"... A book that should be in every television dealer's service workshop, and in every home-constructor's, for that matter."
Journal of the Television Society

"... The book will undoubtedly be of value to TV service engineers, particularly those who are not fully experienced in translating the appearance of faulty pictures into the necessary adjustments or receiver fault location."
Wireless and Electrical Trader

TV FAULT FINDING

Data Book Series No. 5

ENLARGED REVISED EDITION

This a completely new production—not a reprint — and is unique in that it is lavishly illustrated by photographs taken from the screen of a televisor exhibiting the faults under discussion. A handy fault-finding guide is incorporated, and this is cross-referenced to the book itself.

over 100 *Illustrations and Diagrams*

now 92 *pages, high quality paper with heavy art board cover*

PRICE 5s. **Postage 3d.**

Available from your usual supplier, or direct
(*Trade enquiries invited*)

DATA PUBLICATIONS LTD.
57 MAIDA VALE LONDON W9
Telephone CUN 6518

DATA BOOK SERIES, NO. 9

Radio Control

FOR MODEL SHIPS, BOATS AND AIRCRAFT

BY F. C. JUDD, G2BCX

To operate a model ship or aircraft is a most interesting hobby. But how much more fascinating it would be if one could emulate the skipper or pilot and remain in control after the model has been set off on its course. This, thanks to radio control, can now be done, and enthusiasm for it is steadily mounting. With the publication of this book, we really believe that we have produced what will become a recognised handbook in this field.

Standard Edition, art board cover . . 8s. 6d.
Cloth bound, with gold lettering . . 11s. 6d.
Postage 3d.

A really comprehensive work on this fascinating subject

144 pages
135 diagrams and illustrations

TRADE ENQUIRIES INVITED

DATA PUBLICATIONS LTD
57 MAIDA VALE LONDON W9
Telephone CUNningham 6518

Printed in Great Britain for the Proprietors and Publishers Data Publications Ltd., 57 Maida Vale, London, W9, A. Quick & Co. Ltd., Oxford House, Clacton-on-Sea, Essex. *Is obtainable abroad through the following:* Collets Subscription Service, Continental Publishers & Distributors, Ltd., William Dawson & Sons Ltd. *Australia and New Zealand:* Gordon & Gotch Ltd. *South Africa:* Central News Agency. *U.S.A.:* Gilfer Associates. *Holland:* "Radio Electronica." *Scandinavia:* Intrapress. *Registered for transmission by Magazine Post to Canada (including Newfoundland).*

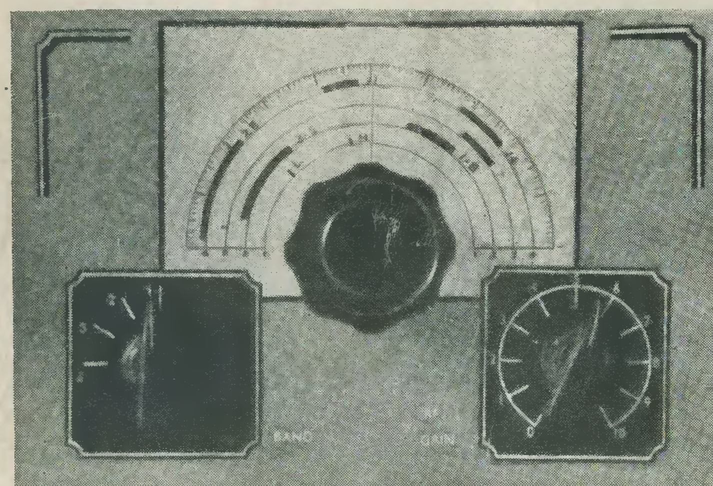
Volume 8
Number 3
OCTOBER
1954

The RADIO CONSTRUCTOR

incorporating The Radio Amateur

for the Radio and Television Enthusiast

THE MINI-PRESELECTOR



COVERING 10-750 METRES

ALSO IN THIS ISSUE

SENSITIVE TRF RECEIVER
TURRET MICROPHONE PRE-AMPLIFIER
THE EASI-BUILD RECEIVER, Part 2
DESIGN, CONSTRUCTION, CALIBRATION & USE OF SIGNAL GENERATORS, Part 2 · MAINS POWER SUPPLY FOR THE RCS RECEIVER
REPAIR & MAINTENANCE OF LINE OUTPUT TRANSFORMERS
General Purpose Circuit for the EF50 · Constructor Looks at the National Radio Show · Let's Get Started · Radio Miscellany, etc.

1/6

www.americanradiohistory.com

THE MODERN BOOK CO.

BRITAIN'S LARGEST STOCKISTS OF ENGLISH & AMERICAN TECHNICAL BOOKS

'VADE-MECUM' Television and Special Tubes, 11th edition. By P. H. Brans. **22s. 6d.** *Postage 1s.*

Radio Valve Data. By *Wireless World.* New edition. **3s. 6d.** *Postage 3d.*

Radio Control for Model Ships, Boats and Aircraft. By F. C. Judd, G2BcX. **8s. 6d.** *Postage 4d.*

The Electronic Musical Instrument Manual. By Alan Douglas. **30s.** *Postage 1s.*

Tape and Wire Recording. **2s. 6d.** *Postage 2d.*

Electronic Gadgets for the Constructor. By E. N. Bradley. **3s. 6d.** *Postage 3d.*

The Oscilloscope and its Applications. Philips Electrical Co. **5s.** *Postage 3d.*

Sound Recording and Reproduction By Godfrey & Amos. **30s.** *Postage 1s.*

Oscilloscope at Work. By Haas and Hallows. **15s.** *Postage 9d.*

Practical Television Circuits. By Camm. **15s.** *Postage 9d.*

TV Fault Finding. **5s.** *Postage 3d.*

The Radio Amateur's Handbook. By A.R.R.L. **30s.** *Postage 1s.*

Practical Wireless Circuits. By Camm. **10s. 6d.** *Postage 6d.*

Basic Electronic Test Instruments. By Turner. **32s.** *Postage 1s.*

Write or call for our catalogue

19-23 PRAED STREET (Dept. RC) LONDON W2
PADdington 4185

SCOTTISH INSURANCE CORPORATION LTD.

62-63 CHEAPSIDE LONDON, E.C.2.

TELEVISION SETS AND SHORT WAVE TRANSMITTERS

Television Sets and Short Wave Transmitters/Receivers are expensive to acquire and you no doubt highly prize your installation. Apart from the value of your Set, you might be held responsible should injury be caused by a fault in the Set, or injury or damage by your Aerial collapsing.

A "Scottish" special policy for Television Sets and Short Wave Transmitters/Receivers provides the following cover:—

(*a*) Loss or damage to installation (including in the case of Television Sets the Cathode Ray Tube) by Fire, Explosion, Lightning, Theft or Accidental External Means at any private dwelling house.

(*b*) (i) Legal Liability for bodily injury to Third Parties or damage to their property arising out of the breakage or collapse of the Aerial Fittings or Mast, or through any defect in the Set. Indemnity £10,000 any one accident.

(ii) Damage to your property or that of your landlord arising out of the breakage or collapse of the Aerial Fittings or Mast, but not exceeding £500.

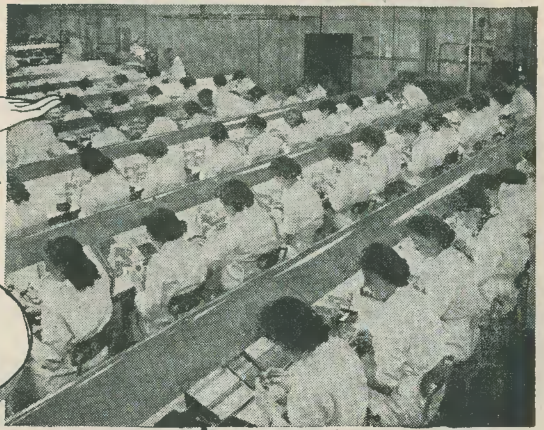
The cost of Cover (*a*) is 5/– a year for Sets worth £50 or less, and for Sets valued at more than £50 the cost is in proportion. Cover (*b*) (i) and (ii) costs only 2/6 a year if taken with Cover (*a*), or 5/– if taken alone.

Why not BE PRUDENT AND INSURE your installation—it is well worth while AT THE VERY LOW COST INVOLVED. If you will complete and return this form to the Corporation's Office at the above address, a proposal will be submitted for completion.

NAME (Block Letters)..
If lady, state Mrs. or Miss
ADDRESS (Block Letters)...

.... /JB

We see to it...



BRIMAR VALVES

are more reliable than EVER!

Rigid control of production processes, a ready acceptance of improved manufacturing techniques, and continual vigilance in the analysis and selection of raw materials ensure that every BRIMAR valve will do its job more efficiently . . . more reliably.

Modern manufacturing methods backed by an intensive research and development organisation enable BRIMAR to anticipate and meet the changing demands of the radio and electronic industries. There is bound to be a BRIMAR valve to exactly meet YOUR specification.

The 12AT7 is a very reliable frequency changer and is widely used in modern T/V receivers, VHF and UHF communications equipment. It is also frequently employed in industrial equipment, computors, navigational aids and test equipment.

now is the time to

BRIMARIZE!

BRIMAR	MULLARD	MARCONI OSRAM	COSSOR EMITRON
12AT7	ECC81	B152 & B309	12AT7

Use the BRIMAR 12AT7

with improved performance at

NO EXTRA COST

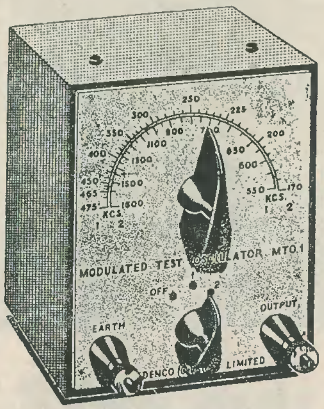
FOOTSCRAY KENT FOOtscray 3333

www.americanradiohistory.com

MAXI-Q REGD.

STOP PRESS WE PROUDLY PRESENT OUR LATEST HIGH STANDARD LOW PRICED INSTRUMENT WHICH WE KNOW WILL BECOME A PRIZED AND INDISPENSABLE POSSESSION IN EVERY CONSTRUCTOR'S SHACK

MODULATED TEST OSCILLATOR MTO.1



★ Provides a modulated signal suitable for I.F. alignment also trimming and tracking R.F. circuits.

★ Frequency is continuously variable from 170–475 kc/s and 550–1600 kc/s

★ Operates from a single 9-volt grid bias battery which is housed within the unit.

PRICE £3 15s. 0d.

Send 1/– in stamps *for general catalogue. Obtainable from all reputable stockists, or in case of difficulty direct from*

DENCO (CLACTON) LTD., 357/9 OLD ROAD, CLACTON-ON-SEA

NEW!

NO. 9 CATALOGUE

your buying guide for

Receiving, Transmitting and TV Equipment

CATALOGUE 3d
POST FREE
U.K., Forces, Overseas & Eire only)

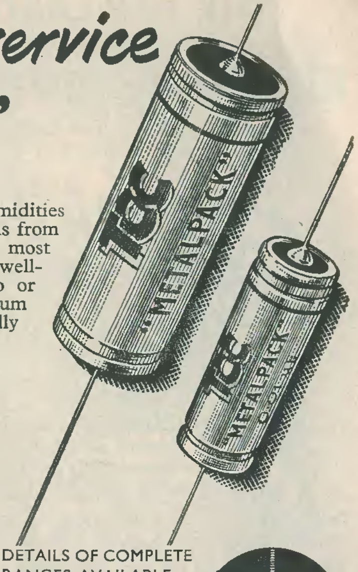
- Illustrated on fine art paper
- 58 pages, with up-to-date list
- Large Amateur stocks
- A square deal
- Ham-to-Ham personal help
- Orders dealt with day received
- All the best makes from one source

Southern Radio and Electrical Supplies
SORAD WORKS
REDLYNCH, SALISBURY, WILTS. *Telephone* Downton 207

For super tropical service

'METALPACK'

PAPER CONDENSERS



This range has been developed for operation in high humidities and high temperatures. Their ability to withstand variations from −40°C. to +100°C. makes them the obvious choice for the most stringent conditions. Internal construction follows the well-proved T.C.C. technique of winding non-inductively two or more layers of paper dielectric to each layer of solid aluminium foil, all impregnated under vacuum, and finally hermetically sealed in aluminium tubes.

Cap. µF	Wkg. Volts D.C.		Dimns. inches		Type No.	List Price Each
	At 70°C.	At 100°C.	L	D		
·005	1,000	750	1½	½	CP45W	1/10
·01	1,000	750	1½	½	CP45W	1/10
·02	750	600	1½	½	CP45U	1/10
·05	500	350	1½	½	CP45S	2/1
·1	500	350	2	½	CP46S	2/2
·1	1,000	600	2¼	¾	CP47W	2/6
·25	350	200	2	¾	CP48N	2/8
·5	350	200	2¼	¾	CP47N	3/-
·5	500	350	2¼	1	CP91S	3/10
1·0	350	200	2¼	1	CP91N	4/-

DETAILS OF COMPLETE RANGES AVAILABLE ON REQUEST

THE TELEGRAPH CONDENSER CO. LTD
RADIO DIVISION: NORTH ACTON · LONDON · W.3 · Telephone: ACOrn 0061

90 DEGREE SCANNING

Please note that 90 degree scanning yokes are now available
These are interchangeable with our existing D.C.300C yoke

Scanning Yoke type DC/390C (90 degree), **42/–.**

Scanning Yoke type DC/300C (70 degree), **39/6.**

Line Output Transformer type L.O. 308, **40/–.**

Focus Coil type F.C.302, **31/–**

Frame Output Transformer type F.O. 305, **21/–.**

Width Control type G.L.18, **7/6.**

Linearity Control type G.L.16, **7/6.**

Smoothing Choke type S.C.312, **21/–.**

Mains Auto Transformer type A.T. 310, **30/–.**

Also available:

Output Transformer type O.P. 1320, **8/3.**

Heater Transformer type M.T. 1209, **10/6.**

These two transformers are as specified for the Easi-Build

All the above are available direct from

ALLEN COMPONENTS LIMITED
Crown Works, 197 Lower Richmond Road, Richmond, Surrey
Telephone PRO 9013

Send 9d. and S.A.E. for recommended Wide-Angle Circuit Diagrams

www.americanradiohistory.com

THE MULLARD

5 Valve 10 Watt

High Quality Amplifier

as demonstrated at the Radio Show can now be heard at

Smith's of EDGWARE ROAD

Component Specialists since broadcasting started

who can supply all the parts for under £8

(less valves)

Priced Parts List available

Full details are contained in a Booklet by Mullard Technical Experts. Price 2/6 from

H. L. SMITH & CO. LTD

287/9 Edgware Road London W2

Telephone Paddington 5891

Hours 9 till 6 (Thursday 1 o'clock)

Nr. Edgware Road Stations, Metropolitan & Bakerloo

ARTHURS HAVE IT!

LONDON'S OLDEST RADIO DEALERS

LARGE VALVE STOCKS

AVOMETERS IN STOCK

Avo Test Meters and Signal Generators and Taylor Meters
Leak Point One Amplifiers and Tuning Units.
Chapman Tuning Units.
Crystal and Moving Coil Mics.
Decca Replacement Heads and Pickups.
Goodman's Axiom 150 Speakers.
Partridge Output Transformers for Williamson Amplifier.
All Components for the Radio Constructor's 16" Televisor.
Weare & Wright Tape Deck £35.

LATEST VALVE MANUALS
Mullard, Osram & Brimar No. 4 5/- each
Mazda 2/- each Postage 6d extra

TELEVISION SETS, WIRE AND TAPE RECORDERS ALWAYS IN STOCK
Goods offered subject to price alterations and being unsold.

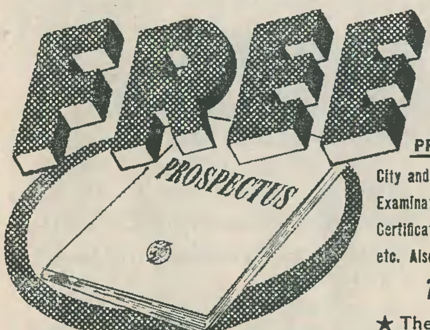
Arthurs *first*

Est 1919

Proprietors: ARTHUR GRAY LTD.

OUR ONLY ADDRESS **Gray House**
150-52 Charing Cross Road
London, W.C.2.

TEMple Bar 5833/4 and 4765 WRITE FOR LISTS



POST TODAY FOR OUR BROCHURE ON THE LATEST METHODS OF HOME TRAINING FOR OVER 150 CAREERS & HOBBIES

PRIVATE & INDIVIDUAL TUITION IN YOUR OWN HOME

City and Guilds Grouped Certificates in Telecommunications: A.M.Brit. I.R.E. Examination, Radio Amateur's Licence, Radio and Television Servicing Certificates, General Radio and Television Courses, Radar, Sound Recording, etc. Also Courses in all other branches of Engineering and Commerce.

The advantages of E.M.I. training

★ The teaching methods are planned to meet modern industrial requirements. ★ A tutor is personally allotted by name to ensure private and individual tuition. ★ Free advice covering all aspects of training is given to students before and after enrolling with us.

NEW LEARN THE PRACTICAL WAY COURSES WITH EQUIPMENT
With many of our courses we supply actual equipment which is sent upon enrolment and remains your property.
Courses include: Radio, Television, Electronics, Draughtsmanship, Carpentry, Photography, and Commercial Art, etc.

Courses from 15/- per month

EMI INSTITUTES The only Postal College which is part of a world-wide Industrial Organisation.

POST THIS COUPON TODAY

Please send without obligation your FREE book.
E.M.I. INSTITUTES, Dept. 179K,
43 Grove Park Road, Chiswick, London, W.4.

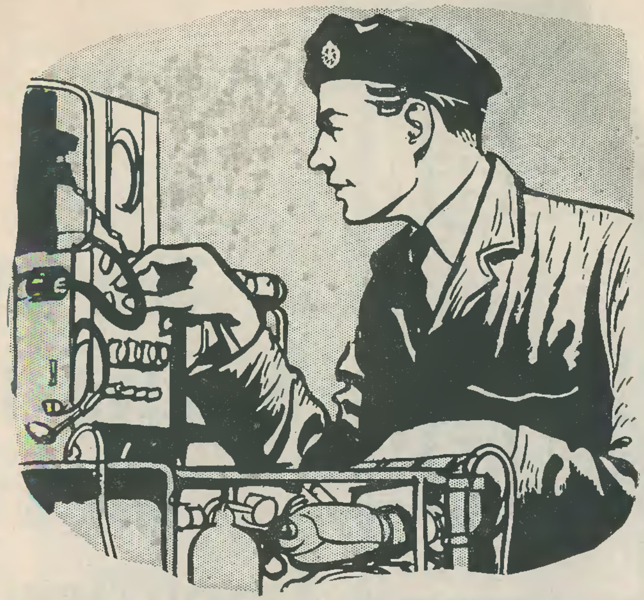
NAME ....

ADDRESS ....

....

SUBJECT(S) 1/10/C38E

Keen on radio and radar?



THERE'S A PLACE FOR YOU IN THE

R·A·F

All the newest developments in radio and radar are now being put into use in the Royal Air Force. There are particularly good opportunities for men in the ground trades which are responsible for installing, operating and maintaining this highly technical and specialised equipment. Both trained and untrained men between the ages of 17½ and 40 are wanted. Trained men will enjoy quick promotion and the increased pay that goes with it. Untrained men are offered the chance to learn a skilled trade that will be highly valuable to them in or out of the Service. All will be doing vital work and leading a fine, healthy life with many advantages civilians can't share: free food and accommodation and 30 days' annual leave on full pay, for instance. Read more about all the advantages of life in the Royal Air Force. **Post the coupon now.**

TO: ROYAL AIR FORCE (J.J.132), VICTORY HOUSE, LONDON, W.C.2.

Please send details of engagements in the R.A.F. Radio Engineering Trade Group.

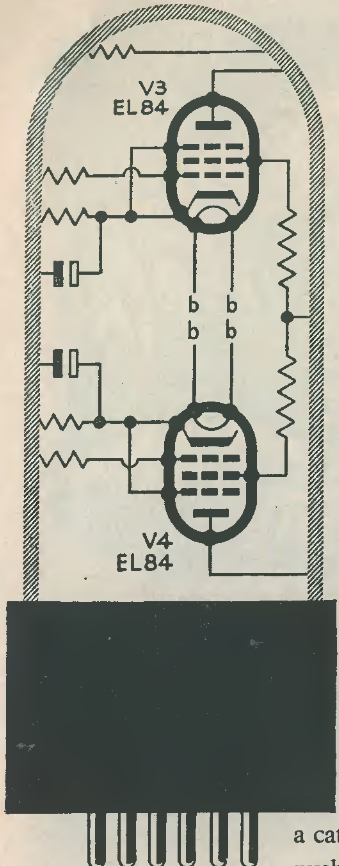
NAME ....

ADDRESS ....

.... DATE OF BIRTH ....

(Applicants from British Isles only)

www.americanradiohistory.com



The MULLARD 5 valve 10 watt High Quality Amplifier Circuit

Mullard have designed a new high quality 10 watt audio frequency amplifier circuit around five Mullard valves. It follows conventional lines and comprises a high gain input stage (Mullard EF86), a cathode coupled phase-splitter (Mullard ECC83) and a push-pull output stage employing two Mullard EL84 pentodes.

Its outstanding advantage is that it achieves really high quality reproduction with simple design and modest cost of components.

Full details of the amplifier and data for the valves are available in booklet form price 2/6 from Radio Dealers.

In case of difficulty write enclosing remittance direct to Valve Sales Dept. at the address below.

These are the valves for the Mullard 5 valve 10 watt High Quality Amplifier.

MULLARD EF86
MULLARD ECC83
MULLARD EL84(2)
MULLARD GZ30
or EZ80

Mullard

MULLARD LTD., CENTURY HOUSE, SHAFTESBURY AVENUE, LONDON, W.C.2
MVM 304A

The
Radio Constructor

INCORPORATING *The Radio Amateur*

CONTENTS FOR OCTOBER

VOL. 8 NO. 3
ANNUAL SUBSCRIPTION 18/–
OCTOBER 1954

Editorial and Advertising Offices
57 MAIDA VALE LONDON W9

Telephone
CUNNINGHAM 6518

Editor
C. W. C. OVERLAND, G2ATV

Advertising Manager
F. A. BALDWIN, A.M.I.P.R.E.

THE CONTENTS of this magazine are strictly copyright and may not be reproduced without obtaining prior permission from the Editor. Opinions expressed by contributors are not necessarily those of the Editor or proprietors

NOTICES

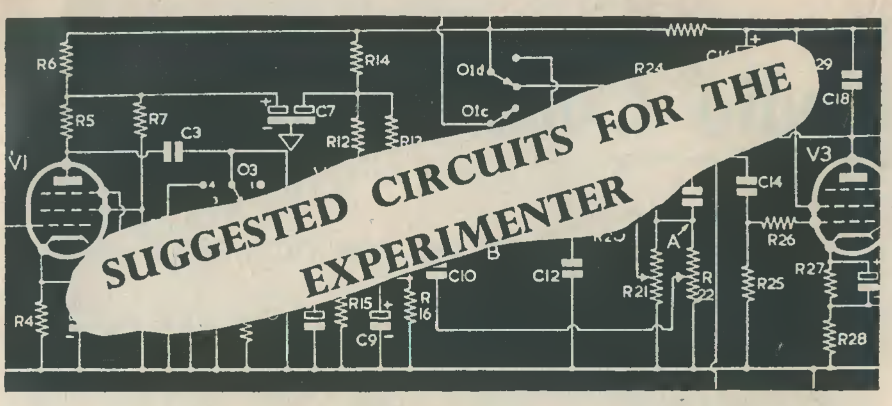
THE EDITOR invites original contributions on construction of radio subjects. All material used will be paid for. Articles should preferably be typewritten, and photographs should be clear and sharp. Diagrams need not be large or perfectly drawn, as our draughtsmen will redraw in most cases, but all relevant information should be included.

All Mss must be accompanied by a stamped addressed envelope for reply or return. Each item must bear the sender's name and address.

TRADE NEWS. Manufacturers, publishers, etc. are invited to submit samples or information of new produce for review in this section.

ALL CORRESPONDENCE should be addressed to THE RADIO CONSTRUCTOR, 57 Maida Vale, London W.9
Telephone CUN. 6518

www.americanradiohistory.com



SUGGESTED CIRCUITS FOR THE EXPERIMENTER

The circuits presented in this series have been designed by G. A. FRENCH, *specially for the enthusiast who needs only the circuit and essential relevant data*

No. 47. A SENSITIVE TRF RECEIVER

IN RESPONSE TO A CONSIDERABLE NUMBER of readers' requests, last month's Suggested Circuit dealt with an inexpensive record-player amplifier suitable for use with modern crystal pick-ups. The choice for this month's circuit follows the same policy, insofar as it has also been the subject of many requests.

The Circuit

The circuit described in this issue is that of a simple four-valve TRF receiver. Despite the fact that particular care has been taken to keep the number of components to a minimum, the circuit uses techniques which should enable sensitivity at all points of the band covered to be higher than that obtainable from the normal class of published circuit. If built with reasonable care, a receiver using this circuit should have a sensitivity of approximately 150μV at full volume setting, or down to less than 50μV if regeneration is allowed to occur. The receiver is intended for medium-wave working only.

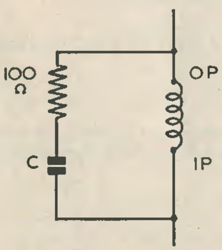


Fig.1
Illustrating tuning of primary winding

E66

The aerial input to the receiver is passed, via L1, L2, to the grid of V1. V1 is a conventional RF amplifier whose gain is controlled by the potentiometer R3. This potentiometer constitutes the volume control for the receiver and functions by varying the cathode bias applied to V1. At full volume, the cathode of V1 is biased only by the voltage dropped across R2; whereas, at minimum volume, the cathode is biased by a relatively high positive voltage obtained from the HT line via R4. It is necessary to apply this positive voltage to the potentiometer since, otherwise, it would be impossible to reduce volume to a minimum when receiving strong signals.

The anode of V1 feeds into L3, L4 in conventional manner, and thence to the grid of V2. V2 is an anode-bend detector whose screen-grid is kept at a purposely low potential in order to enable a high amplification factor to be obtained. The detected voltage appearing at the anode of V2 is then passed to the grid of V3 via C13 and the grid-stopper R8. C12, this grid-stopper, and the input capacity of V3 then form a reasonably effective RF filter.

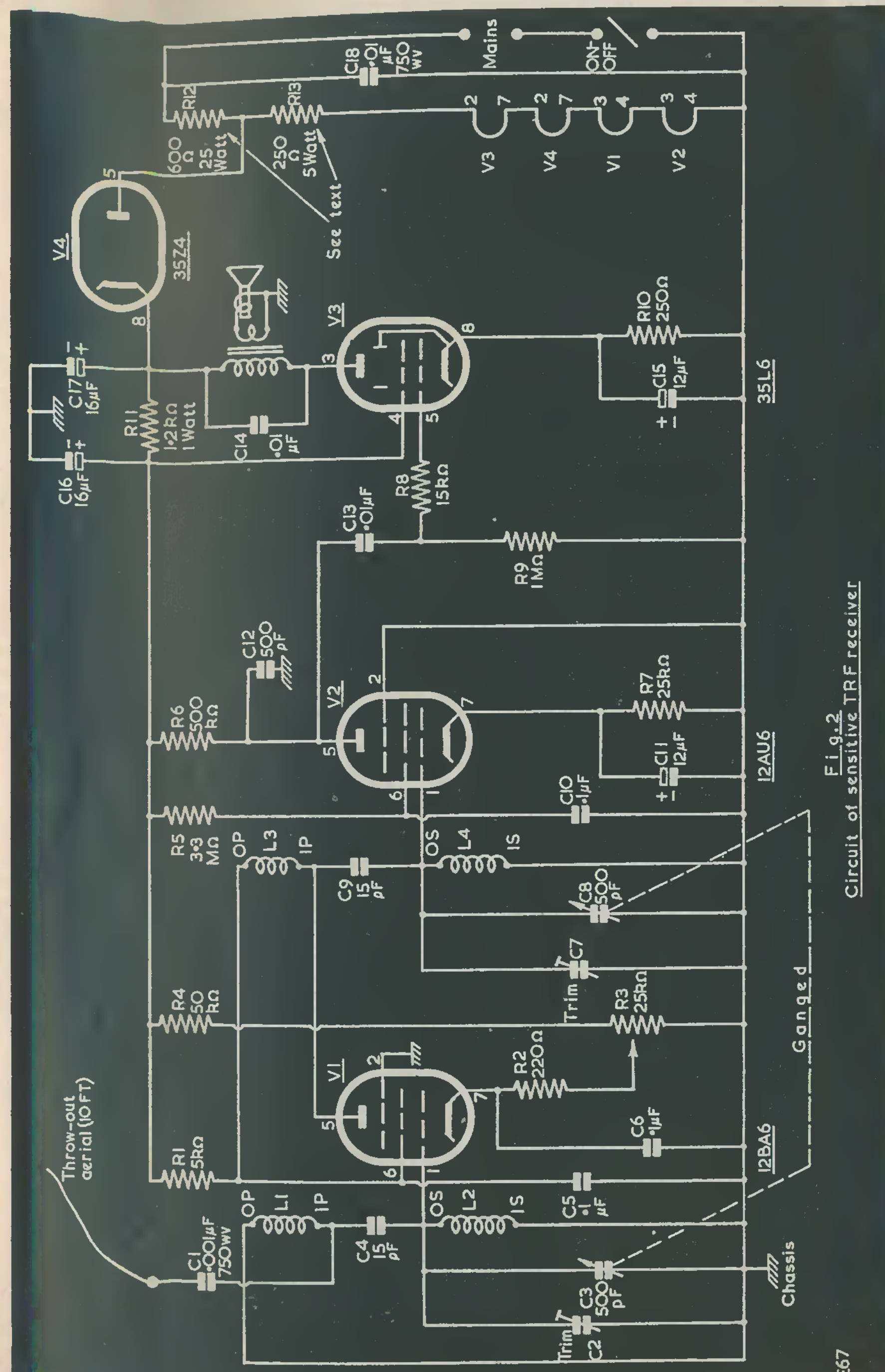


Fig.2
Circuit of sensitive TRF receiver

E67

www.americanradiohistory.com

V3 amplifies in the normal fashion, working into the output transformer and thence to the speaker. The usual tone-correction condenser, C14, is fitted across the output transformer primary; this condenser carrying out also the secondary function of by-passing any RF voltages which may appear at the anode of V3.

