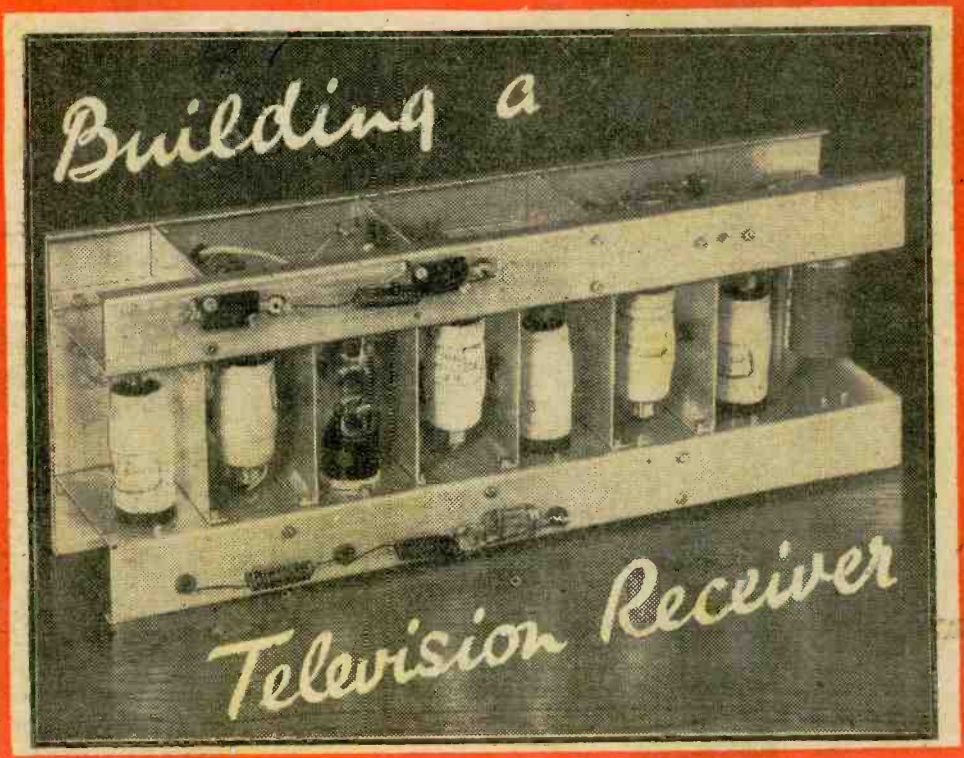
THE 'UTILITY' FOUR

Practical Wireless

9D. EVERY MONTH

Vol. 25. No. 511. || Editor: F. J. CAMM || FEBRUARY, 1949



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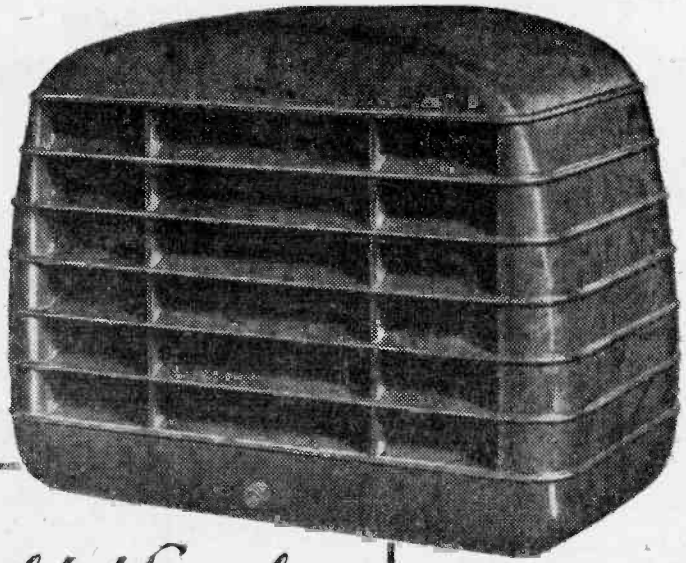

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0—250 "	0—500 "
0—500 "	

D.C. Current	Resistance
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0—100 "	0—2 megohms
0—500 "	0—5 "
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Practical Wireless and PRACTICAL TELEVISION
17th YEAR OF ISSUE
EVERY MONTH
VOL. XXV. No. 511 FEBRUARY, 1949
Editor E. J. CAMM

COMMENTS OF THE MONTH

BY THE EDITOR

A Television Poll

A NEWLY formed television society is undertaking what is called viewer research, because of the need for reliable statistics. To ensure a representative vote they have invited the participation of the Television Society and the Radar Association. Copies of the questionnaire have been distributed to the R.T.R.A. and most of the trade retailers in the receiving area. Newspapers have been invited to bring the scheme to the notice of their readers.

The society anticipates that at least 2,000 viewers will participate, and in this way about 200,000 likes and dislikes will be recorded.

An examination of the questionnaire which viewers are asked to fill in does not impress us. The viewer is invited to vote on a few plays, five musical compositions, six films, five foreign items, six items of variety and revue, nine documentary features, twenty-four regular features, thirteen games and sports items, and a separate questionnaire for the children dealing with films and puppets.

The general questions the viewers are expected to answer are: Do you view each convenient evening irrespective of the programme? Are you in favour of the Monday-Friday afternoon programme (other than outside broadcast of national or sporting importance) being discontinued? If the answer to the previous question is in the affirmative, would you prefer the evening transmission to be extended? Do you consider the present Alexandra Palace policy of repeating evening plays and features on another evening in the same or following week reasonable? What degree of notice do you consider the television service has taken of the opinions obtained by their recent Viewers' Viewpoint census? Speaking generally, what is your frank opinion of the standard of recent programmes? Are you in favour of an immediate visual or aural signal being televised when a transmission fault occurs (e.g., the superimposition of a caption or series of "pips" on the sound channel at intervals) to avoid useless adjustment of controls and apprehension as to the development of a possible receiver fault? Do you consider that television time should be used for the transmission of films or plays in French or other foreign languages? Would you like the composite edition of the Newsreel televised on Sunday afternoon or evening in addition to its normal Saturday morning showing? And in the light of your experience of viewing, present programme standard, and the price of receivers, would you advise a friend to buy a set?

