RADIO SHOW REVIEW

Practical Wireless

9d. EVERY MONTH

Vol. 23 No. 495. || Editor: F. J. CAMM || OCTOBER, 1947

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PRINCIPAL CONTENTS

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Range	Diam.	Ext. Res.	Fitting.	Type.	Price.
300 v.	3½"	15K	Flush	M.I.A.C.	7/6
500mA.	3"	—	Proj.	M.C. D.C.	12/6
250/250/mic/A.	2"	100	Flush	M.C. D.C.	7/6
40 v.	2"	8 K	Flush	M.C. D.C.	7/6
2½ a.	2"	—	Flush	Thermo. H.F.	7/6
4 a.	2½"	—	Port.	H.W. H.F.	3/6
3 KV.	3½"	1 meg.	Flush	M.C. D.C.	20/-
20 a.	3"	—	Flush	M.C. D.C.	7/6
40 a.	2"	—	Flush	M.C. D.C.	7/6
25 a.	3½"	—	Flush	M.C. D.C.	7/6
25 a.	3½"	—	Proj.	M.C. D.C.	7/6
25 a.	3½"	—	Flush	M.I. D.C.	7/6

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Type 3.—500-0-500 v. 150 m/a 4 v. 2½ a., 4 v. 1 a., 4 v. 5 a. 35/-.

Type 5.—450-0-450 v. tapped at 300 v. 150 m/a., 4 v. 3-5 a., 4 v. 3-5 a., 30/-.

Type 35.—350-0-350 v. 250 m/a., 4 v. 3-5 a., 6.3 v. 5-7 a., 6.3 v. 1-2 a., 35/-.

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Practical Wireless and PRACTICAL TELEVISION
15th YEAR OF ISSUE
EVERY MONTH
VOL. XXIII. No. 495. OCTOBER, 1947.
Editor F. J. CAMM

COMMENTS OF THE MONTH

BY THE EDITOR

Radiolympia

AGAIN we present our readers with a Show Number. It is not an issue comparable to those packed pre-war numbers by means of which we were enabled to record for those unable to visit the Show a digest of all that was new and interesting at this great trade show which brings under one roof the whole of the industry. We published weekly then, and produced three Show Numbers with special features.

Now we publish monthly, owing to paper controls and restrictions, and hence our Show Report has had to be compressed into one issue and to reflect the austerity of the times.

Readers will, however, find within these pages a fair and full report of all that is new up to the time of going to press, and our next issue will contain a report of any new disclosures made on the eve of the Show.

A cordial welcome is issued to all readers visiting the Show to call at our Stand, No. 239 on the Ground Floor.

There is no doubt that the Show will be a great success. The lacuna of six years has whetted the appetite of that greatly augmented army of wireless enthusiasts. Apart from members of the public who will mostly be interested in commercial receivers, there is that new band of enthusiasts who made their first contact with the technical side of radio by their war training in the various wireless branches of the Services. They are all keen constructors, and we have no doubt that component manufacturers will be inundated with requests from them for components which are not yet available.

For, make no mistake about it, members of the trade, the demand for components is as great as ever, as the sales of our blueprints bear witness. You have been slow in getting off the mark, and in some cases have been neglectful of the public upon which you founded your businesses. If you do not soon cater for this large public, other firms will come into the field and supply the goods which are so keenly required by tens of thousands of skilled amateurs.

The constructor public now differs from that of pre-war. Most of them have had intensive technical training, which is reflected in the more technical nature of the contents of this journal. We do not, of course, neglect the very beginner; it is our duty to bring him along as we have so successfully done in the past. Many, indeed, of those holding high rank during the war owe their promotion, as they so readily admit, to the knowledge they have gained from this journal and our series of handbooks.

We wish that Radiolympia, the 15th of the series, could have been held in an atmosphere of higher national enthusiasm, free from restrictions and controls, but that has not been found possible. But for the war this would have been the twenty-second Radiolympia. It seems a long time since those tragic days of 1939 when the 14th Show came to such an untimely end. Many of the old firms have fallen by the wayside, but many new ones have come into existence. There are new models, television, and new components worthy of inspection, and we look forward to chatting with all those readers who visit our Stand, and with whom we have been out of personal contact for nearly eight years. We cannot promise them that there is anything radically new at the Show and we suspect many of them will be drawn to it by pure nostalgia.

There is, however, a novelty section, and the latest television receivers are worthy of close attention. There are also to be various meetings and conventions of Radio Institutions and Societies, including the Television Society. In the novelty section you will be able to see a radio controlled model train, infra-red demonstration, electrostatic and intercommunication alarm equipment, demonstrations of the reflection Klystron Valve, the transmission of sound-light, radar transmission and reception, and the new sound and picture reproducer.

We wish it had been possible to give in this issue constructional details of a receiver incorporating some of the latest components, as was, indeed, our practice before the war. Unfortunately, at the time of going to press manufacturers are not yet ready to deliver. Readers may rest assured that when components are to hand we shall incorporate them in one of our guaranteed circuits.

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ROUND THE WORLD OF WIRELESS

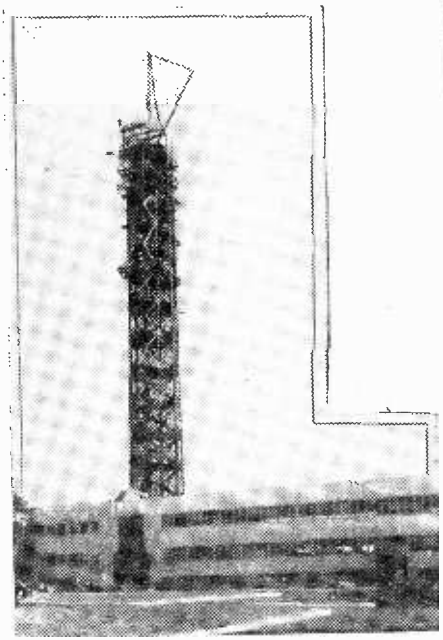
Airmec International Inc.

IN order to make the fullest use of opportunities of trade within the United States, the Board of Radio and Television Trust, Ltd., have formed a corporation in U.S.A. under the above title.

The board of directors of this corporation are Mr. R. W. Cotton, president; Mr. L. D. Bennett and Mr. H. R. Kent. The corporation is located at 347, Madison Avenue, New York 17, N.Y.

Emergency Lighting

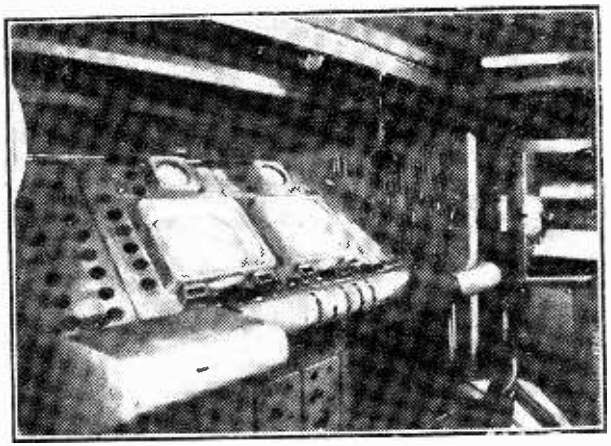
IN order to ensure that the continuity of the lighting will not be broken even momentarily in the event of a mains interruption, the managements of the following places of entertainment, Opera House, Jersey, Majestic Picture House, Liverpool, Grosvenor Sports Arena, Southport, have decided to install "Keepalite" automatic emergency lighting equipment, manufactured by the Chloride Electrical Storage Co., Ltd., of Clifton Junction, Nr. Manchester.



A 300-foot tower erected to house radio laboratories at Nutley, New Jersey. A total of 800 tons of steel was used for this tower, built by the U.S. Steel's American Bridge Company. Experiments carried out in this tower will probably make possible broadcasting of many programmes on a single channel, and multi-channel telephony by pulse time modulation.

Railway Radio

WAVELENGTHS have been allotted to the railways to cover their immediate radio-communication needs. This was recently announced by the P.M.G. in reply to a question in the House. At present the work being undertaken is purely experimental and will probably consist of communication between signal boxes and goods shunting yards.



The interior of one of the new Pye Mobile Television units. This is housed in a "shooting brake" type of car with telescopic reflector type aerial mounted on the roof.

Stolen Set Problem

OWING to the difficulty of identifying a stolen radio set the N.S.W. Commissioner of Police and the I.R.E. (Aust.) Standards Committee have discussed ways and means of overcoming the trouble. It was eventually agreed that serial numbers on sets should conform to the following requirements:

1. Numbers to be stamped on chassis by metal punches, with letters not less than $\frac{1}{16}$in. high.
2. Numbers to be visible without removing chassis from cabinet.
3. Standard position to be on chassis rear strip with numerals upright reading from left to right.
4. Numbering to be carried out before plating or finishing.
5. A manufacturer's identifying mark to be included adjacent to the serial number.

Telephone Service with the Belgian Congo

THE Postmaster-General announced that telephone service with the Belgian Congo was reopened on Monday July 21st, and is available from 9.30 to 11.30 a.m. daily, and from 3.30 to 5.30 p.m. on weekdays. The charge for a call of three minutes' duration is £3.

Colonial Radiotelephones

SIX British colonial territories were provided with extended radiotelephone facilities during July.

Kenya was linked by radiotelephone with Australia, India, Barbados and Bermuda.

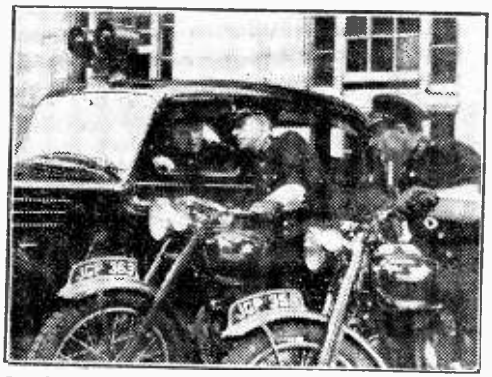
Barbados and Bermuda with India, South Africa and Australia.

Ceylon with South Africa and Australia.

Trinidad with Tobago.

The circuits are provided by Cable and Wireless in Kenya and Ceylon, and by Cable and Wireless (West Indies) in Barbados, Bermuda and Trinidad.

The charge for a three-minute call between Ceylon and Australia is £3, and between Trinidad and Tobago 7s. 6d. On the remaining circuits the charge is £3 15s. for a three-minute call.



London's new Traffic Control car and motor-cycle patrols were recently demonstrated. The patrol car is in radio-telephonic communication with H.Q., and is able to send a motor-cyclist policeman rapidly to any point where road accidents, traffic congestion or other "jams" have occurred.

Broadcast Receiving Licences

THE following statement shows the approximate number of licences issued during the year ended June 30th, 1947.

Region	*Number*
London Postal	2,039,000
Home Counties	1,429,000
Midland	1,551,000
North Eastern	1,668,000
North Western	1,433,000
South Western	930,000
Welsh and Border	620,000
Total England and Wales ..	9,670,000
Scotland	1,038,000
Northern Ireland	154,000
Grand Total	10,862,000

Prosecutions in June for operating sets without a licence numbered 458.

Radio Amateurs' Examination

A COURSE covering the syllabus of the Radio Amateurs' Examination of the City and Guilds of London Institute will be held during the 1947-1948 session at the Brentford Evening Institute. The institute is situated in Boston Manor Road at the rear of Brentford Library and is on the 97 bus and 655 trolley bus routes.

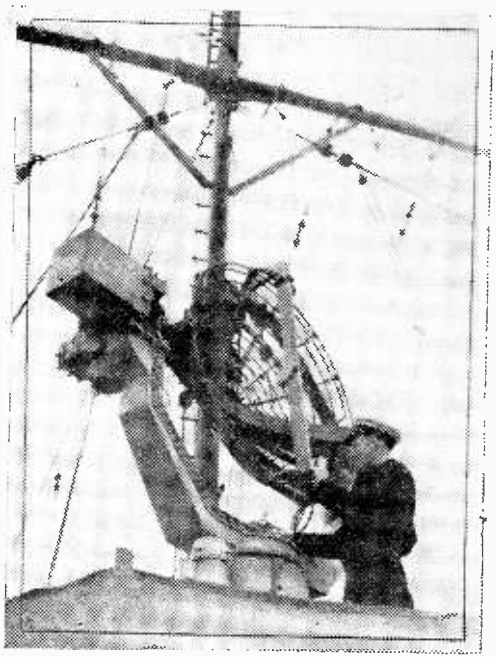
Classes commence in the week beginning September 22nd, but the enrolment week begins on September 15th, when, from Monday to Friday 7 to 8.30 p.m., the head of the institute and his staff will be present to advise and enrol intending students.

The course will continue up to the date of the examination (which is probably in May, 1948), and the fees are: students under 16 years of age, 2s. 6d.; students over 16 years of age, 5s. Full details of this and other technical courses may be obtained from the prospectus, which is available on application to the Principal, Chiswick Polytechnic, Bath Road, Bedford Park, London, W.4.

Atlantic Weather Ship

AT an International conference held in London in October, 1946, eight nations agreed to set up and operate weather reporting ships at 13 places in the North Atlantic. These ships are known as Ocean Weather Ships. And the *Weather Observer*, the first of the Air Ministry's four weather ships, which is to be stationed in the Atlantic, visited London docks recently before leaving to take up her station.

The vessel, which will be based on Greenock, will be at sea for 27 days at a time, patrolling either an area off the south of Iceland or about 300 miles west of the Irish coast. Formerly H.M.S. *Marguerite*, a "Flower" class corvette serving with the Royal Navy, the vessel is commanded by Captain N. F. Israel, who served in the Royal Navy Reserve during the war and received the D.S.C. for his part in enemy submarine destruction.



The special radar aerial mounted on the Ocean Weather Ship "Weather Observer," which recently visited London docks.

A Short-wave Battery Three

Final Details of the Novel Receiver Described Last Month

By R. L. G.

IT will be found preferable to cut and drill the necessary holes before bending the chassis, but it is best to leave the drilling of the hole for the slow motion tuning dial until after the actual assembly of the chassis and front panel. The exact drilling centre can then be accurately determined by assembling the condensers on their brackets, together with the extension spindle, and sliding out the ¼in. spindle, or shaft, until it touches the front panel. The central point of this spindle or shaft can then be marked, the condenser assembly removed, and the necessary hole drilled.

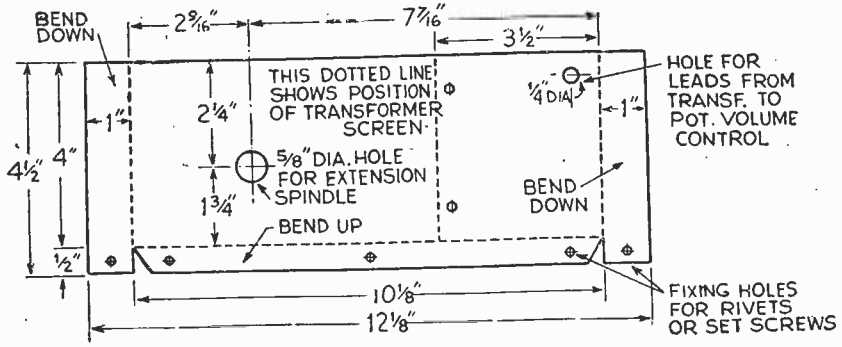


Fig. 6.—Cutting, bending and drilling details for the central screening panel.

The front panel with the centres for the controls is seen in Fig. 5. It will be noted that the two sides are turned back. This not only helps for rigidity, but also eliminates the necessity for additional panel supporting brackets. The panel is secured to the upturned flange of the chassis by three rivets or set screws, with an additional rivet or set screw through the bottom of each side-piece.

The controls will be found most convenient in use, and the author has on occasions operated the set with one hand only, the side of the hand resting lightly on the reaction control, whilst operating the tuning control with the forefinger and thumb.

Coils

A pair of these are shown in Fig. 9 together with the base connections as seen from under the chassis. They are home wound, using 8 ribbed formers of 4-pin variety.

Both grid windings are identical and wound with quite thick gauge tinned copper wire—the turns being spaced by the thickness of the gauge. This will be found quite a tricky business, and 20/22 s.w.g. will be about the thickest that can be handled on such formers without the danger of fracture. The wire should, preferably, be anchored in a vice, stretched taut, and the former turned until the required number of turns are on. The fixing or soldering of the end will also need some patience.

Both windings on the two coils are in the same direction. The reaction winding will, of course, need a thinner gauge wire to accommodate the turns, but this should not be too fine a gauge—26 gauge enamelled will be found quite suitable.

As a guide, the author uses a pair of coils regularly for 20 metre listening. On these the amateur "ham" band approximates to the 100 point on the 180 deg. scale.

R.F. Coil

Grid winding, 10 turns 22 s.w.g. Dipole, 5 turns 24 s.w.g. enamelled. Spacing between windings, ⅜in.

Detector Coil

Grid winding, 10 turns 22 s.w.g.

Reaction, 9 turns 26 enam.

Both spaced one gauge of respective wires.

Distance between windings, ⅜in.

If these coils are accurately wound they should match, and only very slight adjustment of condensers on the shaft should be necessary, but the reader should aim at getting the coils to match correctly, then no constant adjustment of gauging will be necessary for each change of a pair of coils.

H.T.+2 should go to 120 volts, whilst H.T.+1

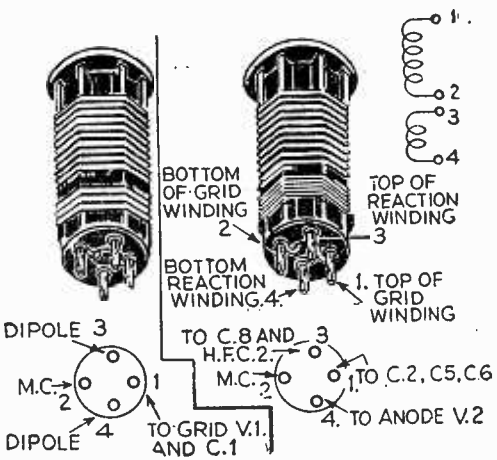


Fig. 9.—Constructional and connection data for the two types of coil used in the Short-wave Battery Three.