The power supply circuit is quite conventional, consisting of the usual half-wave rectifier together with a voltage dropper (R12 plus R13) for the heater chain. The rectifier anode is tapped into the junction of R12 and R13 instead of being connected to the full mains voltage. If this were not done, too high an HT voltage for some of the valves specified might be provided. This method of connection has the further advantage of allowing R12 to perform the secondary function of rectifier limiter. As a minor point of what represents good design practice, the rectifier heater is connected into the heater chain at a lower point than that of the output valve. This position has been chosen to ensure that the cathode-heater potential of the rectifier may be made less than would be given if it took up its more conventional position at the high-potential end of the chain.

Finally, a single-pole on-off switch is provided, the mains connection completed by its contacts being that which connects to the chassis. This method of switching has the advantage of allowing the mains lead to the switch to be routed through the chassis wiring without fear of hum pick-up, since it is at chassis potential when the receiver is switched on. The power wiring is completed by the anti-mains-modulation condenser C18.

The Coils

The most important components in the receiver are the coils. These function best if the coupling coils are wound such that they resonate just beyond the lower frequency end of the band covered; thus boosting the response of the receiver at the point where tuned circuit Q is at its lowest. The experienced constructor who is prepared to wind his own coils should get good results by scramble-winding the coupling coils with very thin wire, say 42 to 44 swg cotton-covered enamelled. The coupling coils will require a large number of turns, especially that for L3. Thin wire is essential in order to keep down the Q of the coupling coil. Coupling coil L1 is tuned by the aerial-earth capacity, and coupling coil L3 by strays. Grid windings (L2 and L4) are conventional, and adjustable cores are desirable.

An alternative solution to the home-winding process consists of using commercial over-coupled aerial coils. (Especially those made by Teletron, which have adjustable iron cores.)

Since the best aerial to use with this receiver is a throw-out length of wire about 10 feet long, it is reasonably safe to assume that the aerial-earth capacity will lie between 30 and 60pF. It then becomes necessary to wind L1 such that it resonates at approximately 400 to 500 kc/s with a parallel capacity in the centre of these two values. When commercial coupling windings are used it may be found that they do not have sufficient inductance to enable this frequency to be reached. In such cases, they may be "tuned" by connecting a condenser across them, as illustrated in Fig. 1. The series resistor is included to maintain the tuned circuit Q at a low value, and the value of the parallel condenser should not be more than 50pF.

The same treatment is needed for L3. In this instance, the stray parallel capacities will be much lower than the aerial-earth capacity which "tuned" L1, and so L3 will either need a larger number of turns or a larger value of parallel "tuning" condenser. Again, however, this parallel capacity should not be greater than 50pF.

Additional coupling is provided by the two low-value condensers C4 and C9. These condensers become effective at the high-frequency end of the band, ensuring that a high degree of coupling is maintained. If the windings are connected as shown in the diagram (in which OP refers to the outside of the coupling coil and IS to the inside of the grid coil, etc.) the coils will be poled such that the capacitive coupling is correctly phased.

Practical Points

The simplest method of building the receiver would consist of mounting all the RF and AF components below the chassis with the exception of the grid circuit of V1, whose components should be mounted above. The chassis would then provide the requisite screening between the two tuned circuits and their wiring. Condenser C5 must be mounted close to V1 for reasons of stability.

The heater dropping resistor, R12 plus R13, could best be provided by a dropper resistor with movable taps. This is due to the fact that the value specified for R12 does not take into account the fact that this resistor also passes the reservoir charging current during positive half-cycles. When the receiver has been completed and tested, therefore, the value of R12 should be reduced experimentally (after the set has been allowed to warm up), until the voltage across the heater chain reaches its correct value. The reduction in value needed should be small only.

Mention was made earlier of the fact that the gain of the receiver will be increased if regeneration is allowed to occur. Such regeneration will be caused mainly by random couplings, and especially by random inductive coupling between the two coils. It should be pointed out, however, that if regeneration is high enough to permit the receiver to go into actual oscillation at full volume setting, the advantages given by the regeneration will be largely lost.

Valves

The valves chosen for this circuit are from the Brimar "Current Equipment" range. Type 12AU6 (the 0.15 amp version of the 6AU6), is not mentioned in the current Brimar manuals, but the writer has been assured that it is available.

Safety

It must be emphasised, before concluding, that the receiver described this month has a live chassis and that the usual precautions therefore apply. Since the on-off switch specified is connected in one mains lead only, the chassis is live (through the heater chain), even when the set is switched off. Also, due to this method of switching, if the chassis is connected to the neutral side of the mains when switched on, it will be effectively connected to the live side when switched off; and vice versa.

WALTON-ON-THAMES AMATEUR RADIO EXHIBITION

Organised by the QRP Society

Mr. A. O. Milne, G2MI, the President of the Radio Society of Great Britain is to perform the opening ceremony at 2.30 p.m. on Saturday, 30th October, 1954.

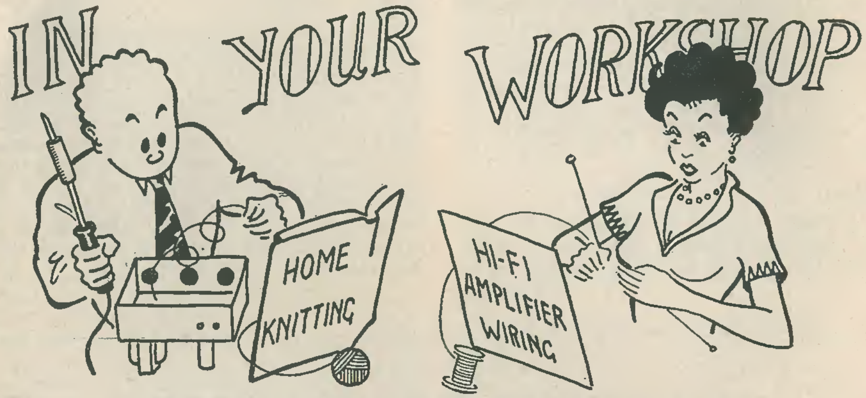
Among the features to be displayed at the Exhibition will be a low-power transmitter (G3JNB/A), "on the air" from the hall at various times during the afternoon, enabling visitors to see and hear radio contacts being made with stations in many parts of the country; a "live" display by members of the Radio Amateur's Emergency Network, the organisation recruited to combat national emergencies such as the flood disaster of 1953; a large and varied assortment of valves, components, receivers, transmitters and test equipment, both new and ex-service, from the stock of Messrs. Proops Bros. of Kingston, any item of which may be purchased at specially attractive prices from the stand; a display by Messrs. Data Publications Ltd. including their popular magazine *Radio Constructor* and the full range of their Data Books as well as their recently introduced transfers, "Panel-Signs"; examples of the developments being carried out by members of the QRP Society, including the very successful Transistor Transmitter by G3IEE, a 70 cms transmitter-receiver and a QRP super-het by G3JKA; a display of the last word in modern components side by side with a stand carrying samples of radio history from as far back as 1913; demonstrations of the latest and most realistic radio-controlled models, and exhibits by several "local" clubs and societies; in fact, something to interest everyone, including the complete layman.

The Exhibition will be held in St. Mary's Parish Church Hall, adjacent to the centre of the town (access from Church Street or Churchfield Road) and admittance will be by ticket, price 1/– (children half) obtainable at the entrance. Blocks of six or more tickets may be had at 8d. each by application, not later than 23rd October, to the Hon. Sec., QRP Society, 92 Rydens Avenue, Walton-on-Thames.

The hall may be reached by bus service from all districts, both London Transport and Greenline, stopping at Church Street, as does the special Walton Station bus which meets all the half-hourly services of the Southern Railway from Guildford, Woking, Surbiton and Waterloo, etc.

For motorists the police have approved parking on the south side ONLY of Church Street, EAST of the entrance to St. Mary's Church.

www.americanradiohistory.com



In which J. R. D. discusses Problems and Points of Interest based on Letters from Readers and his own experience.

WE AMATEUR RADIO ENTHUSIASTS APPEAR to be becoming very conscious of the factor "Q" these days. In the earlier days of radio, a tuned circuit was usually described as being either "high-Q" or "low-Q"; if, indeed, the term "Q" was used at all. Nowadays, we refer quite confidently to Q in concrete numbers. This is, of course, a definite advantage; but it necessitates the use of the term correctly and in its proper context.

What is Q ?

The correct definition of Q (or "quality factor," or "magnification factor," etc.) is that it is the ratio of reactance to effective resistance of an inductance, condenser, or resonant circuit. Q may be shown thus:

$$Q = \frac{X}{r}$$

where X is the reactance and r the effective resistance in ohms.

Alternatively,

$$Q = \frac{\omega L}{r} \text{ for an inductance}$$

and $$Q = \frac{1}{\omega C r} \text{ for a condenser,}$$

when ω is equal to $2\pi f$; and frequency, capacity and inductance are in cycles, farads and henrys respectively.

In resonant circuits it is frequently assumed that the Q of the circuit is very nearly equal to the Q of the inductor. This holds true, however, only when the losses in the condenser are much lower than those in the coil.

The following are approximations:

$$Q \doteq \frac{1}{\text{Power Factor}}$$

$$Q \doteq \frac{fr}{f2 - f1}$$

$$Q \doteq \frac{Cr}{C2 - C1}$$

The first expression applies to condensers or inductors considered separately, and gives a figure for Q which is accurate within 0.5% for values of Q above 10.

The second expression applies to resonant circuits and, if condenser losses are low, is perhaps rather more accurate. In this, fr equals the frequency at resonance, whilst f1 and f2 are the two frequencies on either side of the resonant frequency at which the current flowing in the tuned circuit drops to 0.707 of that obtained at resonance. In the third expression, which also applies to resonant circuits, Cr is the tuning capacity at resonance, and C1 and C2 are the capacities at which the current drops, similarly, to 0.707 of its resonant value. These last two expressions are useful, as they allow Q to be measured without the use of a calibrated Q-meter. They are necessarily approximate, however, because they ignore the losses in the condenser.

(I have emphasised the fact that these last three equations are approximate only, because, amongst other things, they constitute a pitfall to the student who has to sit an examination. Examiners can be very hard-hearted on the question of the correct expression for Q!)

Measurement of Q

One point which the above paragraphs bring to light is the often forgotten fact that Q varies with frequency. The statement that a coil has a Q of, say, 160, does not really signify anything. Such a statement should be qualified by mentioning the frequency at which this figure is obtained. Unfortunately, whilst the reactance of an inductor or condenser varies in simple relation to the frequency applied to it, its effective resistance does not. It is difficult therefore to find a simple expression to equate the varying Q of an inductor or condenser against varying frequency. The result of this is that, when Q figures are required at different frequencies, it is easier to individually measure the Q at the frequencies specified rather than to attempt any involved calculations.

Instruments capable of measuring Q with reasonable accuracy are a very necessary complement of the equipment fitted in a radio laboratory. As was mentioned above, it is possible to find Q by varying frequency or capacity on either side of the resonant frequency. Such methods are utilised now and again in some laboratories, but the process of taking readings and making calculations is apt to become long-winded and tiring.

A far better method is to employ an instrument calibrated directly in terms of Q. In its common form, such an instrument suffers only from the fact that it does not account for the self-capacities of any inductors which may be measured, and that very small values of resistance are unavoidably introduced into the tuned circuit by the Q-meter itself. Such instruments are used most frequently for the testing of inductors, although some may be adapted for measuring the Q of condensers as well.

The basic arrangement employed in a direct-reading Q-meter is as shown in Fig. 1. In this diagram a source of RF, whose frequency is known, is applied via an RF ammeter to the very low-value resistor, R. An RF voltage is built up, consequently, across this resistor; and is thus introduced into the tuned circuit given by L and C. When these two components are adjusted such that their resonant frequency is equal to that supplied by the RF source (or, conversely, when the frequency of the RF source is adjusted to the resonant frequency of L and C) the voltages appearing across either L or C may rise to many times the value of that built up across R. What is of importance here is that the ratio between the two voltages is equal to the circuit magnification; and, thus, to the Q of the tuned circuit. If, therefore, we measure the voltage appearing across either of the tuned circuit components with a very high resistance voltmeter we can obtain a direct reading for the Q of the tuned circuit.

As was just mentioned, Q-meters of this type are most frequently used for taking Q readings of inductors only. The condenser C of Fig. 1 may then be incorporated in the instrument itself; the inductor under test being connected to suitable external "test" terminals. Since, if the condenser C is carefully made and uses high-grade insulation, it is possible to reduce the losses in this component to a negligible value, the Q of the tuned circuit becomes approximately equal to that of the inductor.

The problem of measuring the voltages across L or C is not too difficult if a high

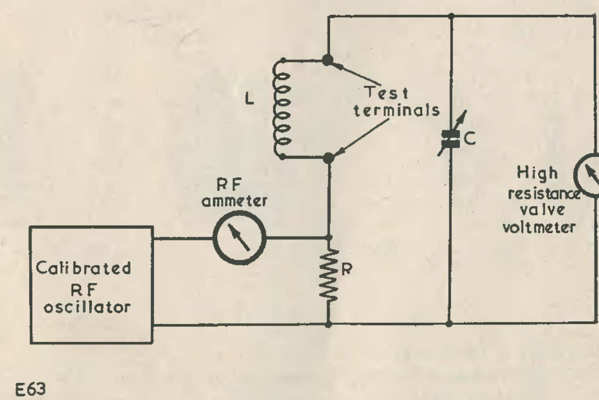


Fig. 1. The basic circuit of a conventional direct-reading Q-meter.

www.americanradiohistory.com

input resistance valve voltmeter is employed. This may be connected either across L or across C (the voltage across either component is equal), but it appears to be more customary to connect it across C. (This is doubtless due to the fact that the condenser frame may then be conveniently earthed.) The condenser C should be calibrated in units of capacity at its panel control or scale.

The source of RF is also of importance, and this usually consists of a calibrated oscillator which is built into the meter. The output of this oscillator is then taken, via a continuously variable attenuator and the ammeter of Fig. 1, to R. The ammeter may, conveniently, be of the thermo-couple type. When in use, it is usual to set the attenuator such that the ammeter gives a certain pre-selected reading (rather like the "set-carrier" marking on some signal generators). The Q reading may then be taken directly from a suitably calibrated scale of the valve voltmeter.

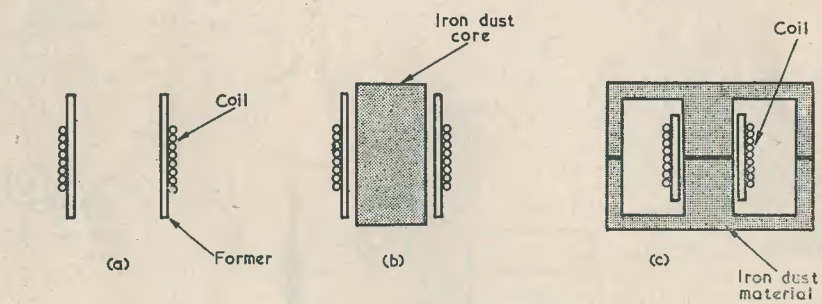
Iron Cored Coils

So much for the Q-meter. Let us now consider one or two points which affect the Q of the type of radio coil we most frequently meet today.

To deal with this question effectively, it is worth while examining what happens when an iron-dust core is added to an ordinary uncored coil.

Fig. 2 (*a*) shows a cross-section through a normal solenoid wound (or single layer) coil. The Q of this coil, as we already know, is equal to its reactance divided by its effective resistance. Now let us see what happens if we insert an iron-dust core inside the coil, as we do in Fig. 2 (*b*). The most obvious thing that occurs, of course, is that the inductance of the coil increases. If the inductance of the coil increases, so also does its reactance and, therefore, its Q. On the other hand, the dust core introduces losses which tend to bring down this increased Q. If, however, *the core used is one which has been manufactured to work at the frequency range over which the inductance will operate*, these losses will not be high and the final Q figure of the cored coil will, almost always, be noticeably higher than that of its similarly dimensioned, air-cored, brother.

Since the inductance of the coil increases after the core has been inserted, this raises another point. Let us assume that the coil of Fig. 2 (*a*) has ten turns and is intended to tune over a certain range of frequencies.



E64 FIG.2

Fig. 2 (*a*) *A simple air-cored inductor*
(*b*) *The same inductor fitted with an iron-dust core*
(*c*) *Cross-section illustrating a coil around which is a complete magnetic circuit of iron-dust material*

Of these points, one of the most important concerns the common or garden iron-dust cored RF coil. There appear to be one or two minor misconceptions concerning such coils. It is considered by some amateurs, for instance, that the addition of an iron-dust core to a coil lowers its Q; whilst others contend that the core increases its Q.

When the core is inserted, we find that we are able to take, say, two turns away from the coil to obtain the same inductance and, consequently, the same frequency coverage as we had before. Removing these two turns reduces the effective resistance of the coil, and thus constitutes another reason for the inference that the addition of an iron core of the correct type increases Q. (This second case assumes, of course, that the cored and uncored coils are required to have the same inductance).

Before going further, I think I should point out that the insertion of an iron-dust core in the centre of a coil, as is done in Fig. 2 (*b*), does not always increase Q *dramatically*. This is mainly due to the fact that the core does not increase the inductance as much as is sometimes imagined. Increases in Q from, say, 70 to 100, are the normal things to expect in a cored coil of this type. Indeed, central cores are sometimes fitted to coils, not necessarily to increase Q only, but also to offer the more attractive function of providing a means of adjusting inductance. It is fairly safe to say that, assuming that the core is of the correct type for the frequency covered, the larger the cross-sectional area of the core in relation to the size of the coil, the greater the increase in Q.

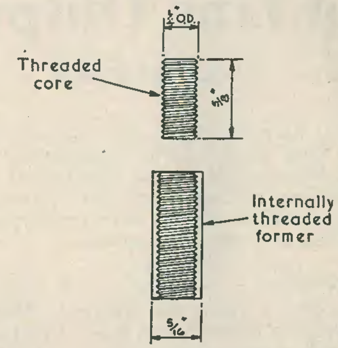
Iron-dust materials become capable of giving very large increases in Q when they provide a complete magnetic circuit, as is shown in Fig. 2 (*c*). This method of construction increases the inductance of a coil by a considerable degree, and results in Q figures well in excess of the Q of a similar air-cored coil of the same dimensions. When the core material completely surrounds the coil the assembly is known as a "pot-core." Unfortunately, the cost of manufacture of iron-dust pot-cores is fairly high and they do not often find their way into the normal domestic radio receiver. Modified pot-core assemblies are used sometimes, nevertheless, in miniature 465 kc/s IF transformers.

TABLE 1

Coil	Tuning Capacity	Q and Resonant Frequency: Uncored	Core half inserted	Core fully inserted
M.W. Aerial	100pF	57	77	90
		1.3 Mc/s	1.1 Mc/s	980 kc/s
Former as Fig. 3	400pF	87	115	135
		675 kc/s	565 kc/s	500 kc/s
M.W. Oscillator	100pF	30	40	50
		1.75 Mc/s	1.5 Mc/s	1.35 Mc/s
Former as Fig. 3	400pF	35	55	60
		880 kc/s	730 kc/s	690 kc/s
L.W. Aerial	100pF	50	55	70
		400 kc/s	335 kc/s	300 kc/s
Former as Fig. 3	400pF	45	60	65
		202 kc/s	167 kc/s	155 kc/s
S.W. Aerial (Nominal 6-18 Mc/s)	100pF	60	62	70
		17.2 Mc/s	14.7 Mc/s	12.7 Mc/s
Former as Fig. 3	400pF	45	48	55
		8.4 Mc/s	6.7 Mc/s	6.3 Mc/s

TABLE 2

Coil	Tuning Capacity	Resonant Frequency	Q
10 turns air-spaced	100pF	8.3 Mc/s	130
22 swg Enam.	400pF	4.1 Mc/s	160
4 turns air-spaced	100pF	13.7 Mc/s	185
22 swg Enam.	400pF	6.8 Mc/s	140
10 turns air-spaced	100pF	8.4 Mc/s	240
18 swg Enam.	400pF	4.2 Mc/s	235
4 turns air-spaced	100pF	15.7 Mc/s	230
18 swg Enam.	400pF	7.8 Mc/s	190
"Telsen"	100pF	1.3 Mc/s	80
M.W. Aerial	400pF	680 kc/s	70



E65

Fig. 3. *Approximate dimensions of test former and core mentioned in the text.*

Typical Q Values

Whilst I was writing this month's contribution, I thought that it would be of interest to readers if I appended some Q figures for the average types of coil that are liable to be met in everyday use.

(*Continued on page* 175)

www.americanradiohistory.com

REPAIR and MAINTENANCE of Line Output Transformers

Part 2. *By* **S. WELBURN**

In last month's article, we gave a brief resumé of the construction of the modern line output transformer and of the basic circuits in which it was used. We now pass on to the more prevalent faults which beset this component.

Breakdown

One of the most frequent troubles in television receivers is given by breakdown of the line output transformer. This occurs when two points in the transformer winding spark over to each other and, by reason of burning or puncturing the insulation between them, create a short circuit.

Breakdowns in line output transformers may be classified fairly roughly into three types. These are: breakdowns due to "slipped turns," internal breakdowns, and surface breakdowns.

Breakdowns due to "slipped turns" usually occur in the EHT over-wind and are caused by incorrect wave-winding at the factory. An illustration is shown in Fig. 5. This diagram shows part of a faulty EHT over-wind and illustrates how a portion of one of the turns, instead of occupying its correct position in the coil, has slipped down slightly so that it lies close to the turns which were wound on several layers previously. A fault of this nature is difficult to notice, and may easily be unobserved by the operative winding the coil. The coil is, quite possibly, still capable of standing the normal voltage tests applied in the factory, but is liable to break down at any future date.

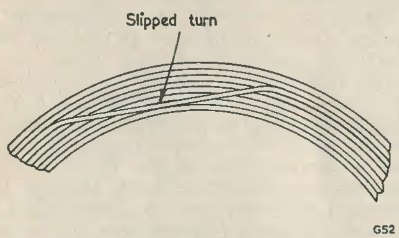


Fig. 5. Detail of EHT over-wind, showing a "slipped turn"

If a coil breaks down in this manner it is usually beyond repair. However, working on the assumption that the faulty line transformer is fit only for throwing away (and that it is not, of course, under guarantee or the subject of an agreement concerning repair with the manufacturer), no harm would be done by trying to cure the trouble. The best method consists of attempting to locate the offending "slipped" wire and of moving it slightly out of its position, if possible, away from nearby turns. Very heavy daubing with polystyrene varnish may then, in one or two cases, effect a cure.

It must be pointed out that it is inadvisable to attempt a repair of this nature, the success of which is problematic, if it is possible to have a new coil fitted by the manufacturer. Emphasis must also be placed on the fact that, in cases where it is decided to carry out the repair, the polystyrene varnish should be applied to the coil in single coats only, the first coat being allowed to dry before the second is applied. This procedure is necessary, since the solvent in the varnish may otherwise soften the adhesive used to strengthen the coil during manufacutre.

Internal Breakdowns

Internal breakdowns are rarer than surface breakdowns, or breakdowns caused by "slipped turns." They are especially liable to occur, however, if the line output transformer is over-driven. This point is dealt with later.

Internal breakdowns occur when two turns in the body of the coil (usually the anode coil) spark over internally. A continuous spark is often then formed, and can sometimes be heard in the transformer itself; the usual effect being a "sizzling" noise. This should not be confused with the very quiet "sizzling" noise caused, occasionally, by corona. In a dark room it may be possible to see the spark which exists inside the winding, although this is not always possible. The spark may cause a certain amount of smoke, as well as giving a smell of ozone.

The continuous spark will probably result in a considerable amount of crackling in the sound section of the receiver. As a confirmation of its source, it may be found that the crackling changes momentarily in strength when the line output transformer is lightly tapped with a rod of insulating material. Due to the partial short circuit, little EHT will be generated.

There is no cure for this fault except replacement.

Surface Breakdowns

Surface breakdowns appear in line output transformers fairly frequently, and can be cleared up in a surprisingly large number of cases without having to remove the transformer from the chassis.

Surface breakdowns occur when, due usually to working in humid conditions, a small amount of moisture is deposited on the outside of the line output transformer windings. If sufficient moisture has been deposited to form a conductive path, a spark may suddenly jump along the outside surface of the winding.

If this spark is allowed to remain in existence for any length of time it will cause "tracking" along the surface insulation, with the result that the insulating material may break down chemically and leave a conductive carbon path between the two sparking points. When this has happened the winding is usually beyond repair.

If treated early, however, the breakdown can often be cured. Assuming, as above, that no guarantees or agreements concerning repair exist, the surface of the winding at the point of sparking may be again painted liberally with polystyrene varnish. When possible, it is a good plan also to melt a little high-quality paraffin wax over the affected area. If the breakdown has been caused by the accidental shifting of the sleeving of one of the lead-out wires from the winding, the sleeving should be carefully re-positioned. The main idea behind the repair is to ensure that the surface area around the two sparking points, and the points themselves, are adequately insulated from the atmosphere in which the transformer has to work.

The repair given by this treatment is not always permanent, unfortunately, and the professional service engineer, who has a reputation to uphold, would probably prefer to change the whole transformer. So far as the amateur is concerned, however, this cure is certainly good enough to be worth the attempt.

It must be pointed out once more that this trouble may also be caused, in the first place, by over-driving the transformer.

Intermittent Faults

It occasionally happens that line output transformers "spark over" intermittently. The sympton is usually that of a sharp, audible "crack" from the transformer itself, accompanied by the temporary collapse of the picture. In company with all other intermittent radio faults, this particular trouble is difficult to clear. If possible, an attempt should be made to locate the spark. It is most likely to appear just after the set has been switched on, when the line timebase is settling down to correct working; and when the brilliance control is turned back, reducing the EHT loading. If the spark can be located, it may then be cured as described above.

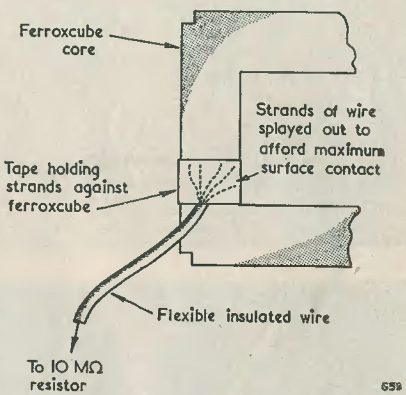


Fig. 6. A suitable method of making an earthing connection to Ferroxcube, as described in the text

A frequent cause of intermittent sparking is given by static charges existing on the magnetic cores of the transformer, when they are not connected directly to chassis. This applies especially to Mullard Ferroxcube which, whilst acting as an insulated core, may still pass current along its surface. Many engineers are surprised to learn this. They can, nevertheless, verify the truth of this point, if they desire, by applying the two prods of a sensitive ohmmeter to the surface of a piece of Ferroxcube. The probable cause of the conductive path is the gradual deposit of a moisture-and-dirt film on the surface.

Because of this surface conductive path, therefore, Ferroxcube cores, when not connected to chassis, may pick up static charges which have high potentials with respect to chassis, or to the windings adjacent to them. When the charge on these cores has built up to a very high potential a spark may snap

www.americanradiohistory.com

across the path between the surface of the Ferroxcube (or any mounting bolts which happen to be in contact with it) and chassis or the winding.

This trouble can be cleared very easily by connecting the Ferroxcube cores to chassis via a 10MΩ resistor. The connection to the Ferroxcube can be made via any mounting bolt which is in close contact with it. If the transformer design is such that no suitable mounting bolt exists, the connection to the Ferroxcube may be made by taping a wire against it, as shown in Fig. 6. The point chosen for this connection must be remote from all windings on the Ferroxcube; and the connecting wire must not be wrapped around the Ferroxcube or it will constitute a "shorted turn."

The 10MΩ resistor affords an ample path to chassis for static charges on the core, and is a safe method of curing the trouble. On no account should a direct connection to chassis be made in a case of this type.

Corona

We have dealt above in some detail with the main breakdown troubles existing in line output transformers. We may now pass on to the question of corona.

Corona is the name given to the brush discharge which occurs when a conductor carrying a high potential causes ionisation of the surrounding air. It is visible in dark surroundings as a blue glow, or haze; this being thickest around the conductor itself. Corona is frequently accompanied by a very quiet "sizzling" noise and a characteristic, and somewhat unpleasant smell.

Corona begins to manifest itself around 10 kV or so, becoming progressively worse as the potential of the conductor rises. It is not generally realised that a conductor which may cause hardly any corona at all at, say, 14 kV, can give rise to most noticeable corona at 16 kV. So far as line output transformers are concerned, the question of the guilty party being over-drive once more applies.

Corona often increases in severity if an earthed metal object is in the vicinity of the high potential conductor. EHT points must, therefore, be kept well clear of the televisor chassis. This applies especially to the EHT lead to the cathode ray tube, even if it is apparently well insulated.

In an ordinary line output transformer of the auto-transformer type (see Fig. 2 of last month's article), it is usual practice to commence taking anti-corona precautions from the tapping for the anode of the line output valve to the outside of the EHT over-wind. Anti-corona precautions are applied, therefore, to the entire EHT over-wind, and to its lead-out wires and terminal points.

Corona appears at its worst if the high-potential conductor has any sharp points and when it is in contact with the air. Terminals which must, essentially, be in contact with the air, are consequently made as rounded in shape as possible in order to present a large, smooth surface to the air.

Successful soldering at such terminals sometimes requires a little practice. One or two home-constructors have been known, for instance, to get into slight difficulties soldering connections to the conventional cup-shaped type of anti-corona tag. The best method of soldering these tags consists of positioning the transformer (or chassis on which the transformer is mounted) such that the tag is horizontal. See Fig. 7 (*a*).