We do not think that this questionnaire will find out anything which is not already known to the B.B.C. At the present time they are handicapped by the limited radius of the transmissions, and they must naturally cut their coat according to their cloth, the cloth in this case being about 70,000 viewers.

It would be a waste of money at the present time to plan production on the same scale as for a viewing public of one million. As the television service expands doubtless the quality of the programmes will advance commensurately.

Another aspect of the problem is that television technique is still advancing. It is good, but it can, and must be, much better, and it has a long way to go before it can compare with its rival, the films. Productions are costly because they cannot be recorded except by the delayed film process. This means that even repeat programmes are almost as costly as the original production. Owing to the shallowness of the focal depth of the picture it is not possible at present to televise certain types of programme.

The defect of spherical aberration on the tube itself is not entirely eliminated. Altogether we do not think that viewers have much of which to complain. This is a case where we think the B.B.C. is doing as much as can reasonably be expected of it.

The proposed extension of the service area of the television service of the B.B.C. by the opening of a new station in the Birmingham area, and the proposal to operate frequency-modulated regional broadcasting stations at frequencies which are susceptible to interference from motor vehicles will undoubtedly increase the urgency and importance of reducing such interference.

It is therefore desirable to obtain the widest possible circulation of the B.S. Code of Practice and the adoption of its recommendations by operators and other users of motor vehicles.

Editorial and Advertisement Offices: "Practical Wireless," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. 'Phone: Temple Bar 4363.
Telegrams: Newnes, Rand, London.
Registered at the G.P.O. for transmission by Canadian Magazine Post.

The Editor will be pleased to consider articles of a practical nature suitable for publication in "Practical Wireless." Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, "Practical Wireless," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

ROUND THE WORLD OF WIRELESS

Broadcast Receiving Licences

THE following statement shows the approximate numbers of licences issued during the year ending October 31, 1948.

Region	*Number*
London Postal	2,107,000
Home Counties	1,485,000
Midland	1,615,000
North Eastern	1,747,000
North Western	1,470,000
South Western	995,000
Welsh and Border	657,000
Total England and Wales	10,076,000
Scotland	1,068,000
Northern Ireland	185,000
Grand Total	11,329,000

The above total shows an increase of 18,200 over the figure for September 30. The total includes 73,800 television licenses—an increase of 7,200.

When a television set is installed, a special comprehensive licence costing £2 covering both sound and television programmes is needed. If the viewer holds an ordinary £1 licence which has not run out, a refund of 1/8d. for every unexpired month of this licence can be obtained simply by presenting the licence at the counter of any Head Post Office with the television licence.

Radiolympia, 1949

THE Radio Industry Council announces that the 16th National Radio Exhibition ("Radiolympia") will be held at Olympia, London, from Wednesday, September 28, to Saturday, October 8, 1949. There will be a pre-view with admission by invitation only on Tuesday, September 27.

H.M. Queen Mary has again consented to be patron of the Exhibition.

Radiolympia was last held in the autumn of 1947, no exhibition being held in 1948. The 1949 Exhibition will cover radio and television studio equipment, transmitters and receivers; radio equipment for world-wide and short-distance communications; navigational aids, including radar; electronic industrial processes and controls, measuring and testing instruments, batteries, valves and components of all kinds.

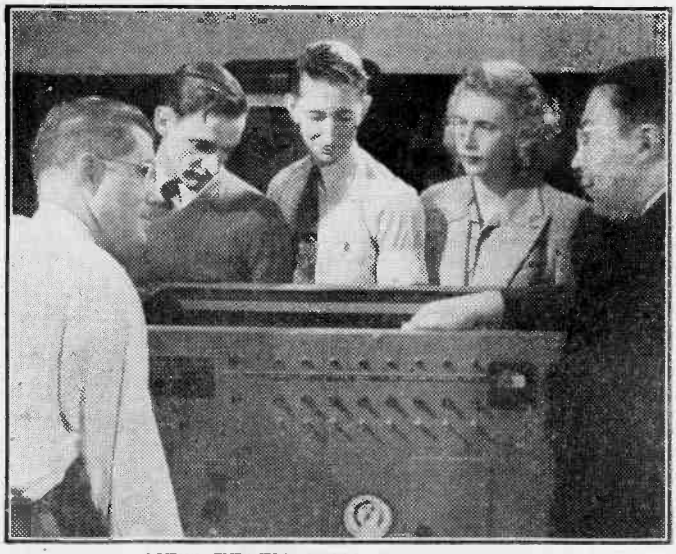
Intending visitors from overseas are asked to inform the Radio Industry Council, 59, Russell Square, London, W.C.1.

Pictures Can be Wirelessed from Singapore

CABLE & WIRELESS announce that photo-telegram service is now open from Singapore to London. Commonwealth rates—£5 for a picture up to 24 sq. ins. and proportionately for larger sizes—will be charged.

Sir Ernest Fisk Receives Royal Society of Arts Silver Medal

BACK in England from his recent trip to Canada, Sir Ernest Fisk, Managing Director of Electric and Musical Industries Limited, has received the Silver Medal awarded to him by the Council of the Royal Society of Arts for his paper on "The Development of Sound Recording and Reproduction."



NEW TELEVISION TUBE TESTER

Part of the Sylvania research staff that recently built an automatic recording spectroradiometer, for precise measurement of television viewing tube light output, witness final laboratory tests. Production of the instrument, which will be used in production quality control in commercial television tube production at Emporium, Pa., was under the direction of A. E. Martin, supervisor of the photonic section and shown at far right. Constance Lingenfelter, standing next to him, will supervise application of the instrument in commercial production. Other participants in the research project, left to right, are Salvatore Roberto, who directly supervised development, having previously worked on a similar instrument for fluorescent lamp measurements; Albert Rann, who drafted exact design of precision components; and George Landis, expert machinist. R. M. Klein, not shown above, helped solve many of the electronic circuit problems.

Sir Ernest Fisk's paper, which was read before the Society during the last session, has been described as one of the most comprehensive and authoritative ever written on the evolution of sound recording and reproduction.

Mass Viewing

AT what was probably the biggest demonstration to popularise television in this country since Radiolympia, the Radio Industry Council staged recently a two-hour programme at the Pillar Hall Restaurant, Olympia, for staff of Lyons of Cadby Hall.