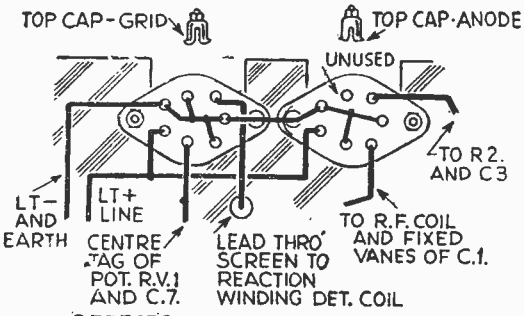


Fig. 7.—Wiring details for valve holders of V.1 and V.2, as viewed from Point "X" in Fig. 3.

whilst with the pentode in use, and a negative bias of 4.5 volts a reading of 5/6 mA was obtained.

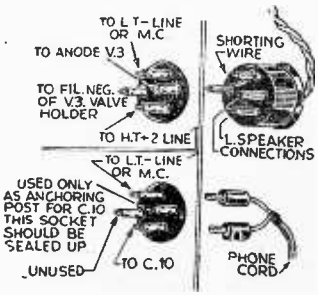


Fig. 8.—Loud speaker and phone panels, showing wiring details.

Volume on speaker is quite adequate for comfortable listening in a normal-sized room. The author uses

LIST OF COMPONENTS.

C1, C2 and C8—25 $\mu\mu$F. short-wave tuning condensers. Ceramic insulation or equal.

L1, L2, L3, L4—Home wound on 8 ribbed formers 4 pin, 2¼in. long by 1⅜in. across ribs.

1 Slow motion tuning dial.

C3—Tubular fixed non-inductive condenser .1 μF.
C4—Tubular fixed non-inductive condenser .1 μF.
C5—100 $\mu\mu$F. pre-set fixed condenser, on frequentite base.
C6—50 $\mu\mu$F. pre-set fixed condenser on frequentite base.
C7—.25 μF. tubular condenser, paper type.
C9—.0001 μF. fixed type, mica.
C10—.25 μF. (minimum) tubular (blocking cond.).
C11—.1 μF. (decoupling).
C12—.1 μF. tubular.

R1—1,000 ohms (½ watt).
R2—1,500 ohms (½ watt).
R3—4/7 megohm grid leak.
R4—30,000 ohms (1 watt).
R5—20,000 ohms (1 watt).
R6—20,000 ohms (1 watt).
R7—5,000 ohms ¾ or ½ watt (grid stopper).
RV1—50,000 ohms potentiometer.
RV2—100,000 ohms potentiometer.

T1—Audio transformer 1-3 ratio. R.I.

One extension spindle control, Eddystone, 4in. long.
One extension spindle control, Eddystone, 2in. long.
One epicyclic drive—ratio 6 to 1.

Three adjustable type aluminium brackets, 2¼in. max. height—*Can be home made.*
One brass coupling with 4 set screws.
Two 7-pin chassis mounting valveholders (ceramic or frequentite base).
One 7-pin chassis mounting valveholder, ordinary.
Two 4 or 5-pin valve holders (frequentite base).
One 5-pin ordinary base.
One 4-pin ordinary base.
Two small tag boards about 2in. x 1½in. having two soldering tags each.
Two glass tubes ¾in. diameter, 3in. and 2in. long respectively.
One fuse holder and fuse.
One U.S.W. coil base for aerial connections, Eddystone.
One four-point on-off switch (Bulgin).

VALVES
One Mullard VP2, 2 volt.
One Mullard TH2, 2 volt.
One Mullard PM22A, (or equal).
One 4-pin valve base for L.S. connection.
One H.T. battery 120 volt with tappings.
One grid-bias battery, 4½ or 9 volt.
One moving coil L.S. with matching transformer.
One reel 22 s.w.g. tinned copper wire for coils and wiring.
Slip-on sleeving.
One reel 26 or 28 s.w.g. enamelled wire.
Aluminium sheet, plywood, set screws, flex, battery wander plugs, etc.

will be best experimented with. 90/100 volts has been used successfully by the author.

On testing with the 'phones only, with speaker plug removed, the set consumed just under 3 mA., a dipole folded aerial, approximating to a square of 14ft. An ordinary L type aerial may, of course, be used if one socket of the aerial entry sockets is earthed.

Message to Our Readers in the Trade

GENTLEMEN,—First of all, Greetings after six years of war. This should have been the 22nd anniversary of the first Radio Show, but actually it is the 15th. We have all learned a great deal since 1939 under the stress of war, and this first post-war Radiolympia will enable members of the trade to show just how far they have progressed under six years cloak of secrecy, and for members of the public to judge between 1947 radio receivers and components, and those of 1939.

Much is expected of the trade, since it was one of the first to cast off the shackles of wartime controls. It is true that much of our home production has to be exported, and there may not be available the quantities in demand for the home market.

The public will expect something more than a redesigned cabinet, or the addition of another gadget which they do not want.

The public requires a trouble-free receiver which will give reasonable service without breaking down for at least a year. A wireless receiver should not be regarded, as it has in the past, as a device for making money on servicing and providing the Spivs of the electrical trade with an easy living.

The public will expect manufacturers to purge their ranks of incompetent dealers and quack serviecmen who have done so much harm to their reputation.

Yours faithfully,
F. J. CAMM

The prices of receivers we know will be high. There is purchase tax, five-day weeks, more and more money for less and less work, which seem to be the new order of things. We do not think the public, which is enjoying the fruits of this new emancipation, can reasonably object to paying the price for it. After all, a manufacturer is entitled to his more and more for less and less!

But, of course, the manufacturer, being a sensible individual, knows that he has to compete for his trade, and that there is a practical limit to the profits he may make; and if there were no such limits the Treasury would take his excess profits anyway. Therefore, we do not think that the public will roam round Radiolympia looking for cheap receivers.

Television will be one of the high spots, but here again, until a satisfactory system of recording has been produced, we do not think that anything startling will take place in this field for some years. Even then there is the problem of the chain of television transmitters, and the tempo of the time is against national expenditure on entertainment.

We shall look with zest for the new components in which our readers are chiefly interested. Our readers are keen experimenters and technicians whose knowledge has been enhanced during the past six years. They are looking for something better than in 1939. The constructor market remains a powerful one, and it is my regret that it has been neglected by those firms whose businesses were founded by experimenters and by the demand from experimenters. The constructor contributes a great deal to the industry in the form of knowledge. It is the pool from which the trade draws its most experienced technicians.

Each year a new generation of experimenters comes along. It is a powerful market worth catering for, and our appeal is that the component manufacturers will increase their supplies of components which are at present in such deplorably short supply. They can rely upon our support.

Because of the paper shortage, we are unable to devote the same amount of space to Radiolympia as in 1939. We are smaller in page area, and we now publish monthly instead of weekly. It is our hope that conditions may soon change, and that we can revert to a weekly publication.

Readers may miss several of the Show features which we ran up to 1939. One of those features was the production of a special design of receiver. At the present time, however, components are in such short supply that we feel it unwise to invite readers to embark upon the construction of a receiver when we know that the supply of components could not possibly meet the demand.

We have, of course, many designs in hand, including one for a television receiver. We have, however, deferred publication until the component position changes.

Visitors to Radiolympia will notice the presence of many new firms and the absence of many old ones. We cannot promise them that they will find anything radically new at Radiolympia, but there will be plenty to interest them and to show them what has been and is being done. It pleases me to know that the industry is in such a healthy state.

Radiolympia this year will be something in the nature of a celebration, and rightly so, in view of the important part played by the trade and by our readers in the war. We shall look forward to meeting our friends in both camps at our Stand No. 239 on the Ground Floor.

Meet the Editor and Staff on Stand No. 239
(GROUND FLOOR)

Transmitting Topics

Ex-Service Equipment, with Especial Reference to T.1154, its Circuits and Modifications

By W. J. DELANEY (G2FMY)

MANY constructors are anxious to purchase some of the ex-Government equipment which is now so widely advertised, but are unable to obtain circuits or other data. It is true that the circuit can be traced out if the set is partially dismantled, but this is not only a long job but is often rendered very difficult owing to some of the special multi-contact switches which are employed in some equipment. These carry out circuit modifications and thus each section of the switch has to be traced. As we have pointed out in these pages before, we are unable to give detailed individual instructions for modifying or using this type of equipment, although from time to time we shall endeavour to provide such information as is available for some of the more popular sets. In this class comes the R.A.F. transmitter model T.1154 known familiarly to R.A.F. men as the "Marconi Jeep." This is readily identified by the array of coloured control knobs and is available at the present time from many sources and at various prices.

The T.1154

Like much other R.A.F. equipment this particular piece of apparatus is not self-contained and needs a separate power supply. It is not a difficult matter, however, to build a power pack to deliver both H.T. and L.T. although if access can be had to a hefty accumulator the correct generator unit may be employed.

The transmitter was modified from time to time, but most of those which have been offered appear to be 1154A or 1154B. In basic principle there is very little difference in all the models, most of the "mods" being, in effect, refinements. There are three ranges, the yellow giving 200 to 500 kc/s, the red giving 3 to 5.5. Mc/s and the blue giving 5.5 to 10 Mc/s. The circuit is a simple MO/PA using the series Hartley oscillator circuit on all ranges.

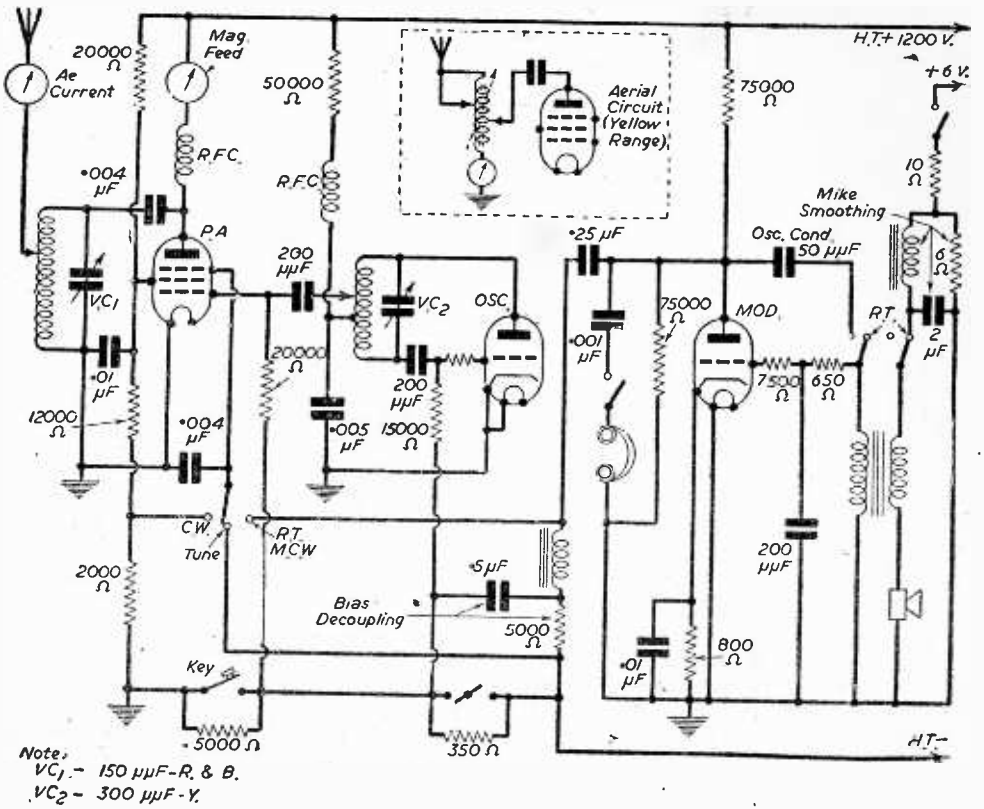


Fig. 1.—Skeleton theoretical circuit of the T.1154 R.A.F. receiver referred to in these notes.

The PA utilises two pentodes in parallel. The valves employed are: oscillator VR105 (CV1105) which is the Marconi Osram ML6, and PA VT104 (CV1104) which is the Marconi Osram PT15.

Tuning

Normal capacity tuning is employed for the MO on all ranges, but the PA has capacity tuning on the red and blue ranges, and permeability on the yellow range. A skeleton circuit of this transmitter is given and this is the basic circuit. It will be noted that there is an L.F. oscillator circuit, and this produces an audio note at approximately 1,200 c.p.s. This is keyed into the 'phones on C.W. and assists in clean sending. On R/T the oscillator is cut and the valve acts as a modulated amplifier, but the 'phones are still in circuit to provide R/T side-tone.

On C.W. the full power is employed, and this is reduced to quarter power on R/T. Another circuit change which is made is that on full power the suppressor grid is biased approximately 60 volts +, and on R/T to about 40 volts —. The mag. feed meter, as will be seen, is a normal anode-current meter, and the other meter usually fitted is a thermo-ammeter reading aerial current.

Separate Sections

Probably the best plan with a set of this type, especially in view of the D/F circuits which are included and the unusable ranges on coils, etc., is to dismantle the set in sections. This will not be found a difficult job and, in fact, is the best plan to adopt with most of the ex-Service gear. It is then a fairly simple matter to build up on the rack-principle any desired circuit arrangement, with complete interchangeability as desired.

Of course, this particular model is not sectional built as are some pieces of Service equipment. However, it is not difficult to identify the various sections, and by cutting the supply leads and other interconnecting wires it is possible to make use of one of the Bulgin, Belling-Lee or similar multi-contact junction strips and make each unit complete, ready for incorporation in any desired combination. The multi-contact connection plugs fitted at the lower end of the set may be used again, although they are probably more clumsy than the bakelite type of Belling-Lee multi-contact plugs.

Many amateurs would probably prefer to retain the control knobs, especially where the later pattern having "click stops" providing eight separate frequencies are fitted. It will not need a lot of ingenuity to arrange for these stops to give any desired settings on your own particular frequency band.

There are a number of pieces of ex-radar equipment also in good supply and these may be treated in a similar manner in some cases, although the majority of them are only suitable for dismantling for the components.

Valves

One of the most popular valves for the amateur transmitter is the R.C.A. 807 and this seems to be one of the most prolific in the stores selling ex-Service gear. It is found in Army and R.A.F. references, the latter being VT60A and the Army reference ATS25A. The CV number is 1364, and for those who are unable to trace the characteristics they are as follows:

Heater	Max H.T.	Max. Ia	Max. Screen	Max. D.C. Control Grid Current	Max. Anode Dissipation
6.3 v. 0.9 mA.	750 v.	100 mA.	300 v.	5 mA.	30 W.

TYPICAL OPERATING CONDITIONS

	Plate Voltage	Control Grid Bias	Screen Voltage	Plate Current	D.C. Control Grid Current	Screen Current	Approx. Grid Driving Power	Typical Power Output
Class C Telegraphy	600 v.	-50 v.	250 v.	100 mA.	3 mA.	9 mA.	.22 W.	37.5 W.
Class C. Telephony	475 v.	-50 v.	225 v.	83 mA.	2 mA.	9 mA.	.13 W.	24 W.
Class AB2 Audio (Two valves)	600 v.	-30 v.	300 v.	200 mA.	—	10 mA.	.4 W.	80 W.

Aerials

A large quantity of coaxial cable is also readily available to-day together with special plugs and sockets intended to accommodate the cable. These facilitate the erection of a very efficient aerial system and its connection to receivers, aerial coupling units, etc. If a dipole or even a Zepp. type of aerial is being erected and a coaxial feeder is to be fitted, many experimenters find it difficult to make the appropriate centre connection or tap the coaxial on to the aerial. It should be remembered that the special Burgoyne Aerial connector is now readily available and greatly simplifies this work. It looks a rather elaborate piece of work, consisting of an aluminium casing which has eventually to be bolted together with 16 nuts and bolts, but it is very efficient, being provided with Steatite connectors and is supplied complete with a tube of weatherproof cement to make the entire assembly watertight. It costs 24s. 6d. and greatly simplifies the work of efficient aerial erection.

ON YOUR WAVELENGTH

By THERMION

The Glorious 15th

I HAVE been to every Radio Show from the commencement—from the days of N.A.R.M.A.T., 2LO, and the rest of it. I have never looked forward to one with so much enthusiasm, perhaps because the scene is set against such a sombre national and international background. When everything seems gloomy anything which appears cheerful is welcome. I well remember the first Radio Show and the frightful junk and ridiculous components which were offered to the public, which in those days was an easy pigeon to pluck since it knew even less than a manufacturer.

In the space of a quarter of a century great changes have taken place. In those days I served, as well as founded, the first wireless journal for amateurs as distinct from a journal designed purely for technicians. In the course of that quarter of a century I have met everyone of note in radio, scientists and technicians, broadcasters and band leaders, director-generals of the B.B.C., radio experts and daily paper radio experts (subtle distinction between the two). Papers have come and gone, and the experts have gone with them.

Only two public journals now remain, and you will find them both represented at Radiolympia.

Nostalgia often makes one wish for the good old days and to presume that things are never so good as they were. Age, however, proves nothing but longevity. It would be idle to deny that things were not better then than now. Of course, in the early days of a new science there is all the excitement which blinds one to inefficiency. Indeed, a thing only becomes efficient whilst you have nothing better with which to compare it. To judge modern wireless transmissions and apparatus with that of the twenties is to endeavour to strike a comparison between Cheddar and chalk.

However, I have not met many of my readers for the past eight years and I am keenly looking forward to doing so at the Show. Even those who disagree with my views about crooners (they are a small number) will be welcome, and maybe they will go away converted. I hope so.

I shall be glad to hear what my old friends have been doing and where they have been, what sets they are building and what they hope to build. I shall be in attendance at the Show every day and a note left at our Stand will find me.

The portents are that attendances are going to break all records. I am writing this well in advance of the Show and not all firms have yet disclosed their plans. I believe that you and everyone else who visit the Show will not necessarily expect to see novelties but to get a whiff of the pre-war atmosphere, and a memory of the days of ease and liberty. Let us hope that the re-introduction of Radiolympia presages a return to those days.

Clubs of organised parties to visit the Show, and provincial clubs, are remaining in town for several days, with theatres in the evening and annual dinners. I have already received many invitations, but as I have not yet discovered the process of how to be in several places at once I fear that I shall be unable to accept all of these invitations. On one evening I shall have soup at one dinner, fish at the next, and coffee at the next. I shall be speaking at those three dinners, too.

Women are taking a keener interest in radio than they did before the war, no doubt due to the technical training they received during the war. Many lady members of the Radar Association will visit the Show and renew their wartime friendships.