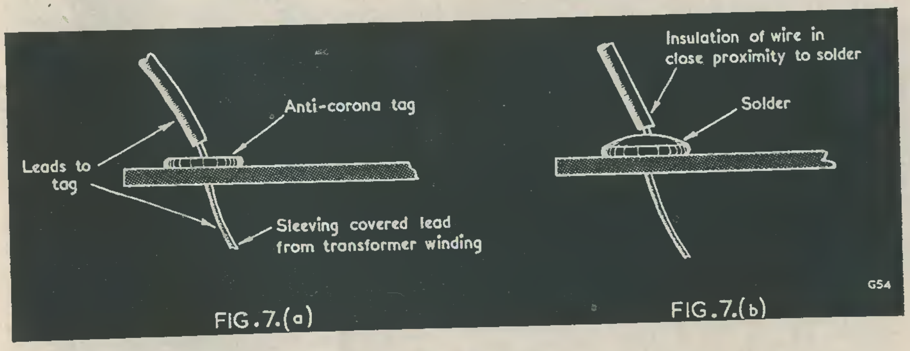


Fig. 7 (*a*) *and* (*b*). *Successive stages in the soldering of an anti-corona tag*

The soldering iron should then be applied to the tag, and enough solder run into it to anchor the wires which connect to it. After the initial amount of solder has solidified, more may then be applied; with the result that the solder in the tag is "built up" in successive stages until it has the rounded appearance shown in Fig. 7 (*b*). It is, of course, quite possible to solder a tag of this type in one unbroken operation, but such a procedure often results in the tag and wires becoming so hot that the solder runs through the central hole; whereupon it may damage any windings it happens to fall upon. Attempting the solder connection in one operation may also result in the flux forming gas bubbles, and a smooth finish is then impossible. Anti-corona tags, incidentally, hold a considerable amount of heat after soldering and can cause annoying burns if touched.

Corona may also be present on the outside turns of the EHT over-wind. For this reason these outside turns are usually covered with a plastic sleeve or with a "tyre" of hard wax; this being done to prevent direct contact with the air.

Corona troubles can usually be cleared by removing sharp metallic points, or by covering the guilty EHT points to prevent contact with the air. A little polystyrene varnish or anti-corona dope often works wonders.

Frayed wire ends are a prolific cause of corona. Fig. 8 (*a*) shows a typical example. The fault shown in this diagram may occur at the end of the flexible lead which carries EHT to the cathode ray tube, the strands having become broken with the passage of time.

Another occasional cause of corona is given by fracture of the strands inside the insulation of an EHT lead. An example is shown in Fig. 8 (*b*).

(*To be continued*)

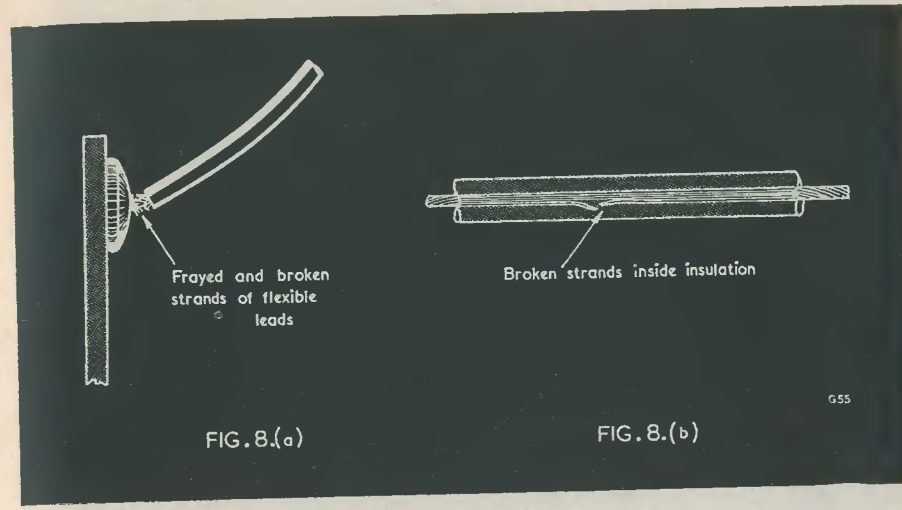


Fig. 8 (*a*) *and* (*b*). *Two frequent causes of corona*

THEY CAME UNSTUCK

One or two readers have had difficulty in applying Panel Signs satisfactorily when using varnish. On investigation it was found that in each case the fault was the same. Some notes are given here in the hope that they will enable other readers to obtain the same high degree of satisfaction as we have ourselves enjoyed.

The trouble was simply impatience—these readers were too eager to see the final result. Now, take for example one of the potentiometer panels. This consists of a thin film of paint, held in position by a water-soluble gum to a sheet of tissue paper. If a coating of varnish is applied to the paint film, and then the transfer is mounted on a sheet of metal, it is obvious that no air can penetrate to the varnish and that it will take a very long time to harden; in fact, a thickish coat of varnish would need five or six days to dry!

Point number one, then, is to apply the varnish thinly. Number two is to let the varnish become very tacky, in fact almost on the point of hardening, before applying the transfer to the metal surface. Point number three is to let the transfer stand long enough, preferably overnight, to get really hardened off before attempting to soak off the tissue paper covering.

www.americanradiohistory.com

THE MINI-PRESELECTOR

By **E. GOVIER**

FOR THE SHORT WAVE ENTHUSIAST, KEEN on receiving either Amateur or Broadcast transmissions from the other side of the globe, it is of paramount importance that the maximum amount of signal voltage is delivered to the receiver. While it is true that a first-rate aerial system will greatly assist in this respect, it is none the less true that a Pre-selector, properly operated, will greatly increase the small voltages delivered by the average aerial.

In addition to the voltage gain, a further RF stage ahead of the receiver will also impart greater freedom from second channel interference. The sum result of the use of a Pre-selector is that both the selectivity and the sensitivity of the receiver is greatly improved overall. To gain these advantages, the small amount of time spent in construction, and the small cash outlay involved, is well worth while.

Circuit

The Pre-selector is constructed around the Mullard miniature EF42, one of the B8A series. This valve is a high-slope pentode with sharp cut-off characteristics, and somewhat similar to the EF50. The EF42 is admirably suited to Short Wave operation, especially as an RF amplifier; and in the circuit shown, will give of its best over the entire frequency range. The valve is internally screened and therefore no additional external shielding is required; pin 3 being connected direct to chassis. The small physical size of this valve, 60 mm in length and 22 mm in diameter, allows the whole unit to be constructed within a very small metal case. (See Constructional Details.)

The frequency range of the unit is from 10 to 750 metres, and the coils used were supplied by the Teletron Company. These coils are extremely efficient, and the types required are—HFA4, 10/30 metres; HFA3, 15/50 metres; HFA7, 50/220 metres, and HFA5, 200/750 metres. All of these have a variable iron dust core, and are wound on .48 inch formers with fitted tag rings. Although only one coil is shown in the circuit diagram for purposes of clarity, the four coils should be wired to a Yaxley type switch, preferably of the ceramic variety. C3 is the variable tuning condenser which must be kept "in step" with the receiver in order to keep both equipments aligned on the same frequency. This condenser is one-half of a miniature two-gang component, the second half of which is, of course, unused. This variable must be of small physical dimensions if it is to fit under the chassis and alongside the four coils specified.

The RF Gain control is the variable resistor R4 in the cathode line. R3 and C4 are the normal cathode bias components. It should be noted that Grid 3 is connected direct to the chassis.

The RFC, also supplied by the Teletron Co., is a four-bank, pie-wound choke which serves admirably in the EF42 anode as shown. R2 with C6 form the decoupling for the anode circuit.

The Pre-selector output is taken from C5 and thence via a length of co-axial cable, the metal braid of which should be earthed, into the receiver aerial terminal.

The power requirements are very small, and may be taken direct from the receiver supply. A plug and socket arrangement fitted on the receiver back drop is ideal for the supply of both HT+ and LT supplies.

Constructional Details

The whole unit is constructed within a small grey-sprayed metal cabinet which may be obtained from R. C. S. Products Ltd. This case is complete with front panel and chassis, all undrilled, and measures some 8″ × 4¾″ × 4″, the whole comprising a very compact unit, and in keeping with the modern trend towards miniature equipment.

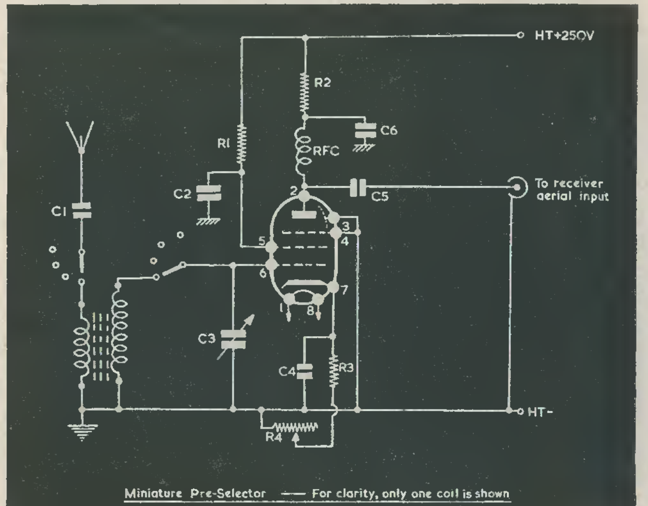
The front cover illustration this month shows a suggested panel layout for the Mini-Preselector. It will be seen that the new "Panel Signs" have been used with great success, not only in appearance—always a great point with the writer—but also with regard to efficient and cheap control panels and dial.

The tuning dial has been self-calibrated, using coloured indian ink for marking purposes. In this instance, the Amateur Bands only are marked, and with the exception of the Home and the Light programmes, no other Broadcast frequencies have been calibrated. The entire Amateur Bands have been "blocked in" with black ink, and it is proposed to give similar treatment to the Broadcast frequencies using red ink. The dial is that obtainable from the No. 2 set of "Panel Signs," i.e. that being currently marketed for Test Instruments, in which two such dials are supplied. The cursor is made of perspex, centre scored and filled with indian ink. This is then screwed to a suitable knob as shown, the whole making a very attractive and accurate dial assembly.

The left-hand control is that of the Band-switch. This transfer is that supplied as a Yaxley-type switch control. The unwanted white positions are blacked out with the same indian ink as used for the dial. The band numbers have been added from the list of words and figures supplied. This also applies to the wording shown on the panel. The right-hand control is RF Gain, and this transfer has been applied to the panel unaltered. Note that to conform to the small panel space available, both of these latter controls have been fixed over a part of the dial, and it therefore follows that the latter transfer must be applied first.

The two corner pieces have been added for purely decorative effect, and, as will be seen, have been taken from a portion of one of the other control transfers contained within the packet. These are merely cut from the transfer with a sharp pair of scissors and then applied to the panel.

The writer would add, in conclusion, that the use of these transfers considerably reduces the cost of construction, both dials and control panels of the normal type being rather expensive items of equipment. The Mini-Preselector, once completed, will be found an ideal item of equipment from all points of view—as a further glance at the front cover illustration will show.



Miniature Pre-Selector — For clarity, only one coil is shown

COMPONENT LIST

R1 100kΩ ½ watt ±10% Dubilier
R2 5kΩ ½ watt ±10% Dubilier
R3 150Ω ½ watt ±10% Dubilier
R4 5kΩ potentiometer, Colvern
C1 100pF ±20% Silver Mica TCC 101 SMP
C2 0.1μF 350V wkg TCC 346
C3 500pF Variable Polar
C4 0.02μF 350V wkg TCC 346
C5 100pF ±20% Silver Mica TCC 101 SMP
C6 0.01μF 350V wkg TCC 346
Coils—Teletron Co. (see text)
Valve—Mullard EF42
RF Choke—Teletron Co.
Panel, Chassis and Case—R.C.S. Products (Radio) Ltd.
Valveholder—McMurdo

The Mini-Preselector Front Panel

A really professional appearance, such as that illustrated on the front cover, can be easily obtained by every reader—Just use PANEL-SIGNS

3/6 per set from your usual supplier, or direct (postage 2d.) from:

DATA PUBLICATIONS · 57 MAIDA VALE · LONDON W9

www.americanradiohistory.com

THE EASI-BUILD RECEIVER

Part 2. *By* **M. HARVEY**

Constructional details of this simple receiver, which has been designed especially for the beginner and for those with limited workshop facilities

IN LAST MONTH'S ISSUE OF THE "RADIO CONSTRUCTOR" we introduced the Easi-Build, giving full details of its circuit and of the performance to be expected. We now carry on to the constructional details.

The Chassis

The first part of the receiver to make is the chassis. Fig. 2 shows the dimensions of this, indicating also the positions of the various holes needed for mounting the components. It should be noted that especial attention has been paid to keeping the chassis as simple as possible in order to assist those whose workshop facilities are limited. No frills or fancy work are needed here.

The chassis may be made of aluminium or similar metal of 16 swg or thicker. Fig. 2 shows the chassis before bending. After the chassis has been cut out and drilled, the two "flaps" should be bent down through 90 degrees, *away* from the reader.

Also required are two metal brackets for mounting the tuning condenser, its drive and the tuning dial. These may be made from the same metal as the chassis. They are illustrated in Figs. 3 (*a*) and (*b*).

Assembly

When the metal work has been completed, the next process consists of assembly and wiring. To assist the reader, Figs. 4 and 5 show the layout of the principal components employed in the receiver. These two diagrams should be studied in conjunction with the photographs in Part 1.

The mains input and heater wiring may now be commenced. This necessitates fitting the valveholders, the heater transformer, two five-way tag-strips, and the volume control. The tag-strips are held under the same 4BA mounting nuts which hold the heater transformer above the chassis (see Fig. 6), and the valveholders are mounted such that their Rimlock locating slots are at the rear of the chassis, as shown in Fig. 4. The valveholder

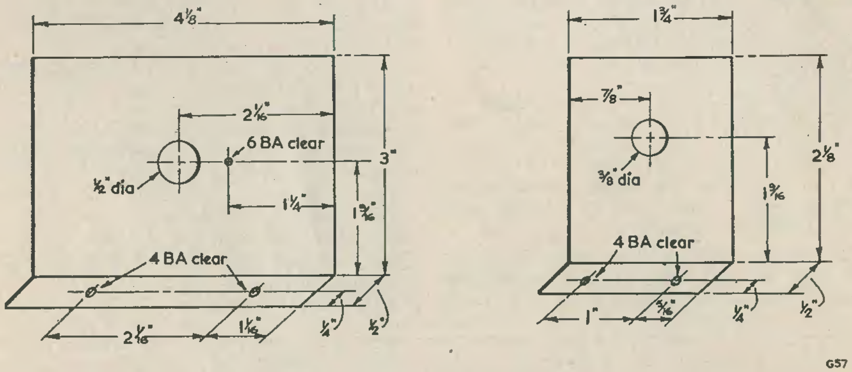


Fig. 3. The two brackets for the tuning condenser and its drive. The "flaps" on each bracket point towards the reader. The 6BA hole of bracket (a) should be countersunk on the side away from the reader

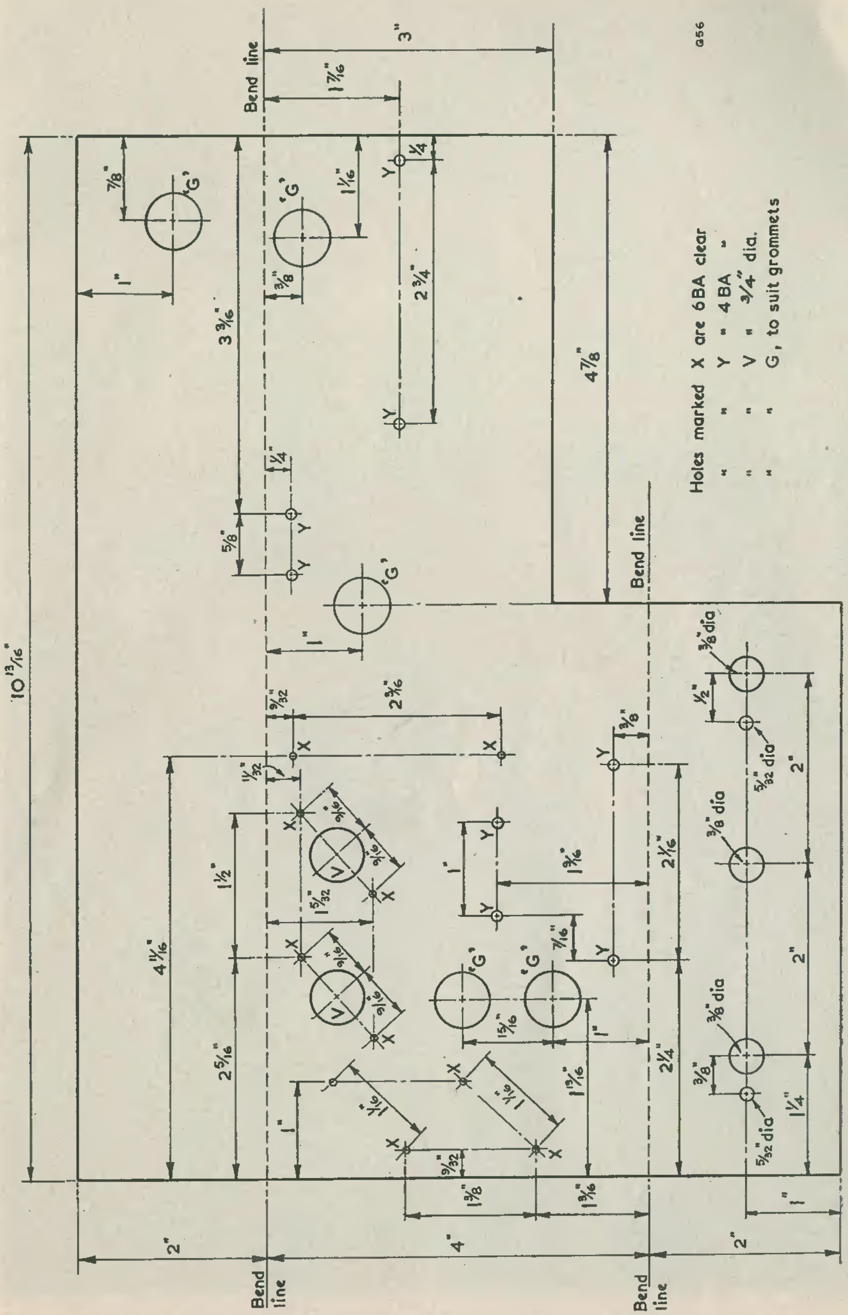
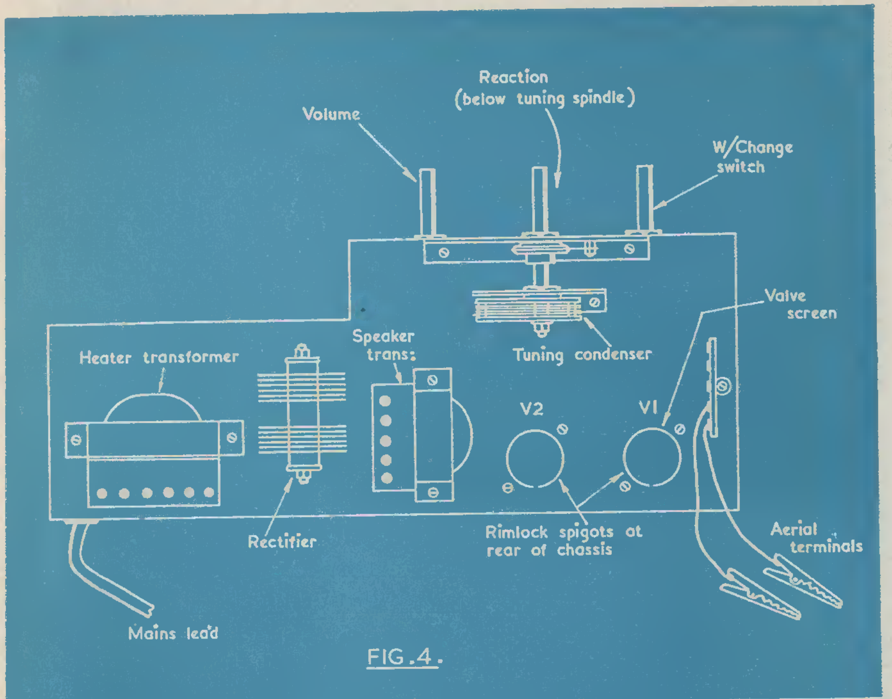


FIG. 2.

www.americanradiohistory.com



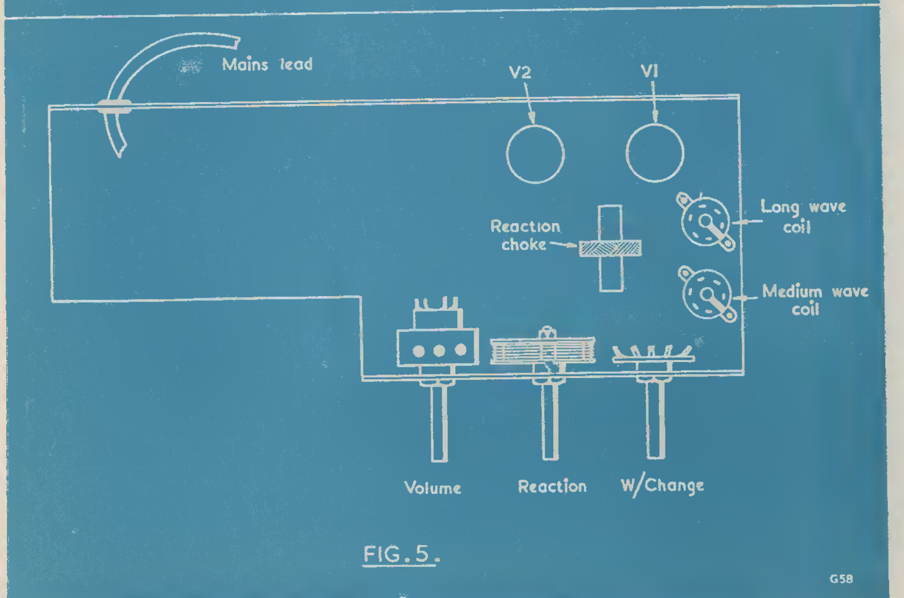
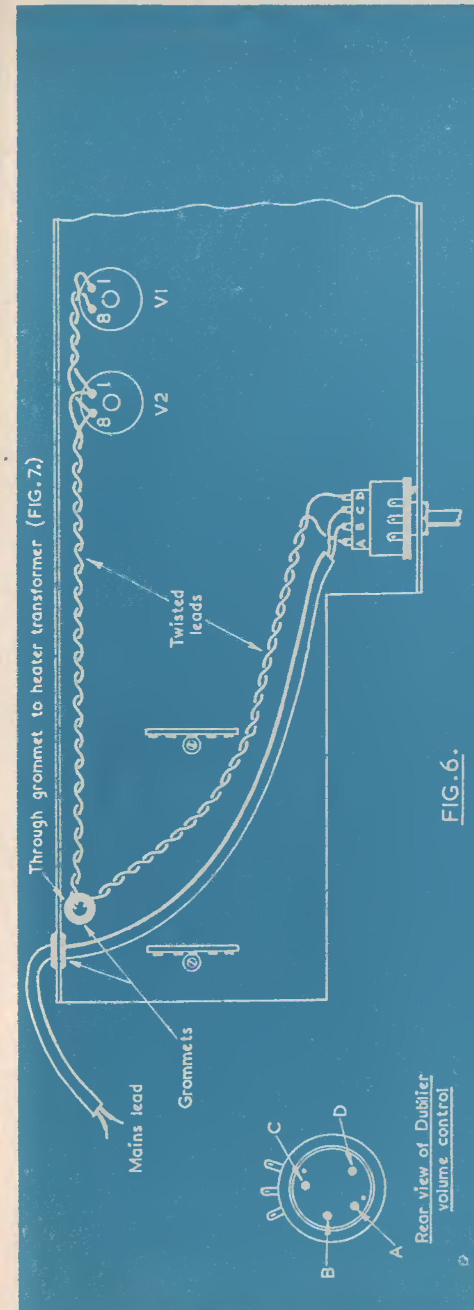
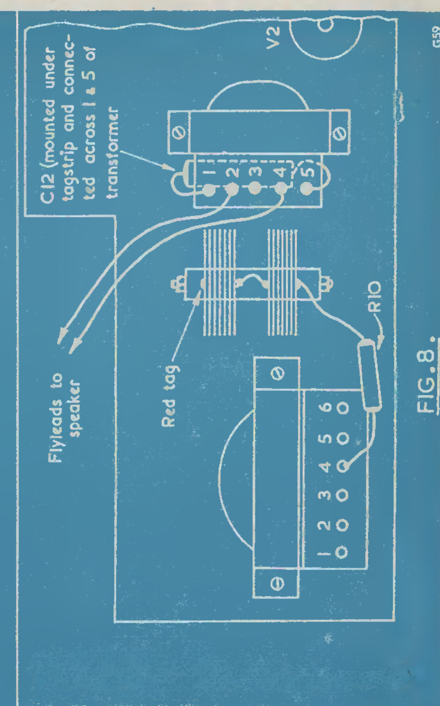


Fig. 4. Layout of the principal components above the chassis

Fig. 5. The principal components below the chassis





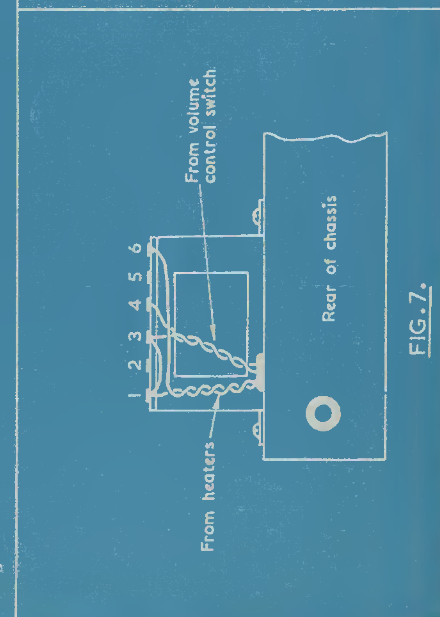


Fig. 6. The mains and heater wiring
Fig. 7. Connecting up the mains heater transformer
Fig. 8. The power supply and output circuit wiring above the chassis

www.americanradiohistory.com

for V1 is that intended for use with the screening-can. At this stage, the five grommets may be fitted to their holes also.

Under-chassis wiring is now carried out as illustrated in Fig. 6. The mains lead is anchored inside its grommet by tying a knot, or by using a similar method of preventing its pulling through. The knot has been omitted from Fig. 6 for purposes of clarity.

The above-chassis wiring to the heater transformer is illustrated in Fig. 7. Although the transformer tags are numbered in this diagram, this is only for reference in these articles. The actual component is not numbered. Note that a wire connects together tags 1 and 3 of the transformer.

The rectifier, smoothing components, output transformer and some of the AF circuit may next be connected up. Fig. 8 shows the additional above-chassis wiring required. This necessitates the mounting of the speaker transformer and rectifier. It must be pointed out here that an earthing solder tag should be fitted under the chassis in the position illustrated in Fig. 9; it being held by the forward mounting nut of the speaker transformer. The condenser, C12, is now also fitted. This component is soldered to the output transformer tag-strip as shown in Fig. 8, and it should be kept well away from the rectifier. The two central lugs of the rectifier must be connected together, as shown, since this is not done when the rectifier leaves the factory. As with the heater transformer, the tags of the speaker transformer are numbered here, this being done for the convenience of the constructor. R10 is also fitted at this stage.

The next part of the below-chassis wiring is illustrated in Fig. 9. The additional components mounted between the two tag-strips serve the incidental purpose of keeping the mains wiring of Fig. 6 in position against the underside of the chassis. For purposes of clarity, the resistors and condensers in this, and subsequent diagrams, are not necessarily drawn to scale.

The brackets holding the tuning condenser and its drive may now be fixed to the chassis, their assembly having already been detailed in Fig. 4. The two 4BA bolts holding the rear of these two brackets also hold two further tag-strips below the chassis. The reaction condenser may now be fitted as well. These additional under-chassis components are illustrated in Fig. 10.

Fig. 10 shows, also, the wiring needed to complete the AF circuits of the receiver back to R1, with the exception of the reaction choke. It will be noted that the grid lead to V2 travels down the right-hand side of the volume control metal case. This method of routeing provides a slight measure of screening which may be of assistance in some individual receivers. The wiring to V1 in Fig. 10 should be kept reasonably short.

RF Circuits

The receiver is now more than half-way towards completion. The next part of the under-chassis wiring is illustrated in Fig. 11. This diagram shows the connections needed for the tuned circuits and for part of the wave-change switch wiring.

The wave-change switch may now be fitted, together with the coils. The locating lug on the wave-change switch should locate with the hole on the chassis already drilled for it. Of the two coils, the medium-wave component may be easily identified by the fact that its centre winding uses thicker wire than does the long-wave coil. In the diagrams the coil tags are numbered for purposes of ready identification, but these numbers do not appear on the actual components themselves. Tag numbers may be determined by the position of the slots. A 5-way tag-strip is fitted above the chassis under one of the 6BA bolts used for mounting the long-wave coil. Its position is indicated in Fig. 13.

Fig. 11 shows the grid and reaction wiring connected to the wave-change switch. In this diagram, and in Fig. 12, the chassis has been "opened out" for purposes of simplicity. As shown in the diagram, two leads travel through the grommets to the fixed and moving vanes of the tuning condenser above the chassis. These leads should be kept short. No wired connection is made to the moving vanes of the reaction condenser as none is needed, the connection to chassis via its own mounting bush being quite adequate. The reaction choke should be mounted vertically above the tag-strip, care being taken to see that it does not project below the bottom level of the chassis.

Fig. 12 shows the wiring of the aerial switching circuits below the chassis, and Fig. 13 the aerial wiring above the chassis.

The receiver is now complete.

Testing

When the receiver has been wired up, it may be initially tested. If desired, however, a quick check of the wiring may be carried out beforehand to ensure that no mistakes have been made.

Before the mains are applied to the receiver it must be again repeated that the chassis is "live" and should be treated accordingly. The screening can for V1 should be fitted at this stage. Without this screen the receiver may pick up excessive hum.

After the mains have been connected and the set switched on and allowed to warm up, there should be a slight hiss from the loudspeaker when the volume control is turned fully clockwise.

