soft and flexible. Polyvinyl acetate is obtainable from Shawnigan Ltd., Marlow House, Lloyd's Avenue, London, E.C.3, under the name of "Gelva" resin. "Gelva" 2.5 is the appropriate grade required. This adhesive is not soluble in but is softened by hot water. It is, more or less, completely damp resisting.

Staining and Polishing Wooden Floors

I SHOULD like to stain and polish dark brown the floor surrounding a big carpet. Please inform me of the best materials to use and the best way of doing the job.—E. Walker (Sheffield).

BELOW is a method of producing a brown-black surface which will last in good condition for 20 years.

First, thoroughly clean the floorboards by scrubbing them with hot soap and water, allow them to dry out and, when still damp, scrape away any remnants of previous stains, grease, etc., the whole aim being to produce a perfectly clean wooden surface. Make a mixture of equal quantities of white spirit and boiled linseed oil. Mix together, also, equal parts of lampblack and raw umber. Lampblack alone should be used if a dead black floor is required. Heat the mixture of linseed oil and white spirit until it is fairly hot. Then stir into it sufficient of the pigment powder described above until it completely colours the liquid. The resulting hot mixture is then simply brushed on to the well-dried floorboards. When, but not before, the preparation has thoroughly sunk into the woodwork, it is gone over with an ordinary wax floor polish. The surface will now have a soft sheen which many prefer to the hard, brittle surface produced by the use of the more usual spirit-shellac polishes.

Information Sought

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

Glass Model Making

WOULD glass model making (small animals, etc.) make a suitable hobby, and, if so, what equipment would I need and where would I obtain the materials ?—E. G. DAVIES (Birmingham).

Making a Unicycle

I WISH to make a one-wheeled cycle as used in circus balancing acts, etc. Can you supply me with plans and information ?—B. TAYLOR (Isle of Wight).

Hand Mortising Machine

HOW can I build a small size mortising machine of the hand type for table and chair leg mortices ? I am in possession of a full set of joiner's tools and a 4in. screw-cutting lathe.—T. J. ROBERTSON (Lerwick).

Special Ink

PLEASE give me a formula for ink suitable for use in a felt nib pen of the fountain pen type as used by artists on TV, etc. The properties I require are: non-clogging, the colour to be transparent and non-corrosive. Also I should like to know a solvent for cleaning, etc., and suppliers of ingredients.—A. E. BLACKWELL (Lancs.).

Magnetic Board

PLEASE supply me with details for making a 4ft. x 3ft. magnetic board to use for instructional purposes in place of a blackboard.—J. K. SWELLS (Bridgwater).

Infra-red Grill

HAVE you any information on the construction of the infra-red grill ? Rashers in 15 seconds, and steak in two minutes would be a novelty.—E. T. LALOR (Eire).

Drip-feed Combustion Stove

I HAVE often heard of a combustion stove working from a drip feed, the fuel being diesel oil and water. Please tell me how it works, and if it would be economical for heating a small workshop.—R. HAWKINS (London, S.W.17).

Illuminated Map

I SHOULD like to make an illuminated map for weather forecasting purposes, with about 20 stations represented by coloured lights. The colours would be changed to conform to different weather conditions, i.e., green—fine, red—warm, etc. Can you help ?—N. CREEK (London, E.6).

Pedal Boat

CAN you tell me how to make a pedal boat similar to those which operate at seaside resorts ? Propulsion is by means of a paddle wheel, operated by the feet.—J. B. GRIMES (Dublin).

THE Cyclist

Editor : F. J. CAMM

VOL. XXV NOVEMBER, 1956 No. 412

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

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

WHAT I THINK By F. J. C.

The New Traffic Laws

ON November 1st certain new traffic laws made under the Road Traffic Act 1956 will come into force, and certain laws which until now have applied only to drivers of motor vehicles will be extended to cyclists. They include reckless or dangerous driving, careless driving and driving under the influence of drink or a drug, and the police are given power to stop drivers, power of arrest, and power to take names and addresses. We do not think that any broadminded cyclists will object to any of these new laws, although there may be the usual whine from the C.T.C. and other bodies.

Pedestrians will now have to obey any signal to stop given them by a police constable engaged on traffic duty. Until now the police have had no direct power to control pedestrians. Here again, this new law will be welcomed by most. Pedestrians have undoubtedy abused the freedom they have hitherto enjoyed and cause every year thousands of accidents in which they are not themselves involved. It is high time that jay-walkers were made to pay the penalty of their foolishness.