Specially installed for the occasion, 25 sets of different types were used. The Alexandra Palace transmission was preceded by talks given by Mr. G. W. Godfrey, of the Radio Industry Council, and Col. D. Wolfe-Murray, liaison officer, B.B.C. Television, who "explained" television to the audience of 400.

Highspot of the evening for the Lyons viewers was the appearance in "Picture Page" of their colleague, Mr. F. E. Jacobs, who decorated the firm's wedding cake for Princess Elizabeth. He was demonstrating the art of Christmas Cake decoration before the cameras at the Alexandra Palace studios.

Canada Tests Mullard Moisture Meter

EXHAUSTIVE tests were recently made on ten moisture meters, in their Grain Research Laboratories, by the Board of Grain Commissioners for Canada.

Instruments for these tests were submitted by the United Kingdom, the U.S.A. and Canada. Announcing the results, the Board reported: ". . . The Mullard Moisture Meter proved to be the most accurate of those obtained from the United Kingdom; the error of prediction of the instrument was ± 0.48 per cent. . . ."

"The major investigation," states the report, "involved the study of 160 samples of Canadian hard red spring wheat covering a wide range of moisture contents. As none of these samples was either dried or wetted, the investigation represents the field conditions which meters might be expected to meet in this country. Duplicate determinations were made with all meters, and the split vacuum method and the Brown-Duvel (oil distillation) method were used as controls. In addition, determinations were made of the bushel weights, thousand-kernel weights and ash contents of the samples, so that the possible effect of these factors on the accuracy of the meters might be studied. A separate study was also made of the instruments."

Exhibition of Components and Test Gear

The Radio Component Manufacturer's Federation is holding its sixth annual private exhibition of British components and test gear in the Great Hall, Grosvenor House, Park Lane, London, W.1, from March 1st to 3rd. For the first time valves will be among the exhibits which will cover every type of component for the radio, television, electronic and telecommunication industries. About 100 firms will exhibit and there will be special facilities for manufacturers, agents and engineers from abroad. Admission is by invitation which will be sent on application to the Secretary, R.C.M.F., 22, Surrey Street, Strand, London, W.C.2.

Philco Changes

RADIO & TELEVISION TRUST, LTD., in conjunction with its subsidiary, Philco Radio & Television Corporation of Great Britain, Ltd., have concluded arrangements with their leading U.K. distributors, who are forming a company to continue the distribution of Philco British-made radio and television sets and other Philco products throughout the United Kingdom. For this purpose the franchise of the Philco Corporation of Philadelphia, U.S.A., will, by mutual consent, be transferred to the new organisation. The new organisation will be taking over the finished and service stocks of radio and television sets from the old company, thus ensuring continuity of service and distribution.

Philco (Overseas), Ltd., the recently formed British subsidiary of Philco Corporation, will cover the manufacture and technical engineering of British manufactured Philco products, thus ensuring the continuation of the high standards always associated with the name Philco.

The Delius Fellowship

SIR THOMAS BEECHAM, Bart., recently introduced a new H.M.V. recording of Delius' Opera, "A Village Romeo and Juliet," which has been made under his direction for the Delius Fellowship. A short address was given by Sir Thomas and was illustrated by excerpts from the recordings.

New Amateur Bands

THE G.P.O. has advised the Society that as from January 1st, 1949, a number of new bands have become available to U.K. amateurs.

All bands currently in use, will continue to be allocated. In addition the bands 144-145 mc/s, 1,215-1,300 mc/s, 5,650-5,850 mc/s, and 10,000-10,500 mc/s will become available.

Frequency modulation as well as amplitude modulation will be permitted on all bands from 420 mc/s upwards, and on all these bands as well as on the 144-146 mc/s band *an input power of 25 watts will be permitted.*

The G.P.O. has now agreed that U.K. amateurs may continue to use the 58.5-60 Mc/s band for a further period—probably until March 31st, 1949.

Television Relays

WE understand that agreement has been reached between the B.B.C. and the cinema industry under which the B.B.C. will be afforded facilities for televising British feature films in exchange for the right for certain cinemas to relay television programmes. At the time of going to press no details or dates have been received.

Using the Oscilloscope—4

In This Article H. R. McDERMOTT Describes a Modulation Monitor and the Production of Valve Curves

ALMOST useful device in the amateur transmitting station, or any other for that matter, is one that enables you to keep a constant check on the percentage modulation of the radiated wave. Such an instrument, using cathode-ray technique, is easily made, using only a basic oscilloscope, i.e., tube and power supply, and a radio-frequency amplifier which may be a single valve, resistance coupled.

A particular advantage of this method is that no time-base is required, with resulting low cost; also, the instrument is easily calibrated in terms of modulation percentage. In Fig. 15 are shown the basic details of the instrument. It will be observed

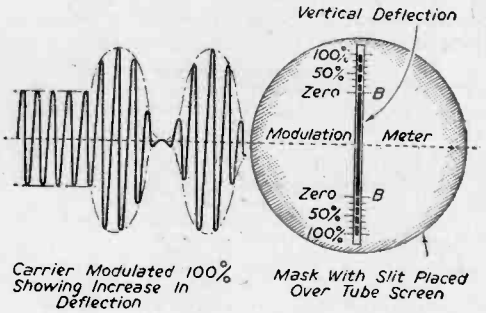


Fig. 15.—Method of masking tube and obtaining modulation indications.

from this that with no modulation a vertical line B—B is drawn out by the spot, and as the modulation level is increased this line expands symmetrically about the dotted horizontal base line. It is easily seen that when the modulation level has reached 100 per cent., line B—B will have expanded to twice its original length, and it is on this fact that the calibration is based. If the line did not expand in a linear manner, calibration would not present so easy a problem.

From Fig. 15 it is seen that a mask is used in front of the cathode-ray tube screen, this being to increase the effectiveness of the vertical deflection and also to enable calibration marks to be easily placed. This mask is made of stiff card or tin, painted black with a narrow vertical slit in the centre; this can be one eighth to one sixteenth of an inch wide. The R.F. amplifier is connected as previously described for the wave envelope modulation tests, and may be the regular oscillograph vertical amplifier, if this is suitable for radio frequencies.