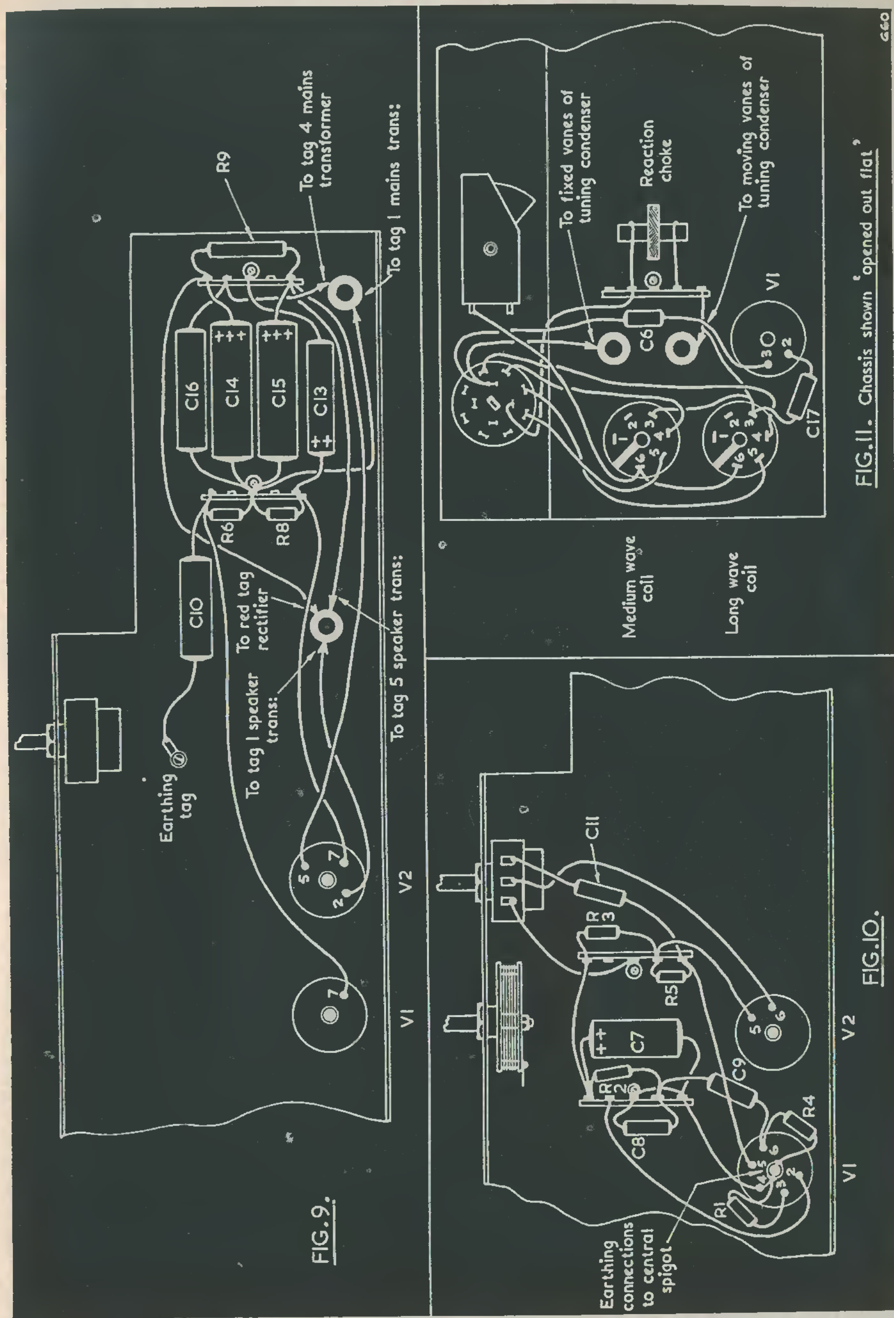


Fig. 9. Wiring up the smoothing components and part of the AF circuits
Fig. 10. Completing the AF wiring
Fig. 11. The initial RF circuits. See note re C17 on page 157.

www.americanradiohistory.com

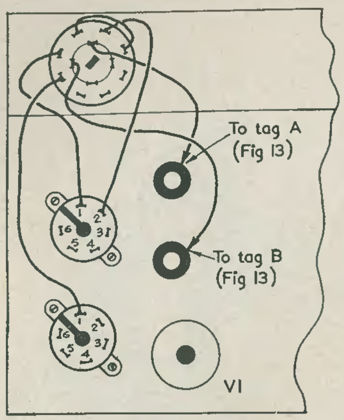


FIG.12.

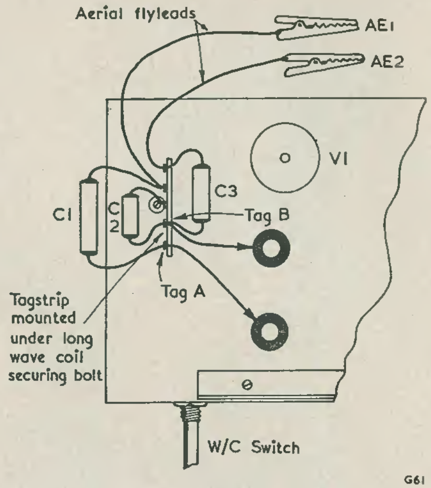


FIG.13.

Fig. 12. *Completing the below-chassis RF wiring*
Fig. 13. *The aerial components above the chassis*

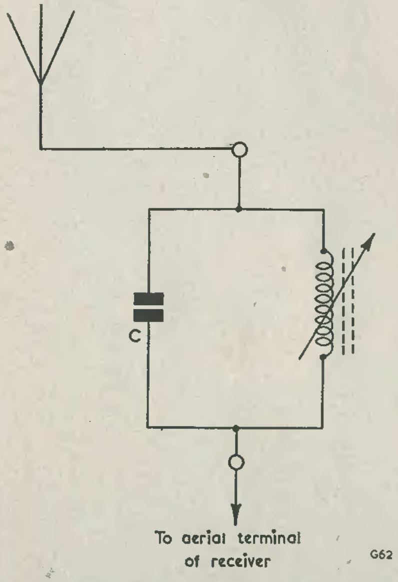


Fig. 14. *A rejector wave-trap. The value of C will depend upon the frequency the wave-trap is intended to reject. If desired, C may be a variable component.*

A short aerial, consisting of about five feet of wire, may next be connected to the "Ae1" terminal. As the tuning condenser is swung it should then be possible to receive several stations on the medium-wave band; and, in most localities, the Light Programme on the long-wave band. Reaction should be set to the minimum position whilst this is being done. It will be found that many weak stations can be brought up to full strength if this control is carefully advanced to the point just below that at which oscillation occurs. If necessary, the volume can then be reduced by the volume control. It must be pointed out that, if the reaction control is advanced beyond the oscillation point, the receiver may cause interference with neighbouring receivers. Reaction should only be used when it is required.

Aerial Systems

As was pointed out earlier, the receiver may be used with both long and short aerials by employing the appropriate aerial input connections. The "short aerial" connection, "Ae1," is intended only for aerials less than approximately six feet or so in length. Longer aerials will damp the tuned circuits and cause loss of selectivity. They may also cause the dial calibration settings of the tuning condenser to be shifted slightly along the scale.

Longer and more efficient aerials may be connected directly to the "Ae2" terminal. When very large aerials are employed, selectivity may be improved by connecting an external 400pF condenser between the aerial and the aerial terminal of the receiver.

In localities which are close to a powerful transmitter, a wave-trap tuned to its frequency may be needed to prevent breakthrough. The circuit required is shown in Fig. 14, and the necessary coil may be obtained from the Teletron Co.

As was mentioned in the introductory article, an earth connection is needed only in cases of heavy man-made interference. When required, this earth connection should be made to the receiver chassis via a 0.01μF 750V wkg condenser.

A tuning scale was included in last month's issue. This scale should be cut out, pasted on to thin card, and affixed to the bracket holding the epicyclic drive of the tuning condenser. A pointer may be made from a piece of thin wire soldered to the epicyclic drive bush. This pointer should be adjusted such that it lies horizontally along the left-hand edge of the scale when the tuning condenser is at the position of minimum capacity. It should then be found that the scale readings correspond reasonably accurately to the frequencies actually received. If desired, dial indications may be made more accurate by screwing out the iron-dust cores in the coils until stations at the low-frequency ends of the bands occupy their exact position on the scale.

Out of several prototype models of the Easi-Build Receiver it was found that one tended to give slightly "fierce" reaction for only a small advance of the reaction control at certain parts of the Medium waveband. Normally this should not occur. If it does, however, the constructor is advised to connect an additional 400pF condenser between the anode of VI and chassis, in the position shown in Fig. 11 for C17 (TCC type SMP501).

NEXT MONTH, THE CABINET

BOOK REVIEWS

DECIBEL TABLES of Power and Voltage Ratios. Price 1*s*, 1*s* 2*d* post free. Obtainable from the Hon. Librarian, British Sound Recording Association, 3 Coombe Gardens, New Malden, Surrey.

A nicely prepared paper bound booklet, reprinted from the Association's official journal, *Sound Recording and Reproduction.* The tables are preceded by a short discourse on their use. For those who need frequently to refer to such tables, their presentation in a handy booklet of this sort is far more convenient than having to find them elsewhere.

THE OSCILLOSCOPE AT WORK, by A. Haas and R. W. Hallows, M.A. CANTAB., M.I.E.E. 171 pages, 320 illustrations. Price 15*s*. Published by Iliffe and Sons Ltd., Dorset House, Stamford Street, London, S.E.1.

It is seldom that one picks up a technical book and finds it to be so interesting and absorbing that it assumes the mantle of a 'who-dun-it' crime novel, in the sense that the reader cannot put the book aside until he has read it from cover to cover at one sitting, and avidly devoured every word. There is no doubt in the mind of the writer of this notice that this book is good, providing down-to-earth theory and practical knowledge in a way that connot fail to enlighten and educate the reader. It is also an invaluable reference book, if only for the 200 or more photographs it contains of oscilloscope traces.

Eleven chapters are devoted to describing the general characteristics of oscilloscopes, the investigation of electrical magnitudes, audio-frequency and radio-frequency amplifiers, oscillators, rectifiers and detectors, modulators, phase-changing and wave-shaping circuits, using the 'scope to identify its own faults, its application in television receiver servicing, and circuits for providing improvements and additions to the instrument.

The price charged for this book is reasonable, especially when the considerable amount of work involved in its preparation is assessed. It is stated that two years' work is represented in the large number of traces depicted, and one can well imagine this to be true by a study of the photographs, every one of which shows clearly and accurately the function being described.

In adapting Haas's original work, *L'Oscillographe au Travail*, Hallows has provided English technical literature with a unique volume that contains a considerable amount of useful information presented in such a way that hardly a word is wasted. There is ample evidence that the book has been carefully prepared by the authors and publishers.

PRACTICAL TELEVISION CIRCUITS, by F. J. Camm. 288 pages, 156 illustrations. Price 15*s*. Published by George Newnes Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

The contents of this book are based upon articles that have appeared in Newnes' monthly journal, *Practical Television.* It therefore presents in readily available form many sound designs for which the original articles are either out of print, or will become so in due course.

Eight television receiver designs for home construction are described in full detail, ranging from a 3″ miniature set to one of the latest 17″ high-performance receivers, the "Super-visor." The illustrations are clear, and are augmented by lucid text. The most ambitious receiver is perhaps the combined television and broadcast set. The neat and well-planned layout whets the constructor's appetite, but he should not find any difficulty in building the set despite its appearance of complexity.

Three designs for pre-amplifiers are included, one of which, the low-noise cascode pre-amplifier, the writer of this review can recommend as a result of tests in a "beyond-the-fringe" area over a long period.

Other items of apparatus useful to home constructors are a spot-wobbler, a black spotter, two designs for EHT generators, and pattern generators. A short chapter is devoted to aerial data, which might well have been made of greater length. There is no mention of impedance matching, and particularly in the case of the slot aerial is this omission noticeable.

The enthusiast whose forte is neat and successful construction rather than technical ability will find considerable pleasure in this book; it meets his needs exactly.

NORMAN CASTLE

www.americanradiohistory.com

THE DESIGN, CONSTRUCTION CALIBRATION and USE of SIGNAL GENERATORS

Part 2. *By* **R. J. STEPHENSON**

NEXT, LET US CONSIDER THE ACTUAL modulation of the RF carrier. There are several objections to trying to modulate the actual oscillator stage. The two most important of these are:—

(1) The oscillator frequency will alter with modulation, i.e. it will be frequency modulated. It has been stated earlier that the expression for resonant frequency contains a quantity including the Ra of the valve. Any alteration in the Ra of the oscillating valve (by modulation) will thus frequency modulate, to a greater or lesser degree, the RF oscillator.

(2) At that part of the AF (modulating) cycle which reduces the RF amplitude, the RF oscillator may cease oscillation completely, causing additional and unwanted "whiskers" due to distortion of the modulating waveform.

For these reasons alone, it is better to use a separate modulating valve. Any of the usual mixing circuits can be employed, the one shown in Fig. 4 being typical. The valve used is an EF50.

It will now be seen why the values of 100Ω and 1kΩ were chosen for the anode loads of the RF and AF oscillators respectively. These values provide sufficient output to effectively operate the mixer valve. The control grid of the EF50 is more sensitive than the suppressor grid, hence the need for different inputs to modulate the RF at approx. 30%. The load resistor Rl of 1kΩ gave sufficient output for all practical purposes. The potentiometer Rv of 7kΩ is a simple attenuator.

In Fig. 5 is given the circuit of a signal generator which the writer has used satisfactorily for some considerable time. It embodies the suggested circuits given previously, and some further details are given below.

The three valves used are all EF50's (VR91). The first five coils are Wearite PH type, numbers PHF4, PHF5, PHF6, PHF7 and PHF1. These coils, with the 500pF tuning condenser, give complete coverage from 25 Mc/s to 150 kc/s. The sixth coil is an old 110 kc/s IF transformer stripped of its trimmers, and about two-thirds of one winding removed to form the coupling winding; this covers from 150 to 50 kc/s approximately. The signal generator thus has complete coverage from 25 Mc/s to 50 kc/s on fundamentals, and since the third harmonic is fairly strong (as well as the second), it is useable from 75 Mc/s to 50 kc/s (4 metres to 6,000 metres).

A suitable set of coils, on 0.48" formers with fitted tag rings and adjustable iron-dust cores, is obtainable from the Teletron Co. These are the type HFA1, 700m-2,000m; HFA5, 200m-750m; HFA7, 50m-220m; HFA3, 15m-50m; HFA4, 10m-30m; and HFA9, 2,000m-4,000m.

S4 and S5 are a two-pole six-way wavechange switch. S1, S2 and S3 are a three-pole four-way switch, the functions of which are as follows. In position 1 (anti-clockwise) S2 disconnects the HT supply completely—this is the "off" position. The heaters are left on to keep the temperature within the cabinet constant. In position 2, HT is applied to the mixer and the audio oscillator only, giving audio output. In position 3, S1 connects the HT to the RF oscillator as well, but S3 shorts the grid of the audio oscillator to chassis. This gives unmodulated RF output. In position 4, HT is applied to all three valves and S3 no longer shorts the audio oscillator grid. This gives modulated RF output.

The choke Ch is an intervalve transformer connected as in Fig. 3. The values of R and C are determined by experiment. In the prototype they were 420Ω and 0.001μF, but the actual values will depend upon the transformer used.

The generator is run from a power pack which supplies several other pieces of equipment, but a suitable circuit for a separate pow r supply, if required, is given in Fig. 6.

The more ambitious experimenter may find need for a more efficient attenuator than the simple potentiometer shown, in which case the output circuit may be modified as shown in Fig. 7. Also, a dummy aerial may be required; this is given in Fig. 8, or, for an 80Ω line, in Fig. 9.

Let us now turn our attention to practical details. We must always bear in mind that all test equipment (as its name implies) is used for checking the performance of other gear, therefore its own performance should be as far as possible beyond reproach. Test gear which is unreliable or inaccurate is, to my mind, useless.

expensive. Some excellent quality components such as switches, valves, and the tuning condenser can be obtained from the surplus market. Fixed condensers and resistors should be viewed with suspicion.

The actual layout should be in no way critical, provided that the leads to the high frequency range coils are kept as short as possible.

Having completed the construction, calibration is the next step. Since all transmitting stations are compelled to keep strictly to their allotted frequencies, they can be utilised as standards from which to calibrate within very close limits. There are easily identifiable stations throughout the whole of the medium waveband, and it will be shown that by using these and an ordinary three-band receiver (LW, MW and SW), the whole of the signal generator coverage can be calibrated. The method is as follows, starting with the

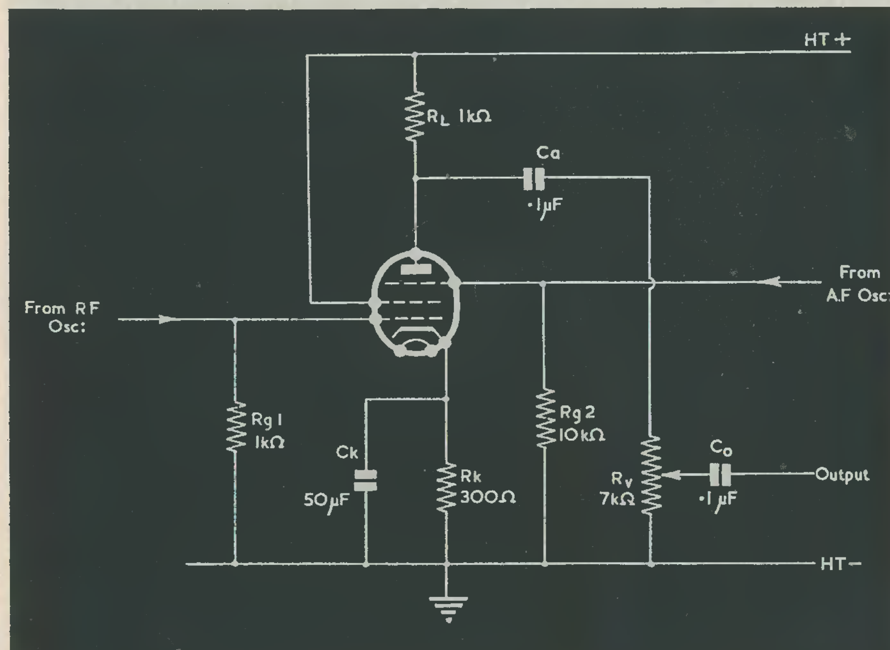


FIG. 4. TYPICAL MIXING STAGE

All the components incorporated in the signal generator should, then, be of the best quality obtainable, and should be thoroughly tested before use. However, the best quality components need not necessarily be the most

medium wave range of the generator.

Tune in an identifiable station on the receiver at the low frequency end of the medium waveband (e.g. Athlone). Couple the output of the generator very weakly to

www.americanradiohistory.com

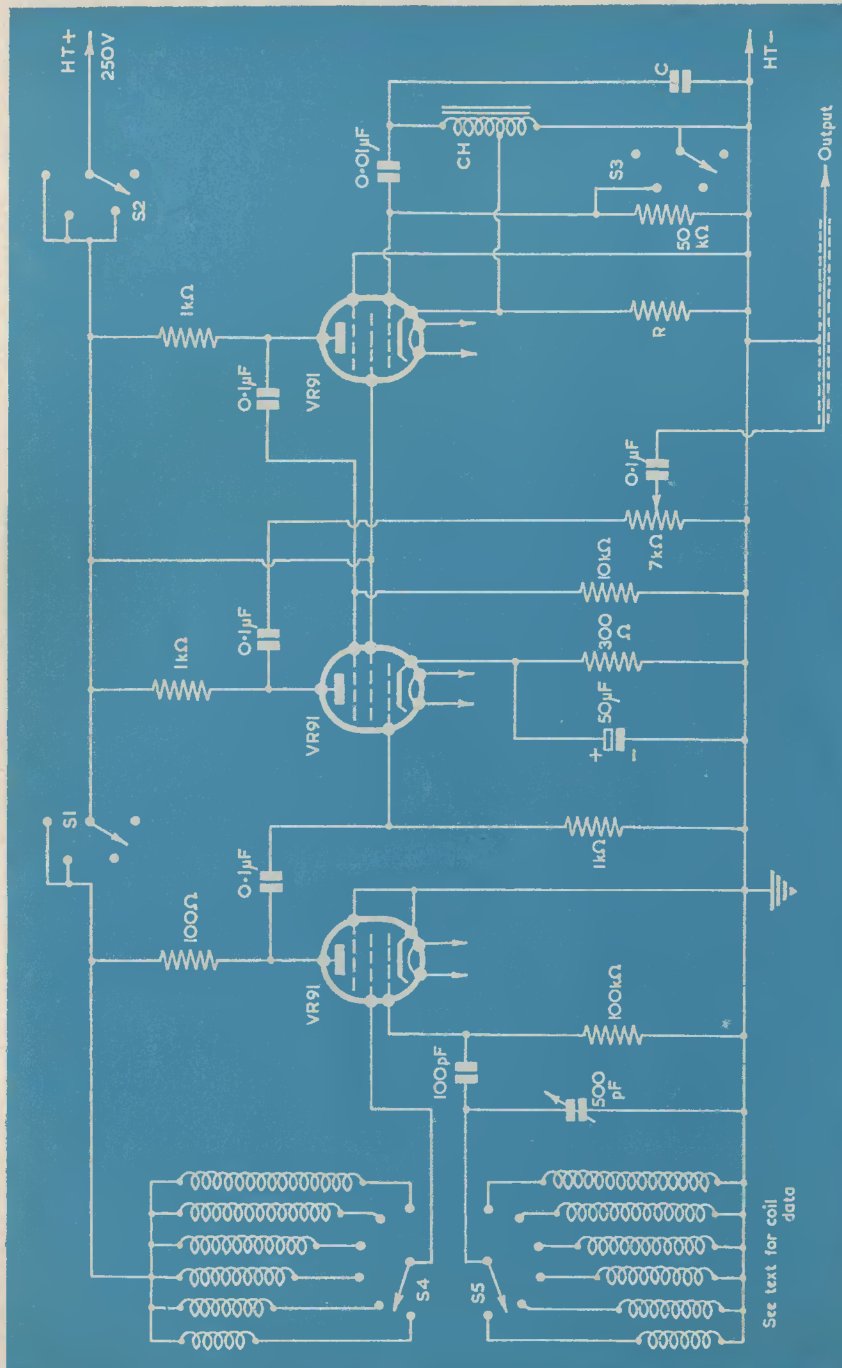


FIG.5. COMPLETE CIRCUIT

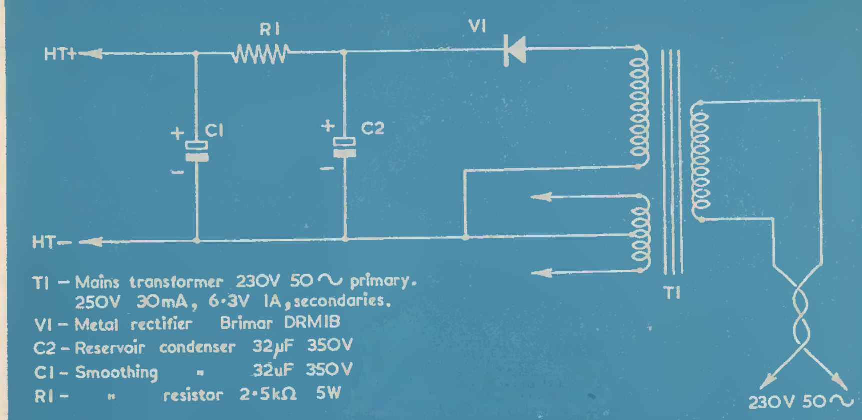


FIG.6. SUITABLE POWER SUPPLY CIRCUIT

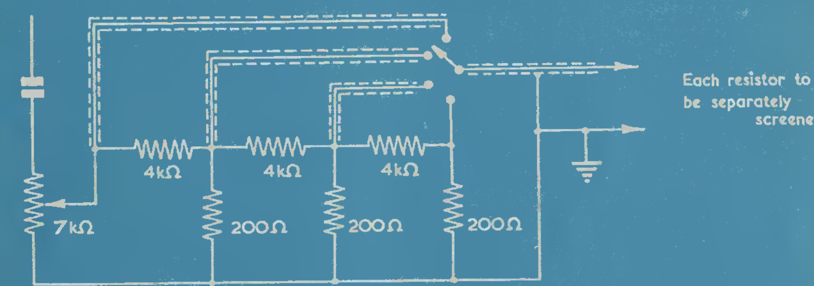


FIG.7. SUITABLE ATTENUATOR CIRCUIT

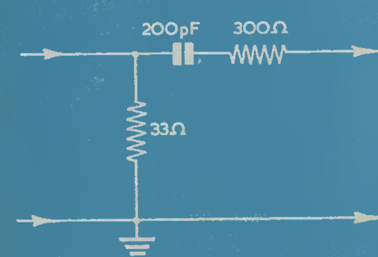


FIG.8. DUMMY AERIAL

FIG.9. DUMMY AERIAL FOR 80 Ω LINE

G65

www.americanradiohistory.com

the aerial. It will be sufficient if the output lead is left on the bench near the aerial. Switch the generator to the appropriate band (without modulation) and adjust for zero beat frequency. Then make a note of the transmitter frequency and the dial reading of the generator.

Tune in the next identifiable station (e.g. Third Programme) and repeat the process.

In this way the whole of the medium waveband can be calibrated, and a graph drawn as shown in Fig. 10.

Frequencies lower than the MW band can be calibrated as follows. Disconnect the aerial from the receiver and connect up the signal generator via a dummy aerial to the aerial socket. Switch both receiver and signal generator on, and allow say half an hour for both to warm up thoroughly. In all the following adjustments the receiver volume control should be left at maximum, and the output of the receiver should be adjusted until it is just audible by reducing the output of the signal generator. This serves two

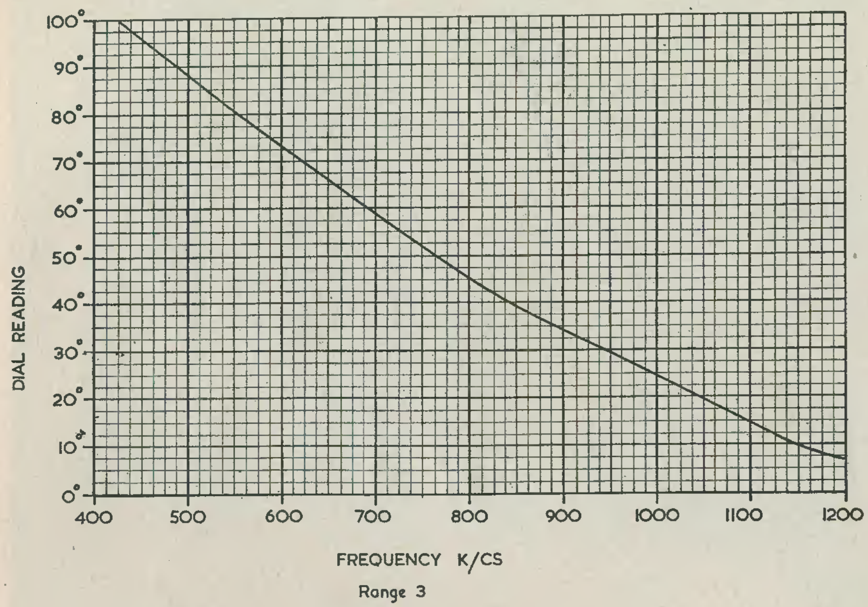


FIG. 10. TYPICAL CALIBRATION CHART

Frequency bands outside the medium waveband will not be quite so easy to calibrate, since there are far fewer identifiable stations. However, we can use the medium waveband of our signal generator as a standard, and calibrate from that. The remainder of the ranges fall into three different groups, as follows:—

(1) Frequencies lower than those already calibrated.

(2) Frequencies higher than those already calibrated (viz. 25-6 Mc/s).

(3) Frequencies higher than those already calibrated, but not covered by the SW band of the receiver (viz. 6-1.5 Mc/s or 50-200 metres).

Let us take these three cases separately.

purposes. It ensures that the receiver AVC is not working, since the signal is insufficient to overcome the delay voltage. Then, when a superhet is employed, many spurious signals will be found, but these will be weak compared to the desired signal. If the attenuator is adjusted until the desired signal is only just audible, the spurious responses will not be heard. Also, the signal generator should be switched to give a modulated output. The actual calibration is done as follows:—

Set the signal generator carefully to 1.2 Mc/s (250 metres) and tune in on the receiver. Now, leaving the receiver set to 1.2 Mc/s, close the condenser vanes of the generator until a signal is again heard. The generator

will now be operating on 600 kc/s and the receiver will be picking up the second harmonic. This can be checked against the graph already drawn, as it is still in the MW band.

Now open fully the tuning condenser of the generator, and switch it to the next lowest frequency band. Close the condenser vanes slowly until the next response is heard. This will be 400 kc/s and the receiver will be picking up the third harmonic. Make a note of the dial reading, range and frequency. Proceed in a similar way for the fourth harmonic of 300 kc/s, the fifth harmonic of 240 kc/s, and the sixth harmonic of 200 kc/s (this, by the way, can be checked against the LW Light Programme).

By now the harmonics will be getting pretty weak, so we proceed as follows. Leave the signal generator set to 200 kc/s (sixth harmonic tuned in on 1.2 Mc/s) and alter the receiver tuning until the fundamental is picked up (Light Programme on LW). Now leave the receiver tuning alone, and proceed as before, picking up the second harmonic of 100 kc/s, the third harmonic of 66.67 kc/s, etc.

In this way, using only one frequency in the MW band (1.2 Mc/s), we can plot any of its sub-multiples on the signal generator. We can now start all over again, beginning with a slightly lower frequency (say 1.15 Mc/s) and plot its sub-multiples. This process should be repeated until plots have been obtained for all the lower frequency ranges at points on the dial no further than, say, 5 degrees apart.

(To be continued)

CLUB NEWS

Amateur Tape Recording Society extends a cordial invitation to new members. Hon. Sec., P. N. Hollis, 143 Lymington Avenue, Leigh-on-Sea, Essex. All enquiries to Assistant Sec., G. A. Widdup, 92 Halifax Road, Rochdale, Lancs.

Chester and District Amateur Radio Society, G3GIZ. Forthcoming events: Tuesday, 5th October, first Auction Sale of the winter. Tuesday, 12th October, a U.S.I.F. film strip will be shown. Any new members will be welcomed. Hon. Secretary, N. Richardson, meetings Tarran Hut, Y.M.C.A., Chester.