Cycle Racing on the Roads

NOW that the Minister has taken over the control of road racing it is pleasant to know that it is the Ministry's intention to consult organisations interested in the matter of regulations to be made under Section 13 of the Road Traffic Act 1956, and that this consultation will be made direct and not through the Committee on Road Safety. This is a minor victory for the British League of Racing Cyclists, who alone of the racing bodies made urgent and frequent representations to the Minister. The other bodies apparently relied on getting their point of view (mostly anti-massed start) put to the Ministry through the cycling representative on the Committee on Road Safety, which is now to be short-circuited. It was pointed out to the Minister that the only cycling representative on this committee was known to have anti-B.L.R.C. views and no doubt the representations which we made to the Minister on their behalf have resulted in his announcement that he proposes to deal direct with the bodies on what new regulations are made. These consultations will provide the League with a further opportunity of stressing their point of view and countering any of the thrusts of the C.T.C., N.C.U., R.T.T.C., of the National Committee on Cycling.

We shall watch developments with great interest to ensure as we have done in the past that subterranean attacks with ulterior motives are brought to light and scotched. Perhaps the bodies concerned will take this as a warning !

The Cycle Show

THE Cycle Show, the last of the annual series (the show is to be held biennially from this year on), has attracted 180 exhibitors of bicycles, mopeds, scooters, motor cycles, side-car outfits, three-wheeled cars, components and accessories. Of the total number of exhibitors, however, only 20 showed bicycles, whilst 25 showed motor cycles, 16 mopeds, 17 scooters, 5 three-wheeled cars. Components and accessories occupied 82 stands. Thus mopeds and scooters, which can be considered as the main rival to the utility cycle, total 33 against 20 for bicycles. This is indeed a sign of the times and confirms our forecast some months ago that the movement would develop and adversely affect the sale of bicycles. The C.T.C., which has damned these small vehicles, will no doubt have second thoughts on the matter.

The Bath Road 100

THE last time a member of the Bath Road Club won the Bath Road 100 Cup was in 1920, when Leon Meredith returned the time of 4 h. 48 m. 1 s. This year's winner, R. C. Booty, who won it for the third year in succession returned a time of 3 h. 58 m. 28 s., thus knocking off over 8 minutes from the time he returned on his first win in 1954. It is significant that the cup was first won by Edmund Dangerfield in 1890, by C. A. Smith in 1891 and 1892, by F. D. Frost in 1894 and 1897, then 23 years elapse before Meredith again secured it for the club in 1920. There has been no Bath Road winner since. It is significant that up to 1920 the B.R.C. had members of high racing calibre, and it would appear that that was its peak year. It was a training school for racing cyclists, but it is now very much a social and knife-and-fork club.

Old Bicycles

ONE of our readers makes a hobby of making scale models of bicycles, and he is always on the lookout for museum pieces. He says that when holidaying in Devon, he enquired at the Exeter Museum if they had any old bicycles on view. They had two, stored away under the public library a quarter of a mile away. In Hastings, they similarly had two old ordinaries stored under the public library half a mile away. The Ilfracombe Museum had one old bone-shaker, to remind the present generation of what went before. This sort of thing must be common all over the country and it is indeed a pity that such valuable show-pieces should be neglected in underground storerooms. An effort should be made to centralise them all in one museum, such as the South Kensington Museum, where a much larger and more representative group of old bicycles may be seen.

Incidentally, at a Model Exhibition held at the Horticultural Hall last year, there was a quarter-scale of the Macmillan bicycle shown. It had obviously been made exactly from the drawings of Macmillan's machine which appeared in this journal. There was, however, no acknowledgment as to the source ! Incidentally, at the Cycle Show readers will be able to see our own models of the Macmillan bicycle, the Werner motor cycle (really a motorised bicycle) and the model of the first motor car, the 1888 Benz. They will be seen on the Auto-Cycle Union Stand.

Amalgamation

TALK of amalgamation is in the air again, now that the Minister has decided to interest himself in cycle racing on the roads. It is a topic which has been raised on and off for the past 20 years, but every time the problem has been investigated, it has been found to be unworkable, not because the idea itself is unworkable, but because the bodies concerned were anxious to preserve their own identities, even as an amalgamated body. In those days, however, the present problem of Ministerial control was not present, and we suggest that the time is ripe for the problem to be examined anew. It is not true to say that because racing cyclists have sectionalised themselves because of their special interests, those interests could not be served by one autonomous body which is prepared to work for the good of the sport. One thing, of course, is very certain, and that is that if an amalgamation does ensue, it will have to be staffed by entirely new blood, free from the bitterness, acrimony, subterfuge and raw deals of the past, and the advice of those known to be guilty of any one of these should not be sought.—F. J. C.