Calibration

With the transmitter and modulation monitor switched on, the transmitter being unmodulated, a short vertical deflection will appear on the screen. This is equivalent to B—B. Adjust the height of this line by means of the vertical amplifier gain control so that it is just under half a screen diameter in length and adjust the line to a central position, as in Fig. 15, so that it is visible through the slot in the mask. Next, mark on the mask, in white preferably, two short horizontal lines at the extremities of the trace. The mask is then removed from in front of the screen, the remainder of the calibration being done with the aid of a ruler. Measure line B—B and make two further marks on the mask top and bottom of line B—B, half the length of B—B, above and below B—B. Mark these each

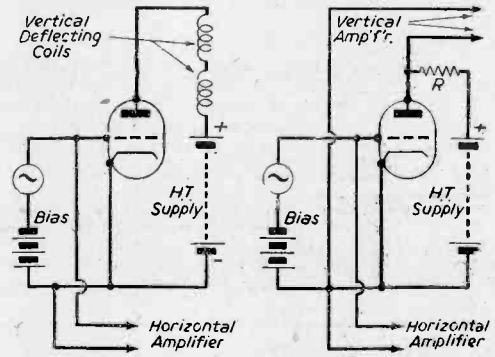


Fig. 16.—On the left (A) circuit for obtaining Eg/Ia curves when magnetic deflection is used, and at B (right) the modification required for electrostatic deflection.

100 per cent., and the original marks "zero," as Fig. 15. The space between zero and 100 per cent. can then be divided, in a linear manner, and marked with other desired levels of modulation. Fifty per cent. modulation will be halfway between zero and 100 per cent., and so on.

In operation, a vertical line will be seen moving up and down as the degree of modulation rises and

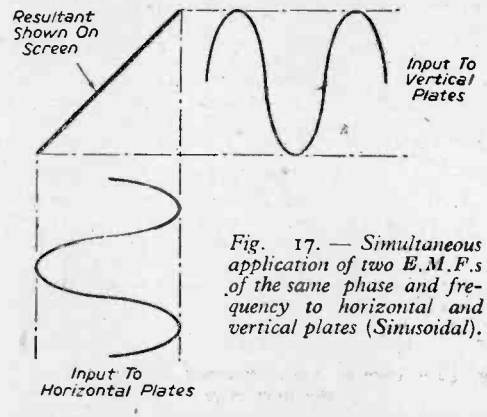


Fig. 17. — Simultaneous application of two E.M.F.s of the same phase and frequency to horizontal and vertical plates (Sinusoidal).

falls, giving a continuous indication of the modulated carrier wave. It is always desirable to keep a constant check on the modulation level in order to prevent distortion and interference with neighbouring stations during loud passages. There is thus no need for the amateur to ask other "hams" for information regarding his modulation level—

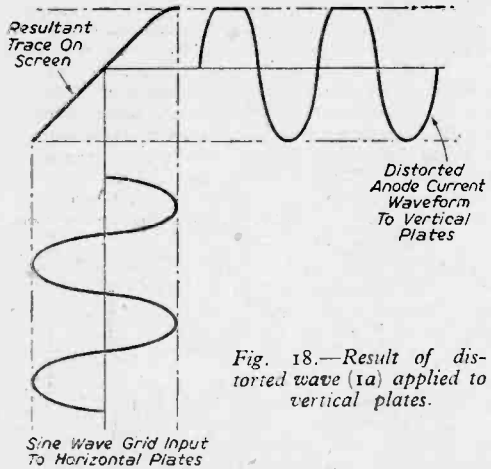


Fig. 18.—Result of distorted wave (1a) applied to vertical plates.

he has it in front of him. If you have an oscillograph, this can be used as described; or the monitor may be built in to your control desk, giving a very efficient and professional touch.

Valve Characteristic Curves

A most interesting application of the oscillograph is the visual examination of the characteristic curves of radio valves. The curve connecting grid volts and anode volts is referred to as the Eg/Ea curve, and that connecting grid volts and anode current the Eg/Ia curve. These well-known curves are normally plotted with the aid of a milliammeter and voltmeter for each set of operating conditions of the valve. This, as you can imagine, is a laborious job, and when the conditions are such that the valve runs into considerable grid current, it is dangerous for the valve, as saturation anode current will flow and the cathode disintegrate. With the oscillograph method the whole of the valve's curve is shown in an instant on the screen. Also, as this method entails only a transient application of the required voltages, operation of the valve under conditions far from normal can be achieved with no risk of damage to the valve.

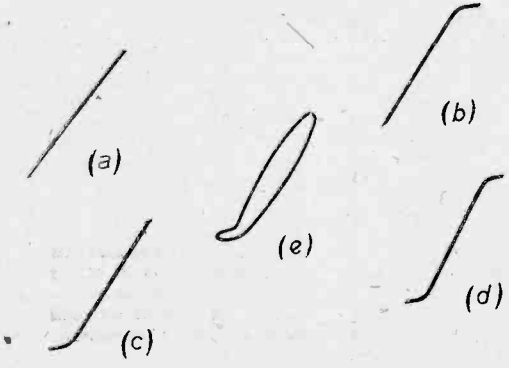


Fig. 20.—Typical traces obtained as explained on the next page.

Typical Circuits

Typical circuits for the measurement of the Eg/Ia curve are shown in Figs. 16 A and B. An alternating E.M.F. is applied to the valve under test, the frequency is not very important and 50 cycles will do as it is easily obtainable from the mains. This alternating voltage is fed to the horizontal plates of the oscillograph via its amplifier and is, in a way, a time-base, although not in the usual accepted meaning of the name. If electromagnetic deflection is used in the oscillograph, a suitable circuit is as Fig. 16A, the deflecting coils being in series with the anode of the valve. If, as is more usually the case, electrostatic deflection is used, a small resistor of the order of 200 ohms is introduced in the anode circuit in order to tap off a potential varying in phase with the anode current.