I wonder that someone does not inaugurate a fellowship of radio pioneers, the qualifications for membership being that they must provide reasonable evidence that they have been actively associated with radio for more than 25 years. Now is the time to do it.

I am pleased to see the increasing growth of the club movement. When No. 1 of the first technical radio weekly went to press only three clubs were in existence. Within six weeks the number had grown to over 70, and by the end of the third year the total number was 317. A further passage of three years saw the number drop to just over 250, and when this last war started we had just over 70 clubs on our books. To-day the number is well over 200, and almost every week brings news of fresh clubs.

Anyway, a cordial welcome to every reader, young and old, old and new, to visit our Stand for a chat.

An Ideal Holiday, or The Swishingly Swishing Swish

[A well-known Radio Authority has stated that if things get much worse in poor old Britain he will be tempted to take a well-earned holiday beside some blue lagoon and listen to the rippling of the waves where some native demoiselle demonstrates real crooning to him whilst swishing her sarong.]

Come, let us haste to blue lagoon,
Palm trees and coral beach,
Where demoiselles in bright sarongs
The art of crooning teach.
An inspiration great is here,
To start us all a-wishing.
Let's drop dull care and make our way
To where sarongs are swishing.
Where politicians cease their moans,
Designed to make us cringe,
Where coupons cease to rule our lives—
Let's have a care-free binge!
Let's join the hula-hula girls
And share their happy songs,
To sound of ululating waves—
And swishing of sarongs.

"TORCH."

Electronic Musical Instruments—4

Some Interesting "Sound Effects" Circuits Described by F. C. BLAKE

POSSIBLY one or two readers have been asked to assist at theatricals by supplying special sound effects such as sirens, aircraft noises, machine guns and the like, and the description of one or two "effects" circuits may therefore be included in this series.

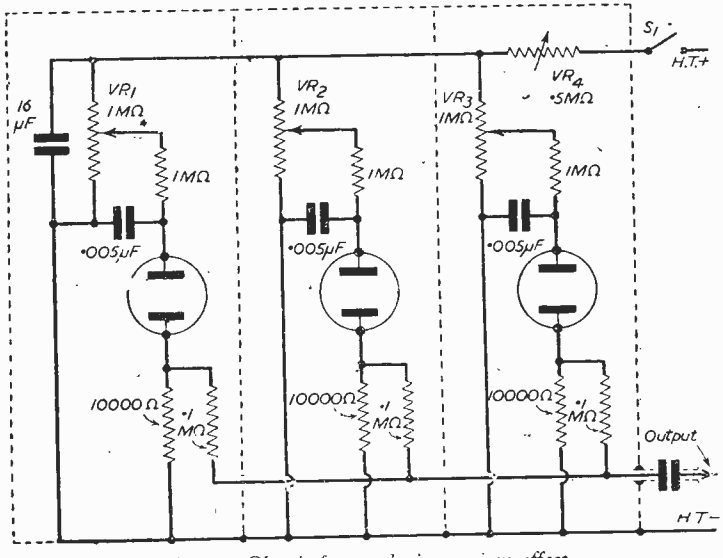


Fig. 1.—Circuit for producing a siren effect.

Neon lamp oscillators, although they may be erratic and rather unstable in operation, are quite simple and cheap to make up, and require only a small H.T. current and, of course, need no filament supply.

The size of amplifier used with these devices will obviously depend on circumstances—size of theatre, amount of "noise" required and so on. It is always best to err on the side of too much than have to admit that you have given the producer "all you've got."

Fig. 1 shows a simple circuit to simulate that detestable noise, the air-raid siren. If your local fire brigade operates on such a device and is situated within earshot it might be advisable to forewarn them—as the effect is extremely realistic!

The Siren

The circuit needs little explanation. Three small indicator neon lamps—without internal resistors—are used. The variable potentiometers VR1-3 are preset and adjusted so that tones of the tonic, mediant and dominant (doh, me and soh) are produced when S1 is closed. Opening and closing S1 will produce the characteristic "warble" of the "alert" siren.

Motor Boat or Machine Gun

Fig. 2 shows a circuit for producing machine-gun and motor-boat effects. With all circuits using neon oscillators the values of components can only be given approximately, as each neon lamp has its own characteristics. In this circuit only one neon is used. S3 sets the oscillator in operation, and bursts of "fire" are obtained by closing S1 which should be in the form of a bell push.

The motor-boat effect operates on the same neon, although if both effects are wanted at the same time a duplicate oscillator will be needed. The output from the neon is modified and softened, so that instead of a staccato rattle a softer, deeper throbbing is produced.

Aero Engine

In Fig. 3 the aircraft engine noise device is similar in design to the circuit of Fig. 1, excepting that the controls are set up so that the two neons are just not at the same frequency, giving rise to the characteristic beating of a multi-engined plane. By varying the controls VR1-2 various effects can

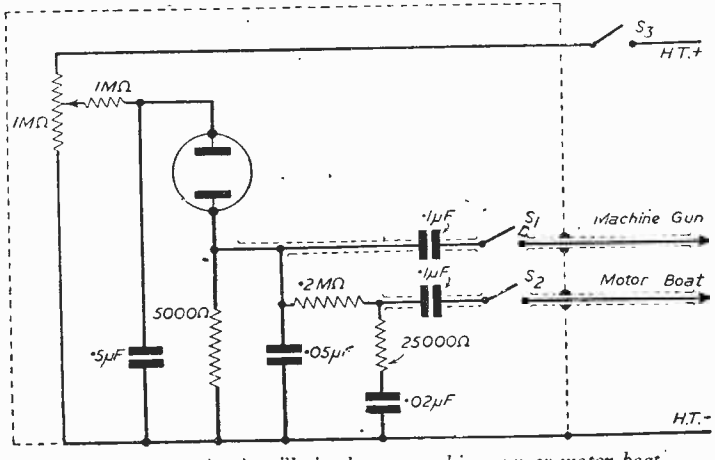


Fig. 2.—This circuit will simulate a machine gun or motor boat.

be produced to simulate power dives, speeding up, slowing down and so on.

When two or more effects are wanted at the same time, some form of mixing panel will be needed, so that music and various effects can be mixed or superimposed at the correct volume level.

The oscillators should be well screened by being placed in a metal box, each oscillator being screened separately as well by means of a metal partition.

Provided that the amplifier H.T. line does not vary with changes of volume the oscillators may be run from this source, otherwise a small separate supply of 200-250 volts will be needed.

An interesting experiment can be carried out with a neon oscillator and a tuning fork. If the oscillator is set up to work at around the same frequency as the fork and the fork is struck and held in the light of the neon, the stroboscopic effect shows the fork operating quite clearly—and when the oscillator is adjusted until absolute synchronism is obtained, the fork appears to be stationary.

A calibrated audio oscillator used in conjunction with a neon makes an excellent stroboscopic tachometer; the neon should be biased in the same way as the neon oscillator—with a potentiometer across the H.T. line, but no condenser to earth is required. If the neon is run direct from the A.C.

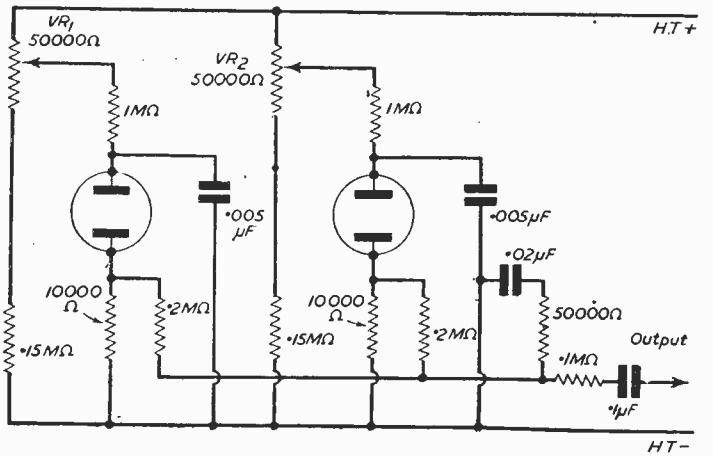


Fig. 3.—For an aircraft engine effect this circuit should be used.

component of the oscillator it will naturally flash twice as fast as the actual frequency.

Another Organ

To revert to the more musical electronic instrument, Fig. 4 shows a method of making an organ,

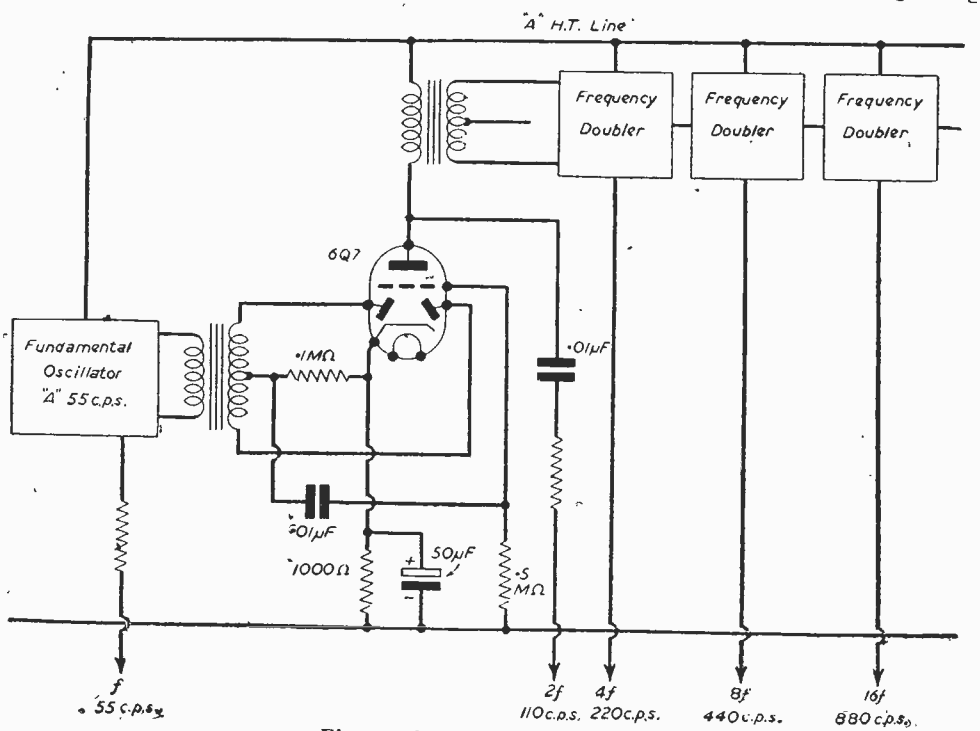


Fig. 4.—A frequency doubler circuit.

using frequency doubling stages. The frequency doublers are in the form of full-wave rectifiers, but instead of using the D.C. component the double frequency A.C. ripple is extracted and amplified. The outputs are suitably padded by resistors so that a uniform volume is obtained from each stage.

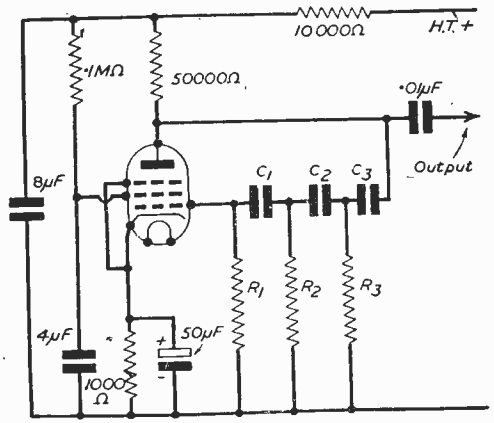


Fig. 5.—An RC oscillator circuit.

Instead of using centre-tapped secondaries on the double transformers, a potentiometer can be connected across an ordinary intervalve transformer and the electrical centre found by adjusting the slider.

Fig. 5 shows a circuit of an RC oscillator which could be used in conjunction with this scheme. It is extremely stable in operation and can be made to operate at extremely low frequencies—well below audibility. A suitable valve for this circuit would be the Mazda SP41, or SP61, a number of which can be obtained from Government surplus stores at the moment under the reference numbers VR65A and VR65. Calculation of the RC network can be made from the formula $\frac{10^6}{2\pi\sqrt{6}\,RC}$

It must be remembered that there is usually a large tolerance rating of ± 20 per cent. on most resistors and condensers and this fact must be borne in mind when designing an oscillator to work at a particular frequency. I find that the best way to set about this is to calculate roughly the components needed and then try various combinations of resistors in parallel. If solid type carbon resistors are used a little judicious filing of the composition will raise the resistance value if the frequency is too high.

APPENDIX

Reference of some British Patent Specifications Electronic Musical Instruments

	Melodic or Solo Instruments	
De Forest	Valve oscillator	100358–1915
Theremin	Beat frequency oscillator	244133
Trautwein	Neon Oscillator	380470
Hammond	Valve oscillator and divider circuits	403365
	Polyphonic Instruments	
Westinghouse	Valve oscillators	365309
Coupleux	,, ,,	359967
Coupleux	,, ,,	342952
Coupleux	,, ,,	410238
Hammond	,, ,, Novachord	529304
Hammond	,, ,, ,,	527058
Hoschke	Reeds electrostatic pickup	451798
Fishman	Reeds electromagnetic pickup	507478
Compton	Reeds electrostatic pickup	434421
Hammond	Rotating tooth wheels	454502
Winch	Photo electric, rotating system	387376
Winch	Photo electric, rotating system	438681
Midgley	Electrostatic, rotating discs	454720
Biggs	Rotating discs F.M. pickup	512943
Hobson	Valve oscillators and P.E. cells	432960
Robb	Rotating tooth wheels	409751
Compton	,, ,, ,,	388036
Halmagyi	Neon oscillators	390678

News from the Clubs

CARLISLE AMATEUR RADIO SOCIETY

Hon. Sec.: J. Ostle, 2 Outgang, Aspatria, Carlisle, Cumb.

THIS society meets on the first and third Fridays in each month at 7 p.m. in the Y.M.C.A., Richmond Hall, Fisher Street, Carlisle. A programme is now being arranged for the winter months, and all new members will be welcomed.

WIRRAL AMATEUR RADIO SOCIETY

Hon. Sec.: B. O'Brien (G2AMV), 26, Coombe Road, Irby, Heswall, Cheshire.

RECENTLY G3CK (Mr. R. Cumberlidge) gave an interesting talk on Power Packs, and G8VS, ex VU2EU (Mr. W. H. G. Metcalfe, A.M.Brit.I.R.E.) related his experiences as an amateur in India before the war, and also some of his wartime radio experiences. A junk sale has also recently been held and was very successful.

Visitors and prospective members are welcome, and any inquiries should be addressed to the hon. secretary.

CATTERICK AMATEUR RADIO CLUB

Hon. Sec.: Cpl. Hall, c/o 2 Sqn., 1st T.R., Royal Signals, Catterick Camp.

THE club is now firmly established in a fine new headquarters at Marne Lines, Catterick Camp. The operating position has been set up in the club room and members can watch operations from the luxury of their armchairs! A workshop is being equipped for members' use, and a club call is on the way. In the meantime the club is on the air under the call G3AKF/A. A fine selection of gear has been acquired, including two 75ft. masts, an H.R.O., an AR88, two CR100's and a Cossor double beam oscillograph. Meetings are held every Tuesday at 7.15 p.m., but the club room is almost always open. All are welcome.

BRIGHTON AND HOVE RADIO SOCIETY

Town Representative: J. R. D. Sainsbury, G8MV, 80 Lansdown Place, Hove 2, Sussex.

THE Royal Naval Air Station, H.M.S. *Peregrine*, was visited recently by a large contingent of Brighton and Hove radio amateurs. The party, which toured the radio communication installations, linked up with enthusiasts from Worthing.

At another recent meeting the group were privileged to hear a lecture given by the noted authority on piezo-electric crystals, Mr. H. G. Menage, of R. A. Rothermel, Ltd., entitled "Rochelle Salt Crystal Applications."

Mr. Wilkins, of "AVO" also delivered an interesting lecture, lavishly supported with models to illustrate the many manufacturing processes through which the famous products are passed.

An interesting and comprehensive programme for the remainder of the season is in preparation.

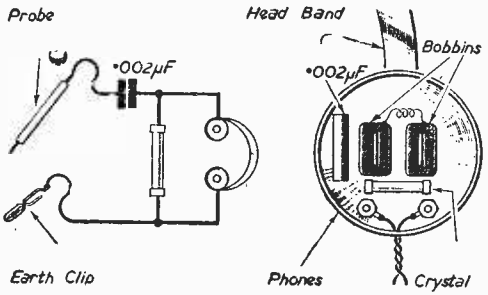
Meetings are held fortnightly at "Golden Cross" Hotel, Western Road, Brighton, commencing at 7.30 p.m.

Practical Hints

A Simple Signal Tracer

THE ultra-simple circuit below has enabled the writer to locate many a defective stage in the progress of servicing receivers, as well as indicating distortion and hum.

Requiring no batteries or mains, it employs the old familiar crystal detector and 'phones. (Crystal and condenser are attached in the 'phone case, making the unit self-contained.)



The simplest form of signal tracer

Starting at the aerial of the receiver, it is probable that the "local" will be heard. From the aerial to the grid of the first stage it should be possible to select a station with the receiver's tuning condenser, and so working from grid to plate until the defective stage is reached.—R. SHAW (Darlington).

Bench Fittings

WHEN there is no room for batteries, etc., on the bench when working, they could be put under the bench on a shelf and the leads taken to countersunk sockets in the bench.

My method of carrying out this idea was as follows:

First, a ½in. hole is drilled through the bench, then a wander plug socket is fitted in a disc of ebonite or three-ply wood, 1½in. diameter, which is then screwed to the underside of the bench with the socket in the middle of the hole. A cover for the hole can be made from a piece of ½in. dowel rod.

This method could also be used for fixing an indicator lamp. In this case a piece of coloured or plain glass could be recessed into the bench top over the hole.

THAT DODGE OF YOURS!

Every Reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay half-a-guinea for every hint published on this page. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL WIRELESS," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Practical Hints."

SPECIAL NOTICE

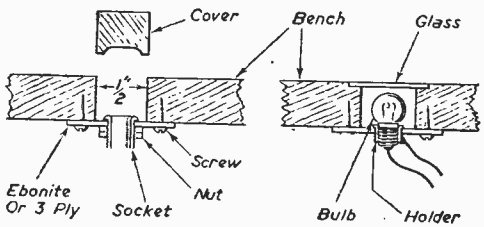
All hints must be accompanied by the coupon cut from page iii of cover.