Neidpath Castle.

A mile S.W. of Peebles - the ancient stronghold of the Frazers Pele tower dates from 14th cent.

Road Safety for the Cyclist

Some Pointers for the Young Rider

BEFORE even venturing on to the road, the safety-conscious cyclist will be certain that his machine is in good running order and is safe to ride.

Two efficient brakes are required by law when a free wheel is in use and one when a fixed wheel is fitted. Either brake should be capable of bringing the machine to a standstill on its own. Braking action should be smooth and should not result in a series of savage jerks. This shuddering or "snatching" action can be the result of a buckled rim, a loose brake pivot bolt (in the case of caliper brakes) or loose head bearings. These are in addition to the more obvious cause of unevenly adjusted brake blocks.

There are numerous mechanical failures which can cause accidents on a neglected machine.

Be Cautious

Caution should be the cyclist's watchword. Always give way to the motorist who doesn't look as though he is going to concede your right of way, even if technically you are entitled to proceed. This sort of situation often occurs at uncontrolled cross roads and T-junctions.

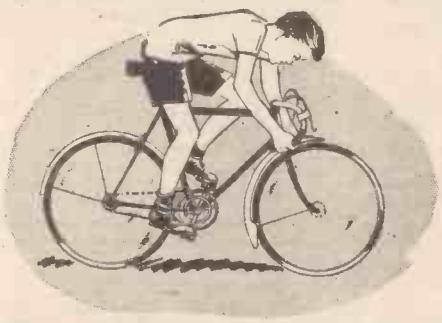


Fig. 1.—The rider cannot properly see where he is going.

Fig. 2.—The correct riding position.

Always keep well over to the left, except when intending to turn right. When you are passing parked cars or other cyclists and it is necessary to swing out, signal your intentions and glance over your shoulder before doing so. There is always the chance that there is a car just about to overtake you and which, owing to the press of other traffic, is not in a position to give you room. It is always safer to allow the car to overtake first than to try to squeeze between the parked car on your left and the overtaking vehicle on the right.

Use Proper Signals

The correct signals for turning should be known and used; indeterminate hand waggling is not only useless but dangerous and misleading as well. The cyclist in the heading picture is turning right and this signal and all the others are shown plainly in the Highway Code, with which every cyclist should be familiar.

When turning right it is necessary to cross the traffic stream in both directions and, whenever possible, it is advisable to take up a position just to the left of the white line in the centre of the road before the turning is reached. When this is not possible, pull up in the kerb and wait for a gap in the traffic before crossing; do not try to force your way across.

Fig. 3.—This rider's machine is too large for him.

When turning left do not approach the corner too fast, so that you have to swerve outwards before turning in order to get round; you might swing into the path of an overtaking car.

At Traffic Lights

Traffic lights are danger points for cyclists. When starting up and only precariously balanced, the cyclist needs only a slight touch from a car wing to collapse him in a heap. Here the "keep to the kerb" rule can be departed from. If the waiting cars in front of you are indicating their intention to turn left and you wish to go straight on, pull up behind them on their off side. If you wish to turn right, position yourself in the right-hand traffic stream so that you can turn without cutting across the path of traffic going straight on. A low gear will be found of great value to the cyclist who has to ride through busy roads in the town; it enables him to pull away smartly from traffic lights without "wobbling" or swerving to maintain balance.

Night Riding

It is vitally necessary for the cyclist to carry front and rear lights, white patch and reflector which conform to M.O.T. requirements.

Although it is not legally necessary for lights to be switched on until the official "lighting up" time, the wise rider will show lights directly it begins to get dark; in dull weather this may be some time before the official hour.

Avoid using batteries that are nearly exhausted and give only a feeble glimmer of light and always carry spare bulbs when using either battery or dynamo lighting.

One of the biggest nuisances to the night cyclist is "dazzle" from the headlights of oncoming traffic and here an old Army trick of closing one eye against the glare and opening it again when the car has passed, will be found very useful.

Position

The position you take up when you ride a bicycle may have a great deal to do with the ability to see where you are going and it is worth while checking to make sure you have an adequate view of the road. Fig. 1 shows an example of bad position, while Fig. 2 shows the correct posture.

If you have charge of children, do not let them ride a machine which is too big for them. It is not possible to control the bicycle properly when it has to be ridden in the position shown in Fig. 3. The same young rider may be perfectly safe on the road when riding a machine that is not too large, as in Fig. 4.