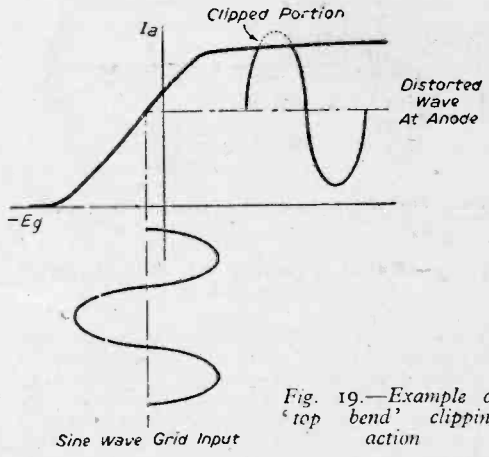


Fig. 19.—Example of 'top bend' clipping action

It is known that the alternating grid voltage and anode current are in phase, so what we are really doing is applying to the oscillograph an alternating E.M.F. of the same phase to both X and Y plates, with the result as shown graphically in Fig. 17. In this set of conditions of anode and grid voltages it is obvious that the variations in anode current are replicas of those of the grid input potential; in other words, the circuit is acting as a distortionless amplifier. This straight line is produced only when distortion is nil. The angle that it makes with the horizontal is governed by the amplitudes of the signals at the tube deflection plates, these being varied by the oscillograph amplifier gain controls.

Another Effect

The next effect to consider is that in which the anode current variations are not replicas of the alternating grid potential. Say, for instance, that the amplitude of the A.C. input is so large that grid current flows resulting in the peaks of anode current being clipped by the top bend in the Eg/Ia

characteristic curve (Fig. 18) of the valve. How this state of affairs is shown on the oscillograph screen is indicated in Fig. 19. The sinusoidal grid E.M.F. is fed to the X plates and the clipped anode current waveform applied to the Y plates. The characteristic top bend as shown in the curve of Fig. 18 is self-evident in the trace shown on the screen, Fig. 20b.

Other sets of conditions are just as easily shown in the visual method just described. If, for instance, the grid bias applied to the valve were so large as to make the valve operate near the point of cut-off,

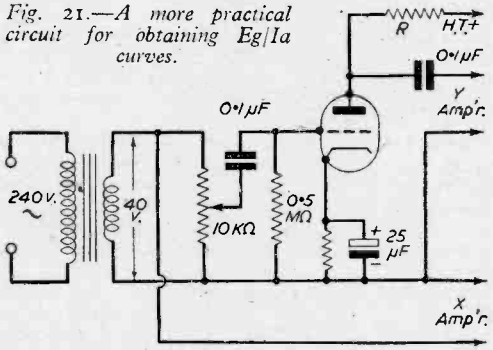


Fig. 21.—A more practical circuit for obtaining Eg/Ia curves.

the negative peaks of the anode variations would be clipped to some extent and the resulting trace would be similar to Fig. 20c. The final case is that in which the grid input potential is so large or the bias so small that both positive and negative peaks are clipped, resulting in the curve of Fig. 20d.

More Practical Circuit

A more practical circuit for examining Eg/Ia curves is that shown in Fig. 21. The mains transformer supplies about 40 volts r.m.s. to the grid of the valve under test, this voltage being adjustable by means of the 10,000 ohm input potentiometer. The cathode bias resistor may also be made variable, so as to provide easy adjustment to the conditions of amplification. The resistor R may be either the actual lead of the valve or a few hundred ohms as in Fig. 16b; a point to note here is that if appreciable capacity or inductance is present in the anode circuit the go and return traces of the spot will not be coincident and the "curve" may widen out as Fig. 20e. This corresponds with the conditions present in Fig. 20c, except that phase shift is evident in the circuit. In some cases phase shift is very

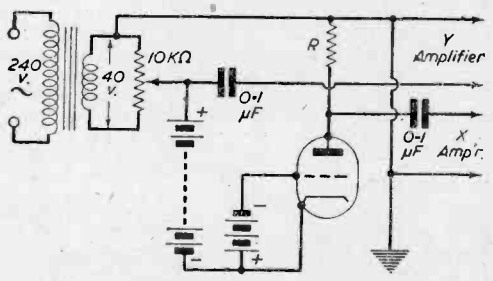


Fig. 22.—Circuit for taking Ia/Ea curves.

important and we will consider this further when we come to deal with amplifier characteristics. If your oscillograph amplifier is subject to phase shift then this effect will make itself evident on the screen.

Ia/Ea Curves

The production of Ia/Ea curve is quite straightforward and the circuit for this is given in Fig. 22. Note that the cathode of the valve is considerably negative with respect to earth and take care not to touch same if the H.T. is at all high. The diagram is self-explanatory, R being again about 200 ohms and the bias and H.T. potentials being adjusted as required for the particular valve under test. One point not previously mentioned is that you can, of

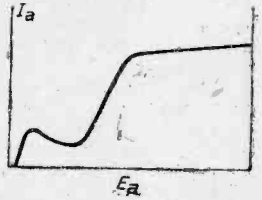


Fig. 23. — A typical Ea/Ia curve of an S.G. valve. Note the negative resistance dip.

course, test valves other than triodes by these visual methods by simply arranging a suitable potential for the screening grid or grids, making sure that the supply is well decoupled. For most output pentodes the screen is connected directly to H.T. positive or the top of the anode load and so is easily done. The curve for a typical screened grid valve is probably the most interesting to see, and this is shown in Fig. 23. A pentode valve would not have the negative resistance dip of the screened grid valve.

Should the traces obtained in any of these tests appear to be the wrong way round, reverse the X and Y inputs in turn until the trace assumes its correct position. If desired, these tests can be made using the valves and power supply of any available amplifier, but care should be exercised when using the circuit of Fig. 22, due to the position of the earth connection.

Mullard Electronic Tube for the Measurement of Acceleration.

THE accurate measurement and recording of acceleration by electronic methods is made possible by the DDR100 Accelerometer Tube recently announced by Mullard Electronic Products, Ltd. This device is basically similar in construction to an all-glass valve of the loctal type, and has the advantage that it may be mounted in any attitude. This feature, coupled with the high output and excellent response of the tube at low and zero frequencies, enables it to be used with great advantage as a low mass pick-up for measuring and recording the acceleration and vibration of high velocity elements. One of the chief advantages resulting from the high output of the tube is that it makes possible the observation and recording of acceleration without the necessity of using a special high gain amplifier. This is a desirable feature in certain flight tests in aircraft, and among the numerous applications of the tube to aeronautical research, is the measurement and recording of vibration on aircraft in flight.

A Twin-channel Radiogram

A Radiogram Using Separate Bass and Treble Amplifiers and Multi-speakers

By E. D. WARD

THE crippling purchase tax on radiograms and the liking of light oak furniture prompted me to construct a complete radiogram, with cabinet, and I now possess a gram. equal to anything (if not better) than can be bought commercially, and it also matches my furniture, and this I could not possibly achieve with any commercial job, as there are no light oak grams. on the market, to my knowledge. The total cost was less than £50.