—R. CLARKE (Walton-on-Thames).

Test Prods with Interchangeable Points

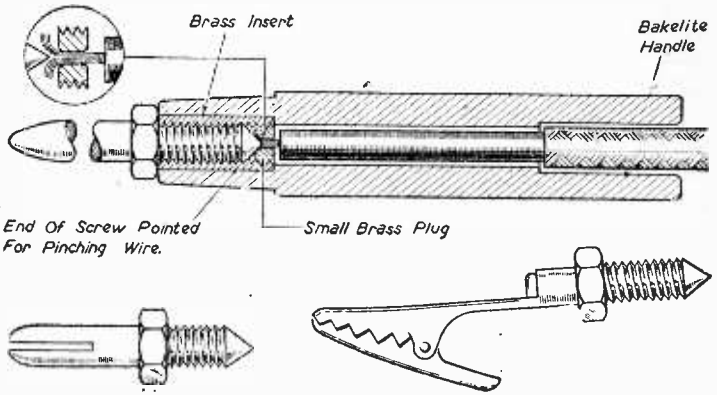
THE handles of these prods were made from old razors of the bakelite pattern, which have a brass insert in one end (tapped 2 B.A.).

First, drill right through the handle, taking care not to damage the thread. This is quite easy if you drill so far from each end. Next, tap the insert a little farther down to allow for the plug. This is just a small piece of 2 B.A. studding with a hole drilled through the centre and countersunk either side (see inset). The threaded portion of the



A useful idea for the workbench.

"point" should be V-shaped to pinch the test lead against the plug. The versatility of the test-prods is shown by the suggested alternative end connections.—G. C. WILLIS (Monkseaton).



Making test prods with interchangeable points.

An Accurate Capacity Meter

Constructional Details of a Useful Adjunct to the Service Workshop.

By J. R. DAVIES

THE writer has for a long time felt the need of an accurate capacity meter in his workshop. As it would not be used for more than occasional work it was decided that the expense of a commercial capacity meter was not justified. What was wanted was an accurate and reliable meter which would read from about 5 $\mu\mu$F to 2 μF. It would need to be easily constructed and at low cost. After some experimenting a meter was constructed fulfilling all the above requirements and whose cost to the writer was nil, all components being obtained from the spares box. Even if all the components had to be bought, by using battery valves the cost would hardly be more than £3 to £4.

After due consideration the circuit decided upon was one of the bridge type. A meter of this type is very simple, and with a little care a very accurate instrument may be constructed. Also, no meters are required, thereby cutting the cost.

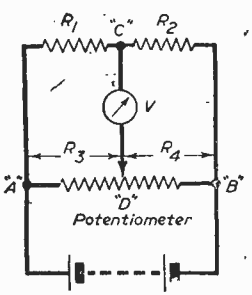


Fig. 1.—Circuit of Wheatstone Bridge.

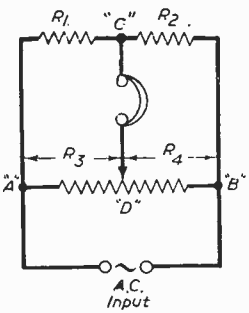


Fig. 2.—Showing modification of Fig. 1. The A.C. input may be conveniently supplied by an A.F. oscillator.

How the Circuit Works

An explanation of the working of a bridge circuit would not come amiss at this point. In Fig. 1 is shown a circuit of the Wheatstone Bridge. A D.C. voltage is applied at points "A" and "B," and a voltmeter is connected between "C," the junction of R_1 and R_2, and "D," the slider of the potentiometer. Now let us assume that R_1 has a value of 1 ohm and that R_2 is 10 ohms. If the applied voltage at "A" and "B" is 11 volts, then it is obvious that the voltage developed across R_1 is 1 volt and that across R_2 is 10 volts. Now if the slider of the potentiometer is moved along the resistance element there will come a time when it will tap off 1 volt between itself and point "A." As the potentials at "C" and "D" are then both 1 volt above that at "A," there is no potential across the voltmeter and it will read zero. Now, for the slider to tap off 1 volt above "A," it will have to be $\frac{1}{11}$ of the distance from "A" to "B." Thus, assuming the potentiometer to consist of two resistances R_3 and R_4 (see Fig. 1) the ratio $\frac{R_3}{R_4}=\frac{1}{10}$ This is the same as the ratio of R_1 to R_2. Using any values it can be seen that the meter will read zero (or the bridge will be "balanced") whenever $\frac{R_1}{R_2}=\frac{R_3}{R_4}$. If R_1 is known and R_2 is unknown, it is possible to find the value of R_1 by observing the ratio of R_3 to R_4 and substituting in the formula above. Alternatively, the resistance R_2 could remain constant for all tests and the potentiometer be provided with a scale calibrated directly in ohms. Then the unknown resistance could be connected

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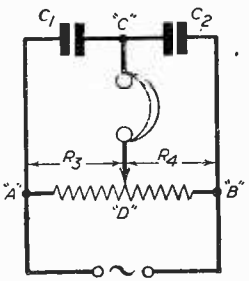


Fig. 3.—Showing how condensers may be connected in the bridge circuit instead of resistances R_1 and R_2 (Fig. 2).

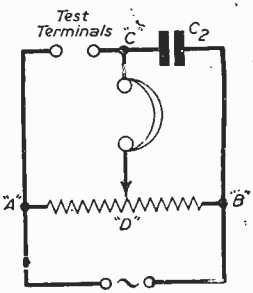


Fig. 4.—Circuit of simple capacity bridge.

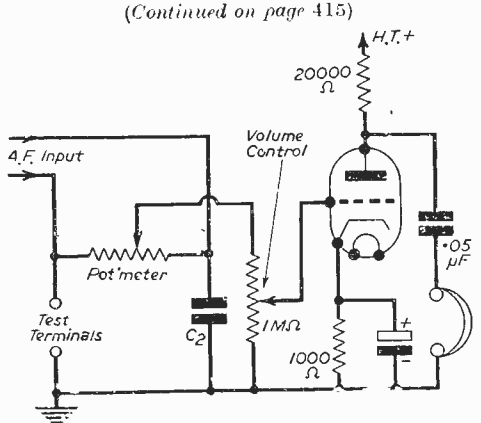


Fig. 5.—Modified version of Fig. 4. Point "C," of Fig. 4, is now connected to earth, and the A.F. input has both leads isolated from earth. Any L.F. amplifier type triode may be used.

in the R_1 position and, after the bridge was "balanced," its resistance read directly off the potentiometer scale. Notice that the voltmeter does not have to be calibrated as it is only intended to show zero volts.

Let us take a further step. If an A.C. voltage were applied at points "A" and "B," and an A.C. voltmeter connected between "C" and "D," the bridge would function in exactly the same manner as its D.C. counterpart. If the frequency of the A.C. were within the audible range, an earphone could be used instead of the meter, the "zero" position being that when the earphone is silent. See Fig. 2.

Now condensers also "pass" alternating currents. The reactance of a condenser (i.e., the

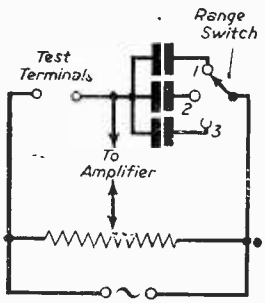


Fig. 6.—Showing how different values of C_2 (Fig. 4) may be switched in to provide different ranges.

opposition, or "resistance," it offers to A.C.) is equal to $\frac{1}{2\pi fC}$ ohms, where f is the frequency of the A.C. in cycles per second, and C is the capacity in farads. If we re-draw Fig. 2, using condensers (as in Fig. 3) instead of the resistances R_1 and R_2, the original formula, $\frac{R_1}{R_2}=\frac{R_3}{R_4}$, is replaced by:

$$\frac{\frac{1}{2\pi fC_1}}{\frac{1}{2\pi fC_2}}=\frac{R_3}{R_4}$$

Simplifying this we have:

$$\frac{2\pi fC_2}{2\pi fC_1}=\frac{R_3}{R_4}$$

$$\frac{C_2}{C_1}=\frac{R_3}{R_4}$$

It will be seen that the frequency applied is immaterial. Therefore any oscillator supplying any frequency or mixture of frequencies will suffice. The point about the mixture of frequencies is rather important and is encountered later in this article.

To put the circuit of Fig. 3 to practical use, condenser C_2 remains constant. The condenser under test is connected to the "test" terminals (see Fig. 4), the slider of the potentiometer adjusted to the balance position, and the capacity of the unknown condenser read off a scale fitted to the potentiometer. The method of making up such a scale is discussed later.

Putting the Bridge to Practical Use

On putting the simple bridge circuit of Fig. 4 to practical use a few points of detail and some modifications have to be attended to.

First of all, the impedance offered by the 'phones

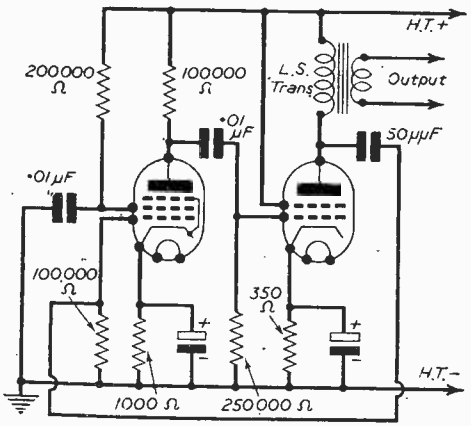


Fig. 7.—Circuit of A.F. oscillator used with bridge. Any R.F. pentode followed by any output pentode or tetrode will suffice. Some individual adjustment of values may be required to produce the hiss component required (see text). Output is at low impedance.

to the bridge circuit is somewhat low and represents a rather heavy load. This causes no effect when the bridge is balanced, but when it is slightly "off-balance," the load causes the volume of sound to be attenuated and thereby "flattens" the position of the "dead-space." If a valve amplifier is used, the headphone load may be replaced by the grid impedance of the valve. This can be as high as 1 megohm. Fig 5 shows the circuit. The volume control is a help as different volumes of sound occur when measuring various capacities.

The potentiometer used in the bridge circuit is a very important item of the instrument. Its value should be between 10 and 50 KΩ. It must be wire wound. It should be a new component, if possible, and if it has any "crackles" it is useless. It should be of large physical size as this reduces its self-capacity. Also, a large physical size means a longer track, and the slider may "pin-point" the "dead" space more accurately.

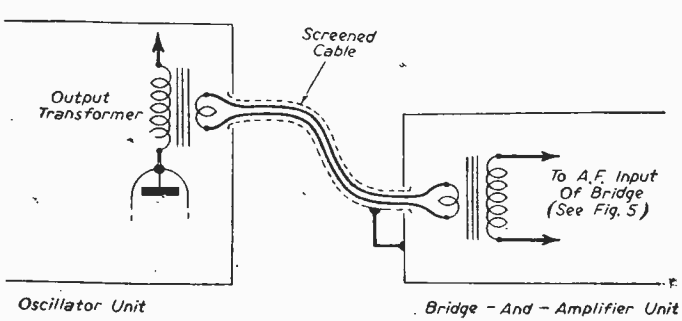


Fig. 8.—Showing method of connecting A.F. oscillator to bridge unit.

To increase the range, the constant capacity C_2 (Fig. 4) may consist of two or three fixed condensers, which may be switched in in turn. Suggested values for these condensers are:

1. 0.1 μF to give an approximate range of 2 μF to 0.005 μF.
2. 0.005 μF to give an approx. range of 0.1 μF to 0.0002 μF.
3. 0.0001 μF to give an approx. range of 0.002 μF to 5 $\mu\mu$F.

The reader will note that there is a large amount of overlap between the ranges. As the scale of the potentiometer becomes cramped at the ends, this gives greater accuracy. Fig. 6 shows how these condensers may be connected. The writer cannot give exact figures for the limits of the ranges as this depends on the individual physical construction of the potentiometer. The condensers used must be of the mica-dielectric type. The range switch should be a low-capacity type, such as a wave-change Yaxley.

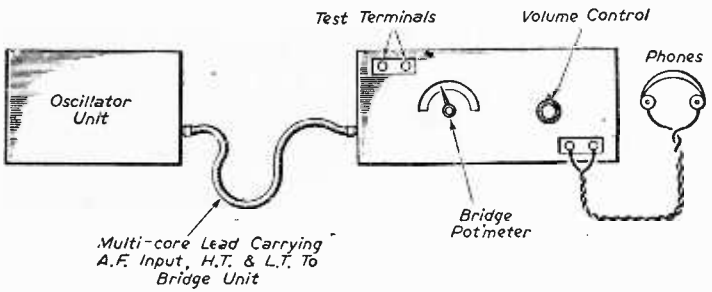


Fig. 9.—How the capacity meter was finally arranged.

Measuring Condensers of Low Capacity

When measuring condensers of 50 $\mu\mu$F, or under, it was found that their reactance to ordinary A.F. tones was too high for any appreciable sound to be heard in the 'phones. As the reactance of a condenser decreases as the frequency is raised, it was necessary to use a higher A.F. In the end, it was decided to use an oscillator that supplied a loud hiss. This hiss proved very successful indeed, and capacities of as low as 5 $\mu\mu$F were measurable.

It was decided, for simplicity, to use an oscillator that supplied the hiss in addition to ordinary tones. A multi-vibrator circuit was tried with a buffer-amplifier valve and gave reasonable success. Better results were obtained by using the circuit of Fig. 7. This may be roughly classed as a form of multi-vibrator, but it has a fundamental frequency equal approximately to that of the resonant frequency of the output transformer. The noise it generated was pretty unmusical (as one would imagine!), and there were plenty of harmonics and hiss. The reader will remember the point raised earlier concerning the fact that the frequency applied is immaterial. In theory this is quite true, but in practice slight discrepancies may be introduced by the self-capacity of the wiring and components in the bridge circuit itself. If the same oscillator is used all the time when the bridge is calibrated and when it is used, these discrepancies will remain constant.

The oscillator was made as a separate unit from the bridge itself. A.F. input to the bridge was supplied as shown in Fig. 8. A speaker transformer gave a low-impedance output from the oscillator, and was connected by screened wire to the bridge unit proper. Here it was stepped up again by another speaker transformer and applied to the bridge circuit. This method of connection ensures that very little capacity exists between points "A" and "B" (see Fig. 4) and earth.

The Final Construction

After all the snags mentioned above had been encountered and remedied by the writer, he finally made up the capacity meter as shown in Fig. 9. The bridge-and-amplifier unit was completely screened. Wiring in the bridge itself was rigid and well spaced. The oscillator need not be screened if it is kept a good distance from the 'phone leads and the condenser under test. Although the writer used mains-type valves there is no reason why battery valves could not be employed. The only reason that the writer used mains valves is because he has a general purpose mains unit fitted to his work-bench to supply all test equipment. The use of battery valves would save the constructor the cost of a power pack. The drain on batteries would be negligible as the bridge would, of course, be used only for short periods.

The Calibration of the Bridge

For calibration purposes, the bridge potentiometer should be fitted with a pointer and a scale. The bridge may then be calibrated by finding the potentiometer settings for various known condensers. As many condensers as possible should be used, and when sufficient readings have been taken, a graph may be drawn for each individual range and a direct-reading scale finally fitted. As most condensers are manufactured to low tolerances it will be necessary to take as many readings as possible, and draw a graph to the average. If you have condensers of good tolerance, say ± 2 per cent., these should be used as much as possible. Different capacities may be made up for calibration purposes by connecting condensers in series or parallel.

For condensers in parallel:

$$C = c_1 + c_2 + c_3$$

and for condensers in series:

$$\frac{1}{C} = \frac{1}{c_1} + \frac{1}{c_2} + \frac{1}{c_3}$$

where C is the total capacity, and c_1, c_2, c_3, etc., the capacities of the various condensers respectively.

Performance

The performance of the instrument constructed as above has proved very successful, measuring condensers with an accuracy of ± 2 per cent. down to 15 $\mu\mu$F; below that, the accuracy worsens to about ± 5 per cent. at 5 $\mu\mu$F.

If the reader takes reasonable care with the construction, there is no reason why he should not have an accurate capacity meter.

RADIOLYMPIA REVIEW 1947

A Guide to the Main Exhibits

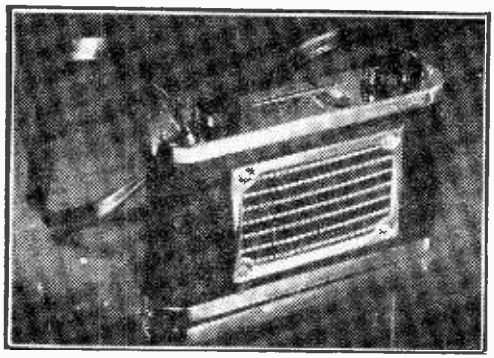
In some cases details of exhibits have not been released at the time of going to press.)

THE paper shortage prevents us from giving our customary stand by stand review of the exhibits at Olympia, and it will thus only be possible to pick out the highlights of the show. Owing to early Press dates, last minute releases will obviously have to be dealt with at a later date. Looking at the exhibits as a whole they may be subdivided into sections—receivers of all kinds, test equipment, components and subsidiary items. Receivers will be seen in all different types, many of familiar appearance, but quite a few newcomers, most of which are in what might be termed the "high-fidelity" class. It is obvious that much more attention is now being paid to really high-quality reproduction and listeners are obviously not satisfied with the standard of reproduction which was regarded before the war as "quality." We have not had the privilege of hearing many of the new sets, but as an instance of how really good quality has been obtained with standard type receivers we might mention the Ferguson Model 201. This has a push-pull output stage and gives remarkably fine quality signals on suitable broadcasts.