Clifton Amateur Radio Society. October meetings: 1st, 15th and 29th, Constructional. 8th, Junk Sale. 22nd, "Miniaturisation," by D. Deacon, G3BCM. Meetings at 225 New Cross Road, S.E.14, 7.30. Sec., C. H. Bullivant, G3DIC, 25 St. Fillans Road, Catford, S.E.6.

Hounslow and District Radio Society. Meetings at Grove Road Junior School, Hounslow, at 7.30, every fortnight. Hon. Sec., R. J. Parsons, 16 Cypress Avenue, Whitton, Middlesex.

Kingston and District Amateur Radio Society. Oct. 7th: The Mullard 5–10 Amplifier demonstration by Messrs. Ferguson & Busby, of Mullard Ltd., with musical records. Oct. 20th: Annual General Meeting. Sec., R. S. Babbs, B.Sc., 28 Grove Lane, Kingston.

Norwood and District Group RSGB. Next meeting Oct. 16th at Windermere House, Westow Street, Crystal Palace, 7.30.

Radio Amateur Invalid and Bedfast Club. Local reps are needed for Brighton, Cardiff, Hull, Craven Arms—Shropshire, and Bacup, Lancs. Please contact the Sec. Blind member G3JOH is anxious to make more CW contacts on 80m. Books, both technical and fiction, are welcomed, please send to J. Gill, Book Store Manager, 30 Sholebroke View, Leeds 7. Is anyone willing to duplicate a monthly newsletter at a reasonable price? Hon. Sec., W. H. Harris, 25 Playford Lane, Rushmere, Ipswich, Suffolk.

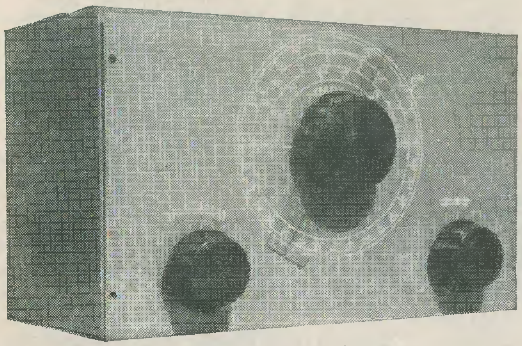
South Manchester Radio Club. Oct. 8th, Annual General Meeting. Oct. 22nd, Faults and Fault Finding in Radio Equipment, by N. Ashton, G3DQU. Nov. 5th, Simple Receiver Construction, by M. Barnsley, G3HZM. Hon. Sec., M. Barnsley, G3HZM, 17 Cross Street, Bradford, Manchester 11.

Torbay Amateur Radio Society. Meetings are held on the 3rd Saturday each month, at the Y.M.C.A., Castle Road, Torquay, 7.30. Hon. Sec., L. H. Webber, G3GDW, 43 Lime Tree Walk, Newton Abbot.

Wirral Amateur Radio Society meets at 7.30 on the 1st and 3rd Wednesdays each month at the Y.M.C.A., Whetstone Lane, Charing Cross, Birkenhead. Sec., A. C. Wattleworth, 17 Iris Avenue, Claughton, Birkenhead.

www.americanradiohistory.com

BUILDING THE RCS BATTERY RECEIVER*

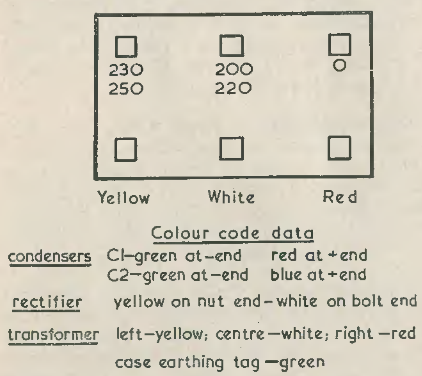


Part 4

AC MAINS POWER SUPPLY

By **JAMES SINCLAIR**

In the last three issues of this magazine we have described, on a step-by-step basis, the construction of a one, two, and three-valve receiver operating from a battery power supply. Whilst such a power supply



E69

is the obvious choice for the beginner in radio receiver construction, it is, from many points of view, more advantageous to obtain the power requirements from a mains pack.

Batteries have a nasty habit of running down just at the critical moment, and, in addition to this, during the latter period of use the failing supply obviously has a deleterious effect on the receiver performance. This slow decline in power output rapidly increases as the batteries near the end of their working life. Continual replacement, every few weeks or months according to amount of use, is apt to be somewhat expensive over a period of time. It soon becomes apparent, even to the veriest beginner, that a battery power supply is not only a costly item but also very soon outstrips the total cost of the receiver and all accessories.

The RCS Power Unit, type PU1, is an ideal unit for the beginner. Purchased in component form as available cash permits, and constructed by the enthusiast himself, it considerably assists the beginner in a practical manner to obtain some knowledge of AC mains power packs and power supplies. Once constructed, it is housed in an attractive metal cabinet, painted grey to match the receiver, and will, with due care and attention, provide adequate power supplies to the 3-valve set previously described. A switch is provided on the power unit panel for on-off operation, and power supplies to the receiver are taken via a rubber grommet-protected aperture in the side of the case. AC power input is provided for in a like manner.

The PU1 unit provides some 120 volts at 20mA and 6.3 volts heater supply at 1.5A. This is more than adequate for the receiver power requirements, and in use it will therefore be found to run absolutely cool, even after prolonged use. The unit, although marketed for use with this receiver, will of course be found extremely useful to many readers who own and operate a battery receiver other than the one described. Its adoption will avert further financial outlay on battery renewals. Alternatively, those who use a portable receiver in the summer (*sic*) months, would most probably be attracted to the idea of using this power unit with such a receiver during the winter period at home. Provided the power requirements are satisfactory, all that is required are the connection of the output leads to those normally connected to the batteries. It is also, of course, ideal for incorporation into test equipment.

From Fig. 1 and the illustration, it will be seen that a small metal rectifier, in conjunction with a specially designed double wound transformer, are the main components.

Assembly Instructions

Step No. 1. Affix switch to front panel. Place in position the two rubber grommets on side of case.

" No. 2. Obtain length of twisted lighting flex and pass through rubber grommet. Connect one lead to figure 0 on transformer tag panel. Connect other lead of flex to RED on switch.

" No. 3. Solder YELLOW of metal rectifier to YELLOW on transformer tag panel. Connect WHITE of rectifier to WHITE on tag panel.

" No. 4. BLACK and RED leads from transformer windings are now soldered to GREEN tag on transformer casing.

" No. 5. To GREEN tag also affix GREEN ends of both smoothing condensers (C1 and C2). These are mounted above the tag board and directly above each other.

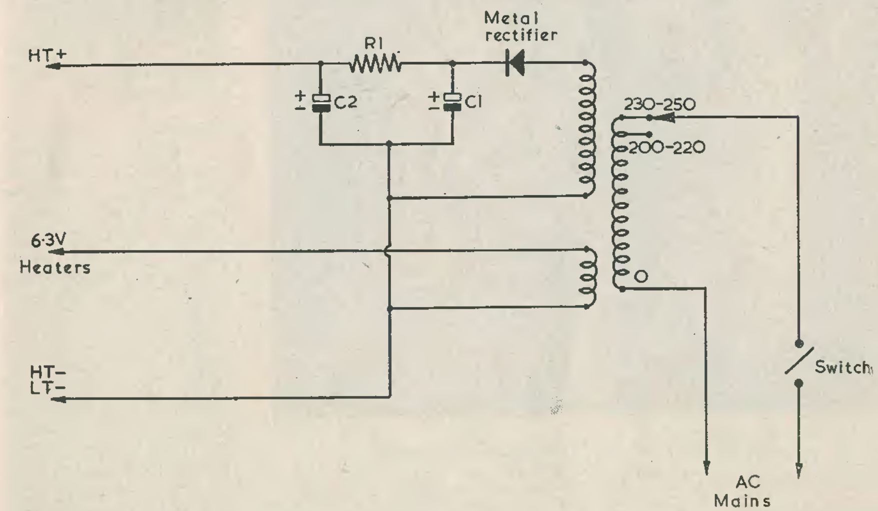


Fig.1
Circuit of RCS power unit type PU1

E70

The condensers C1 and C2, together with R1, ensure that complete freedom from mains hum is achieved, and no trace of this bugbear is apparent even with the most sensitive headphones.

Step No. 6. From WHITE (one end of rectifier) solder short length of wire to RED of the uppermost condenser (C1).

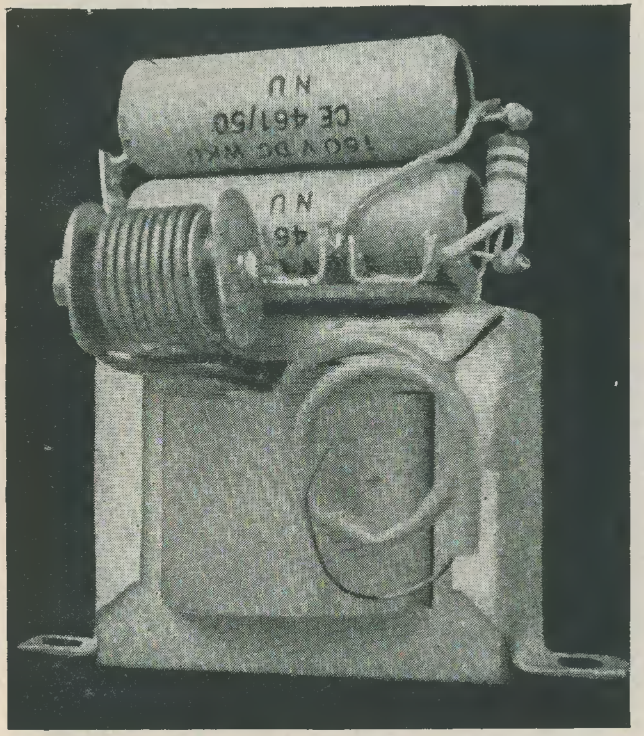
* *See advertisement on page 187*

www.americanradiohistory.com

STEP No. 7. From RED of top condenser, solder one end of R1. Connect other end of R1 to BLUE on lower condenser.

" No. 8. From BLUE on lower condenser (C2) solder length of wire to RED on transformer tag panel.

" No. 9. With the aid of a knife or similar instrument, carefully remove enamel from BLUE lead coming from transformer winding.



The Power Unit wired and ready for fitting into its cabinet

STEP No. 10. Solder length of wire from YELLOW on switch to appropriate mains tapping on transformer panel. This connection will depend on the AC mains voltage input locally available.

" No. 11. From BLUE on lower condenser, solder one end of RED wire. Connect other end of this wire to both RED and GREEN wires on the receiver, having first taken the RED wire through the rubber grommet on si.le of unit case.

STEP No. 12. Solder length of BLACK wire to GREEN on transformer casing. Pass this wire through rubber grommet on case and connect other end of wire to both BLACK and BLUE wires on receiver.

" No. 13. Connect ORANGE wire to BLUE lead coming from transformer winding. Pass this through rubber grommet and thence to ORANGE wire on receiver.

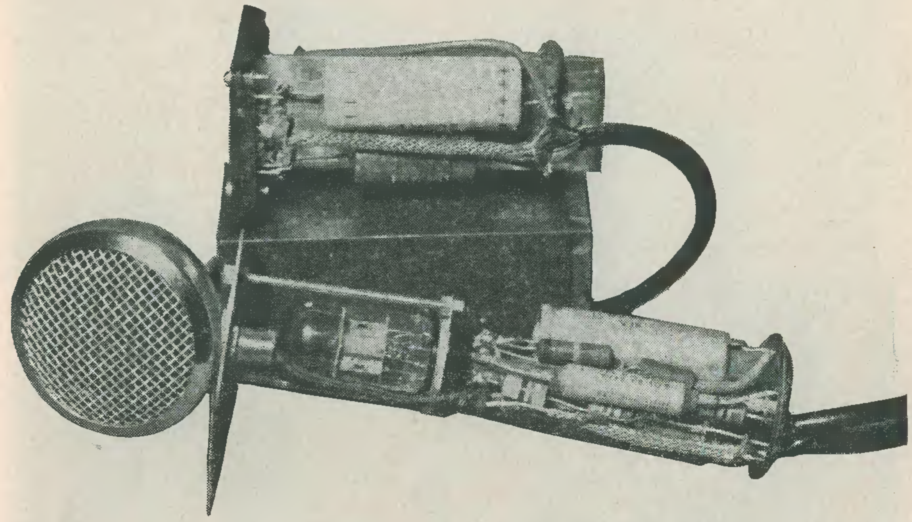
STEP No. 14

Having completed the above, secure the whole assembly to the inside of the metal case provided, by means of the nuts and bolts. NOTE: BLUE lead from transformer, when connected to ORANGE on receiver, should be protected at the join of the two wires by a small length of insulating tape. This completes the assembly and wiring of the unit.

Operation

Having completely wired, and checked the instructions with the unit, it should now be plugged into the mains power socket. Connecting the headphones in the normal manner, and switching on the power unit, the valves will be seen to light up in the normal manner although it is probably a good point to remove all the valves before this is done, and to connect a 6.3V bulb from the BLUE transformer lead to chassis. In this way, should there be a wrong connection, and trouble result, only the bulb will be affected, and not the valves. It should be stressed, however, that provided the instructions are carefully followed, and all connections thoroughly checked after construction, no troubles should be experienced. Switching off the unit, replace the previously removed valves and again switch on the power supply. The receiver should now function in the normal manner.

TURRET MICROPHONE PRE-AMPLIFIER



By **W. E. THOMPSON,** A.M.I.P.R.E.

THE HAND MICROPHONE TO BE DESCRIBED was evolved for the purpose of providing speech amplification in a large hall, but its usefulness is by no means limited to this particular field. The basic requirements were that the crystal microphone and its pre-amplifier should be integral, the feeder cable should be at least 12 yards long, the cable should consist of as few wires as possible, the output should be sufficient to drive a Williamson amplifier to full power, and the microphone and pre-amp. should be light-weight. Since a Williamson amplifier was to be used, it was also necessary that the output from the pre-amp. should be "hi-fi."

Various circuits were tried out for the pre-amplifier, the one finally decided upon being that shown in Fig. 1, which is similar to one which appeared some time ago in *The Radio Constructor*. Certain component values in Fig. 1 differ slightly from those of the original circuit.

The first section of the 12AT7 double-triode V1 functions as a high-gain voltage amplifier to step up the output of the crystal microphone to the required level. The output voltage developed across the anode load R6 is fed via C4 to the grid of the second triode section, which operates as a cathode follower in order to obtain a low output impedance. It is thus possible to feed the signal via the electrolytic capacitor C2 over a long length of co-axial cable with very little attenuation of the higher frequencies. The signal is passed to the input gain control of the main amplifier via the feed capacitor C6.

The primary function of the resistors R2 and R3 is to prevent the signal voltages from entering the HT feed line and thus finding an easy shunt-path to earth. The resistance values are high compared to the impedances of the feed capacitors C2 and C6. In addition, these resistors serve as voltage droppers and decouplers, and so reduce the rather high HT line voltage fed out from the Williamson to values suitable for the 12AT7, as well as restricting to some

www.americanradiohistory.com

extent the voltage standing on the centre core of the co-axial cable.

It will be readily appreciated that by feeding the input signal over the same wire as the HT feed, one wire between the pre-amp. and the Williamson is dispensed with. A pair for the heater of the 12AT7 is required, of course, and this 6.3V feed is centre-tapped to earth at the winding of the mains transformer. The outer braiding of the co-axial cable provides the earth return for the pre-amp.

In order that the microphone and its pre-amplifier could be made up into a form that was easy to construct and be light and convenient to carry around in the hand, small components have been used throughout. The whole unit weighs 14*ozs*, not including feeder cables. All components shown to the left of the dotted line in Fig. 1 are contained in the "handle" of the microphone, by mounting them in turret fashion below the valveholder of the 12AT7. The feed components to the right of the dotted line, namely R1, R2, C1 and C6, are housed in a small screening box of their own. They could have been accommodated in the main amplifier, but for the author's particular purpose it was necessary to keep them separate. This small box also contains a miniature 4-pin socket which marries with a small plug on which are terminated the co-axial cable and heater feed for the pre-amplifier. Connection to the main amplifier is made by cable terminated in an octal plug; this registers with an I0 valveholder used as an input receptacle on the Williamson.

The pre-amp. housing and mount for the microphone is made from a length of thick-walled aluminium tube such as is used for TV aerial masts, and two discs of 22 swg sheet aluminium, to the dimensions given in Fig. 2. Some care may be needed when drilling and tapping the 8-BA holes axially in the wall of the tube, otherwise there is nothing that calls for particular skill in metalwork.

A disc of paxolin, as shown in Fig. 3, is required to anchor the components and serve as a terminal board. A length of 2-BA rod $3\frac{1}{2}$*in* long supports the disc, the other end of the rod being filed down so that its diameter is reduced until it is a tight fit in the spigot in the centre of the 9-pin valveholder. Two lengths of 6-BA rod $2\frac{1}{2}$*in* long are used to support the valveholder on the top disc which carries the microphone, the valveholder and disc being clamped between 6-BA nuts.

The components are supported by their own wires between the tags of the valveholder and the paxolin disc, and where it is necessary to make cross-connections between some components they can be effected on the paxolin disc as shown in Fig. 4. This also

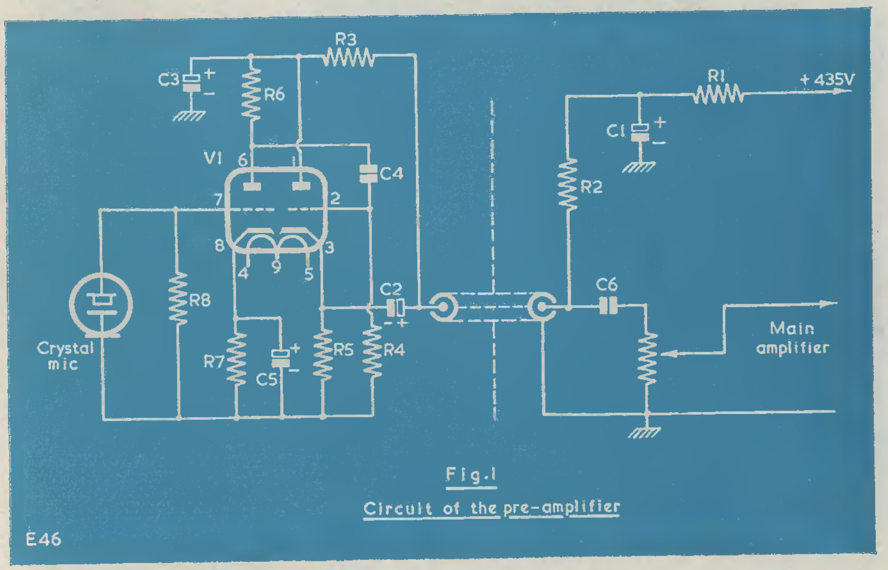


Fig.1
Circuit of the pre-amplifier

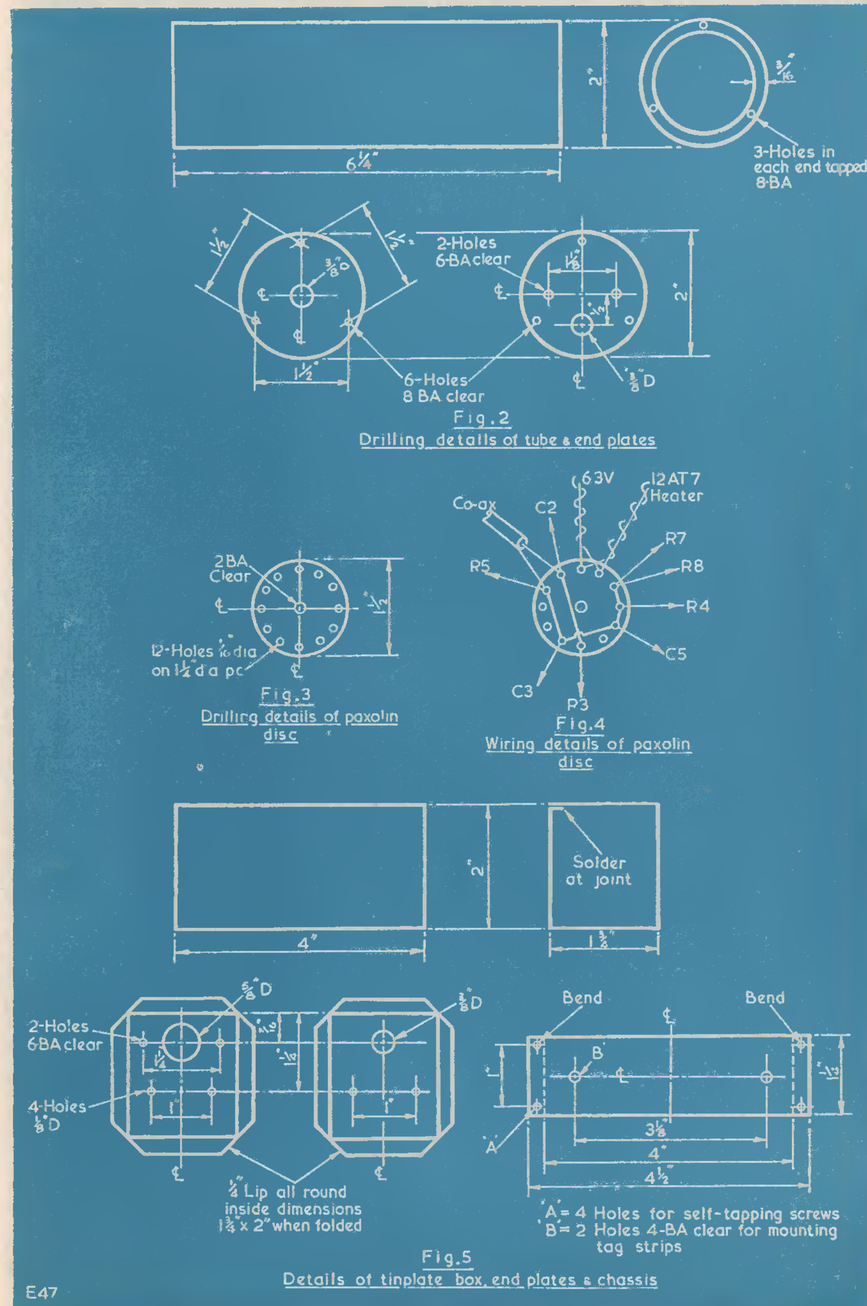


Fig.2
Drilling details of tube & end plates

Fig.3
Drilling details of paxolin disc

Fig.4
Wiring details of paxolin disc

Fig.5
Details of tinplate box, end plates & chassis

www.americanradiohistory.com

shows the location of the components around the twelve holes, and the connection points for the feeder cables.

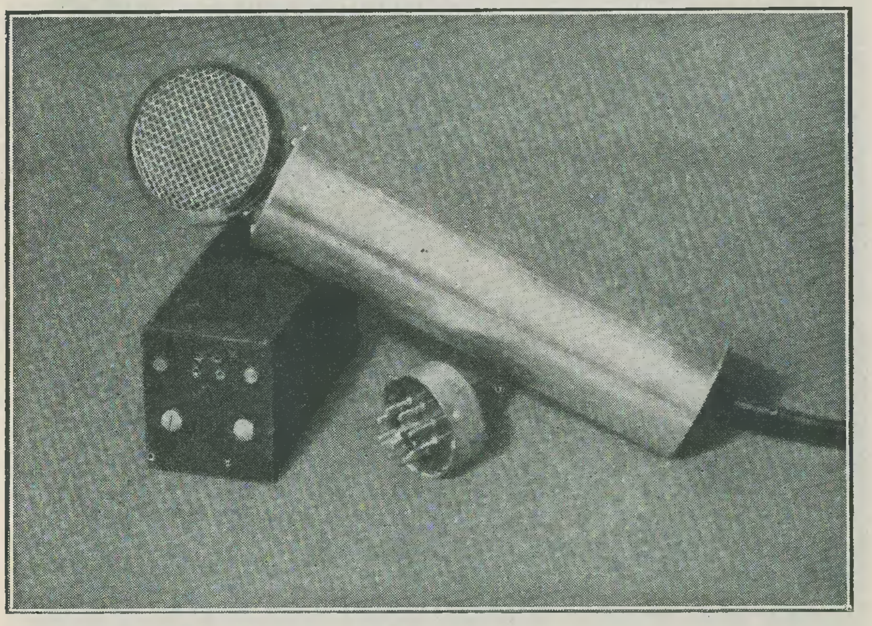
It is necessary that the outer case of capacitor C2 shall be insulated, and it should be noted that its negative terminal is connected to the cathode of the second triode – pin 3 of the valveholder. There is enough room to accommodate the normal size of ½W insulated type of carbon resistor, but if uninsulated miniature resistors such as the Morganite type T are used it might be policy to slip some sleeving over them to guard against possible HR contacts.

The usual precautions should be taken to keep connections as short as possible, especially at the grids of the triodes. Screening of the wire between tag 2 of the valveholder and the junction of R4-C4, and of the heater feed, is necessary to keep hum induction to a minimum.

Almost any type of crystal microphone can be mounted on the "handle," although the one used by the author was a Regent London houses at about 25/– complete. The handle and plug are dispensed with and the microphone housing mounted on the top disc using the existing threaded bush, and a ⅜*in* 26-tpi nut from a Yaxley switch. Two thin washers for packing out the microphone housing from the top disc were found necessary.

The co-axial feeder, and the thin flat-twin cable for the heater feed, are protected by means of a grommet where they pass through the bottom disc. As the outer braid of the microphone lead supplied is already bonded to the insert housing, earth continuity for the metal-work is ensured.

It has not been found necessary to provide ventilation for the components in the "handle," though some may feel that a couple of holes in the tubing are justified, if only to allow an outlet for the small amount of heat from the 12AT7. Practically no heat is dissipated by the resistors since the total HT current of the twin triode is only 2.5mA, measured on the load side of



The Turret Microphone Pre-amplifier assembled in its casing, with feed components in separate box

product which is supplied in a chromium-plated housing and is complete with bakelite handle, screened feed and a plug. These are available from several of the popular

R3. The total HT drain from the main amplifier is not more than 4.0mA, including polarizing currents of the electrolytics.

The following voltage measurements are quoted for guidance. They were taken with a Taylor 85A multi-range meter, 20kΩ/V.

Readings taken on the 500-V DC range:

HT side of R1:	435V
Junction of R1-R2:	385V
HT side of R3:	305V
Tag 1 of valveholder:	245V
Tag 6 of valveholder:	130V

Readings taken on the 10-V DC range:

Tag 3 of valveholder:	5.3V
Tag 8 of valveholder:	3.0V

In all cases the negative terminal of the meter was connected to chassis.

The tinplate box for the feed components is made to the dimensions given in Fig. 5, which also gives details of the small "chassis" for securing the few resistors and capacitors. Three 3-tag soldering strips, centre tag earth, are used to anchor these components. The 4-pin socket is mounted on one end-cover with 6-BA screws and nuts. Self-tapping screws hold the end-covers to the chassis, and retain them securely in position over the ends of the tinplate box. For finish, this box was crackle-painted, while the pre-amplifier housing was wire-brushed to a satin finish and given a coat of clear cellulose.

The whole outfit cost a little less than £4. No junk-box stuff was used, even though it was available. If spare components which are on hand are used, the cost can be considerably reduced. The quality of reproduction from this unit has evoked favourable comment from several of the author's fellow Club members, and the manner of its construction has also appealed to them. One can envisage that a microphone and pre-amplifier of this sort could be used to provide speech input for a transmitter, but it has not been tried out in this role. It might also have some scope in the field of tape-recording, for the long feed cable that can be used gives it the advantage of mobility. Like the Gypsy, it can be of the roving kind.

It has been used on several occasions for speech amplification, with the Williamson, in large halls. For this purpose, five loudspeakers are employed, placed around the hall so as to give good sound coverage. Some idea of its effectiveness can be judged from the results of one such function where over 200 people were present, the announcer being able to speak at normal voice level into the microphone and make himself clearly heard over the conversation murmur that always abounds at these gatherings. An even stiffer test was an occasion when it was used at a large party for children, and we know what a noise youngsters can make under such circumstances!

The author wishes to extend due acknowledgement to his friend J. L. Warne for producing the photographs for this article.

Parts List

R1, R2, R3	22kΩ ½w
R4	1MΩ ½w
R5	4.7kΩ ½w
R6	100kΩ ½w
R7	2.2kΩ ½w
R8	4.7MΩ ½w
C1	4μF 500V DC wkg.
C2, C3	8μF 450V DC wkg.
C4	0.01μF 350V DC wkg.
C5	20μF 12V DC wkg.
C6	0.1μF 350V DC wkg.
V1	12AT7 Brimar.

Other Items

Crystal microphone. Regent.
B9A valveholder. McMurdo.

1	disc paxolin 1½″ diam., 1/16″ thick.
1	piece aluminium tube 2″ diam., 3/16″ wall.
2	discs 20 swg aluminium 2″ diam.
1	piece 24 swg tinplate, 4″×7¾″.
1	piece 24 swg tinplate, 4½″×1¼″.
2	pieces 24 swg tinplate, 2½″×2¼″.
1	3½″ length 2-BA screwed rod.
2	2½″ lengths 6-BA screwed rod.
2	4-BA×½″ ch-hd. screws.
2	6-BA×⅜″ ch-hd. screws.
6	8-BA×¼″ rd-hd. screws.
4	small self-tapping screws.
2	2-BA full nuts.
2	4-BA full nuts.
10	6-BA full nuts.
1	⅜″ 26-tpi nut.
2	thin ⅜″ washers.
2	grommets, ¼″ hole, ⅜″ neck.
1	octal plug.
1	4-pin miniature plug and socket.
3	3-tag term. strips, centre tag earth.

Miscellaneous

Wire, sleeving, screening braiding, 70Ω ¼″ co-ax cable, flat-twin lighting flex.