What was wanted was a circuit that could give a fair output with good quality and the ability to bring out the bass and treble with separate controls; circuits using 807s in push-pull are all very well, but who wants such an output for a medium-size room? Even on my gram. the volume is only half-way unless I want my neighbour to hear as well.

The Circuit

The twin channel amplifier is not a new idea; the Americans have been using it for years, but the results are excellent, especially when all the speakers are mounted on one baffle.

The frequency-changer and I.F. stages were bought already wired up (there are a few to choose from nowadays), but when I started work on mine there was only one available.

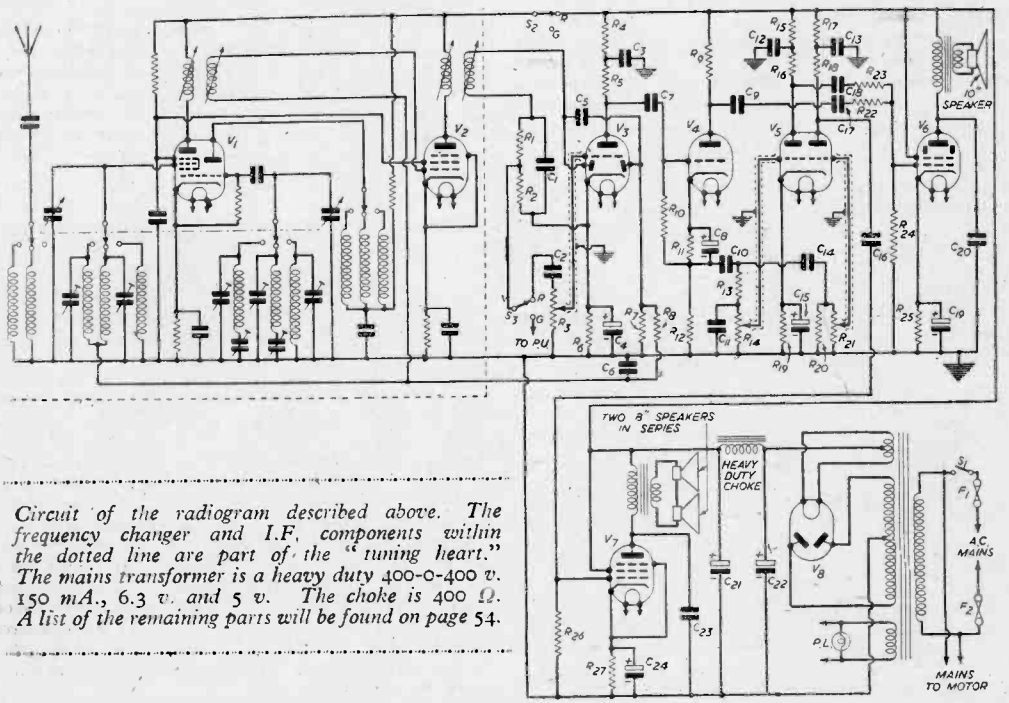
The detector and pre-amp. is quite conventional, using a 6Q7G the output of which is fed into a phase splitter (6C5). The output from the anode of the 6C5 is taken straight to the output valve used for the bass (6L6G).

From the cathode of the 6C5 the output is fed to the triode portions of an ECC34, one triode amplifiying the bass and one the treble. The output from the bass triode is fed into the grid of the 6L6G, as well as the output from the anode of the 6C5, these signals both being in phase with each other.

The output from the treble triode is fed into a KT61 steep slope tetrode working two 8in. speakers in series. 4 μF decoupling and careful screening are used in the twin triode stage to prevent hum.

The 6L6G works a 10in. speaker, and the three speakers are mounted on a single baffle, the 10in. in the centre, with an 8in. either side.

Originally the 6L6 worked a 15in. speaker, but when it came to cabinet construction I sacrificed



Circuit of the radiogram described above. The frequency changer and I.F. components within the dotted line are part of the "tuning heart." The mains transformer is a heavy duty 400-0-400 v. 150 mA., 6.3 v. and 5 v. The choke is 400 Ω. A list of the remaining parts will be found on page 54.

LIST OF COMPONENTS

R1—100kΩ.	R26—1MΩ.
R2—500kΩ.	R27—100Ω.
R3—2MΩ (all volume).	C1—.0001 μF.
R4—50kΩ.	C2—.02 μF.
R5—150kΩ.	C3—4 μF.
R6—2,300Ω.	C4—25 μF.
R7—2MΩ.	C5—50 pF.
R8—1MΩ.	C6—.1 μF.
R9—50kΩ.	C7—.05 μF.
R10—100kΩ.	C8—25 μF.
R11—1kΩ.	C9—.1 μF.
R12—50kΩ.	C10—.1 μF.
R13—50kΩ.	C11—.05 μF.
R14—1MΩ (bass volume).	C12—4 μF.
	C13—4 μF.
R15—15kΩ.	C14—.0005 μF.
R16—50kΩ.	C15—25 μF.
R17—15kΩ.	C16—.1 μF.
R18—50kΩ.	C17—.1 μF.
R19—1,600Ω.	C18—.1 μF.
R20—50kΩ.	C19—25 μF.
R21—.25MΩ (treble volume).	C20—.0023 μF.
	C21—16 μF.
R22—100kΩ.	C22—16 μF.
R23—100kΩ.	C23—.0023 μF.
R24—1MΩ.	C24—25 μF.
R25—170Ω.	

VALVES

V1—6K8G.		V6—6L6G.
V2—6K7G.	V4—6C5.	V7—KT61.
V3—6Q7G.	V5—ECC34.	V8—5U4G.

this so that a record cupboard could be built under the speaker network.

To complete the unit I chose a Garrard RC60 changer, but there are several others that can be obtained these days.

When all the speakers are mounted on the baffle it is essential that they are all in phase with each other, otherwise all the bass will disappear; correct phasing may be readily achieved by trial and error.

The Cabinet

The cabinet was made from a utility tallboy, and before I started to carve it up I measured out all the wood that would be available. By careful planning, the only piece I had to buy was the speaker baffle—everything else was on the tallboy. It doesn't need a skilled man to convert the cabinet, and the only other tool that is needed apart from the usual tools is a joiner's clamp. A lid stay and hinge with some green felt for the top of the cabinet completed the job.