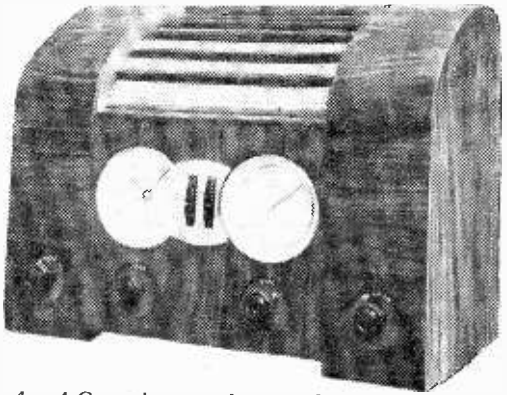
SPECIAL RECEIVERS

The Decola

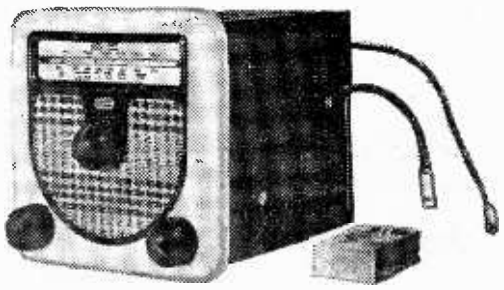
With regard to receivers or electric gramophones designed especially for high fidelity, we may instance the Decola, and Acoustical Manufacturing Companies' products. The first is a gramophone only (no radio), whilst the latter includes amplifiers, special loud-speakers, etc. The Decola is novel in that it utilises three 12in. loud-speakers mounted on a curved cabinet front. This results in a 120 degs. sound radiation with a consequent preservation of the higher frequencies at any listening point. The price is £216 11s. 3d. (including P.Tax). An eight-valve, eight-waveband radio unit may be obtained for this instrument.



The new Romac "126" "Personal" receiver. Weighing only 4½lb., this is a 4-valve battery-operated superhet, with self-contained L.T. and 67.5-volt H.T.



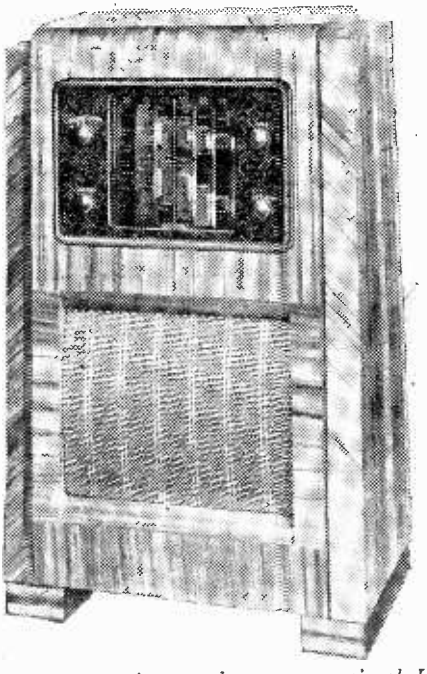
An A.C. mains 5-valve superhet which switches itself on automatically. This is the Goblin "Time Spot" receiver, with built-in synchronous self-starting movement.



A new car-radio from the Pye factory. Its size may be judged by comparison with the box of matches lying beside it. Obtainable for 6- or 12-volt supply, it costs £12 12s., plus tax.

Acoustical Manufacturing Co.

Among the Acoustical Manufacturing Company's equipment may be mentioned the automatic output limiter which is incorporated in one of their amplifiers. This is a special form of A.V.C. circuit with a calibrated front panel control marked from 5-120 watts. This device is particularly useful in P.A. work, where it enables the mike to be set and give a steady output of, say, 20 watts, no matter whether the announcer is 4in. or 4ft. from the mike. The compression and expansion times are such that the circuit does not interfere to any extent with short time modulation in the voice. Their labyrinth speaker is stated to provide a smooth bass response down to 35 cycles. This is accomplished by means of a 5ft. pipe folded in a certain manner, and the speaker unit feeding the pipe a part of the way along it. This controls the $\frac{1}{4}$ and $\frac{1}{2}$ wave resonances and other discrepancies and enables a smooth output to be obtained.



This Fitton receiver employs unconventional L.F. circuits and is claimed to provide very high fidelity. A similar chassis is available in other cabinet designs, and may be seen on other pages.

PORTABLES

The Romac "126"

This is probably one of the most interesting of the very small "personal" types of receiver now being produced. Its actual size is 9½in. long by 5¼in. high by 2in. deep and it weighs 4½lbs. There are four valves in a superhet circuit, and the supplies (which are included in the case) are a U2 cell and a 67.5-volt Ever Ready battery for H.T.

The "Pam" record player with amplifier, a combination of many from the Pye Company. It may be obtained as a public address outfit or for domestic use, and may be built up in various combinations.

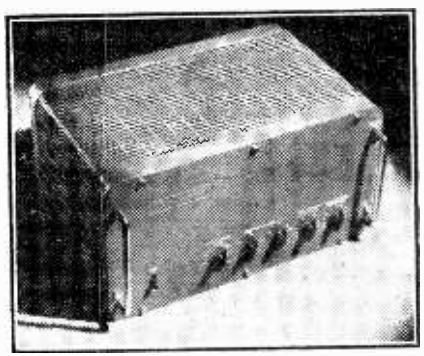
A shoulder strap is fitted and this contains the aerial, although aerial and earth sockets are provided so that a normal outside aerial and earth may be connected if desired. This little receiver costs £17 3s. 8d., plus P.T.

The Pye Baby "Q"

This old friend is conspicuous in its lovely coloured leather finish, with the "built-in" white carrying handle, grooved to accommodate the fingers. It also incorporates a four-valve superhet using the all-dry valves, although in this set a 90-volt H.T. battery is used. The tuning scale is marked with station names and the control knobs are set wide apart so that tuning may be carried out without obscuring the tuning scale. Its overall size is 13in. wide by 11½in. high and 7in. deep, and the price, £14 14s., plus tax.

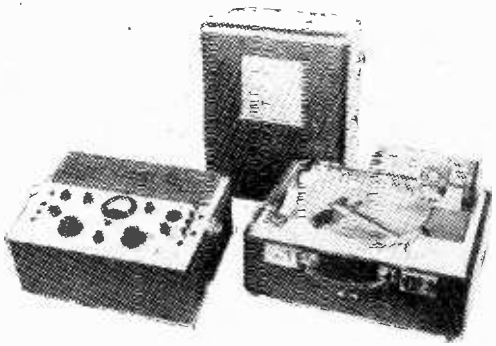
STANDARD RECEIVERS

Among what might be called the "standard" types of receiver there are quite a number of novelties. Apart from special circuit schemes there are some interesting new cabinet ideas, such as in the Ambassador range. There are two



Rated at 90 watts, this is the Acoustical Company's Model M.91 A.C. amplifier. It is one of the range of quality units and has an output stage using a special form of cathode-follower circuit.

receivers which stand out from their fellows—they are time-controlled. Of these, the Goblin "Time Spot" (shown on page 417) incorporates a five-valve superhet circuit in a more or less standard type of cabinet, with the time-control movement matching the tuning scale. The control is a 12-hour

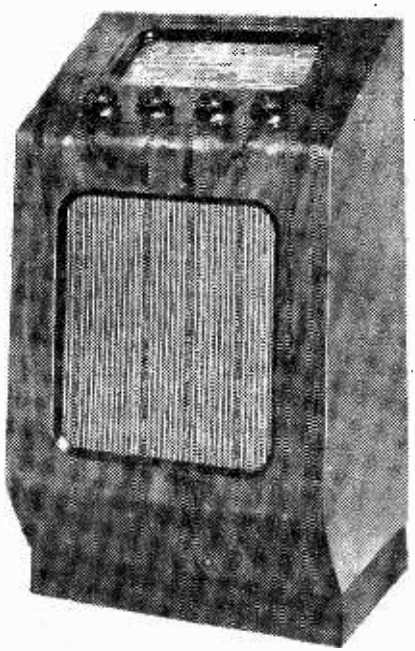


A new portable sound-on-disc recorder from Birmingham Sound Reproducers. It is hoped that this will be demonstrated at Olympia by making records on the spot.

mechanism of the synchronous self-starting type, and the receiver is provided with a calibrated volume indicator.

Ambassadors

The receivers made by R. N. Fitton, Ltd., are known as Ambassador receivers and consist of a "545" and "4756." The latter series is available as a table model, console, special console, non-auto-radiogram and an auto-radiogram. The same



Ferguson Model 201 (distributed by Thorn Electrical Industries) is a 7-valve superhet of the small console type and gives remarkably fine quality signals. It is only 28½in. high and costs 38 guineas, plus tax.

chassis is included in each design and is a five-valve six-waveband arrangement with electrical bandspread over the 11, 13, 16, 19, 25, 31, 41 and 49-metre bands. The large dial has six separate scales and four controls, whilst the internal scheme incorporates special L.F. circuits. Again the question of high-fidelity reception has been taken into account. Prices range from £20.

Ultra

In the range of Ultra receivers the model T.44 is a luxury six-waveband model with extra wide short-wave coverage at high quality. It has 10 valves, including rectifier and magic eye, and a 10-watt push-pull output stage. Other features of this model are inter-station noise suppression, bandspread tuning and exceptional bass reproduction.

Radio Instruments

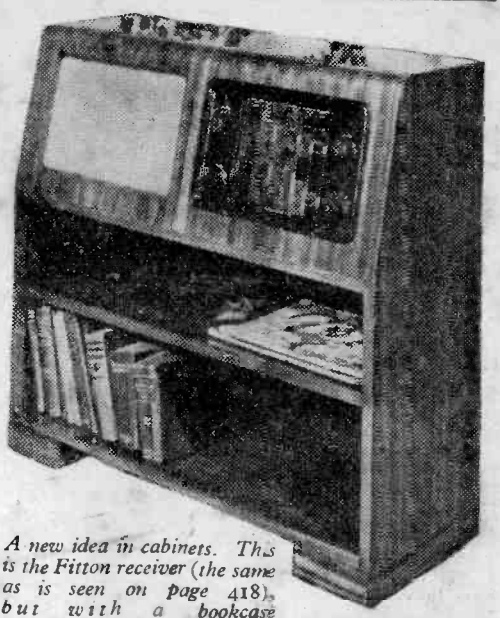
The Airflo and Aria receivers will be featured by Radio Instruments, the latter a small universal set designed for high-quality reproduction. The Airflo is one of the receivers first produced in 1936 for those requiring high-quality reproduction, and although the original circuit has been considerably modified in the light of modern knowledge the original principle of the off-set loudspeaker has been maintained. The receiver is a five-valve superhet table model and costs £26 12s. 6d. plus tax.

Pye, Ltd.

Among the many Pye models will be the television receiver, a new car radio and something new in battery-operated receivers. This last is to be found in a modern moulded cabinet with new plastic grille, flywheel tuning, good quality reproduction and is a four-valve three-waveband superhet with extension speaker and pick-up sockets. It costs £17 17s. 3d., including tax, but less batteries. A.C./D.C. receivers, test equipment and amplifiers will also be featured on this stand.

NOVELTY SECTION.

A Novelty Section (a better name is under consideration at the time of going to Press) is to be featured. Contributors to the section will include Standard Telephones & Cables, Ltd. (a vibration table); Philips Lamps, Ltd. (radio-controlled model train); Electric & Musical Industries, Ltd. (infra-red demonstration, Dunlop electrostatic and intercommunication alarm equipment); and British Thomson-Houston Co., Ltd. (demonstrations of the reflection klystron valve, the transmission of sound light, 3 c.m. radar transmission and reflection, and a new sound and picture reproducer).

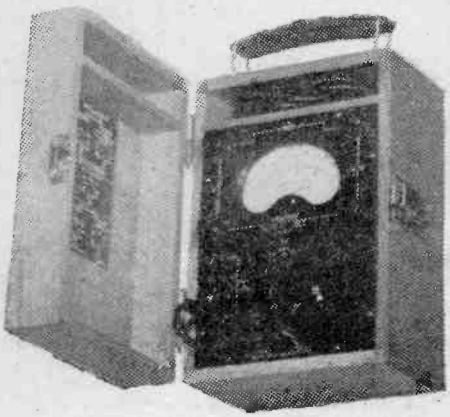


A new idea in cabinets. This is the Fitton receiver (the same as is seen on page 418), but with a bookcase cabinet. It costs £34 plus tax. It should be noted that these receivers have six wavebands, with electrical bandspread over the 11, 13, 16, 19, 25, 31, 41 and 49-metre bands.

TEST EQUIPMENT

Automatic Coil Winder Co.

The products of this firm are well known under the trade name "Avo," and the Avometer is familiar to every experimenter and serviceman. A new instrument to be seen on this stand will be the valve characteristic meter, a more or less de luxe valve tester. It will test any standard receiving or small transmitting valve on any of its



On the left is the "Vampire" A.C. test set made by Everett, Edgcumbe & Co., Ltd. This operates over all the audio frequency range, and is invaluable for those whose measurements take into account phase angle. It reads volts, amps and power (5 to 5,000 watts). On the right is the Pye Baby "Q" all-dry portable. This costs £14 14s. plus tax, and is a 4-valve superhet with enclosed L.T. and 90-volt H.T.

normal characteristics and under conditions corresponding precisely to any desired set of D.C. electrode voltages. A multiple selector switch enables any valveholder to be set up to any electrode combination and valveholders are provided covering all the latest valve developments.

Marconi Instruments

Apart from apparatus for manufacturers there will be some useful equipment for the service engineer. These include a portable receiver tester, combining a crystal-standardised signal generator, a tone source and an A.F. power meter; a valve voltmeter with internal dry battery; and a beat frequency oscillator. This is designed for A.C. mains operation and is directly calibrated over the range 50-12,000 c/s with a maximum output of 300 mW, and is provided with an output level meter and ladder attenuator of 0-50 dB.

Everett, Edgcumbe

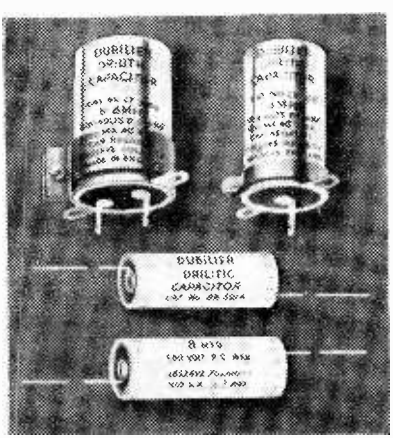
The frequency response of the multi range volt-amp-ohmmeter (all-purpose tester) will be demonstrated on this stand, and the top frequency on show will be at least 15 kc/s. The "Vampire," a portable A.C. test set, will interest those whose measurements take into account phase angle.

Dawe Instruments

This exhibit will include test apparatus for communication work and laboratory use; stroboscopes for speed determination; flash units for analysis by means of high-speed photography; moisture in timber indicator; and other novel electronic equipment.

ACCESSORIES

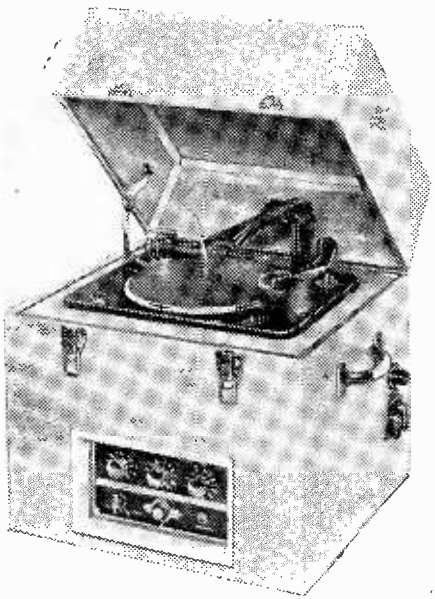
The constructor will undoubtedly find his main interest in those firms exhibiting components, and such firms as Bulgin, Wearite, Cyldon, Varley, Dubilier, T.C.C., will display many well-known old friends as well as new items which will attract attention.



Four of the new "Drilitic" capacitors from the Dubilier range. These are electrolytics rated at up to 500 volt working and available in single units, in 8-8 or 16-8 μF double units. They are very small and easily mounted.

Dubilier

As an example of modern design the new electrolytics on the Dubilier stand will prove of interest, as they have been considerably reduced in size, and it is now possible to obtain a metal can containing an 8 and a 16 μF condenser much smaller than the pre-war 4 μF unit. These new models are also available with wire ends and enable much smaller receivers to be built. In addition to these will be seen the "Nitrogol" paper condensers, a wide variety of resistors for all purposes, volume controls and similar items.



A 30-watt A.C. single record player from the Trix range. It is obtainable in various ratings and with auto-change equipment.

Bulgin

It will be impossible to list all of the items to be found on the Bulgin stand, but amongst them will be seen cable plugs and sockets, capacitors, chokes, co-axial connectors, group boards, fuses and fuse-holders, knobs, switches, television components, terminals, valveholders and volume controls. A new foot-operated switch may be of use to experimenters or amateur transmitters in circumstances where a third hand is called for.

Wearite

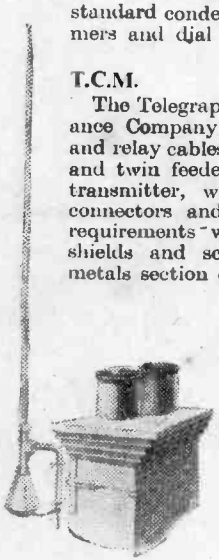
The range of "P" type coils and coil packs will no doubt interest most constructors here. They enable various types of circuit to be constructed easily and compactly, and are efficient and robust. They are designed for an I.F. of 465 kc/s. I.F. Transformers in standard and miniature sizes, A.F. transformers, ceramic rotary switches, and vibrators and vibrator power units will also be featured.

Wingrove and Rogers

"Polar" condensers in various types will be seen here, and the whole of the present production of Messrs. Wingrove and Rogers is concentrated on manufacturers' requirements—2- and 3-gang condensers of the miniature type, 2-, 3- and 4-gang standard condensers and postage stamp trimmers and dial movements.

T.C.M.

The Telegraph Construction and Maintenance Company's exhibit will display R.F. and relay cables and special metals. Coaxials and twin feeders will interest the amateur transmitter, whilst moulded terminations, connectors and accessories for a variety of requirements will also be seen. Mumetal shields and screens will be found in the metals section of this display.



One of the Antiference Company's aerials. This is known as the "Exstat," Model ASA102, and is available for vertical or horizontal mounting.

Electron

The well-known Electron aerial wire (an all-copper, P.V.C. insulated wire in various lengths), and a new rod aerial for window or chimney fitting will be seen here.

Chloride

The popular Exide range of batteries, both H.T. and L.T., will be seen here, together with Drydex batteries, cinema talkie apparatus battery, met. balloon battery, and other battery accessories.

Garrard Engineering Co.