SUCCESSFUL TESTS WITH SUN-POWERED TRANSMITTER

THE *Daily Telegraph* reports that tests with a transmitter powered by a battery of 16 photo-electric cells exposed to daylight have been successfully carried out. The transmitter operated on the 160-metre amateur band, and CW signals were received at distances of up to 30 miles. The apparatus, employing transistors, was built by Mr. J. M. Osborne, G3HMO, of Buckingham.

www.americanradiohistory.com

Radio Miscellany

ALTHOUGH ONCE AGAIN TELEVISION appeared to dominate the National Radio Show, and despite the fact that *every day* for the past eighteen months television receivers have been installed in 2,500 homes, sound receivers are still outselling TV.

In recent years there has been a widespread belief that the appeal of TV would become so powerful that sound radio would inevitably be superseded, except for the few without the means or those without access to the programmes. The current steady demand for sound radios proves this is still far from the true position. Indeed a good TV can be bought on the never-never for a smaller down payment than the cost of a good radio. Obviously sound radio is far from being old-fashioned even if TV still gets all the limelight. There is certainly no fear of steam radio passing away for years yet—if ever.

Conversely, there are signs that many viewers are reverting back to their former listening habits once the flush of novelty wears off. After a few months even the less discriminating viewer tends to look-in only when the programmes *might* interest him or there is nothing particularly attractive on sound radio. Certainly more and more people are showing a preference for a good broadcast rather than a routine TV programme. Disregarding the sports events and the purely spectacular items, vision adds but little to the sound. Often it actually detracts from it. As a viewer since the early days I must admit that I have found few TV entertainment programmes which have given me so much pleasure as many of the sound programmes have. In fact, I can hardly remember getting a good laugh out of TV, and only too often find myself acutely embarassed by TV artists trying to be funny. On sound radio, nonsensicality can be twisted by one's imagination into readily acceptable situations which become even funnier as they pass into absurdity. Comic adventures are not the only form of entertainment more amusing on sound only. Many plays and talks take on a vivid reality, creating scenes in the listener's imagination infinitely better than anything that can be put on in the TV studio.

Just lately we have had some outstanding steam radio programmes—perhaps inspired by the competition of TV. They have certainly made me wonder if TV comedy, in particular, has any future. It certainly has little past.

Rivalry

Many older listeners will recall something of the liveliness and enthusiasm which the pioneers of broadcasting infused into the early programmes. Often the material was poor, the timing faulty and the announcements facetious, but it certainly had an atmosphere and air of mutually friendly enjoyment.

Something of the same spirit re-appeared at the beginning of regular television in 1936. Gerald Cock, who was then running it, realised his new baby needed presentation with a friendly approach, and together with a small band of enthusiasts managed to infect viewers with something of the very real pleasure they derived from what they were doing. You could almost feel that you were participating in it, and not been merely allowed to watch it.

Unfortunately there were only a handful of viewers in those days. The public were chary of buying expensive sets, and even by the outbreak of war they could only be numbered in thousands. Also few constructors were then capable of tackling TV and there were no "proved" amateur designs. Thus the early tradition never became strong enough to have much influence when TV became a "Big Thing" and the typical BBC superstructure was imposed on top of it. Then it became the ponderous and cautious affair we know today, timidly trying to avoid giving imaginary offence to nobody in particular, and without purpose—except perhaps to dole out little handfuls of "culture" with such painful earnestness that it frightens the customers instead of "improving" them.

Are we threatened with a second helping? As one who has consistently advocated competitive television, my hopes for something a little more spirited have risen over the last couple of years. The original scheme has been gradually watered down, to the growing uneasiness of those who were once so optimistic. Those who have felt like myself must have been stricken with amazement when the Chairman of the Independent Television Authority was quoted as saying "We are going to provide an alternative service, not a competitive one" and other strange utterances in the same vein.

If the whole thing is to be turned into a Shadow BBC, it is misleading to call it "independent." In fact, why start at all? We would then be saved the expense of a duplicate Board of Governors and a second administrative set-up. It seems it is to be like a Russian election in which you have the choice of voting for one of two candidates who both belong to the same party.

Let us hope by now that someone among his colleagues has reminded Sir Kenneth that he has been put into the job to run an independent and competitive TV service, and not, as he puts it, "fix things" with his friend and neighbour Sir George Barnes.

CENTRE TAP *talks about* COMPETITIVE TV · EXPANSION OF FM · SOURCES OF SET NOISE

Coming Shortly

In recent years after each trip to the Continent I have had something to say on the growth of VHF broadcasting in Western Germany and Austria. Many readers, too, who have spent holidays there have been equally impressed with the quality of reproduction (often in areas where normal reception is poor or indifferent) and the freedom from interference.

Germany and Austria are the only places relying chiefly on VHF, but gradually the rest of Europe is preparing to follow suite. Medium and long-wave broadcasting will, of course, continue for a great many years to come, and is hardly likely to be completely superseded in the foreseeable future.

Enthusiasts in south-eastern England have, since 1950, been able to listen to the experimental frequency modulated VHF transmissions from Wrotham. (Pronounced ROOT-HAM, by the way, not ROOTH-HAM as you still hear in some parts of the U.K.). Within my experience the chief Wrotham listeners have been drawn from the quality-fans, most of whom have used converted ex-WD gear, but in recent months there has been an increasing interest in home-constructed FM receivers.

Wrotham is coming into regular operation next May. That is "official" regular operation—it has been regular enough for quite a while now, and reception has been good throughout the London area and much of the south-east. By May of the following year eight more stations in all parts, including Scotland, Wales and Northern Ireland, will have their regular services. Each of the VHF stations will comprise triple transmitters carrying the Home, Light and Third programmes.

Many constructors will find a new thrill in their hobby. VHF demands extra care, precision in coil dimensions and tuning circuits, and minimum stray capacitances. FM also adds some complication in the way of additional circuitry, but the result is going to make a really worth-while difference in reception quality and absence of background noise. To say that the mass of listeners have forgotten what first-class broadcast reproduction sounds like is hardly an exaggeration. True, there are many who are unable to fully appreciate the difference between good and bad. They will assure you they "know what they like," but I think even they can hardly fail to be impressed by the contrast.

Silence is Golden

Complete absence of any sort of background is almost unattainable, but with FM its reduction to a tiny percentage of the volume level is readily achieved. There is inevitably a little noise from the set itself. Thermal agitation of the valves, and even some resistors (particularly those of the carbon type) are "noisy." However good a set is, it must have a few weak links which may become a source of trouble as the set ages. First there is the volume control which may make perfect contact for a while, but the track either wears or picks up a film of dirt or grease sooner or later. Then there are the switch contacts. In recent years these have improved out of all recognition both in the retention of their "springiness" and designs that are self-cleaning in use. Tuning condenser bearings are also a frequent source of noise—in fact any contact that is not well and truly soldered seems a potential source of noise unless carefully designed and adjusted.

Not the least troublesome is the valve-holder. Valves with solid pins, banana pins, side contacts, etc., have all had their vogue, and now with the miniature types we are at the mercy of tiny contact areas, and are dependent on holders where the contact surfaces cannot be examined or easily cleaned.

www.americanradiohistory.com

A GENERAL PURPOSE CIRCUIT for the EF50

By **B9G**

IN THE WRITER'S EXPERIENCE, SO MANY people have trouble when using EF50 valves that it was felt an article on the subject would be of some assistance to readers.

These troubles, it seems, fall into three separate classes:—

(1) Very high noise level—sufficient to swamp weak signals.

(2) Severe instability with uncontrollable oscillation tendencies.

(3) Complete lack of, or very little, gain.

If we take these faults and analyse them, we shall find that in all cases the valves are being operated incorrectly in one form or another. The EF50 is a high gain valve and is naturally more critical as regards its operating conditions than a more docile valve, such as the 6J7 for example. Keeping this in mind, it is obvious that any form of coupling between anode and grid will result in severe instability. Screening must be such that anode and screen grid pins and connections must be *completely* shielded from the control grid, cathode pins and connections, and all returns for the valve returned to *one* common point. This is very important, and includes the earthy end of the grid circuit.

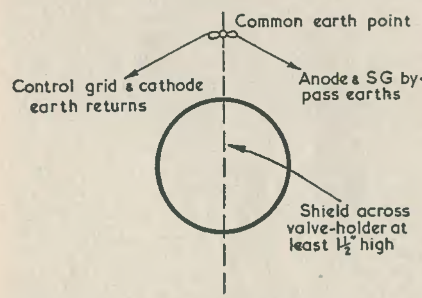


FIG.1

A method of doing this is shown in Fig. 1; note that the screen is also shielding the earthing wires.

Still remembering the words "high gain," let us consider the input. The valve operates with a negative bias of – 2V. No input signal must exceed this figure, or the valve will be overdriven and distort badly or give very weak signals—usually both. The input circuit must therefore be chosen to prevent overdriving, and a gain control provided to reduce amplification of the early stages of the receiver. The circuit shown has been fully tested by the writer and will enable an EF50 to be operated at full gain.

It is impossible to use all the gain available from two EF50's in cascade on an avera e signal input. The only reason for using two such valves is to give extra selectivity, and where two are used as an IF amplifier, the first valve is always controlled (see Fig. 2).

The coil L1 can be the primary of an IF transformer or the anode winding of an RF coupling coil. The input can be the secondary of an IF transformer or a tuned grid coil for RF. AVC can be applied to this circuit, but is not recommended with the values shown. This arrangement will work well between 400 kc/s and 40 Mc/s, but for higher frequencies it may be wise to use small capacity condensers (say 50pF) in parallel with the 0.01μF values.

A superhet using this circuit with one RF, Mixer, Oscillator, and two stages of IF, is always operated with VR1 on the first IF stage, this control being set at its minimum value (10 volts on the valve). If this is not done, the following stages will be overdriven, especially when receiving CW signals with the AVC set in the "off" position.

The last point to be covered, number one in our list, is the high noise level question. The answer is very simple—high gain is being used in an attempt to compensate for low Q tuning circuits, which is seldom satisfactory. In addition to the foregoing, any noise caused by faulty soldered joints or aerial/earth connections, is amplified more with a high gain valve.

An EF50, used as an RF amplifier in front of an average receiver, will give surprising results—quite capable of overloading the receiver.

END

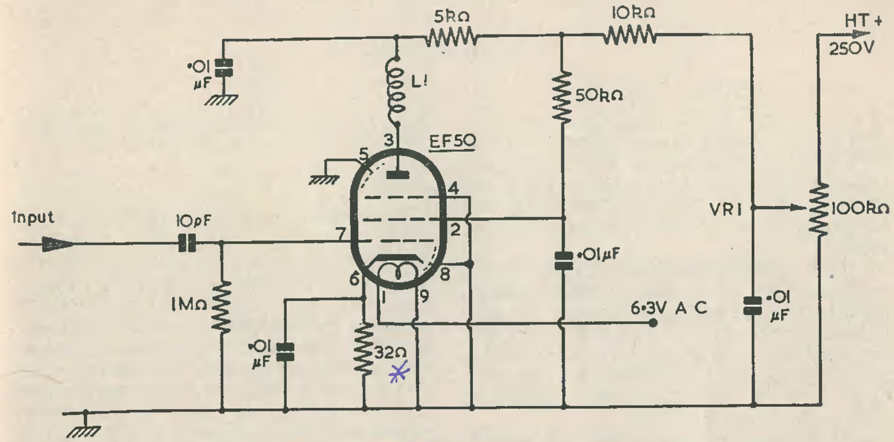


Fig.2
General purpose IF or RF amplifier

IN YOUR WORKSHOP—*cont. from p.143*

I started off, therefore, by choosing three commercial coils wound on formers of the type illustrated in Fig. 3. These were a medium and long-wave aerial coil, and a medium-wave oscillator coil. The medium-wave aerial coil was wound with litz wire, the other two coils with 43 swg single-silk-enamelled. All coils were wound in single pies. The figures in the columns show the different Q and frequency readings obtained from two different tuning condenser settings; and apply to the coil in the uncored state, to the state in which the core is inserted such that one end is just half-way into the pie, and to the fully cored state.

I then checked a typical short-wave coil on the same former and under the same conditions. This coil consisted of 10 turns of 28 swg doubled-cotton-covered-plain solenoid wound. As may be seen, the core did not affect frequency considerably, nor did it greatly affect Q. (The correct core material for this frequency range was used.)

Remembering the days before the war when I used to get Schenectady at loudspeaker strength with two battery triodes, I next checked several coils of the type I used to employ then. The results, shown in the second table, were illuminating. The first coil consisted of 10 turns of 22 swg enamelled wire, first wound tightly on a wooden former and then sprung off such that its two ends could be held by the Q-meter terminals. (A low-loss former was not available at the time.) The air-spaced coil thus formed was approximately equivalent to one wound rigidly on a low-loss ribbed former, and had a diameter of 1¾" and a length of 1¼". I next chopped six turns off this coil, leaving myself with a four-turn coil whose length was approximately ¾". This coil I also checked.

I then wound two similar coils using a thicker wire—18 swg enamelled—and checked these as well. I feel certain that those readers who are short-wave enthusiasts will be interested in the high Q figures which are obtainable with coils of this construction.

Finally, for purposes of comparison, I dug around in a junk box and unearthed one of those very old Telsen medium and long-wave coils (*circa* 1930), which were wound on 2½" bakelite formers. Unfortunately, only the solenoid-wound medium-wave coil was extant, and it gave the rather depressing Q figure shown at the bottom of the table. So we weren't really any better off in those days after all!

www.americanradiohistory.com

Let's Get Started

16 : LINES

By **A. BLACKBURN**

By popular definition, "lines" are one topic which, quite properly, ought never to be the subject of an article, the principal objection appearing to lie in the shooting of them. Already too much misleading information has been conveyed by them!

It is understandable, therefore, if the reader is wary of an article which appears, from its title, to be a collection of tall tales outlining personal skill. However, the subject this month is of real importance to the radio engineer and enthusiast, and in radio lines have a definition and significance superior to common usage.

It is well known that the effect of connecting a long wire to an oscillator results in the wire radiating uniformly in all directions. This is one of the problems to be overcome in cases of transmitters feeding directional aerials—the feed from the transmitter must be prevented from radiating in such a manner. There is a tendency for a plain piece of wire to radiate equally in all directions, thus depriving the aerial of most of its directional properties and rendering it more or less useless.

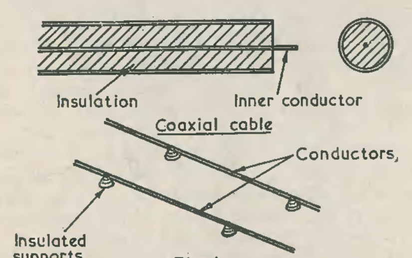


Fig.1
Open wire feeder

E73

A possible answer to this—and one which is frequently applied—is to screen the aerial feeders, but then we are presented with another snag. The screened lead does not react in the manner one might quite justifiably expect, and in order to tackle the matter from the right angle, it is well to be equipped with the inside story of operation.

Feeders

In the last article it was explained that, in order to effect a maximum transfer of energy from source to load, the generator and load resistances or impedances must be matched, that is, equal in ohmic value. We assumed that the generator and load were in close proximity, and the connecting medium did not, therefore, enter into our argument.

Now, since the term "close proximity" is a relative one, and must be qualified, we define it as being dependent upon the frequency in use. Twenty yards between two ordinary telephones would normally be considered a short distance, and the connecting line does not require a great deal of attention. However, a similar distance separating a 100 Mc/s transmitter and its aerial is quite a different matter, and some consideration needs to be paid to the connecting medium.

There are two types of feeders normally used to connect a source to a load when the physical distance between them is relatively considerable, the simplest of which is the open wire feeder.

It consists of two wires spaced a definite distance apart, the spacing being retained as accurately as possible over the complete length of the system. Two important applications of this method can be found in the Post Office telephones and in feeding aerials at the lower and middle radio frequencies.

The second method is by means of the co-axial line, which is a conductor mounted in the centre of a cylindrical outer conductor. The centre conductor is held in place by either a continuous insulator, running through the complete length of the lead, or by insulating discs spaced along it. Examples of an open wire feeder and a co-axial line are shown in Fig. 1. The properties of these lines are common in nearly every respect, the principal differences being caused by the insulating materials in the co-axial line.

Co-axial line will be familiar to all TV constructors and owners—it is invariably

used to feed the receiver from the aerial. Anyone who has bought any of this cable will have noticed that it is specified by a resistance, normally "70 ohms co-ax. cable," *irrespective of length.* You might quite justifiably feel that this specification isn't very adequate. It seems to be common sense to assume that the resistance of ten yards of cable must be half that of 20 yards and that the specification must therefore refer to the resistance per foot or per yard.

If it were the centre conductor which had the resistance of 70 ohms, this assumption would have an element of truth—the resistance must obviously vary directly with the length. If it were the conductor—but it isn't. The confusion arises from a general inclination to abbreviate present-day terms to a point of ambiguity. Thus, the real meaning of the term 70 ohms co-ax. cable is "co-axial cable of characteristic impedance 70 ohms."

Characteristic Impedance

Admittedly, even this rather pedantic manner of ordering cable does not explain the expression characteristic impedance. The only way to find out is to open it up and take a look at the inside.

At first glance there seems to be no more to the cable than a pure capacity between the inner and outer conductors—or between the parallel wires if it happens to be an open wire feeder. Both cases are similar. If the cable comprises *only* a capacity and inner and outer conductors, the capacity will vary with length; the longer the cable, the higher the capacity. But the property in which we are interested is constant, irrespective of length. So our reasoning has fallen down somewhere.

Let's take a look next at the conductors themselves. They may give us a clue.

We already know that any piece of wire, straight or curly, has some inductance, which gives us our first lead. The line is beginning to take some shape. The feeder really consists of a series inductance and parallel capacity, as shown in Fig. 2. In practice, the capacity and inductance are distributed along every fraction of the cable, but in order to make it easier to visualise, we have lumped it together in sections. The inductances of both leads have also, for the same reason, been lumped into one side, giving the impression that the other lead contains no inductance.

At this stage, unless we wish to get involved in a network of mathematics, we shall have to skip a few steps in our argument and examine the results that others, who enjoy doing sums, have obtained about Fig. 2.

Looking into the cable from points AA, the line, provided it is infinitely long, appears as a pure resistance, which is called the characteristic impedance (Zo)—or, more correctly in this case, the characteristic resistance (Ro). The value of Ro depends upon the inductance and capacity of the line. Well, we've discovered what is meant by this elusive term, but obviously a line of infinite length is not a practical proposition. It is a simple matter, however, to cheat the line, and, retaining its Ro at the correct value, use any length we wish.

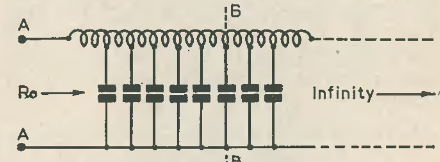


Fig.2

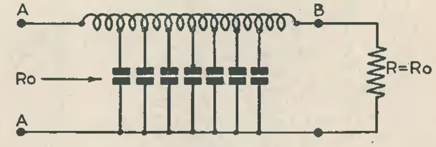


Fig.3

E74

An infinite line must consist of an infinite number of L and C sections, as shown in Fig. 2. Now suppose we break into the line at BB, to the right we shall still have a line of characteristic resistance Ro, as before. There is no reason, therefore, why we should not substitute for this line a pure resistance of value Ro, and connect it between points BB, whereupon the length of the line to the right of these points can be dispensed with. So our line to the left of BB now becomes as shown in Fig. 3, and we may use any length we wish.

Just to show to the more sceptical reader that Ro stays the same for any length of line, the value of Ro is given by

$$Ro = \sqrt{\frac{L}{C}} \text{ ohms,}$$

where L=inductance of the line per unit length (metres, yards, etc.)
and C=capacitance of the line per unit length.

Ro, therefore, depends upon the ratio of L and C. So, if we calculate the Ro of a line on the basis of its inductance and capacity for 10 feet and then calculate it again on a basis of 20 feet we shall arrive at the same value for Ro in each case. You will notice that frequency does not enter into this expression at all, which means that Ro is a pure resistance at all frequencies.

www.americanradiohistory.com

Having sorted out the whys and wherefores of Ro, we can now consider the line as it is when connected between source and load. Fig. 4a shows a co-axial line of characteristic resistance Ro, connected between a generator and load both having a resistance Ro. This represents a perfectly matched system and all the energy leaving the generator will be absorbed in the load. For the sake of completeness, the same circuit has been redrawn (Fig. 4b) with the co-axial line represented as its equivalent "L and C" line. The load Ro may, of course, be anything which, to the signal; appears to be a pure resistance, like an aerial or even a tuned circuit at resonance.

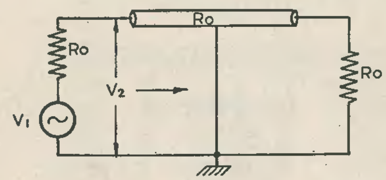


Fig.4a

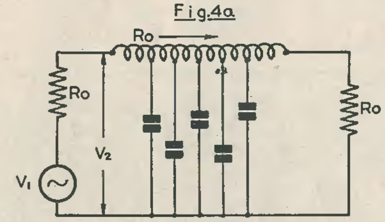


Fig.4b

E75

Mismatching

As we saw last month, a loss of power results when a generator and load are close together and the internal impedance of the generator does not match the load. Due to the mismatch, there will still be loss of power if a long line is inserted between them, but such a line will give rise to complications.

Suppose that a switch were inserted between generator and line in the circuit shown in Fig. 4. Upon closing the switch, the first surge of current would start down the line, and the voltage across it would be equal to V_2. As it travels down the line, this current has no knowledge of what is at the end of the line, so in accordance with Ohms Law, it sets up the correct voltage all down the line from V=IRo. However, if the load does not equal Ro, when it reaches the end of the line, the current cannot set up the correct voltage across it. In other words, the generator is supplying a definite power to the line, but if this power reaches the load and it is not equal to the line Ro, then some power must be surplus, because it can only be completely absorbed by a match, i.e. Ro. Assuming, therefore, that the generator's internal resistance is equal to the Ro of the line, the surplus energy returns down the line and will be absorbed by the internal resistance of the generator.

Energy is, therefore, travelling backwards and forwards along the line. These travelling waves add and subtract, and so form a pattern of standing waves along the line as shown in Fig. 5. The distance between successive maxima and minima will be one-half wavelength. The values shown in Fig. 5 are those which would be recorded by a voltmeter run along the line, and the ratio of maximum and minimum values depends upon how badly the line is mismatched. If the line is matched, the voltage is, of course, the same at all points along the line.

It will be readily seen by now that, if the line is very short compared to the wavelength, none of these conditions need be considered, because mismatching cannot set up standing waves on a line, say, 1/100th of the wavelength long. That is why we had to be sure what we meant by "close proximity" at the beginning. For instance, 100 Mc/s represents a wavelength of about 3 metres, whereas the highest audio frequency on a telephone line represents a wavelength of hundreds of kilometres.

Effect on Generator

The feelings of the generator throughout all this have been rather poorly treated. Remember, it is receiving voltages from the line and the effect upon the generator depends upon the length of the line. (We have assumed all along that there are no losses in the line, that is, the applied voltage at one end reaches the other end without attenuation).

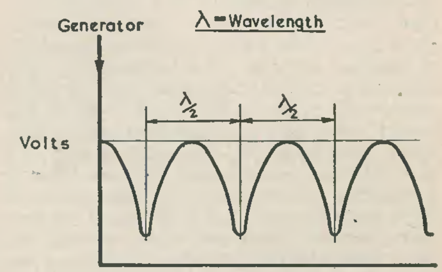


Fig.5

E76

Because of the changing current and voltage conditions along it, the characteristic resistance of the line no longer looks like Ro at all points. All is well provided that the generator is any number of half wavelengths away from the load. It can then be fooled into thinking that the line is correctly terminated, because the voltage standing wave has a value—at every half wavelength from the load—equal to the value it would have at all points along the line under matched conditions. At intermediate points, however, the generator may see loads that differ considerably from Ro. At all multiples of a quarter wavelength from the load, the current and voltage are in phase and the generator sees a pure resistance, however different in value it may be from Ro. At intermediate points, the current and voltage are not in phase and the generator sees a reactance.

This could give unnecessary trouble, if an oscillator, or the tank circuit of a transmitter, for example, were coupled to the line, as the reactance may cause detuning.

An illustration of these effects in practical terms would be to connect a signal generator to a line any odd multiple of a quarter wavelength long, and to leave the line open circuit. A *short* circuit would then be reflected across the generator. If the line were changed to a half wavelength, an *open* circuit would be reflected across the generator.

Properties

The point to emphasise is that, when a co-axial or open wire transmission line is used to connect a source and load, care must be taken to ensure that they are all matched.

However, grossly mismatched lines may be made to serve very useful purposes. We found, just now, that a quarter wavelength line, shorted at one end, reflects an open circuit across the other end. If the open circuit ends of the line were connected across an open wire transmission line, it would therefore have no effect upon the line. An example of this is shown in Fig. 6, where the quarter wavelength line supports the main line. This does away with the need of insulators to support the line.

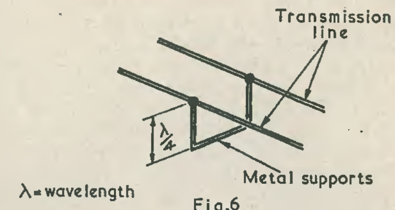


Fig.6

E77

An incredible feature of critical length lines is that they may present a capacitance to AC but a short circuit or conductor to DC. A piece of short circuited line, three-eighths of a wavelength long, reflects a capacity across the generator, but to DC it is obviously a plain conductor. Alternatively, a piece of open circuited line one-quarter of a wavelength long reflects a short circuit across the generator, but is an open circuit to DC.

All these conditions only apply at the frequency which makes the physical length of the line the correct number of wavelength units long.

TRADE REVIEW

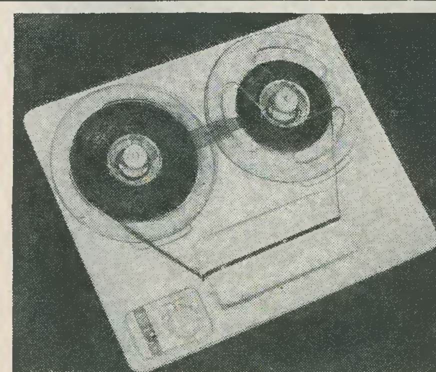
LANE 2-SPEED TAPE TABLE MARK VI. VERDIK SALES LTD., 8 RUPERT COURT, LONDON, W.1. PRICE £18 10 0

General Specification

1. Drive. Three high-grade motors driving from left to right.
2. Controls. Single knob and ON-OFF. Mechanically and electrically interlocked.
3. Automatic band brakes. Tape reels are LOCKED when machine is in OFF position to avoid tape spills during transit.
4. Facilities.
   (*a*) Record, playback, fast forward and fast rewind (under 1 minute).
   (*b*) Two speeds, $7\frac{1}{2}$ in/sec., $3\frac{3}{4}$ in/sec.
   (*c*) Simple drop-in tape loading. Tape does not require handling when in use.
   (*d*) The Table will take standard reels up to 1,200 ft capacity.
5. Twin track heads.
6. Playing time per 1,200 ft reel: 2 hours at $3\frac{3}{4}$ in/sec., 1 hour at $7\frac{1}{2}$ in/sec.
7. Visual "cueing" indicator.
8. Separate high-grade record and erase heads.
9. Finish: Quality stove enamel.
10. Size $14\frac{1}{2}$ in × 12 in × 4 in deep.

Electrical Specification

1. Record/Replay head. High impedance type with .0005 gap.



2. Attainable frequency response 40–10,000 cycles with suitable amplifier and tape.
3. Erase head. High impedance type with .005 gap.
4. Power consumption: 52 watts in record position. 70 watts in rewind position.
5. Supply voltages: Model Mark VI 210–250V 50 c.p.s. A.C. only. Model Mark VI/EX 110–125V, 50 or 60 c.p.s. to order A.C. only.

www.americanradiohistory.com

A CONSTRUCTOR VISITS THE

21st NATIONAL RADIO SHOW

ALTHOUGH THE FIRST NATIONAL RADIO Exhibition opened in 1926, it has only now achieved, in 1954, its "coming of age." The reason, of course, is that it had to go into retirement during the war years; when the Radio Industry was manfully fulfilling its enormous contracts for the supply of equipment to the Services. Now that the country is in a state of peace (more or less) the industry can settle down once again to its task of fulfilling the requirements of the civilian market in the field of entertainment, and the needs of industry in the shape of electronic aids to greater production.

Before the war it used to be said that the Show was becoming more and more a "furniture exhibition," and that exhibitors were concerned only with sales. Such a charge could hardly be levelled against the 1954 Show, in which electronics was given considerable space and prominence, and in which technicians were available on every stand.

Television

In common with previous years, the greatest interest in the domestic market was given by television. There was little in this sphere which was new this year, however, insofar as the "tube and time-base" parts of television receivers were concerned. Apart, mainly, from Philco, Ferguson, HMV and Ferranti with 21 inch tubes (the latter 90 degrees), 14 inch to 17 inch sets were the order of the day; prices being more or less in proportion to the size of the tube and the size and finish of the cabinet. "Gadgets" were conspicuous by their absence; and there was, in actual fact, little to choose between different manufacturers so far as performance and appearance were concerned. The reproduced pictures were of good quality, although one manufacturer showed receivers in which line transformer ringing on the screen was almost vividly evident. Audible 10 kc/s whistle with most models was very subdued, if present at all.

Large screen projection models were shown by Nera, Valradio, Philips and White-Ibbotson. Smaller projection receivers were exhibited by Ferranti and Philips, the former with 20 and 24 inch screens, the latter with an 18 by 13½ inch screen. These three sets were of the table or console variety, and the brightness and definition of the picture were at least as good as that obtained by direct-viewing cathode ray tubes.

Band III receivers were very much in evidence, although the original excitement about the Alternative Television Service has now died down. Some sets were fitted, as a matter of course, with 13 channel tuners; others were capable of adaptation at any future date. A Band III signal was piped around the Show, and consisted of a caption superimposed on a picture of a tank of swimming fish. This exciting scene was reproduced by at least one television receiver on each of the larger stands. The definition of this picture was not as good as might be expected but, since the faults were evident in every set tuned to the Band III programme, it is probable that the fault lay at the source.

Pam exhibited the only separately available Band III converter at the Show, and it was claimed that this would work with any post-war television receiver, whether TRF or superhet, and regardless of the intermediate frequency used in the main receiver.