The louvres on the front of the cabinet are made of beech, french polished to contrast with the light oak, and the speakers are faced with some dark green cloth stretched taut over the baffle.

MINISTRY APPEALS TO HOUSEWIVES
Keep Waste Paper separate, dry and clean for salvage.

Three-valve Receiver-generator

Further Constructional Details of the Combined Receiver-signal Generator

By F. G. RAYER

Calibration from Broadcast Stations

Though various dial-readings may be obtained by listening to B.B.C. and other stations with the unit, it is best to set the switch to "Oscillate" and carry out calibration in conjunction with an ordinary receiver. If the latter is a straight set, only a very short aerial should be used and the reaction control should be used in the usual way to obtain maximum sensitivity and selectivity.

Take a wire from the "R.F. Output" socket of the oscillator and place this near the aerial lead-in of the receiver. Now tune in a B.B.C. station, afterwards tuning the oscillator until its note is heard on exactly the same frequency. Note down the frequency and dial reading. After making a number of readings in this way advantage can be taken of the harmonics which will be heard. The second harmonic will be heard when the oscillator is tuned to half the frequency (or double the wavelength) of that at which the receiver is set. For example, tune the receiver to the North transmitter, operating on 449.1 m., 668 kc/s. Tune to this with the oscillator set on range 4. After noting the reading, switch to range 5. Tune until the oscillator note is heard at reduced volume. This will be 898.2 m., 334 kc/s.

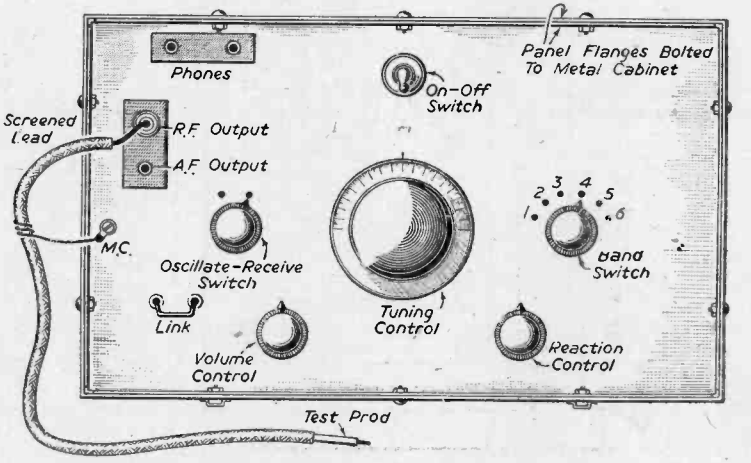


Fig. 7.—Panel layout and identity of the various controls.

By a similar procedure all the ranges can be fully calibrated. The Third Programme will provide 514.6 and 1,029.2 m. If the oscillator is left at 1,029.2 m. and the receiver tuned to the signal on the long waves, then the receiver can be left in its turn and a calibration point of 2,058.4 m. obtained by tuning the oscillator on range 6 until the harmonic is heard. The long-wave Light Programme transmitter, besides providing a reading for 1,500 m., will also enable the oscillator to be calibrated on 3,000 m. and so on.

A few tests with receiver and oscillator in this way will soon show that the procedure is really very simple in practice. No difficulty should arise if it is remembered that harmonics will be heard only when the oscillator is tuned to a *lower* frequency than the receiver. For example, if the receiver is tuned to 200 m. the fundamental will be heard when the oscillator is also tuned to 200 m., and the harmonic when the oscillator is tuned to 400 m. But if the oscillator is set to 100 m. nothing will be heard.

The reaction condenser in the generator should be left set at maximum while such calibration is undertaken. When the switch is turned from "Oscillate" to "Receive" an extremely slight variation in dial-settings will arise because of the change in internal capacities. But if leads are short and well spaced this change will be so small as to be of no importance and the unit can be used for listening with the same calibration holding good.

Ultra-short-wave settings on a receiver can be checked by switching the generator to range 1 and listening for the second harmonic, which will be heard at twice the frequency (half the wavelength). For example, if the oscillator is set at 12 metres its note will be heard on 6 metres also.

A.F. Circuit Testing

If the test prod is connected to the "A.F. Output" socket an audio-frequency signal is obtained, the internal condenser guarding against short circuits via apparatus being tested. Beginning from the loud speaker, the prod can be applied to point after point throughout the L.F. amplifying section of a receiver. This will immediately show where a fault causing an absence of signals is located.

I.F. Circuits

To test these, plug the prod lead into the R.F.

(*Continued on page* 86)

LIST OF COMPONENTS

.0005 μF low loss tuning condenser with reduction drive.
.00025 μF. low loss reaction condenser.
Two 30 pF. pre-set condensers.
.0001 μF, .001 μF, .005 μF, and .1 μF fixed condensers.
2-pole 6-way switch. 4-pole 2-way switch. (Coventry Radio.)
3-point on-off switch.
.1 megohm potentiometer.
Two 500 ohm, two 10,000 ohm, .1 megohm, and 1 megohm resistors.
All-wave H.F. choke.
1 : 3 or 1 : 5 L.F. transformer.
Three 4-pin valve holders.
Tuning coils, with reaction windings, for 10 to 3,000 metres.
Screened flex, sockets, terminals, metal panel, chassis and cabinet, etc.