This exhibit will feature the automatic record changer mechanisms and the new high-fidelity pick-up. This has a completely interchangeable armature and sapphire needle point. When the needle needs replacing, the entire armature unit is changed, and thus all difficulties of rubber damping, etc., are avoided.

Erie Resistors

Carbon resistors, vitreous enamelled wirewound resistors, suppressor resistors, carbon track potentiometers, ceramicons, ceramic trimmers and similar items will be seen on this stand.

Multicore

Every constructor is familiar with the Multicore solder and this particular stand is virtually a model factory where operatives from radio industry factories in the London area show how Ersin Multicore solder is used in the production of radio components and accessories. More than 30 soldered joints will be made on a 27ft. conveyor belt by girls from the Bush factory—using Multicore solder.

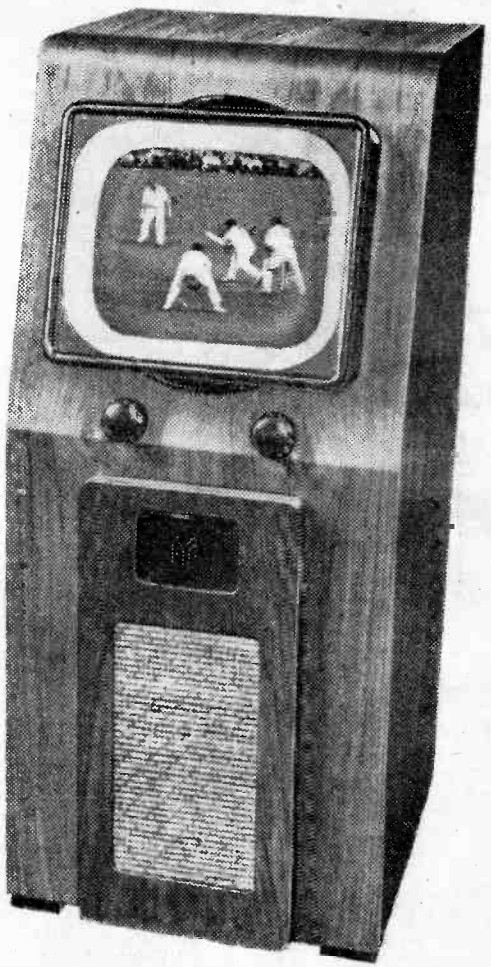
T.C.C.

This stand will feature every type of fixed condenser for radio and television equipment, both receiving and transmitting, in paper, mica, silvered mica, ceramic and electrolytic.

AERIALS

Several firms will be featuring aerials, both of the normal receiving type and the special television arrays. Of the latter may be mentioned the Belling Lee, Antiference and Aerialite.

The Belling-Lee television aerials are available in various types for outdoor erection, together with a new inverted "V" which may be mounted on a convenient chimney or on the rafters in an attic. The arms of the dipole are bent at 45 deg., giving independence of the aerial upon the angle of polarisation of the incident signal wave.



A Pye television receiver of the console type. Although having only two controls (Brightness and Volume) the remaining controls, such as Contrast, Line Hold, etc., are accessible, being mounted immediately behind the small panel seen below the two control knobs. Thus it is a simple matter to make adjustments as and when required. This model gives a black-and-white picture.

D.C. Eliminators

Details of How a D.C. Eliminator may be Employed Much More Profitably.

By W. NIMMONS

WHILST the majority of houses in this country are on A.C. mains, there are still many on the D.C. system—with no apparent move to change over. So it looks as if those on D.C. at present will remain on D.C. for some little time, and the prospective user is forced to take cognizance of what can and what cannot be done with the means at his disposal.

With D.C. we are somewhat limited in the matter of voltage, for the fixed voltage of the mains cannot be stepped up or down to meet the requirements of heaters and anodes, etc. It is true that the voltage can be "broken down" to any suitable value by means of resistors, but when the current is large and the required voltage small this method is extremely inefficient. Nevertheless it is the best we can do with D.C. mains.

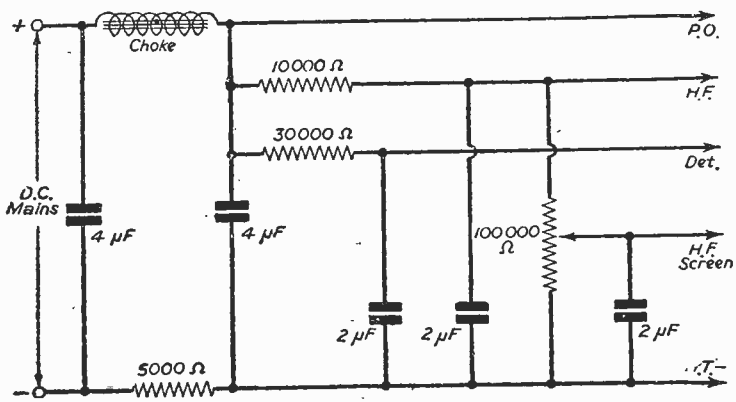


Fig. 1.—An old type of D.C. eliminator for use with a set not employing decoupling.

The D.C. eliminator—which takes the place of a H.T. battery—fills the need of those who prefer the performance of a battery set, without the need for buying H.T. batteries! This is an economical and satisfactory method of supplying the H.T. requirements of the set, and since the load on the mains is extremely small the cost is trifling.

Such an eliminator, designed for the older type of set without decoupling components, is shown in Fig. 1. It will be seen that the various resistors and condensers take the place of the usual decoupling components which are normally incorporated in a modern receiver. This, of course, is with the exception of the two 4μF condensers which, with the smoothing choke, are for the purpose of eliminating the hum which is always present in the mains although these are nominally D.C.

This provides four tappings, viz., the leads to the power output valve, H.F. valve, detector valve, and the screen of the H.F. valve; in addition there is, of course, H.T.—. If used with a modern set with only one H.T. positive lead, it is best to ignore three of the tappings and take the output from that lead marked P.O., or power output. The circuit will then resemble Fig. 2, which is that of an eliminator for supplying a modern decoupled receiver.

The output of this, whilst adequate for all normal purposes with a battery set using a power valve or battery pentode or tetrode, still falls far short of what the mains are capable of providing. It enables the battery set to work at an output of 160 milliwatts for a power valve, or about 300 milliwatts for a pentode. Both these figures are far below those obtainable with a mains pentode, which is in the region of 2 or 3 watts.

For example, the current through the eliminator with the 5,000 ohms resistor in the negative lead would be about 20 milliamps at 120 volts, or 15 milliamps at 150 volts; these values, whilst adequate for battery valves, are far below mains standard.

It might be argued: "Why not reduce the value of the resistor, and thereby obtain an increased output?" Bearing in mind that the currents involved are extremely small from a mains point of view, there seems to be some weight in this argument.

Using Mains Valves

Unfortunately, to increase the output would only mean overloading the battery valves involved. These are designed for maximum anode voltages of 150, with modest currents; to increase the output would mean that the voltage would rise above the maximum allowable, with the result that the filaments of these valves would be damaged.

The obvious solution is to employ a mains valve. With this, the series resistor can be cut out entirely and nearly the full voltage of the mains employed. There is still some voltage drop in the smoothing choke, but this will only amount to 10 volts or so.

Remembering that it is only *power* we want—not so much great volume as power to take care of loud

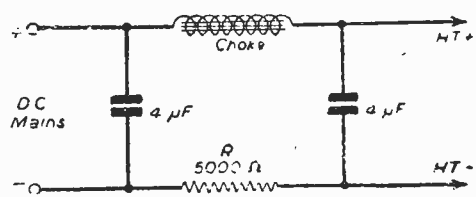


Fig. 2.—In this circuit the current through the eliminator is limited by 'R.'

passages in the music—it is natural that the output valve only comes under consideration. The previous valves in the receiver, presuming they are performing satisfactorily, can quite well be left as they are with the addition of extra voltage droppers in their anode circuits. This simplifies the conversion considerably, as the output valve can be changed very simply where it would require considerable modification to change the detector or H.F. valve owing to the complication of the coils, etc.

Again, there are listeners who "fancy" the distance-getting qualities or tonal purity of their battery sets, or value them for sentimental or other reasons; these cannot fail to benefit from the modifications suggested.

The main difference between a battery valve and a mains valve is that while the former has a simple filament the latter has a fairly complicated heater and cathode system. The heater is quite distinct from the cathode, which performs all the functions of the filament in the battery valve, and is made in various voltages up to 40. At the latter voltage the heater

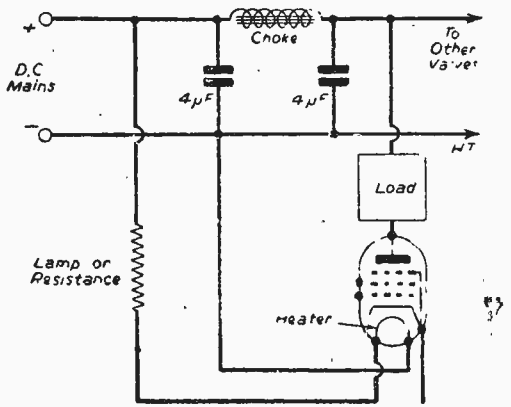


Fig. 3.—An eliminator supplying both H.T. and heater voltages and currents.

usually consumes .2 amps. To break down the voltage from the full voltage of the mains to that of the heater we have to employ a resistance. In many cases a lamp makes a suitable resistance if the light is not objected to or is in other ways convenient.

The necessary modifications are illustrated in Fig. 3. It will be seen that the heater is connected direct to the mains through the resistance or lamp, and that the H.T. voltage for the set is obtained through the smoothing choke, with a large condenser to H.T. — on either side of it. It is essential that the lamp, if one is employed, be of the correct wattage to pass .2 amp. Details of this will be given later. If a resistance is used, the value is very simply calculated. We take the value of the mains voltage, say 220 volts, less the voltage of the heater. That is 180 volts. We then divide this by .2, or the current of the heater. The result is 900 ohms. It is essential that the construction of the resistance should be such that it can dissipate the heat developed.

Complete Circuit

Fig. 4 shows how a complete receiver, using the mains pentode, may be designed to run from a D.C. eliminator. This is a complete circuit, and shows the necessary switching.

The current is about 40 milliamps., and presuming that the smoothing choke has a D.C. resistance of 400 ohms, the voltage drop through the choke will be 16 volts. With 220-volt mains this leaves 204 volts to work the set. As this is above the customary voltage for battery valves it is essential to drop some voltage to the H.F. and detector valves.

This is done through the 20,000 ohms resistor in the anode lead to the H.F. valve; the 100,000 ohms resistor between H.T. positive and the screen adjusts the voltage for the screen to the desired value. In the detector anode circuit we have the load resistance (30,000 ohms) and also a 50,000 ohms decoupling resistance. This latter is higher than usual, and presuming the detector current to be 2 milliamps, the voltage drop across the decoupling resistance will be 100 volts. This adjusts the detector anode voltage for smooth working, but if power grid rectification is contemplated the decoupling resistance can be reduced to 10,000 ohms. In this case a grid-leak of ½ meg. or even ¾ megohm can be used.

The coupling to the grid of the output valve is by the well-known auto-coupling method, with a condenser of .5μF. If for any reason this condenser resonates with the particular transformer employed, it is recommended that the value be changed—upwards rather than downwards. For example, a 1.0μF or 2.0μF might be employed. I mention this point because at large volumes a resonating condenser and transformer can be very unpleasant and may damage the speech coil suspension of the loudspeaker. By shifting the capacity of the condenser, preferably upwards, this defect can be cured.

Note also the negative feedback resistance, 500,000 ohms, between the output valve's anode and the detector's. This value seems to be about right for speech and music, but if it reduces the output too much it can be increased to 1 or 2 megohms; or if one wants a large amount of negative feedback it can be reduced to 250,000 ohms. A switch in series with the resistance makes the negative feedback optional, as there are cases when the set is better without it, as when searching for distant stations.

Mains Unit

The mains unit is preferably made up in the form of a separate unit, with three leads going to the set. One of these is the H.T. positive lead, and the other two are the heater leads; one of these, i.e., the negative, is also the H.T. — lead.

A double-pole single-throw switch serves to isolate the mains completely from the set. Two ordinary tumbler switches can be used here, or one only if it can be ascertained which main is earthed. The switch should be put in the mains lead which is *not* earthed; otherwise carry on as per the diagram.

It may not be necessary to use 4μF condensers in the eliminator. The writer used two 2μF, with a barely perceptible hum, thus saving space; but the condensers used must be capable of withstanding the voltage without breakdown.

One side of the heater of the output pentode is connected to chassis, and to the negative mains; the other side of the heater is connected to the positive main through a lamp or resistance, as previously noted. The size of lamp for a .2 amp.

heater is apparently 44 watts with a mains voltage of 220, but this is subject to correction. In the first place, we have the 40 volts of the heater, and secondly the voltages of the fuse bulbs which are in series with the lamp and heater. We can take these to be 6 volts each. So that added to the voltage of the lamp, 220 volts, we have 40 volts and 12 volts, or a total of 272 volts. If we divide this into 44 we get a current of only .16 amp., which means that the heater would be under run. Taking the next size of lamp, i.e., 60 watts, we find that the current would be .22 amp., or a 10 per cent. overrun. This would not do, so we take a 40-watt lamp and a 15-watt lamp and join them in parallel to give a total of 55 watts. With this we find that the current is .201 amp., which is accurate enough for anybody.

If the constructor wishes to use a barreter he should obtain one that passes .2 amp. and calculate the resistance, if any, which will be in series.

It will be noted in Fig. 4 that the cathode is joined to chassis. This was done so that the same grid-bias battery could be used to bias the output valve. Automatic bias may be used if desired, but with battery bias the tone is better and the battery is virtually no trouble, and should last about a year.

The results obtainable with this combination will be a revelation to the battery user. The Brimar 7D6, for example, takes 6 volts grid-bias for an anode current of 32 milliamps., and has a mutual conductance of 10 and a power output of 3.75 watts. No battery valve can approach this.

Other valves will, of course, require a different grid-bias voltage. The actual voltage required should be ascertained from the makers' catalogues, or can be calculated if the bias resistance and the current are known. It is risky to work in the dark as far as grid-bias figures are concerned.

To use the eliminator, see the S2 and S3 are open. Close S1 and wait until the pentode valve has attained working temperature—about 1 minute. Then close S3 and finally S2. These precautions are taken to safeguard the cathode in the case of the

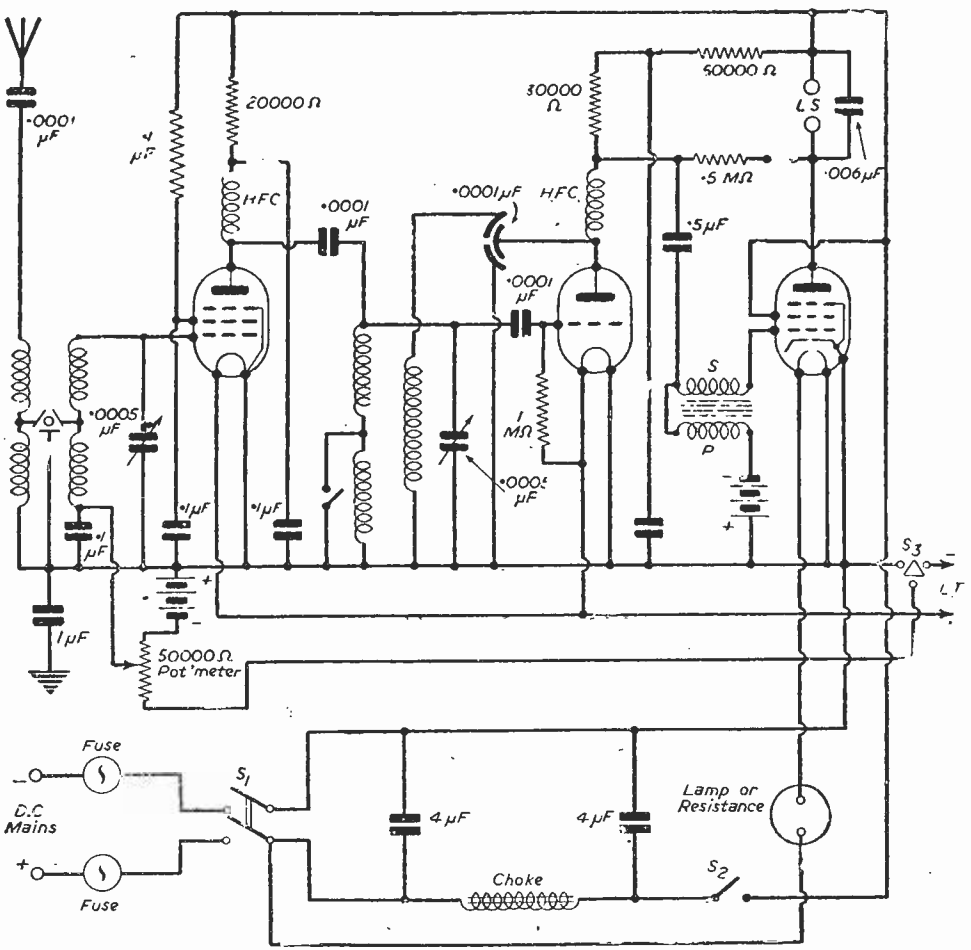


Fig. 4.—This diagram shows how a mains pentode may be used in conjunction with battery valves and a D.C. mains eliminator.

indirectly heated pentode and the filament in the case of the battery valves.

When switching off open S1 and finally S3. The H.T. should go on last and come off first, if long life is wanted from the valves.

It is important to remember to open S1 when making any adjustments to the set. The reason is that the chassis may be at high potential with respect to earth, and you may get a nasty shock if you happen to be standing on a tiled floor. Even such innocent things as grid-bias plugs can convey the shock, so it is as well to be doubly careful.