The Pam converter consists of a neat little box with a two-way switch, two co-axial sockets and a co-axial lead fitted to its front panel. The co-axial lead connects to the aerial socket of the main receiver, and the Band I and Band III aerials to the two co-axial sockets of the converter. All tuning controls are internal, to be pre-set when the unit is installed. The positions of the front panel switch are "BBC TV" and "Commercial." No mains switch is fitted as the unit is intended to be switched on with the main receiver. A transformer gives isolation from the mains.

The Pam converter line-up is of interest since it uses a cascode valve (PCC84) in a non-cascode application. The first triode of the PCC84 input valve is cathode-coupled to the second triode; the gain control being in the common cathode. The frequency-changer is a double-triode ECC81, using the familiar UHF mixing circuit. A comprehensive four-section tuned filter provides the coupling to the main receiver, this being used to prevent oscillator frequencies from the converter reaching the set, and vice versa.

Pye gave a very effective demonstration of 3D television, in which the screen had to be viewed through polaroid spectacles of the type used at the cinema. A 3D television camera was directed at a model on the stand, the resultant signals being shown on display units. These units employed a 45 degree mirror on which, apparently, were directed two CRT's through polaroid filters.

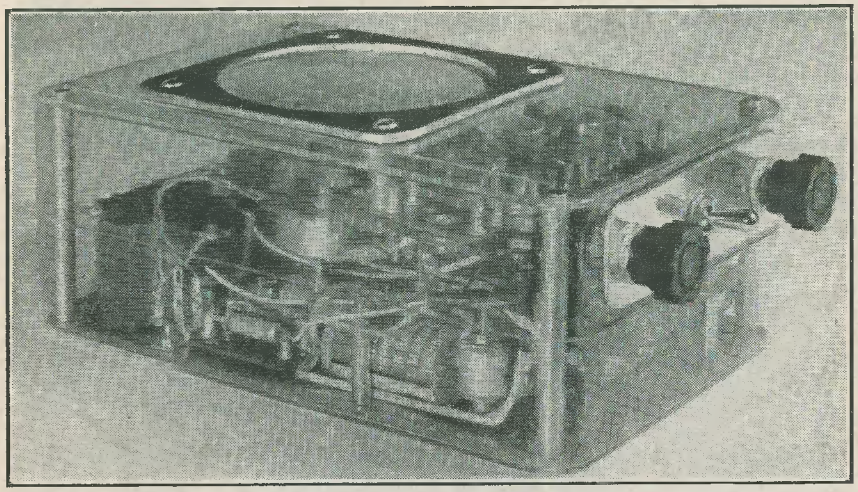
Home constructor television sets were in evidence. One of these, employing the well-tried Allen scanning components, was in continuous use all the time, giving a 17 inch picture equivalent to any of those shown in manufacturer's receivers.

Electronics

Electronic displays were evident and were, also, excellently presented.

consisted of a series of large discs bearing appropriate legends which revolved at different speeds. The frequency of the "strobing" light was varied to "lock" these discs one after the other. Also "strobed" in this exhibit was a fountain of coloured water.

Mullard provided much amusement with a "Disappearing Gold Ball" guarded by "invisible rays." As soon as the hand approached the ball it disappeared.



An experimental transistor portable radio receiver which was shown on the G.E.C. Stand at the National Radio Show. This receiver incorporates 3 point contact transistors, 5 junction transistors and a point contact diode. It operates off 3 No. 8 batteries incorporated in the body of the set—drainage for a 100mW hour is 9V 30mA (270mW). Also shown was the FM Tuner Unit described in the July and September issues of this magazine. (Photo by courtesy of G.E.C.)

On the heavy engineering side, Hancock and Co. showed an oxygen cutting machine capable of cutting out any design in heavy sheet metal direct from a drawing. The machine consists of an oxygen burner servo-coupled to an electronic tracer head which follows outline drawings placed in the machine. The photo-cell tracer of this machine tends always to follow the area on the drawing which is half-white, half-black (or half-blue in the case of a blueprint), thus causing the burner head to follow the outline of the drawing. It is possible, therefore, for complicated outlines in heavy sheet metal to be obtained directly from drawing-office specifications without the use of expensive templates.

Stroboscopes were shown by Dawe Instruments and by EMI, the latter company providing a really effective display. This

The National Physical Laboratory showed a "Noughts and Crosses Machine" which could not be beaten. It is interesting to note that, even with a simple arrangement such as this, the possible combinations are such that the machine has to recognise 157 key situations.

Radio Control was much in evidence, including Mr. Alan Tamplin's well-known radio controlled Churchill Bridge-Laying Tank. Mr. Tamplin also exhibited "Nellie," an Electronic Beer-Barrel which rolled anywhere around the arena as directed.

The thirsty members of the public leaving the Electronic Barrel could see plenty of liquid at the Ultra stand, which featured the well-known "Sarah" Air Sea Rescue equipment in a colour cinema show. "Sarah" is now stock equipment in the RAF.

www.americanradiohistory.com

Standard Telephones and Cables (Brimar) had several attractive displays including one of an electronic production counter using a germanium photo-cell. This employed a very simple circuit and counted glass tubes holding rectifiers on a moving belt. The counter did not respond to empty tubes. Brimar also showed a novelty entitled "Hear Yourself Speak." The public spoke into a microphone at one end of an illuminated amplifier circuit diagram, whereupon a stream of light passed along the "AF wiring" of the circuit. When the light reached the loudspeaker symbol, the sound was reproduced by an internal loudspeaker.

The Telegraph Condenser Co. gave an impressive display of its standard components, including the newly released Hi-K ceramics for multi-channel TV up to Band IV and beyond. These condensers are the answer to a designer's prayer, as they are easy to fit and have almost no losses at all. Also shown were the "Superlytic" condensers, whose leakage current is so low that they may be used for AF coupling.

TCC had a further exhibit showing the advantages of fitting power-factor correction condensers to inductive machinery. The condensers bring the consumed current in phase with the voltage, reducing costs, maintenance and meter consumption.

The Services

The Services, this year, put on a very fine show indeed.

Most notable was the Royal Navy, which partitioned off its own area of floor space. Within this space were shown representative models of ship and shore radio cabins, training aids, PA and radar systems, and almost everything needed to make up the electronic complement of a modern ship.

Of particular interest was the "electronic clock" which displays on a cathode ray tube the hands and face of a clock. All the figures and the hands shown are generated entirely by waveforms, and it is emphasised that the picture obtained is not a reproduction of an existing clock face. At the centre of the "clock," also traced by the electronic beam, are the letters "ARE" (Admiralty Research Establishment) and a four-figure group showing the exact time traced by the hands (thus 1215, etc.). The figure group changes as the second-sweep "hand" passes the minute division.

This almost magical display was in the charge of the engineer who developed it, and who explained to the writer, whilst casually pointing to two six-foot racks bristling with valves, uniselectors and relays, that it was "all so simple that he couldn't understand why people thought it was complicated at all!" The three hands are "written" on the face of the tube with the aid of a radial time-base, whilst each number—0 to 9—represents part of a Lissajou figure, which is put into position by DC bias. The tube is magnetically deflected (but it could have been electrostatic, if desired); and it has a modulating grid to enable the trace to be blacked out after it has "written" each number. The whole cycle, consisting of tracing out the numbers, letters and hands, etc., has a repetition frequency of 1,500 c/s, each number taking up about 700 microseconds. The clock is accurate, being locked to the 50 cycle mains.

The demonstrator also wanted to emphasise that this "clock" is not a toy (as some disgruntled taxpayers had apparently hinted), but is a simple application of CRT "writing" as developed at ARE for radar equipments which could not, for obvious reasons, be exhibited.

The picture on the screen was accompanied by a loud ticking from an adjacent loudspeaker. The writer cannot resist betraying the confidence that this ticking was obtained from a cheap alarum clock secreted away out of sight with a microphone and amplifier!

The Army also had an excellent array of exhibits, including one very realistic panorama of television-viewed aerial bombardment, and a working model of a tank gun which could be servo-controlled by members of the public. The Army also exhibited some of the very first radio sets ever used in the field.

In one corner of the Army area was a home-built receiver in which the only manufactured items were two valves and a loudspeaker. Everything else was made, literally, out of junk. Connections were made by cut-out strips of tin, or even barbed wire, whilst the tuning condenser consisted of one tin sliding over another. Resistors were provided by grate polish for low values, and by pencil marks for high values.

The RAF demonstration consisted mainly of half a dozen airmen servicing VHF aircraft sets under the supervision of a sergeant. For some reason everyone wore overalls.

High Fidelity

High fidelity was much to the fore and many demonstration rooms were given over to this branch of electronics. The writer, who hadn't the time to collect tickets for each demonstration in the normal manner, found that the words "Radio Constructor" were more than enough to give him immediate entry.

Collaro gave a very good demonstration using their Studio pick-ups. Commentary was given by tape, whilst records were selected by the demonstrators in charge. The amplifiers used were Leak, Quad, and a simple two-stage job, these feeding into various representative loudspeakers. Stan Kenton, who apparently ranks with breaking glass so far as high fidelity demonstrations are concerned, was sorted out by the Studio pick-up with ease. This pick-up can most confidently be recommended to those in search of true reproduction.

GEC used their "912" home-constructor amplifier in their exhibit. To add realism, this firm gave an excellent demonstration of stereophonic reproduction, including an incredibly realistic impression of a train passing through the auditorium! GEC departed to a certain extent from the custom of using accepted high fidelity discs, substituting instead their own recordings made especially for the exhibition.

Mullard showed the 5-valve 10-watt amplifier recently featured in the *Radio Constructor*, this being demonstrated with a selection of reproducers. The pick-up was an Acos model. The records played included "A Study in Percussion," Capitol Full Dimensional; "Foghorn Boogie," Capitol F D; and "Meet Mr. Callaghan," Les Paul, also Capitol F D. The "reefer" atmosphere was suitably dispelled by Beethoven's Fifth (conducted by Kleiber and truly beautifully reproduced) and Tchaikowsky's lovely Quartet No. 1. A Bach Chorale, recorded by Demessieux, brought the Organ of the Victoria Hall, Geneva, to Earls Court. Here is an amplifier which the high fidelity constructor can tackle, knowing that he has got the best.

As well as discs, hi-fi is now available on tape; and HMV are just on the point of releasing high fidelity tape recordings to the market.

Whilst it is impossible to cover all the tape recorders at the Show, it is worth while mentioning the Reflectograph made by Rudman, Darlington. This firm specialises in scientific and industrial recorders which go well outside the audio spectrum, with the result that their normal models have a very wide range indeed, as their demonstrations bear proof. These recorders possess the advantage, also, of having continuously variable speed control; and are available in cabinets with or without amplifiers.

Sound Radio

Although sound radio occupied a fair amount of space in the Show, it showed no new trends.

At the T.C.C. Demonstration Room. On left, Mr. Barnes (T.C.C.); Centre, Mr. Thompson (R.C.S. Products); on right, Mr. Baldwin (The Radio Constructor).

(Photo by courtesy Mullard Overseas Ltd.)

Alba exhibited the smallest receiver, this being a 3-waveband superhet in a cabinet measuring 8 by $4\frac{3}{4}$ by $4\frac{1}{2}$ inches. Champion exhibited their increasingly popular range and showed also the various stages of manufacture of one of their receivers, which has a printed circuit.

FM was not as evident as the writer had hoped. FM receivers were shown, nevertheless, by Ferguson, Murphy and Philips. These receivers had an FM band combined with normal broadcast coverage, and were not of the adapter type.

www.americanradiohistory.com

HANNEY of BATH offers

ALL COMPONENTS FOR: OSRAM 912 AMPLIFIER and MULLARD 5 VALVE 10 WATT HIGH QUALITY AMPLIFIER

Send for priced parts list.

FREQUENCY MODULATION. For Wrotham high fidelity transmissions. DENCO technical bulletin giving circuit and point to point wiring diagram for building a F.M. Feeder unit, **1/6.** We have all components available. Priced parts list on application.

W.B. STENTORIAN. High Fidelity Speakers. HF610, **50/6**; HF810, **60/6**; HF912, **67/–**; HF1012 (3 or 15 Ω), **73/6.**

ACOS Hi-g, Pick-ups. HGP 20-1 std., or LP **68/8.** Heads only, std. or LP, **42/3.**

COILPACKS. DENCO, CP 4/L and CP 4/M, **33/4**; CP 3/370 pf. and CP 3/500 pf., **42/8.** OSMOR "Q" HO, **48/–**; LM, **40/–**; Batt., **50/–**; TRF, **40/–**; HF stage for HO pack, **20/–**; ETA 4-station pack, **43/8.** We stock COILS by Weymouth, Osmor, Wearite, Denco, Teletron and R.E.P.

WIDE ANGLE COMPONENTS. ALLEN. Teleking Chassis, **50/–**; Coilsets (TK and Super-Visor), **44/6**; LO.308, **40/–**; FO.305, **21/–**; DC.300c., **39/6**; FC302, **31/–**; GL.16 and 18, **7/6** each; SC.312, **21/–**; AT.310, **30/–**; OP.117, **9/–**; BT.314, **15/–**; DENCO Chassis Magnaview, **37/6**; Chassis, Super-Visor, **51/6**; Coilsets, Magnaview, **41/2**; WA/DCA1, **43/–**; WA/FCA1, **31/–**; WA/LC1 and WC1, **7/6** each; WA/FMA1, **21/–**; WA/LOT1, **42/–**, WA/FBT1, **16/–**.

Send **6d.** stamps for our General List of components for Viewmaster, Soundmaster, Williamson Amplifier, Teleking, Magnaview (Brimar and English Electric large screen TV), Super-visor, Mullard Universal, Close tolerance Silver Micas, etc., etc. Please add 1/– postage to orders under £2.

L. F. HANNEY
77 LOWER BRISTOL ROAD, BATH
Tel. 3811

Frequency Modulation Tuner

described in the July and Sept. 1954 issues.

JACKSON BROS. dial and condenser	£1 5 3
Completely drilled chassis	8 0
All coils with S.M. Condensers and Cans	£1 0 6
Complete Set of Parts, including valves, pair of matched Germanium crystals and small items such as nuts and screws	£7 2 6
Complete Tuner, assembled and aligned	£10 0 0

G. BLUNDELL
7 SUNNYSIDE HOUSE
CHILDS' HILL LONDON NW2

No Resistance with ERSIN MULTICORE SOLDER

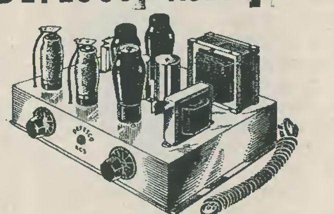
One imperfectly soldered joint can ruin reception and frustrate hours spent in assembly work. Be sure you use Ersin Multicore Solder on all connections in your equipment. Five cores of extra-active, non-corrosive Ersin flux, prevent oxidation, *clean* surface oxides and eliminate 'dry' and H.R. joints. The Size One Carton gives you waste-free, trouble-free soldering without the need for extra flux. Get a carton today — and ensure good reception.

SIZE 1 CARTONS 5/- RETAIL

Catalogue Ref. No.	Alloy Tin/Lead	S.W.G.	Appr. Lngth per carton
C 16014	60/40	14	21 feet
C 16018	60/40	18	55 feet
C 14013	40/60	13	19 feet
C 14016	40/60	16	38 feet

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

DEFESCO AUDIO AMPLIFIERS



Ready for use or **KITS** from **50/-**

Illustrated Data available. Valve/Component Lists. *Stamp please.*

RADIO UNLIMITED
ELM ROAD : LONDON E17

New Guaranteed Surplus Valves

6AG5, 6C4, 6AL5, 6AM6, 6J6, 6J7G, 6K7G, 6F8, VS110A, 954, 955, 956, 15D2, EF50, EF54, EC52, EF91, EB91, W77, EF92, Z77, **5/–.** 6AC7M, 6U5G, OZ4, KTW61, **6/–.** 6F6G, 6K7M, 6G6G, EL32, 6K6G, **6/6.** 5Y3GT, 12BE6, 12A6M, 7C5, 6F7, 6J7M, 6CH6, 6V6GT, EF50 (syl.), X66, 6AK5, VR150/30, 6AT6, 6BA6, 6BE6, 6BJ6, 6BW6, 6BS7, 6SG7M, 6X5GT, 6X4, 1S5, 1T4, 1R5, 3S4, **7/6**; EL35 (6L6G), 6Q7G/GT, 6SL7GT, 6SN7GT, 6K8G, 5Z4G, 5U4G, 12AT7, 12AX7, **8/6**; 6SQ7M, KT66, CBL1, ECH35, 7S7, **10/–**; 6AG7M, 866A **12/6.**

All valves despatched by return. Please add 6d. postage.

JOHN ANGLIN
160 CLEETHORPE ROAD, GRIMSBY, LINCS.
Tel. 56315

NEW! RADIO & T.V. OUTFITS

LEARN THE PRACTICAL WAY

Specially prepared sets of radio parts (which you receive upon enrolment) with which we teach you, in your own home, the working of fundamental electronic circuits and bring you easily to the point when you can construct and service radio sets. Whether you are a student for an examination; starting a new hobby; intent upon a career in industry; or running your own business — these Practical Courses are intended for YOU — and may be yours at Very Moderate Cost.

EASY TERMS FROM £1 A MONTH

FREE! PROSPECTUS

POST THIS COUPON TODAY

To E.M.I. INSTITUTES, Dept. 179X,
43, Grove Park Road, Chiswick, London, W.4

SUBJECT(S)........

NAME........

ADDRESS........

.... 1/10

COURSES WITH PRACTICAL EQUIPMENT INCLUDE:-
Radio (Elementary and Advanced), Television, Mechanics, Electricity, Chemistry, Photography, Carpentry. Also Draughtsmanship, Commercial Art, Amateur S.W. Radio, Languages, Etc.

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

IC36

A LIMITED NUMBER of bound volumes of the *Radio Constructor*, Volume 7 only, are available at the special price of £1 1s. 0d. Orders should be sent without delay to the Subscription Manager, Radio Constructor, 57 Maida Vale, W.9.

Chassis

16 S.W.G. ALUMINIUM. FOUR FULL SIDES

6" × 4" × 2" **4/–**, 7" × 5" × 2" **4/6**, 9" × 8" × 2½" **6/–**, 10" × 8" × 2½" **7/–**, 12" × 8" × 2½" **7/6**, 12" × 9" × 2½" **8/6**, 14" × 10" × 2½" **9/6**, 16" × 10" × 3" **11/–**.

VALVES. 6J5, 6C5, **5/–**; 6K7, 6K6, 6J7, 25Y5, **7/–**; 6X5, VT52, 6V6, 6U5, **7/6**; 6SN7, Y63, 6J6, **8/6**; 5R4, 6SL7, **9/–**; 5V4, 5U4, **9/6**; 1H5, 1N5, **11/–**.

MAINS TRANS. 200/250v, 250/0/250 80 MA 0/4/6.3v 4amp, O/4/5v 2 amp, 350/0/350 80ma ditto, **20/–** each.

VOL. CONTROLS. ¼, ½ and 1 meg **2/9**, W/SW **3/9**.
Please add postage. C.O.D. EXTRA

ELMO PRODUCTS
230a UTTING AVENUE, LIVERPOOL 4

Have Your Copies Bound

VOLUMES OF
RADIO CONSTRUCTOR
FULLY BOUND IN IMITATION LEATHER WITH GOLD LETTERING. 8s. 6d.
POST FREE. PRICES FOR OTHER PUBLICATIONS ON APPLICATION

If not required to be bound in remove covers before sending

A. QUICK & CO LTD
OXFORD HOUSE
CLACTON-ON-SEA · ESSEX

www.americanradiohistory.com

RADIO CONTROL FOR MODEL SHIPS, BOATS AND AIRCRAFT. 8/6
THE OSRAM 912 AMPLIFIER. 3/6
THE MULLARD 5-10 AMPLIFIER. 2/6
AMPLIFIER MANUAL NO. 3. *by J. S. Kendall.* 3/6
BERNARDS VALVE MANUAL NO 1. 5/–
BERNARDS VALVE MANUAL NO. 2. 5/–
BERNARDS VALVE SUBSTITUTION MANUAL. 5/–
THE EMPEROR RADIOGRAM CONSTRUCTION BOOK, *by Walter J. May.* 3/6
THE BOY'S BOOK OF CRYSTAL SETS 2/6
PRACTICAL TRANSISTORS AND TRANSISTOR CIRCUITS, *by J. S. Kendall.* 3/6

Packing and post 3d. per book extra

Trade Enquiries Invited

KENDALL & MOUSLEY

(Technical Books Dept.)

18 Melville Road, Birmingham 16

RADIO LABORATORY HANDBOOK *by Wireless World* 25/–
TELEVISION EXPLAINED *by W. E. Miller* 5/–
RADIO VALVE DATA *by Wireless World* 3/6
Mandl's TELEVISION SERVICING 44/–
MODULATORS AND FREQUENCY CHANGERS *by D. G. Tucker* ... 28/–
BASIC ELECTRONIC TEST INSTRUMENTS *by Rufus Turner* 32/–
RADIO AND TELEVISION MATHEMATICS 35/–

Please add postage to above prices

Direct from

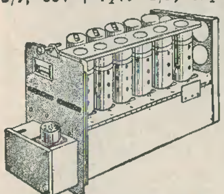
G. & J. BOOKSHOP LTD.

38 Newport Court
Charing Cross Rd. London, WC2

£5 TV TUBES. GUARANTEED 3 MONTHS

TV TUBES. £5. 12". Most types from stock Insured carriage, 15/6. Picture shown to callers. **SPECIAL OFFER** of tubes with burns or cathode to heater shorts, **30/–** plus carriage.

H.T. BATTERIES. 1/9 Alldry min.; 40V + L.T. $1\frac{1}{2}$V 3/9, 60V + $1\frac{1}{2}$V. **3/9**, $67\frac{1}{2}$V personal portable type. **3/9**, 60V. **5/9** Post on H.T. Batteries, 1/9 each.



L.T. BATTERIES. $4\frac{1}{2}$V. New Ever Ready, ideal bell batteries, only **1/–**. Post 6d. (List price, 3/6).

V.H.F. 1124 RECEIVER, 17/6. Complete with valves, 30.5–40 Mc/s IF 7 Mc/s 6 channel switching. Covers TV sound, fire amateurs, etc. Convertible to mains (AC or AC/DC). Drawings FREE. Post 2/6.

METERS, 12/9. 100 micro amp. New and boxed, 2" scale in $2\frac{1}{4}$" square mounting. Post 1/6.

CAR RADIO TRANSFORMER, 5/9. 6 volt, new. Post 1/9.

REAR LIGHTS, 1/9. Ideal side or tail lights. Infra-red glass, easily changed. Post 9d.

SPOT LIGHTS, 8/6. Butler's new, but Ex-W.D. $7\frac{1}{4}$" × $6\frac{1}{2}$" deep. Prefocus fitting. Post 1/6. **BULBS** for above, 6 volt 30, 36 or 48 watt. 12 volt 36 or 48 watt, **4/6** each.

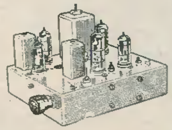
CRYSTALS. Germanium, **1/9** with 3 free circuits. Brand new by B.T.H. Long wire ends. Post 3d.

DUKE & CO.

621 ROMFORD ROAD, MANOR PARK, E.12
GRA. 6677

If you appreciate

HIGH FIDELITY



We are stockists for all the components for the following high quality units.

MULLARD "5–10" amplifier. Full constructional details with wiring diagram, etc., and detailed price list

Price **2/6** *post paid*

G.E.C. "Nine-one-two" amplifier. 9 octaves, 12 watts. Full stage by stage constructional details and detail price list.

Price **3/6** *post paid*

DENCO FM tuner unit. A tried and tested circuit which gives excellent results up to extreme fringe areas. Tunes the whole of the VHF band allocated so will be suitable for all parts of the country as the new stations come into operation. Start building now. Total cost about **£7.** Chassis ready punched with all holes. Full constructional details and price list, **1/6.**

Home Radio of Mitcham

187 LONDON ROAD · MITCHAM
SURREY. MIT 3282

Open until 6.30 p.m. every day inc. Sats. (Wed. 1 p.m.)

CHASSIS AND COVER. Steel chassis 7" x 10" front panel with handles 9" x 8", suitable for mounting new front panel as existing one is over-drilled. Cover 8" x $7\frac{1}{4}$" x $10\frac{3}{4}$" deep. In very clean condition. Price 3/–, post 2/1.

SMALL D.C. MOTORS. Size $2\frac{1}{4}$" long x $1\frac{1}{2}$" wide x $1\frac{1}{8}$" high, frey fitted $\frac{3}{16}$" shaft, operates from 6-12 volt, weight 11 oz. As new **15/6**, post 1/3. 12-24 volt **9/6.** We have sold many of this 12 volt type to model boat builders for use in boats up to 3" 6" long.

GYRO ANGLING UNITS. This unit contains a 24 volt reversible motor worm and spur reduction gearing to a shaft dog which rotates approximately 7 r.p.m., also fitted with pulsing device for operating electrically a repeater compass. This unit is suitable for rotating aerial arays, etc., since by using this unit in conjunction with the repeater compass, exact direction of the aerial can be ascertained by reading from the remote indicator. Price **20/–**, post 2/–.

PILOT'S REPEATER COMPASSES (suitable for working with above unit—Gyro Angling Unit). Pilots repeater compasses or observers repeater compasses, containing 24 volt repeater motor. Ref. number 6B/742. Brand new, price **12/6**, post 1/6.

UNISELECTORS. Siemens miniature 3 banks of 10 contacts. 3 sets of wipers set at 120 degrees. Coil resistance 10 ohms. Stripped from new equipment. Price **27/6**, post 1/6.

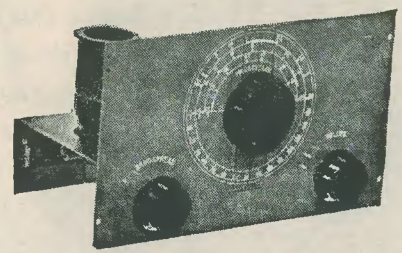
ARTHUR T. SALLIS (RC)

93 NORTH ROAD, BRIGHTON
SUSSEX
Telephone **Brighton 25806**

Enjoy the Thrills of ALL Wave Radio at a

Down-to-Earth Price

Build this Set for **30/–** from our Components.



★ Covers 10–100 metres.
★ World-wide reception.
★ Low drain valve.
★ Picture diagram and instruction for beginners.
★ Assembling time 1½hr.

This 1 valve S.W. receiver can be built from our list of components for **30/–**, including valve and 1 coil covering 20–40 metres. Provision is made to increase to 2 or 3 valves if required, and all components are colour-coded so that the beginner can build this set quite easily. *Send 2/– for specification, wiring diagram, layout and price list to:—*

R.C.S. PRODUCTS (RADIO) LTD

11 OLIVER ROAD, LONDON, E17. Mail order only

YOU CAN RELY ON US

Radio and TV Component Bargains

VALVES
6V6G **7/6**, 6X5G **7/6**, 6X5gt **7/6**, 6SN7 **9/6**, EM34 **7/6**, 6U5G **7/–**, ECC40 **9/–**, EL42 **8/–**, ECC81 **9/6**, 6K7G **7/6**, 6K7(metal) **8/–**, KT63 **7/6**, EF54 **6/–**, EF50 **7/–**, EL32 **7/6**, 12A6 **7/–**, 12SC7 **6/6**, 6J7G **7/6**, 76 **6/6**, 12J5 **4/6**, EB34 **3/6**, EF36 **6/6**, 6B4 **7/6**, 6B8 **7/–**, 6K8G **8/6**, 12K8gt **8/6**, 1T4 **7/6**, 1S5 **7/6**, 1R5 **8/6**, 3A4 **7/6**, R3 **9/–**, 35Z4 **7/6.**

TRANSFORMERS TV
WB107 Line **32/6**, WB106 Frame **25/6**, WB103 Heater **42/–**, WB103A Heater **52/6**, Denco WA/LOT1 Line **42/–**, WA/FMA1 Frame **21/–**, WA/FBT1 F/Blocking **16/–**, Allen LO308 Line **40/–**, FO305 **21/–**, BT314 **15/–**, and Haynes (when available) Osram 912 Amplifier Book **3/6**, all parts stocked.

VOLUME CONTROLS
5K, 10K, 25K, 50K, 100K, 250K, 500K, 1mg, with Switch **4/–**, Less S/W **2/6**, DP Switch **5/6**, Wirewound Preset from 100Ω to 30K **3/2** each. Standard 3w Colvern **6/4.**

TRANSFORMERS
Speaker Trans. Pentode O/P **4/6.** Midget Mains **3/9**, Battery Standard **4/–**, Super-Midget for P/Portables **5/–**. Charging Transformers 2v, 6v and 12v charging at 2a **19/6**, 1v, 2v, 4v, 6v, 10v, 15v, 20v, 30v, up to 15v at 4a 30v at 2a **22/6.** Midget Mains Transformer 60m/a 250-0-250v 6.3v at 3a, 5v 2a **21/6.** Elstone SR/250 or SR350 **28/6.**

SOLDERING IRONS
Tyana Pencil Bit **14/11**, Adcola Pencil Bit **25/6**, Detachable Bit **33/6**, Henley Small Pencil Bit **19/8**, Solon Standard Pencil **25/4**, Oval Bit **23/8**,

LINEAR POTS
$\frac{1}{4}$ mΩ, $\frac{1}{2}$ mΩ, 1 mΩ, 2 mΩ, **6/6.** As above with Centre Tap **7/6.**

COILS
Osmor Full Range **4/–** each, Weymouth 'H' Type **3/9**, 'K' Type **5/–**, CS3W3 **12/3** per pair, CT2W2 **10/–** per pair, Denco Maxi-Q Midget Chassis or Plug-in Type **3/11** each. Full Range of Osmor and Weymouth Coilpacks.

IF TRANSFORMERS
Denco IFT11 **12/–** pair, P4(Weymouth), **15/–** pair, Wearite M800 **21/–** pair, 501/502 **20/–** pair.

Q MAX CHASSIS PUNCHES
$\frac{5}{8}$", $\frac{3}{4}$" **12/4**, $\frac{7}{8}$" **13/4**, 1", $1\frac{1}{8}$". $1\frac{1}{4}$" **16/–**, 1" Square **24/–**. (All inclusive of keys).