As a final warning, never carry anything that is going to prevent you from controlling the machine properly.

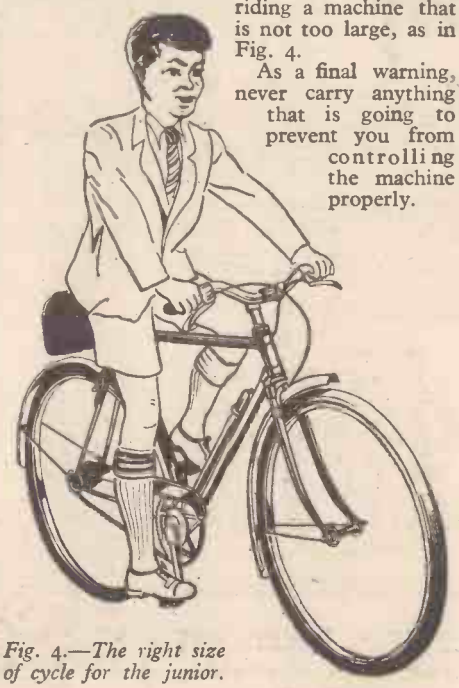


Fig. 4.—The right size of cycle for the junior.

Published about the 30th of each month by GEORGE NEWNES LIMITED, Tower House, Southampton Street, Strand, London, W.C.2, and Printed in England by W. Speaight & Sons, Exmoor Street, London, W.10. Sole Agents for Australia and New Zealand—Gordon & Gotch (Asia), Ltd. Sole Agents for South Africa—Central News Agency Ltd. Subscription Rate (including postage): For one year, Inland 18s. 6d. Overseas 17s., Canada 17s.

"Practical Mechanics" Advice Bureau. COUPON
This coupon is available until November 30th, 1956, and must be attached to all letters containing queries, together with 6d. Postal Order. *A stamped, addressed envelope must also be enclosed.*
Practical Mechanics. November, 1956.

Free Guide — SUCCESS IN ENGINEERING

132-PAGE BOOK FREE!

SEND FOR YOUR COPY

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

ENGINEERING, RADIO, AERO, ETC.

Aero. Draughtsmanship	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'gmnt. & Admin.	Mathematics (all stages)
Practical Foremanship	Radio Technology
Ratefixing & Estimating	Telecommunications
Time & Motion Study	Wiring & Installation
Engineering Inspection	Television
Metallurgy	Radio Servicing
Refrigeration	Gen. Elec. Engineering
Welding (all branches)	Generators & Motors
Maintenance Engineering	Generation & Supply
Steam Engine Technology	Aircraft Mainten. Licences
I.C. Engine Technology	Aerodynamics
Diesel Engine Technology	Electrical Design
Ordnance Survey Dr'ship.	

BUILDING AND STRUCTURAL

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

GENERAL, LOCAL GOVERNMENT, ETC.

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

BECOME A DRAUGHTSMAN—LEARN AT HOME AND EARN BIG MONEY

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

★ **OVER SEVENTY YEARS OF CONTINUOUS SUCCESS** ★

NATIONAL INSTITUTE OF ENGINEERING

(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.S.H.,
A.M.I.E.D., A.F.R.Ae.S.,
London B.Sc., Degrees.

Fully guaranteed postal courses for all the above and many other examinations and careers. Fully described in the New Free Guide.

THE ACID TEST OF TUTORIAL EFFICIENCY

SUCCESS—OR NO FEE

We definitely guarantee that if you fail to pass the examination for which you are preparing under our guidance, or if you are not satisfied in every way with our tutorial service—**then your Tuition Fee will be returned** in full and without question. This is surely the acid test of tutorial efficiency.

If you have ambition you must investigate the Tutorial and Employment services we offer. Founded in 1885, our success record is unapproachable.

ALL TEXTBOOKS ARE SUPPLIED FREE
PROMPT TUTORIAL SERVICE GUARANTEED
NO AGENTS OR TRAVELLERS EMPLOYED

Free Coupon

To: NATIONAL INSTITUTE OF ENGINEERING (Dept. 29), 148-150, Holborn, London, E.C.1.

Please Forward your Free Guide to

NAME .....

ADDRESS .....

.....

My general interest is in : (1) **ENGINEERING** (2) **AERO** (3) **RADIO** (4) **BUILDING** (5) **MUNICIPAL WORK**

(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.
(2d. stamp only required if unsealed envelope used.)

SEND OFF THIS COUPON NOW AND BE ALL SET FOR SUCCESS