New Method of Production

Some Interesting Details of a New Method of Making Radio Receivers Without Interconnecting Wires and Leads

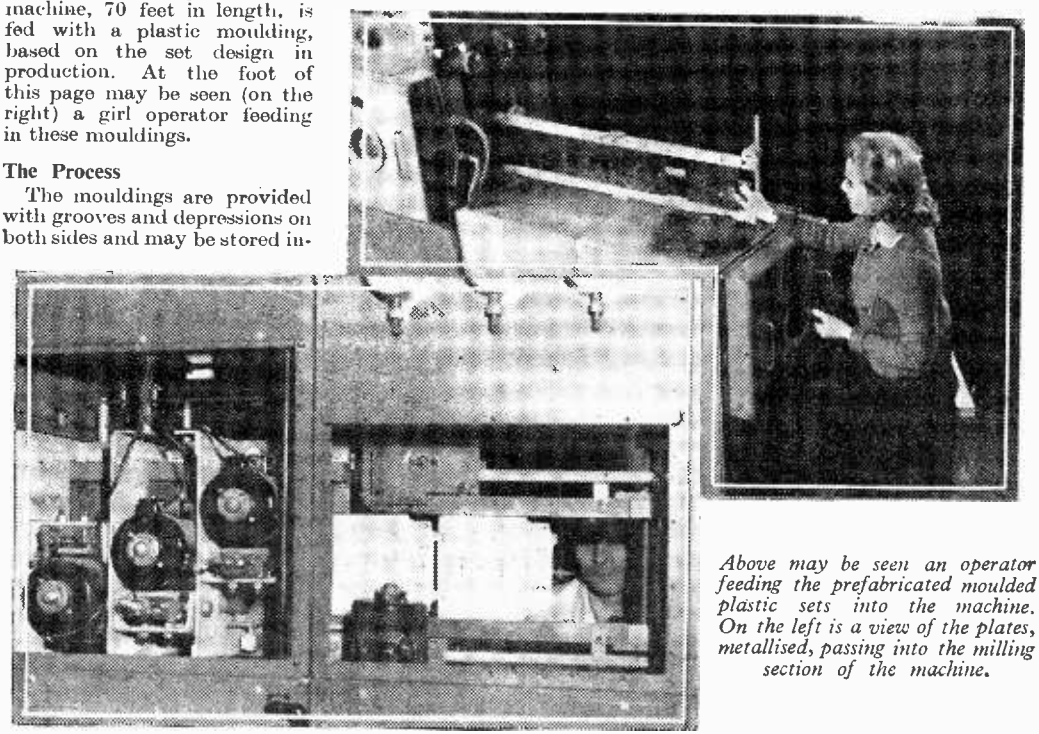
IN the new method of receiver production to be described here, the interconnecting wires are eliminated and all connections are carried out by an entirely new process. There are many advantages to this method of construction, not the least of which is the high degree of reliability which is introduced, as such troubles as "dry joints" and loose connections are overcome. Furthermore, the job of production is greatly speeded up, and it is claimed that by this new method 180 complete radio receivers of a standard two-valve all mains type may be produced in an hour.

The system has been perfected in this country by Mr. J. A. Sargrove, and in its basic form it consists of an insulated plate upon which are embossed certain shapes and lines agreeing with components or connecting points. These are metallised and thus conform to normal component and wire schemes. In practice a huge electronic machine, 70 feet in length, is fed with a plastic moulding, based on the set design in production. At the foot of this page may be seen (on the right) a girl operator feeding in these mouldings.

The Process

The mouldings are provided with grooves and depressions on both sides and may be stored indefinitely in this form. When ready for processing they are dried out by an infra-red ray process, and then fed into the machine. To prepare the plate for the metallic deposit they are, in the first part of the machine, roughened by blasting with abrasive grit, and are then cleaned. As the plates proceed through the machine, carried between runners as may be seen on the left of the lower illustration, they are sprayed on both sides simultaneously by metal spray pistols. The number of these stages depends upon the thickness of metal which is required in the finished circuit.

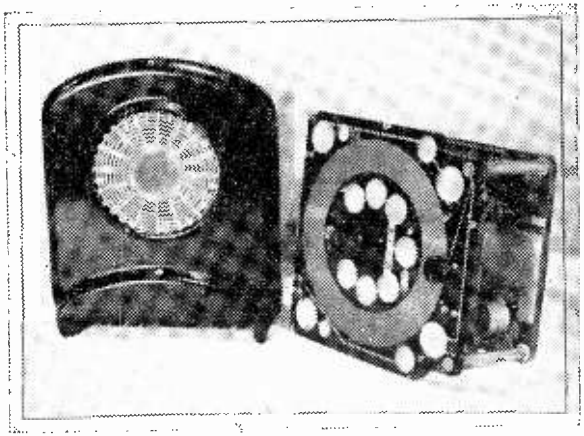
Next high-speed milling tools pare away the surface of the plates so that there is left an insulated plate carrying metal in grooves forming a network of conductors, inductances and in certain places condensers. Whilst still in the conveyor the circuits are electrically tested. If more than one plate in



Above may be seen an operator feeding the prefabricated moulded plastic sets into the machine. On the left is a view of the plates, metallised, passing into the milling section of the machine.

succession is rejected, the machine is stopped and previous processes are checked and adjusted. From this stage, they pass to graphite spraying machines, where resistance paths are sprayed through stencils, and these sprays are automatically timed to ensure accuracy in the finished resistance value.

The plates then pass to sections of the machine which remove all unwanted material, plastic, metal or graphite from holes, slots, etc. Then metal sockets are inserted automatically for terminal points, and



The complete cabinet and a finished chassis ready for installation.

combined riveting, welding and soldering operations make sound connections at the required points. Further electrical tests are then applied, and the graphite deposits are burnished to provide stability. After a thermal and electrical ageing process, all in the conveyor belt of the machine, the plates are sprayed with lacquer, and appear at the other end of the machine where they are taken up by a further operator to be finally assembled into cabinets with speakers, etc.

Component Substitution

It will be seen from the above brief explanation that certain items cannot be prefabricated by this process. Valves, variable condensers, mains leads, speakers, etc., still have to be employed, but the system aims at producing practically the entire set automatically, and with a very much higher degree of reliability than is claimed for standard processes. For instance, in the latter stages of the equipment just described, the mains plug, switch parts, mains resistor terminations, etc., are provided by a novel automatic die-casting system into premoulded recesses and grooves, in a specially designed plastic cabinet. This is moulded without the conventional metal inserts, and these are then interconnected automatically by a graphite spraying and burnishing machine which produces the mains voltage dropping resistor within predetermined parts of the cabinet.

On this page is an illustration of the complete chassis of the two-valve set, and its accompanying cabinet. The large circle is actually a spiral trace which is the tuning coil, and the light circles are capacities formed by a very thin skin of plastic being left in the plate to act as a dielectric and the metal deposit on each side acting as the normal plates. The distance pieces between the two plates act as electrical connectors.

Electronic Control

For those who are interested in the finer details of the processing work it may be mentioned that all operations are electronically controlled. For instance, the spraying machine has eight nozzles arranged four on each side. Reels below the spray carry zinc wire, and vessels containing ethane, propane and oxygen are also conveniently arranged. When a plate arrives opposite the spray gun the electronic control unit causes the guns to open up and starts a timing cycle which regulates the admission and ignition, in the correct sequence, of the above-mentioned chemicals, starts and controls the supply of the zinc wire into the melting flame and admits compressed air for atomising and spraying the molten metal. Where a continuous flow of plates is passing through the machine the timing circuit of the control unit perceives each plate in turn and extends the operating time until the last plate has been processed. As soon as a plate fails to arrive opposite the guns the equipment is switched off.

A.C./D.C. Equipment—A Warning

AS is well known, in a receiver intended for D.C. or "universal" mains operation no mains transformer is used. Consequently, one mains connection is taken directly to the earth-return line of the receiver, which includes the metal chassis, tuning condenser, screens of valves and coils and any other metal parts in contact with the chassis. Contact with any of these parts is virtually direct contact with one mains lead. If there is a leakage through the body and earth to the other mains lead shocks will be experienced.

Disconnect the Mains Lead

Disconnecting the mains lead before any adjustments are made will provide a complete safeguard. No mains apparatus should be left where children may touch connections, etc. If risks of this type cannot be avoided the receiver should be enclosed in a wooden cabinet. If the tuning dial escutcheon is of metal this may be connected to the chassis *via* the reduction drive and tuning condenser, and therefore an insulated panel is desirable. If control knobs with grub-screws are used the latter should not project, and it is worth while filling the space above the screw with Chatterton's Compound or other wax. Attention to these points will remove the possibility of shocks. All A.C./D.C. receivers employ condensers in series with aerial and earth leads, and, for the above reasons, these should not on any account be omitted.

Finally, it should be remembered that all mains apparatus is potentially dangerous, and it should accordingly be handled with care.

Some A.C. Power Problems—3.

Harmonics in Current and Voltage Waves, and Pulse Loads are Dealt with Here.

By "DYNATRON"

THE waveforms of Fig. 6 are not "rectified." They vary symmetrically on each side of zero, so, although much distorted, they do represent *alternating* currents oscillating about a zero datum line—there is no D.C. component. Still, the "distortion" is due to *harmonics*; pure sine-waves of various frequencies, added together as above. In cases where the distortion is the same for positive and negative half-cycles, as in Fig. 6, only *odd* harmonics can be present.

In general, one of the "harmonics" will be a sine-wave of the same frequency as the wave itself—or, in the case of a rectified current, the frequency of the original A.C. supply, e.g., 50 cycles sec. This is the *first harmonic*, or *fundamental-frequency* ("fundamental," for short). In the output circuit of a valve working in Class B, the fundamental current will be at the frequency of the signal (or "drive") applied to the grid.

"Higher harmonics" are multiples of the fundamental-frequency. If *even* multiples, 2, 4, 6, etc., they are called *even harmonics*, whilst *odd harmonics* are, individually, at 3, 5, 7 times, etc., of the fundamental-frequency.

Well, to cut a long story short, half-waves such as Fig. 4(a) contain only *even* harmonics—with fundamental and D.C. Thus, if the A.C. supply is 50 c/s., we shall have as constituents of the rectified current, (i) the D.C. component; (ii) the fundamental-frequency harmonic, 50 c/s., and (iii) higher harmonics at 100 c/s. (second harmonic), 200 c/s (fourth), 300 c/s. (sixth), etc. There will be no *odd* multiples in a wave of this shape.

So, now you will see why there is also A.C. power in the resistance of Fig. 5(a)—*harmonic power* + a D.C. power. Or perhaps it would be more explicit to write:

Total power in a D.C. resistance = D.C. power + fundamental power + harmonic power. "harmonic" here signifying all components higher than the fundamental.

"Complex" R.M.S. Value

When we said that the average power is $\frac{1}{4}.I^2_pR$, this is the average value of all three of the above components. The R.M.S. current is then $\frac{1}{2}I_p$.

Since the voltage across a D.C. resistance will also be a pulsating waveform, the power will also be given by $\frac{1}{4}.V^2_p/R$, or the R.M.S. voltage $= \frac{1}{2}V_p$. The total power, as seen, is "complex," being made up of D.C. and a number of A.C. components. Hence the above have been called "*Complex R.M.S. Values.*"

The term was introduced in the theory of mercury-arc rectification, but is of interest because we may presently refer to other "R.M.S. values" in connection with this pulsating current. Indeed, the complex R.M.S. value is seldom of interest in itself.

It does emphasise one important principle. If a current of distorted waveform is passed through a D.C. resistance, the mean power (and *heat*) developed will be due to all the frequency components causing the distortion—including D.C., in a rectified waveform.

Harmonics in Current and Voltage Waves

This is not merely an interesting point. It is a principle which may be stated more precisely when it will help a great deal to understand other principles which follow.

We stated that power is produced by all the harmonic components, providing the voltage and current waves are identical. More precisely: *power will be developed by a given harmonic, providing there is a corresponding harmonic in the voltage wave,* and the same applies to steady D.C. values.

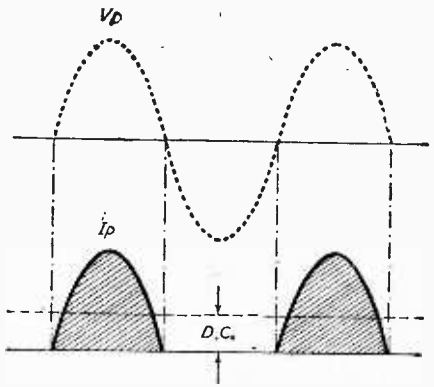


Fig. 7.—If an "average D.C." is multiplied by an alternating *voltage, what sort of "power" does the answer give? The D.C. in the diagram is the mean value of a half-wave current. The sine-wave voltage is the mains voltage.*

A simple illustration will make this clear. First, let us consider D.C. power. Suppose the current consists of rectified half-waves, having a mean D.C. value of $0.318\ I_p$, but that the voltage is a *sine-wave*, Fig. 4.

We have "D.C." in the circuit, but can it develop any true *watts*? The voltage is a sine-wave *whose mean value is zero*; it has no D.C. component; we have D.C. "amperes," but not "volts," therefore there can be no D.C. *power*/*Watts* = *Volts* × *Amperes*, which here means, $0 \times 0.318I_p = 0$!

Similarly, with regard to the A.C. harmonics. If there are no corresponding harmonics in the voltage wave, there can be no true harmonic "power" (*watts*).

If, as in Fig. 7, there is a fundamental harmonic whose frequency is the same as the voltage wave, *mean power will be developed at this one fundamental-frequency only.* The D.C. and all the higher harmonics are incapable of developing any power. You may

(*Continued on page* 431).

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say, in some cases, that the load is of such a nature that it "picks-out," or "extracts" the fundamental harmonic, eliminating all others.

A single valve in Class B, or Class C, with tuned-circuit load well exemplifies the point. The valve current is pulsating (half-wave in Class B), but the load offers appreciable impedance only to the fundamental-frequency. A sine-wave voltage is developed at this frequency, whilst the higher harmonics produce no useful output. Obviously, the D.C. component of anode current can give no power in a resonant A.C. load, though it does cause an average D.C. power to be dissipated at the anode since, there, we have also a mean D.C. voltage derived from the H.T.

Audio-frequency, push-pull Class B also amounts to much the same thing. If adjustments are correct, the output voltage across the whole or any part of the transformer primary will be substantially a sine-wave. The mean output will be at fundamental-frequency, because harmonics in the current wave have no corresponding voltages in the output circuit.

If you are interested in a more general mathematical statement of our "principle," here it is: *the average product of any two sine-waves of different frequencies is zero.* In other words, a second harmonic current gives zero resultant power (i.e., average power) if multipled by a first harmonic voltage, etc. To get any average power there must be a harmonic of the same frequency in the voltage wave.

A Curious Result!

All this leads to a somewhat odd result in the rectifying circuit of Fig. 5(a).

On the right-hand side of the dotted line, the current *and* voltage are of half-wave pulsating form. Complex power is developed in the D.C. resistance R.

But on the left-hand side we have the A.C. mains supplying a sine-wave voltage—the current will still be pulsating. Thus, *only A.C. power at first harmonic frequency* (say, 50 c/s) will exist on this side of the rectifier. That is not to say there will be no higher harmonics in the current-wave; *the average A.C. power will be equal to the "complex power" in R.*

How does this come about? I have heard it suggested for an analogous case that all the harmonics are "converted into fundamental power." The statement was made in reference to an R.F. amplifier having a non-aperiodic load such as a tank circuit. I doubt if it is true exactly in the sense stated, but it contains an important truth as will be seen from the case under discussion.

Here, as the voltage is sinusoidal and at one fixed frequency, the A.C. mains may perhaps be regarded as analogous to an "aperiodic" circuit generating a sine-wave voltage. Actually, the circuit we are considering is an inversion of amplifier principles, because what is really being done is converting A.C. into D.C.—it is the other way about in an amplifier. Still, there is undoubtedly an important principle applicable to both cases.

It is this: to a half-wave current *and* voltage, the D.C. load is R ohms—the actual resistance used. But, to the A.C. mains, the load resistance is *twice* R. Let us denote it by R_{ac}, as in Fig. 8. We may call R_{ac} a "fundamental" A.C. load at the mains frequency.

The "Pulse Load" Again!

Why should R_{ac} be 2R? I will tell you in a moment. I want to digress a little into the subject of the "pulse load" which I have mentioned so often in recent writings.

To be sure, the "pulse load" has been a perplexing sort of quantity. I am just looking over some technical correspondence of two years ago, where I pointed-out that this queer load-value is a "*D.C. equivalent*" of the A.C. load in a Class B or C amplifier. Later thinking on the problem seemed to suggest that "equivalent" was not the right word.

But, I freely admit, in the example we are now considering, that we have what is almost tantamount to a demonstration of equivalence. It was the precise illustration I was using to hammer home my point in the technical correspondence referred to.

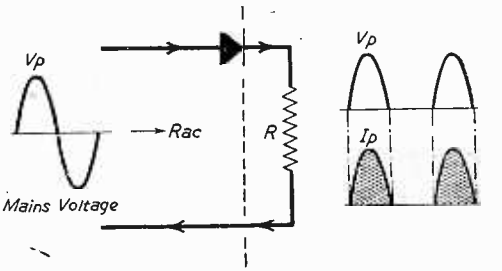


Fig. 8.—On the right of the dotted line, current and voltage are pulsating. To the left, the current is still of pulsating waveform, but the mains voltage is a sine-wave. "Fundamental power" will be taken from the mains, equal to the sum of the various power components in R. The A.C. mains will see a load $R_{ac}=2R$.

A D.C. resistance R becomes a resistance $R_{ac}=2R$. In R, the power is complex, containing D.C., fundamental and higher even harmonic components. On the A.C. mains side, a kind of "impedance-transformation" takes place: R becomes a resistance R_{ac}, which takes exactly the same power as R, but it is *all fundamental A.C. power.* What is this if not *equivalence*?

Well, it is a small point, and I cannot go into all the arguments in full just now. My own view is that something very much like an A.C. "power-factor" has to be introduced to make sense of everything. But, for the present, we will call R_{ac} a "*fundamental equivalent*" of the D.C. load R.

When you bear in mind all the components that do produce power in R, whilst on the A.C. side we have only one fundamental component developing power, it does look as if there is something in the idea of harmonics being "converted." But, there is a little more to be said on that point!

As to the explanation of "R_{ac}": the amplitude of the half-wave current is I_p. It can be shown by Fourier Analysis that the amplitude of the first harmonic, sine-wave component is only $\frac{1}{2}I_p$. Therefore, if we neglect any voltage-drop in the rectifier, the peak half-wave voltage V_p across R will be the same as the peak sine-wave volts V_p from the mains. For the same peak current I_p, we have:

$$R = V_p/I_p$$
$$R_{ac} = V_p/\tfrac{1}{2}I_p = 2.\ V_p/I_p = 2R.$$

(To be continued)

Programme Pointers

A Note About a New Dictionary of Music and Other Topical News. By MAURICE REEVE

WHO doesn't derive infinite pleasure from browsing through a work of reference? Is there anything more restful, profitable or nostalgic than to peruse a well-compiled anthology, dictionary, gazetteer or symposium, roaming among great men and events of the past, pondering over the seemingly insoluble problems of the present, or speculating on the immense potentialities of the future?