RESISTORS
$\frac{1}{4}$w $\frac{1}{2}$w 4d., 1w 8d.. Midget Type 'T' $\frac{1}{2}$w max **6d.**, Type 'R' 1watt max **8d.** Full Range. 2% High Stab. **1/6** each (Range 100 ohms to 2mg). Wirewound max 7 watts **2/3**, 10 watts **2/9** (33 ohms to 10K only).

A BARGAIN
New Tubular 8mfd 500v Wire-End Electrolytics **1/11** each. 2 for **3/6.**

Orders Despatched Promptly, C.O.D. by Return (over £1). Please add P/Pkg. fee up to £1-1/– £2-1/6. Over £2 Free.
Catalogue of Surplus Ready soon 6d. each. Catalogue of New Proprietary Components (250 Illustrations, 70 Pages) 3/– Returnable on Order over 30/–

Next Door South Ealing Tube Station. 6 o'clock, 1 p.m. Wed.

82 SOUTH EALING ROAD
LONDON W5 *Telephone* **EAL 5737**

RADIO SERVICING CO

www.americanradiohistory.com

HENRY'S

RADIO LIMITED

CRYSTAL MICROPHONE INSERTS
8/6
POST FREE
Ideal for tape recording and amplifiers. No matching transformer required.

F.M. FEEDER UNIT
Denco's last word in Audio. Complete kit **£6 7 6**
Fully assembled and aligned at **£8 10 0**
Alignment service **7/6**

PYE 45 Mc/s STRIP Type 3583 Units. Size 15"×8"×2". Complete with 45 mc/s Pye Strip, 12 valves 10 EF50, EB34 and EA50. Sound and vision can be incorporated on this chassis with minimum space. New condition. Modification data supplied. Price **£5** *carriage paid*

INDICATOR UNIT TYPE 182A. This unit contains VCR517C Cathode Ray 6" Tube complete with Mu-Metal Screen, 3 EF50, 4 SP61 and 1 5U4G valves. Offered Brand NEW (less relay) in original packing case at **67/6**, *plus* **7/6** *carriage*. **Demonstration Model now on view, completely modified as per the article now being featured in this issue. All components for conversion can be supplied.**
Kit of modification parts and "182A" Unit **£8 18 6**
carriage paid

CATHODE RAY TUBES
VCR97 **40/–** *car.* **2/–**
VCR517C **35/–** *car.* **2/–**
VCR139A **35/–** *car.* **2/–**
Guaranteed for TV
3BP1 **30/–** *car.* **2/–**

T.C.C.—.1 5/7000 v. wkg. Type CP58QO. Bakelite Case, **7/6** each

We have 20,000 American & B.V.A. valves in stock

ALL VALVES NEW AND GUARANTEED

1R5 7/6
1S4 7/6
1S5 7/6
1T4 7/6
1C5 8/–
3A4 9/–
3V4 7/6
3S4 7/6
5Z3G 8/6
5U4G 8/6
5Z4G 8/6
6A7G 8/6
6AC7 6/6
6A8G 8/6
6AM6 9/–
6B8 7/6
6C5GT 5/–
6C6 6/6
6D6 6/6
6F6G 8/6
6G6G 6/6
6H6GT 5/–
6J5GT 5/–
6J6 9/–
6AK5 9/–
6J7G 6/6
6K7G 6/6
6K8G 9/–
6L6G 10/–
6U5 7/6
6U5G 7/6
6N7GT 7/6
6Q7GT 8/6
6SJ7GT 8/6
6X5G 8/6
6SA7GT 8/6
6SQ7GT 8/6
6SG7 7/6

6SK7GT 7/6
6SL7GT 9/–
6SN7GT 9/–
6SC7 10/–
6V6GT 7/6
6AG7 12/6
12A6 7/6
12K7GT 8/6
12K8GT 8/6
12Q7GT 8/6
12SA7GT 8/6
12SQ7GT 8/6
12SJ7 8/6
12SK7 8/6
12SR7 7/6
25Z6GT 8/6
25Z5 8/6
35Z4GT 8/6
35Z5GT 8/6
25A6 8/6
35L6GT 8/6
50L6GT 8/6
42 8/6
43 8/6
75 8/6
80 8/6
866A 15/–
TZ40 37/6
931A 50/–
EA50 2/–
ECH35 12/–
EF54 6/–
EB34 3/6
EBC33 8/6
EF36 6/6
EF39 6/6

EY51 12/–
EK32 6/6
EF91 9/–
EL33 10/–
EL32 7/6
EF50 Red Syl. 10/–
EF50 5/–
SP2 8/6
VP2 8/6
TDD2A 8/6
DK40 9/–
UL41 9/–
UY41 9/–
4D1 4/–
8D2 4/–
9D2 4/–
D41 5/–
KT2 5/–
U52 8/6
U19 10/–
Y63 8/6
MU14 8/6
PL81 11/–
PL82 10/–
PX25 12/6
PY81 10/–
PY82 8/6
KT33C 10/–
KT66 12/6
GU50 12/6
XP2V 4/–
XH (1.5) 4/–
VU111 4/–
VU133 4/–
VU120A 4/–
QP230 8/–

VR105/30 8/6
VR150/30 8/6
CK510AX 5/–
D1 2/–
AC6PEN 6/6
AC5/PEND D 12/6
PEN25 6/6
PEN46 7/6
QP25 6/6
SP61 4/–
SP41 4/–
HL23/DD 6/6
VP23 6/6
VP41 7/6
U22 8/6
ATP4 4/–
TP22 8/6
TH233 10/–
41MP 7/6
42SPT 6/–
215SG 4/–
MS/PEN 7/6
MS/PENB 7/6
VT501 7/6
AC/PEN (7) 10/–
PENDD 4020 12/6
FC13C 10/–
VP4(7) 8/6
ID5 8/6

SETS OF VALVES
Ten EF50 (Ex-Set Brand New Units) 5/– each **45/–**
6K8G, 6K7G, 6Q7G, 5Z4G, 6V6G **37/6**
1R5, 1S5, 1T4, 1S4 or (3S4 or 3V4) **27/6**
TP25, HL23/DD, VP23, PEN25 (or QP25) **25/–**
6K8G, 6K7G, 6Q7G, 25A6G, 25Z5 or 25Z6G **37/6**
12K8GT, 12K7GT, 12Q7GT, 35Z4GT, 35L6GT or 50L6GT **37/6**
12SA7GT, 12SK7GT, 12SQ7GT, 35Z4GT, 35L6GT or 50L6GT **37/6**
PX25's Matched Pairs pair **25/–**
TEN 6AM6 (EF91) **80/–**

VCR97 Brand New. Ideal for 'Scopes. Slight Cut-off **15/–** P.P **2/–**

R.F. UNITS
RF24 20-30 mc/s **15/–** *Post free*
RF25 40-50 mc/s **19/6** *Post free*
RF26 50-65 mc/s **35/–** *Post free*
ALL BRAND NEW WITH VALVES

MORSE PRACTICE BUZZER
Complete with tapper and 4 volt buzzer on baseboard, **6/–**, brand new. *Post paid*

CRYSTALS
200 kc/s, 2-pin (U.S.A.) ... **10/–**
465 kc/s, 2-pin (U.S.A.) ... **10/–**
500 kc/s, 2-pin (British) ... **15/–**

Send postage for new '54 comprehensive 23-page catalogue
Open Monday to Sat. 9 a.m. to 6 p.m. Thursday 1 p.m.

5 Harrow Road, Paddington, W.2

Telephone **Paddington 1008/9, 0401**

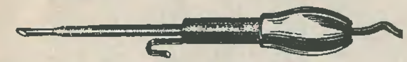
DON'T MISS THIS HANDBOOK!

INDISPENSABLE TO THE AMATEUR TRANSMITTER AND LISTENER

It contains all those details of information which the transmitter and SWL constantly require.
Right up-to-the-minute Amateur Band Prefix lists, both alphabetically and by country, Zone Boundaries, Call Areas, Mileage Tables, QSL Bureaux, "Q" and "Z" Codes, WWV Skeds, and much other information, as well as a selection of maps of DX areas.
Price 2/6, postage 2d.

DATA PUBLICATIONS LTD 57 MAIDA VALE LONDON W9

ADCOLA
(Regd. Trade Mark)
SOLDERING INSTRUMENTS



Reg. Design No. **860302** *(British, U.S. and Foreign Patents)*
Designed for wireless assembly and Maintenance
Supplied for all volt ranges from 6/7v to 230/250v 3/16" Dia. Bit Standard Model 25/6
Sole Manufacturers **ADCOLA PRODUCTS LTD.**
Sales Office and Works **Cranmer Court, Clapham High St. London SW4 (MAC 4272)**

ALL ITEMS POST PAID UNLESS OTHERWISE STATED

VALVE BARGAINS. 1R5, 1S5, 1S4, 3V4, 3S4, 3Q4 **6/–** 1T4 **5/–**, 6V6 **6/–**, ECL80 **7/–**, SP61, VR65 **4/–.**

SPEAKERS. All P/M all 3 OHM, 5 inch **11/6.** 6½ inch **12/6.** 7 inch elip. **13/6.**

CABINET BARGAIN. Ideal for that set to make up and sell or for a spare. Brand new polished walnut veneer finish **16/6.** With TRF or S/het chassis, dial, back plate and 3 knobs **19/–**, post **1/–.**

COMPLETELY ASSEMBLED ready to work 4 valve + rects/het L/M wave, 200–240 volt A/C chassis. To fit our **16/6** cabinet with valves and 5-inch SPEAKER **£5 17 6** 3 valve plus rect TRF for the **16/6** Cabinet L/M wave 200–240 volt A/C **£4 7 6.**

MISC. BARGAINS. Chassis 12X6X2 appx. All drilled for s/het. **3/–**, post 6d.

GERMANIUM DIODES 1/–.

A. BLACKBURN, CENTRAL HOUSE, BURY WHARF, BURY ST., RUISLIP, MIDDLESEX

Teletron Super Inductor Coils

Miniature Dust Core Types
Specified by the designer of the EASI-BUILD Receiver. Type SP/1. **2/6.** Type DM/1 (LW), **3/9.** DM/2 (MW), **3/9.**

Type HAX Crystal Transformer coil as Radio "Head" for recording and quality amplifiers. Free from overlap, **3/–.**

TRANSISTOR Coils of high "Q" Triple wound. Type HMX (MW), **3/–.** HLX (LW), **3/6.**

Type TRF A/HF. Dual Wave matched pairs (*as illustrated*), **7/–.** pr. Postage 3d all types.

Available from leading stockists. Stamp for complete list and circuits.

The Teletron Co. Ltd.
266 Nightingale Road, London N9
Telephone HOW 2527

Trade enquiries to sole distributor:
S. Mozer, 95 Kendal Avenue, London, N.18.

www.americanradiohistory.com

Prices slashed at Clydesdale

INDICATOR UNIT TYPE 166
With VCR-97 Tube and valves, 7/VR91 (EF50), 4/VR54 (EB34), 1/VR116, 1/VR92 (EA50), etc. dim. 20" × 18" × 9½
Used, good condition.
ASK FOR B/H885 — **79/6** each — *CARRIAGE PAID*

INDICATOR UNIT TYPE 166
as above, but less tube and valves.
ASK FOR B/H885A — **32/6** each — *CARRIAGE PAID*

ION TRAP MAGNET ASSEMBLY
(Mfg. Surplus)
Type IT/6 by Elco for 35 mm. tube neck.
ASK FOR B/H919 — **2/6** each — *POST* 3d. *EXTRA*

EX. U.S.N. TEST OSCILLATOR TS-24/ARR2
Low/high frequency battery powered for TBX alignment, H.F signal 245 mcs. L.F. signal tunable 540 to 830 kcs. with valves 2-955 acorn triodes and clockwork time switch with calibrated dial O/30 mins. Unit dim. 9¾" × 7½" × 7", finish black.
ASK FOR B/H364 — **27/6** each — *CARRIAGE* 3/–

PLEASE NOTE. Carriage and Postal Charges refer to the U.K. only. Overseas freight, etc., extra.

Order direct from: *Telephone SOUTH 2706/9*
CLYDESDALE SUPPLY CO. LTD.
2 BRIDGE STREET GLASGOW C.5

It will pay you
to pay us a visit

NOW OPEN!

Here's a new idea in buying your equipment! Just walk around and take your choice—in your own good time—of a wide selection of surplus items. No lists at present. Come and pick your bargains.

The Walk-around Shop
52 TOTTENHAM COURT ROAD, W.1
A few minutes from Lyons Corner House

★ *SPECIAL OPENING OFFER* ★

SURPLUS TEST EQUIPMENT including
Cossor Ganging Oscillators Model 343
Beat Frequency Oscillators
Multi-Range Test Meters by
AVO, EVERSHED-VIGNOLES, FURZEHILL, TAYLOR, etc.
Numerous other items!

ALWAYS AVAILABLE *A large and varied stock of RADIO VALVES, COMPONENTS, RECEIVERS, TRANSMITTERS, TEST EQUIPMENT, etc.*

Open all day Saturday
PROOPS BROS. LTD.
52 TOTTENHAM COURT ROAD, W.1. LANgham 0141
We also have a Walk-around Shop at:
39 CAMBRIDGE ROAD, KINGSTON. Kingston 4614

OSMOR radio products limited

418 BRIGHTON RD. SOUTH CROYDON, SURREY
Dept. R.C.17 *Telephone* **CROydon 5148/9**

COILPACKS. A full range available for Superhet and T.R.F. Mains or Battery. Size only 1¾" x 3½" x 2¼". Ideal for the reliable construction of new sets, also for conversion of the 21 RECEIVER, TR 1196, TYPE 18, WARTIME UTILITY and others.

SEPARATE COILS 4/– each
A full range available for all popular wavebands and purposes.
★Only 1in. high. ★Packed in damp-proof containers. ★Variable iron-dust cores. ★Fitted tags for easy connection. ★Low loss Polystyrene formers.

.F.s **Standard** 465 k/c. Permeability-tuned with flying leads. Size 1⅜" x 1⅜" x 3½". For use with OSMOR coilpacks and others, **14/6** pair. **MIDGET I.F.s** 465 K/c. ¾" x ¾" x 2⅜", **21**/– pair. PREALIGNED **1/6** extra.

FREE Send 5d. (stamps) for fully descriptive literature, including The really efficient 5 valve Superhet Circuit and practical Drawings. 6-valve ditto, 3-valve (plus rectifier) T.R.F. circuit, Battery portable superhet circuit, Chassis Cutter, Coil & Coilpack leaflets and full radio & component lists and interesting Miniature circuits etc.

Our Technical Dept. will be pleased to answer (by letter only) any enquiry relating to circuits in which Osmor Coils or Coil Packs are used or are intended to be used.

VALVES NEW TESTED AND GUARANTEED

1A4	8/6	6BS7	8/6	8D3	7/6	EBC33	8/6
1A7GT	12/6	6F8G	8/6	12AH7	7/6	ECH35	11/6
1B4	8/–	6G6G	5/9	12AT6	8/6	ECL80	12/6
1C5GT	11/6	6J5G	5/–	12AT7	8/6		
1E7	9/6	6J7G	8/6	12AU7	8/6	EF22	7/6
1H5GT	10/6	6K6	8/6	12AX7	6/9	EF37A	15/–
1N5GT	10/6	6K7G	5/6	12Q7GT	8/6	EF36	7/6
1R5	7/9	6K8G	8/6	25A6	8/–	EF39	6/6
1S5	7/9	6K8GT	8/6	57	7/6	EF80	10/6
1T4	7/9	6L6G	9/6	58	7/6	EF91	7/6
3S4	7/9	6N7	6/9	5763	8/6	EF92	8/6
3V4	7/9	6Q7G	8/6	807	8/6	EL32	7/6
5Y3GT	9/6	6Q7GT	8/6	954	2/6	EL91	10/6
5Z4G	8/6	6SJ7	8/6	1625	10/6	EZ35	8/–
6AG5	6/9	6SK7	8/6	9006	5/6	EZ40	9/6
6AM6	7/6	6SL7	8/9	AZ31	10/6	GZ32	15/–
6AT6	8/6	6SN7	8/6	DAF91	7/9	KT32	8/6
6BE6	8/6	6SS7	6/9	DF91	7/9	KT33C	8/6
6BW6	8/6	6U7G	8/6	DL92	7/9	ML4	7/–
6B7G	8/6	6V6GT	8/6	DL94	7/9	PL82	10/6
6B8	7/6	6V6G	8/6	EA50	2/–	PY82	10/6
6B8G	7/6	6X4	8/6	EAC91	6/–	VR91	8/6
6BA6	8/6	6X5GT	8/–	EAF42	9/6	U50	9/6
6BR7	8/6	7H7	8/6	EB91	6/6	6FG6	8/6

MATCHED PAIRS 6V6G and gt, **17**/–; 6F6G, **17**/–; KT66, **25**/–; 6G6, **12**/–; 6J5G and gt, **9/6** per pair. 6K8G, 6V6G, 6Q7G, 6K7G, 5Z4G, **34/6** per set. 1R5, 1T4, 1S5, 3S4, **30**/– per set.

ELECTROLYTIC CONDENSERS
2 mfd, 350vw T.C.C., **1/3**; 8 mfd, 350vw, T.C.C., **1/6**; 8 mfd, 450vw B.E.C., **1/9**; 32 mfd, 450vw, B.E.C., **4/6**; 8+8 mfd, 450vw B.E.C., **3/9**; 8+16 mfd, 500vw, Dub., **4/9**; 8+8 mfd, 500vw, Deb., 4/–; 32+32 mfd, 275vw, B.E.C., **4**/–; 12 mfd, 50vw, T.C.C., 1/–; 20 mfd, 12vw, T.C.C., 1/–; 25 mfd, 25vw, T.C.C., **1/3**.

R. COOPER
32 SOUTH END CROYDON SURREY
Telephone CROydon 9186

SMALL ADVERTISEMENTS

Reader's small advertisements will be accepted at 3d per word, minimum charge 2/–. Trade advertisements will be accepted at 8d. per word, minimum charge 6/–. If a Box Number is required, an additional charge of 1/– will be made. Terms: Cash with order. All copy must be in hand by the 10th of the month for insertion in the following month's issue.

PRIVATE

NEW VALVES, all guaranteed. PEN383, EY51, 9/–. EF80, PY81, ECL80, 8/6. 1OF1, 6Q7, 12Q7, 12K8, 6P25, 7/6. 6AG5, 6U7, 6J5GT, 6SK7, 12SK7, 12SG7, VR91, 5/6. Also used but guaranteed: B36, Z77, U404, 4/–. W. Fewell, 308 Nisbet House, Homerton, London E.9.

FOR SALE. 6" TV, complete, good working order enlarger, £12. SAE enquiries. W. Nicholls, 8 Bellamy Drive, Stanmore, Middx.

FOR SALE. Two Canadian 58 Mark 1 Trans-Receivers, cases, accumulators, phones, mics, aerials, vibrators. £12. "Wireless World" amplifier, 4 watts, undistorted, P.P., Mains Trans., 200mA, 6 and 4 volt. £8. C. Limb, 222 Goldhawk Road, London, W.12.

TUITION. Expert private tuition given in Radio and Mathematics (London). Terms moderate. Box No. D134.

FOR SALE. 1224A receiver, re-valved, phones, £4. 1082 less coils and one dial, £1. Radio Mail resistance capacity bridge, rexine case and phones, 10/–. Plenty of valves and spares cheap, must clear, callers only. Otter, 144 Victoria Road, Kirkby-in-Ashfield, Notts.

VALVES. Two VT61A, two EF50, 6K8, 6Q7, 6J5, CV284, all new, 35/–. Foreman, 7 Laurence Road, Romford, Essex.

FOR SALE. Ex-Government short wave 208 receiver, also partly constructed 12" TV with tube and valves. Barber, 18 St. Peter's Avenue, Cleethorpes, Lincs. Tel. 61440.

FOR SALE. Rotary Converter, 24 volts D.C. in, 230 volts AC out, at 120 watts, £5. Ideal for RAEN, mobile work or to run radio in boats, caravans, etc. Box No. D135.

WANTED Component values for WS38, condensers and resistors, etc. Fernie, 47 Princes Gardens, London, S.W.7.

WANTED UCL11 valve. Saywood, 7 Grange Road, South Harrow, Middx.

TRADE

RADIO UNLIMITED. "Return of Post" service. New valves, 6K7G, 4/–, 39/– doz. 6L6G, 5U4G, 8/6 each, 90/– doz. 6SN7, 6SL7, 6BE6, 6BA6, 6BW6, 6J7M, EL32, EF39, 7/– each. Fil/trans. 200/240V, 6V at 1.5A, 5/6. Coilpacks 3-wave, L.M.S., 24/6. Elip 7" × 4" speakers, 18/6. Radio Unlimited, Elm Road, London, E.17.

CRYSTAL RECEIVERS with Teletron Coil and B.T.H. Germanium, two outputs, phone and recording, 14/6, postage 9d. SAE photo and useful hint. T. Wilkinson, 42 Frances Road, Windsor, Berks.

COMPONENTS. Weymouth, Maxi-Q, Osmor, radio and TV components, valves, chassis. F.M. Tuner Units, etc., built to order. Curtis Radio 22 Elmore Road, Luton, Beds.

"GLOBE KING" (Regd.) Miniature Single Valve Receiver gets real Dx. Amateur Radio enthusiasts should send for free copy of interesting literature and catalogue (enclose stamp for postage). Write to makers: Johnsons (Radio), 46 Friar Street, Worcester.

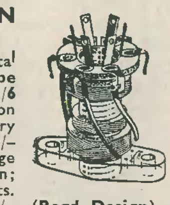
[*continued on page 192*

VALVES—OVER 3,000 IN STOCK

6AM6, EF91, 8D3, Z77, W77, EF92, 9D6, 6AL5, D77, EB91, EAC91 ... ... 5/–
12AT7, 6BR7, 6CH6, 6BW6, 6F33, EC91, EL91, 6AM5, 6AK5, CV284, CV286 ... ... 7/6
SKILLMAN, FRANCHISE ST., WEYMOUTH

NEW! **RADIO AND TELEVISION COMPONENT CATALOGUE**
available on request to
J. T. FILMER
MAYPOLE ESTATE, BEXLEY, KENT
Telephone: Bexleyheath 7267

REP HIGH GAIN COILS



Dual Range Miniature Crystal Set Coil with Circuit. Type **DRX1** 2/6
Dual Range Coil with Reaction with 2 mains and 2 battery Circuits. **Type DRR2** 4/–
Matched Pair Dual Range T.R.F. Coils with Reaction; with battery and mains circuits.
Type DRM3 ... Pair 8/– **(Regd. Design)**
★ All Coils wound on Low-loss Formers
★ Individually Tested and Guaranteed
★ *Post 3d. on all Orders* ★ *Trade Supplied*
RADIO EXPERIMENTAL PRODUCTS LTD
33 MUCH PARK STREET COVENTRY

TELEKIT SUPPLY

Mail Order Dept.
CHANTRY LANE WORKS, CHANTRY LANE, BROMLEY, KENT
Telephone: RAV 5845

When ordering, please mention RADIO CONSTRUCTOR and enclose 6d. postage

NEW Earphones. 150 ohms, 8/6 pair.
BUZZERS, new (miniature) Chrome Plated, 6 or 12 volt (Twin Coil), 3/– each.

VALVES, New and Surplus Guaranteed

1B24	50/–	6BE6	6/6	7S7	6/–
1L4	5/6	6BR7	8/6	5763	8/–
*1LN5	5/–	6BS7	7/–	9D2	5/–
1S5	6/6	6BW6	6/6	9D6	6/6
1T4	6/6	6CH6	6/6	*12A6	5/–
1U5	6/–	6J5	5/–	11D3	6/–
3V4	6/6	6K7	4/–	12BE6	7/–
6AL5	7/6	*6SH7	5/–	*1299	5/–
6AM6	6/–	6V6	7/–	15D2	4/–
6AT6	7/6	6X4	6/6	19AQ5	10/–
6A8	8/–	6X5	7/6	AL60	4/6
6B8	6/–	7D5	6/–	EF50	5/–
6BA6	6/6	7D8	6/–	OZ4	4/–
W77	6/6	7H7	6/–	VR21	3/–

*Soiled

Ammeters (Hot Wire), 0–10 amps, diameter of meter 5½". *New in maker's original cartons,* 15/– including post and packing.
Please send us your enquiries for Valves and all Radio parts, etc.

NEW RETAIL SHOP NOW OPEN AT 104 HIGH STREET, BECKENHAM, KENT

www.americanradiohistory.com

Frequency Modulation Feeder Units

for studio quality, noise free reception of B.B.C.'s experimental transmissions from Wrotham. Tunable 88–100 Mc/s. Latest type valves used. Line up:—1-R.F. Frequency Changer. 2-IF. Ratio Discriminator. A.F. output to existing equipment. Power supply needed: 250v at 50mA, 6.3v heaters.

Kit less valves	£5 17 0
Kit with B.V.A. valves ...	£10 8 0
Kit with surplus valves ...	£8 3 8
Assembled and air tested ...	£12 0 0
Assembled with surplus valves	£9 15 0

These units use well-known manufacturers I.F.'s and R.D. transformer and are built to their specification. Within 30 miles of transmitter good results are obtainable with 1-IF. stage. Prices then reduced to:

Kit less valves	£5 6 6
Kit with B.V.A. valves ...	£9 0 6
Kit with surplus valves ..	£7 4 6
Assembled and air tested ...	£10 12 6
Assembled with surplus valves	£8 16 6

All with circuit, point to point wiring diagram and constructional details. Circuit only 1/8 post free, refundable if kits or units are purchased.

Components for above units supplied separately. Completely drilled chassis with screens, 7/6; IF Transformers, 6/– each; Ratio Discriminator Transformers, 12/6 each; Aerial, R.F. & Osc. Coils, 3/11 each; Tuning Condenser, 6/6. Small calibrated dial and pointer knob 1/6. Valve Holders with screening cans, B7G & B9A, 1/3 each. Allorders over £1 post free

Demonstrations given Monday to Friday, day and evening. Saturday, evenings only.

Cash with Order please

Radio & Electrical Service

7 Plender Street

Camden Town · London N.W.1.

Telephone EUSton 3155

REPORT PADS

REPORT/REPLY RATIO LOW ?

Then send a report which contains all the information a station requires. Each pad contains 50 printed forms detailing the headings under which reports should be made. Your QSL returns will be much higher if you use these properly prepared reports. Printed on a high quality paper suitable for airmail transit they cost only 3/9 post paid.

Orders with remittance to

DATA PUBLICATIONS LTD
57 MAIDA VALE LONDON W9

SMALL ADVERTISEMENTS

continued from page 191]

BLUEPRINTS. High Gain 10 Metre Converter, with a de-luxe circuit comprising EF91 RF stage, ECC91 double triode mixer and oscillator, EF92 IF amplifier, with stabilised voltage supply via a 7475, 1/8 post free with full instructions, Data Publications, 57 Maida Vale, London, W.9.

KENDALL AND MOUSLEY. Manufacturers of Laboratory Equipment, chassis and instrument cases, also suppliers of B.V.A. valves, Radio and TV components, 99 Dudley Port, Tipton, Staffs.

COILS, COILS, COILS. We can supply coils for all frequencies, RF Chokes, Filters, etc. Coils wound to specification – send details for estimate. Send SAE for circuits and Data. The Teletron Co. 266 Nightingale Road, London, N.9.

I.P.R.E. PUBLICATIONS, 5,500 Alignment Peaks for superhets, 5/9. Sample copy *The Practical Radio Engineer*, 2/–. Membership examination particulars, 1/–. Syllabus of TV and Radio Courses free and post free. Secretary, I.P.R.E., 20 Fairfield Road, London, N.8.

METALWORK. Al types cabinets, chassis, racks, etc., to your own specification. Philpott's Metalworks, Ltd. (Dept. R.C.), Chapman Street, Loughborough.

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 Telecommunications R.T.E.B. and other professional examinations. Train with the College operated by Britain's largest Electronic Organisation, Moderate fees. Write to E.M.I. INSTITUTES, Postal Division. Dept. RC28, E.M.I. Institutes, London, W.4.

OSMOR – for efficient coils, coilpacks, etc. Send 5*d*. stamp for FREE circuits and lists. Dept. RCC, Osmor Radio Products, Ltd., 418 Brighton Road, South Croydon, Surrey. Telephone Croydon 5148/9.

JOIN THE ISWL. Free services to members including QSL Bureau, Translation, Technical and Identification depts. Dx certificates, contests, and activities for the SWL. Monthly magazine 'MONITOR' duplicated, containing articles of general interest to the SWL and League members, 10/6 per annum, post free. ISWL HQ, 86 Barrenger Road, London, N.10.

ANNOUNCEMENT. A. Jerome Alcock, Cheadle, Stoke-on-Trent, regrets that he is unable to accept orders for bookbinding until further notice, which will be published in this Journal.

PANL, the air-drying crackle finish. In black, green and brown at 3/6 per 1/8th pint can, post paid, from – G. A. Miller, 8 Kenton Park Crescent, Kenton Middx.

TELETRON SUPER INDUCTOR COILS

as specified for the EASI-BUILD

DM/1	Long wave coil	3/9
DM/2	Medium wave coil	3/9
SP/1	Reaction choke	2/6

Obtainable from your local stockist, or, in case of difficulty write to:

THE TELETRON CO
266 NIGHTINGALE ROAD . LONDON N9
Telephone HOW 2527

THE JASON 3-SPEED GRAMOPHONE MOTOR

A motor designed to suit the most critical taste at a reasonable cost. The cast aluminium turntable is accurately machined and is fitted to a hardened steel shaft turning on a steel thrust ball in a well bearing. The weight of the turntable ensures freedom from rumble and wow.

The speed selector for 78, 45 and 33 1/3 consists of an accurate rubber tyred idler wheel which engages a three-step motor pulley. When the motor is out of use the idler wheel is withdrawn from the motor pulley and turntable to prevent deformation of the rubber, thus preventing the appearance of "flats."

A small variation allows the motor to be set to exact speed irrespective of mains voltage or frequency fluctuations.

The whole unit is mounted on a sturdy cast base and is finished in a stove enamel.

Price of complete unit **£14 18s. 2d.** This includes the cast aluminium base, turntable and drive unit and special motor.

All parts available separately

JASON MOTOR COMPANY

328 CRICKLEWOOD LANE LONDON NW2

www.americanradiohistory.com