Grove's "Dictionary of Music and Musicians," Gerald Bullitt's "The Jackdaw's Nest," Maurice Baring's "Have You Anything to Declare?" as well as the standard, classical anthologies and dictionaries, offer us endless pleasures and satisfactions.

A Dictionary of Music

An excellent new example has recently been added to this ever-lengthening series in the form of "Everyman's Dictionary of Music," compiled by Eric Blom, and published by G. M. Dent at 10s. 6d.

No practising musician or music lover should fail to keep a copy on his or her piano. Mr. Blom is to be most highly complimented on the immense amount of scholarship and erudition he has compressed into its 706 pages, just as the publishers deserve to be on the neatness and trimness of its design and format. Price and space preclude all illustrations, musical quotations or diagrams; one must turn to at least the Oxford Companion to Music for these. Also, wisely or unwisely (I won't say), no reference is made to living performers.

But there is a wealth of information which is so excellently compressed in the various articles that one is easily able to interrupt one's studies or pleasures just for long enough to garner the information required, and without having to read lengthy treatises in library tomes. A column-long article on Chopin is immediately followed by a paragraph on the famous "Chopsticks" tune, familiar to the childhood of some of us. Nearly six columns are given to an exhaustive list of the various works inspired by Shakespeare. Whilst another fascinating subject dealt with in close on four columns is a list of "quotations," tunes which composers have used in more than one of their works as well as others they have "borrowed." There are 10,000 entries, ranging from Beethoven to Bolero, Schubert to Saxophone, and from Lento to Lilliburlero.

Referring to the latter, I looked for "Tipperary" and "The Girl I Left Behind Me" without success. But, as Lilliburlero is not credited with being the great marching song of Marlborough's wars and is not included with the giving of that fact in view, the omission of the others, not to mention "Lilli Marlene," is explained. Also a much sadder exclusion. I noticed St. James's Hall among the "S" entries; but poignant memories of a lifetime of great concerts and great artists rose within me as I looked for Queen's Hall without success.

Assessments, opinions and valuations are not included; they couldn't be within the designed compass. But it is excellent value, and a first-class investment for all those not yet in possession of a work of musical reference.

Sir Thomas Beecham

Sir Thomas Beecham was in the wars again recently. The reason may be well known to most readers, but its implications are worthy of reflection and consideration. At his recent Mozart Festival, Lady Beecham, who was to have played one of the master's piano concertos, withdrew from the programme at about 48 hours' notice owing to indisposition. The agent, Mr. Harold Fielding, all ready with his list of substitute artists, was about to select one when Sir Thomas put his foot down. "In Tschaikowsky by all means," he told the audience, "but in Mozart, never."

His argument was the artistically ascetic one that the harmony of ideas and unity of purpose established between the two artists as a result of long association and rehearsal, would inevitably, and disastrously, be dispelled by the last-minute arrival of a "foreign" artist, however eminent. The treatment of the work as a whole, with the piano as an integral part, as opposed to the more popularly-held conception of the piano as a "solo instrument" lording it over the "orchestral accompaniment" and "dictating" the rendering of the work, obviously being Sir Thomas's interpretation of his duties to the public as an artist. Orchestral works were played in substitution.

On the other hand is the age-old tradition, "the show must go on." Are there not many excellent pianists with the highest ideals and a full sense of the responsibilities they owe the music they play; pianists of great reputation, known for the integrity of their Mozart playing, and who would have filled the breach if not with 100 per cent. satisfaction to Sir Thomas, than with 95 per cent. to the audience? To what extent and in what implied direction do both an artist's and an agent's obligations to their audience lie? An advertisement is put out, stating that So-and-so will play such-and-such. So-and-so cannot appear. The questions arising are these: was the original advertisement a form of contract, and has that contract in effect been broken already? If those concerned did, in effect, contract to play a certain work, which advertisement has collected an audience and their money, then that work should be performed even with a substitute artist. If, on the other hand, it is the artist who is the basis of the contract, if any, and not the work, then to what extent may the unwittingly defaulting artist be "substituted"?

There is yet a third angle to the problem. Is the announcement, which explicitly and unequivocably states that such-and-such works shall be performed by such-and-such artists, in effect a contract to be fulfilled, with the obvious qualifications, such as death, illness or incapacity; or is it nothing more than an implication that there will be an evening of good music on the advertised "lines" performed by first-class artists such as those specified, each of whom will turn up and play their piece, all being well?

Underneath the Dipole

Television Pick-ups and Reflections. By "THE SCANNER."

IT is surprising how one's senses readily accommodate themselves to what might be called anomalies and anachronisms. It does not take very long for the ear to become accustomed to a large volume of sound apparently emerging from the mouths of very small figures reproduced on the end of a cathode ray tube. When the picture area is as small as a picture-postcard this association of eye and ear may be an uneasy one; but the "drugging" process is speedy, and within a few days the viewer is blissfully unconscious of the glaring discrepancy in the presentation of Lilliputian bodies with gargantuan voices.

Arty-crafty Television

After all, the eye has accepted the light and shade of monochrome photography and cinematography for a long time as being a faithful reproducer of scenes. Scientists laboured to give us the anastigmat lens to improve definition and depth of focus in photography, and then to provide the diffusion discs, gauzes and soft focus lenses subsequently insisted upon by the portraitists. Some purists already protest that in introducing colour to photography and to motion pictures the higher art of photographic interpretation of "mood" has suffered a set-back.

Colour photography is mere "reporting," say these long-haired high-brows. So we must take care that in accepting these small pictures on our television sets we are not ourselves becoming arty-crafty, all corduroy and comargo, resisting the steady progress of better (and bigger) television pictures, which bear a more natural relation to the sound volume. Our choice of a set will still depend upon the three factors—screen size, definition and price. And the biggest factor is probably the smallest price!

Picture Sizes

The 10 by 8in. size of picture has always seemed to me to be adequate, and I have always personally preferred direct vision sets to those using mirrors. However good the mirror was, it always seemed to me to take away a certain "something" which I have been quite unable to assess. In straight photography a transparency print always seems to have more "life" than a print on opaque paper. This is particularly so when looking at still stereoscopic transparencies and comparing them with ordinary stereo photos, both being viewed through their appropriate viewing instruments. A new method of stepping up the size of a picture without employing huge cathode ray tubes has now been developed. This introduces new optical methods entirely and makes use of a small tube, a lens system and two mirrors, though one of the latter may be omitted if there is no objection to a somewhat cumbersome chassis. Known as the Schmidt system, a picture at the end of a smallish tube is reflected almost directly back by a spherical concave mirror around the outside of the tube. The tube is encircled by an aspherical correcting lens, made in the form of a ring surrounding the neck of the tube, and the re-formed picture is projected upon a silvered screen, via another mirror! Pictures up to 30in. wide are claimed with an apparatus occupying very little space. It seems a complicated method to me, involving much high precision optical work. However, progress in the manufacture of moulded plastic lenses has been rapid, and optical glasses which formerly cost many pounds may be turned out for a few shillings by mass production.

Seeing is Believing

Personally, I think it will be a long time before big screen television is available for home use at a reasonable cost, and I feel that straight forward projection, through straight forward lenses, probably of plastic type, will be the answer. The screen? I forecast a translucent back projection screen. This will give that transparency brilliance mentioned earlier for all persons directly in front, at the expense of those who view the screen from a side angle and who will see a somewhat unevenly illuminated picture. Still, this will not matter for home use, where the viewers rarely number more than four or five persons. This is something I *have* seen and consequently can believe!

Recorded Programmes

The B.B.C. struggle along with a limited budget and, all things considered, do a fine job. Many excellent programmes are televised and finished, there being no means of recording scene and picture for reproducing at a later stage. Of course, the cinema camera and film recording could be used, but this is a most expensive method. Film stock, development, processing and prints alone would cost upwards of £2 a minute, and much more if the scenes were shot, cut and edited as for the cinema.

The Television Coalition

The B.B.C. has its monopoly. The film people—and especially the Rank Group—have their film facilities, their artistes, their equipment and their big screen television ready for installation in cinemas. And yet there is a deadlock. The B.B.C. want the newsreels and other films, even if the latter are old and have had their day at the cinemas. On the other hand, the Rank circuit wants to be able to project television pictures of historic and sporting events at its cinemas. Sooner or later, there will be an agreement which will benefit both—and television viewers will participate.

How long will it be before this desirable state of affairs is likely to come about? The newsprint cuts prevent me from enumerating the varied forecasts I have heard, and all of them are subject to so many "buts" that they are as unreliable as most Derby tips. The wedding of the Princess would obviously be an appropriate and happy moment for the B.B.C. to make available full television facilities to the film people. But the high executives of both sides seem to be so fully occupied in overcoming the frustrations of our times.

Impressions on the Wax

Review of the Latest Gramophone Records

THE Melachrino Orchestra, which is more and more coming to be regarded as one of the finest light orchestras in the country, and noteworthy for its string section which broadcasts regularly and is making a series of recordings, is now featured in a new series of B.B.C. programmes with Richard Tauber every Sunday from 9.30 to 10 p.m. in the Light Programme. This month the orchestra, conducted by George Melachrino, play "Memories from the Ballet" on *H.M.V. C*3594. Arranged by G. Melachrino, the record, which is in two parts, includes excerpts from "Faust Ballet," "La Source," "Casso Noisette," "La Boutique Fantasque," "Ballet Egyptien," "Coppelia," "Swan Lake," "Sylvia," and the "Sleeping Beauty Waltz."

Famous in Britain for his symphonic treatments of popular dance numbers and light classics, André Kostelanetz is equally renowned in America, where he can command £1,000 for a half-hour broadcast. His latest recording on *Columbia DX*1384 features colourful orchestrations of some of the most famous of Jerome Kern's compositions.

An interesting recording and one that will appeal to lovers of the piano is that by Benno Moiseiwitsch (pianoforte), playing "Saint-Saëns—Concerto No. 2 in G Minor, Op. 22," on H.M.V. *C*3588-90. This, the second of the five piano concertos written by Saint-Saëns, is probably the most popular. Composed in 1868, and first given in Paris in December of that year, it consists of three movements: andante, allegro scherzando and finale. The Concerto begins with an introduction for the soloist based on brilliant figures of a Bach-like character. This leads to the first movement proper, where the piano announces the first principal subject. There is a flowing second subject. The allegro scherzando opens with four bars in which the timpani emphasise the dominant rhythm. The finale pursues its way with utmost vivacity and forms a suitable ending to an entertaining work. Moiseiwitsch gives a fine performance and is accompanied by the Philharmonic Orchestra, conducted by Basil Cameron.

Vocal Recordings

Josef Locke has been singing for 20 years, since he was seven years old, in fact, with a wide repertory of everything, from folk song to opera. The late Count John McCormack took great interest in him, advising him to give up opera and to devote himself to ballads, for which his voice was considered more suitable. Locke must be one of the tallest tenor singers in the country—6ft. 2ins. in his socks. The two Italian songs he has chosen on *Columbia DB*2322 provide ample opportunity for the display of his voice; both pieces are supremely melodious, and the nostalgic air of "Come Back to Sorrento" is admirably conveyed by the artist.

Richard Tauber's new songs consist of settings of two major poets by British composers. Sir Landon Ronald was a fine song composer, and his work in this direction has been successful with a wide public. Frank Bridge has enjoyed a less widely spread popularity; nevertheless, he was a musician of great taste and compositional skill, whose best work is to be found in the chamber music and the songs. Tauber sings these songs, "Come to Me in My Dreams" (F. Bridge) and "Good-night" (Landon Ronald)—*Parlophone R*020554—in the manner that has made him one of the most popular tenors in the country.

Variety

One of the finest points about *Oklahoma* is its unity. Composer (Richard Rogers), librettist (Oscar Hammerstein 2nd) and choreographer (Agnes de Mille) have worked closely together to launch the play on a vivacious stream of melody and dance. The basis of the piece is Lynn Rigg's folk play of rural America, set on the farm in the State of Oklahoma at the turn of the century. Singable tunes abound, and the selection that has been recorded on *H.M.V. C*3595-6 gives a vivid summary of the best of them. The artists involved are all those engaged in the Drury Lane production.

One of the most notable facts about the voice of Steve Conway, and one that certainly does not detract from its appeal, is that it bears a striking resemblance to the late Al Bowlly's. Conway, who made many broadcasts with Sandy Macpherson in the radio series "In Romantic Mood," has now attained popularity as a solo recording artist in his own right. The two ballads he has recorded on *Columbia FB*3326, "Beware My Heart" and "Time After Time," are respectively from the films *Carnegie Hall* and *It Happened in Brooklyn*.

Hawaiian exponent Felix Mendelssohn has popularised a musical style that originated in the South Sea Islands. In "Sweet Leilani," a popular commercial number based upon a traditional Hawaiian theme, and "Moonlight and Shadows," sung by Dorothy Lamour in the film *Jungle Princess*, he has chosen two tunes that are perfectly suited to his melodious combination. The respective lyrics are sung by Archie Coates—*Columbia FB*3322.

Dance Music

The Skyrockets are, of course, one of the famous dance bands born in the Royal Air Force during the war. After demobilisation they decided to continue playing together as a co-operative band with Paul Fenoulhet directing. Their latest recording is "Linda" and "Try a Little Tenderness," on *H.M.V. DB*5982.

For those who like dancing there is "Heartaches" and "Come Back to Sorrento," played in strict dance tempo by Victor Silvester and his Ballroom Orchestra on *Columbia FB*3324; Harry Davidson and his Orchestra continuing their "Old Time Dance Series" on *Columbia DX*1383; "The First Day of Summer" and "Heartaches," played by Lou Preager and his Orchestra on *Columbia FB*3323; "Sirocco" and "Oustral," played in strict dance tempo by Victor Silvester's Strings for Dancing on *Columbia FB*3314, and, finally, "The Little Old Mill" and "Heartaches," played by Geraldo and his Orchestra on *Parlophone F*2234.

Open to Discussion

The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

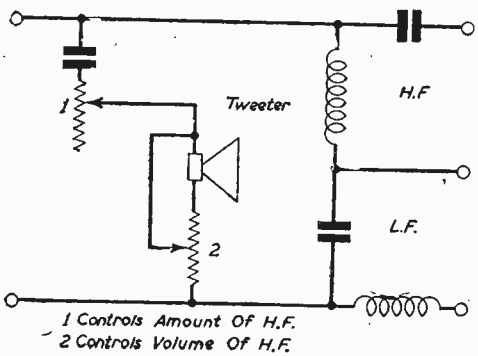
Dual Speaker Networks

SIR,—With reference to your article on dual speaker networks, readers might be interested in a further modification.

For about 15 years I have used this triple arrangement, which is basically similar to the one your writer has suggested.

I am now using a 12in. Rola for bass, an 8in. for "middle" and a tweeter for top.

If I feel I could enjoy a little more "timbre" I increase output from tweeter. Here is my own effort.



The circuit used by Mr. Holt.

On the whole, very enjoyable reproduction can be obtained.

After listening to such an arrangement one wonders how on earth anyone can sit listening to single speaker reproduction.—S. I. HOLT (St. Annes).

Peculiar Faults

SIR,—In recent letters peculiar faults have been discussed and I think readers will be interested in one which I came across.

I had built an amplifier for use with gramophone records, the circuit was similar to the intercom. amplifier of Nov., 1946. The mike transformer is not used and the volume control operates on the 6J7G which is screened by an aluminium can. I also fitted a variable tone control.

Whilst I was experimenting with it (the tone control was disconnected), I touched the grid of the 6J7 and the whole circuit, previously quite stable, burst into violent oscillation. There was nothing very unusual about this, but as I advanced the gain a bright green spot appeared on the bulb of the 6V6 on a level with the top of the anode and at right-angles to the beam plates. There was also a spot on each side of the bulb. As I advanced the gain still more the noise increased and the spots became lines about 3-16in. long. This was not just a "blue-glow" but a sharply defined trace like that of a cathode-ray tube. Another touch of the volume control and the "trace" disappeared, sparking took place inside the anode. At the same time brilliant white sparks came from the back of the output transformer. Then I switched off. Examination of the transformer showed that the anode tag was only about 1-16in. from the clamp and this is where the arcing occurred. This sparking no doubt prevented an insulation breakdown in the windings, as I have known that to happen when an output valve oscillates badly.

What I am puzzled about is the "trace" on the valve. Has any other reader experienced this or is it, as I think, unique?

I think that perhaps some impurity in the glass caused this fluorescence. The 6V6 is a Cossor and is clear all over.

I might add that the amplifier has since been completed and is working perfectly, neither valve nor transformer show any ill effects from their rough treatment.—NORMAN DEAN (Manchester, 14).

American Service Equipment

SIR,—With reference to your correspondent, W. P. Gunasekera, of Ceylon. He will find conversion details of the BC625 and BC624 in the U.S. magazines listed below. I also list several other U.S. service sets which have been described and may be of interest to other readers. I regret I am unable to loan or sell any of the magazines listed. They can, however, be obtained direct from the publishers for 50 cents (2s. 6d.) in most instances. Can any reader supply or assist me in obtaining circuits of the R1147B and R1481 receivers?

Radio Craft.

BC625. Transmitter Modification Details. April, 1947.
BC 412A. Radar Oscilloscope Modification Details. July and October, 1946.
SCR536. Handie Talkie Circuit, etc. July, 1946.
No. 19. Mark II. Converting to A.C. February, 1947.

Radio News.

BC624. Rx Conversion. October, 1946.
BC625. Tx Conversion. November, 1946.
AN/ART-13 Tx Conversion. December, 1946.

Q.S.T.

BC 348Q. Converting. January, 1947.
BC 645. Converting. February, 1947.
BC 221. Frequency Meter as a V.F.O. March, 1947.
BC 342. Revamping. September, 1946.
BC 375. Revamping. December, 1946.

C.Q.

ART-13. Converting. November, 1946 and February, 1947.
1068A. Converting. June, 1947.

—A. W. J. MARSH (Newport, Isle of Wight).

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