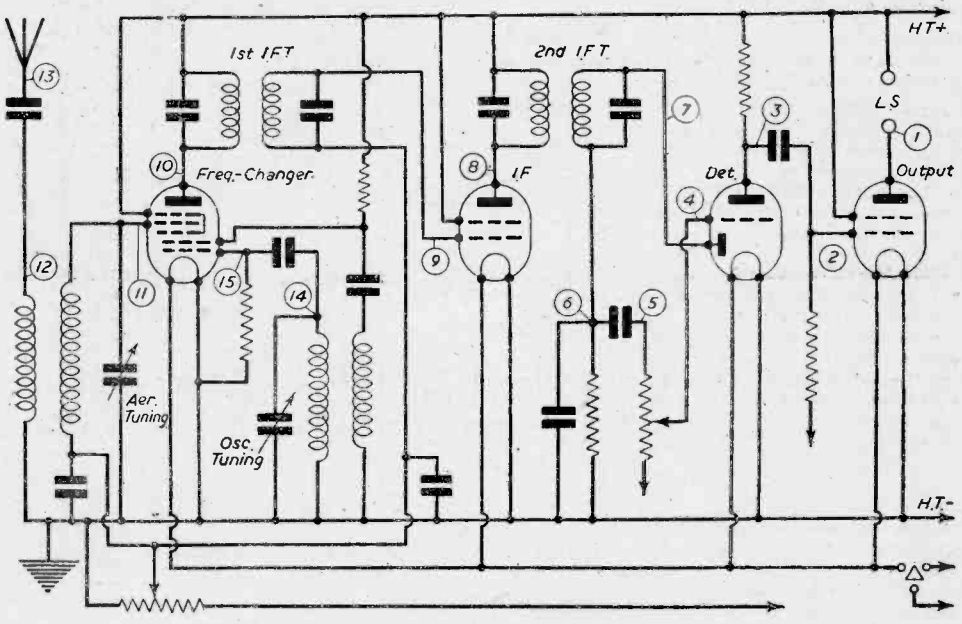


Fig. 8.—Testing points in a standard superhet. 1-6 are A.F., 7-10 I.F., 11-13 R.F. and 14-15 oscillator.

Television Sync Separator

A Double Limiter and "Clipper"

By D. HEALEY

MANY readers who have built their own television receivers and are situated outside the service area of Alexandra Palace will no doubt have experienced difficulty in obtaining stable synchronising of the time-bases, due to varying conditions and fluctuating signals.

The writer's own-built receiver, operated at 75 miles from Alexandra Palace, gave trouble of this kind, and, after several arrangements had been tried, the one given in the following circuit gave the best results over long periods, synchronising being rock steady if the signal output of receiver was above 5 volts.

It can be seen from the circuit that it consists of

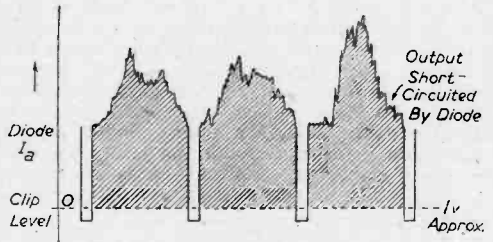


Fig. 2.—How the picture impulses are shorted and the negative pulses obtained.

a diode separator followed by a valve amplifier having a low voltage on its anode and screen. By using this type of arrangement double limiting is achieved and all sync pulses are brought out at the same level.

How it Functions

The action of the separator is as follows: Positive-going video signals are fed to the diode anode via R2, which prevents short circuit of tube input, its cathode being biased to +1 volt above "no signal" level by R4, R5 and decoupled by C1. When the input rises above this level the diode conducts, short-circuiting the output, thus producing negative-going sync pulses of 1 volt at its anode. These are then fed via C2, R7 to the grid of the amplifier, R7 being inserted to limit the effects of noise on the tips of the sync pulses which may occur on heavy interference.

The anode and screen of the valve have only a low value of H.T., which causes the valve to cut off when the input exceeds approximately .75 volts, the amplified pulses appearing at the anode and screen, from where they are fed to the time-bases through suitable filter circuits.

Details of the original circuits used are included in the diagram, but any type of normal filter circuit can be used without upsetting the working of the separator.

If pulses of opposite polarity are required for other types of time-bases, readers will, no doubt, be able to modify the circuit so as to work the amplifier on the upper bend of its curve instead of the lower bend, thus producing negative pulses at the anode of amplifier.

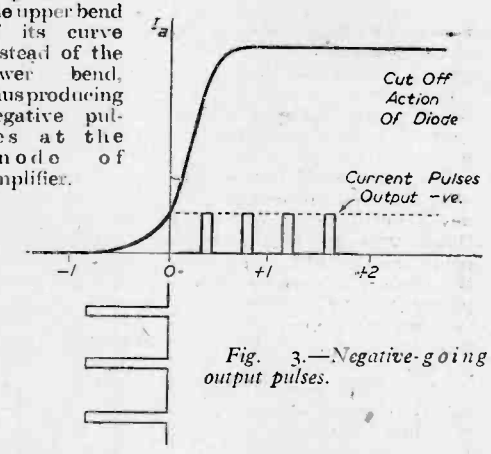


Fig. 3.—Negative-going output pulses.

LIST OF PARTS

C1—25μF 25v.	R5—150kΩ
C2—.1μF	R6—1mΩ
C3—25μF 25v.	R7—10kΩ
C4—.05μF	R8—20kΩ
C5—.001μF	R9—30kΩ
C6—.001μF	R10—100kΩ
C7—2pF	R11—4.7kΩ
R1—1mΩ	R12—100kΩ
R2—5kΩ	R13—100kΩ
R3—56kΩ	R14—100kΩ
R4—4.7kΩ	R15—47kΩ

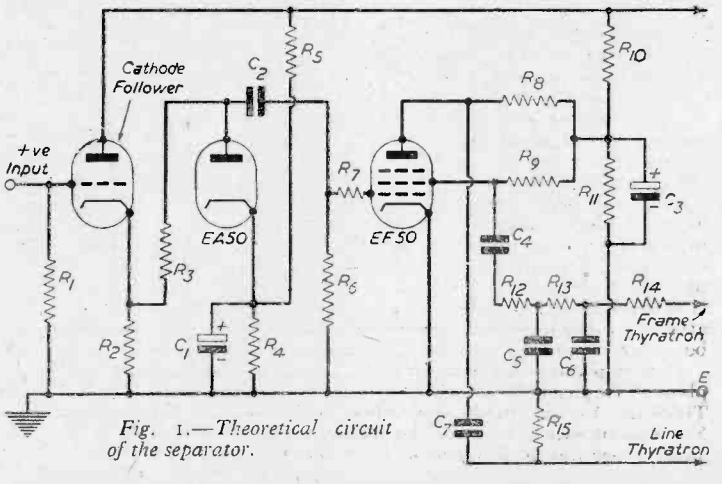


Fig. 1.—Theoretical circuit of the separator.

ON YOUR WAVELENGTH

By THERMION

"Cæsar's Mistress"

CÆSAR'S wife must be above suspicion. So wrote Julius Cæsar about 100 years before the birth of Christ. This month the Editor has delegated to me the delicate task of reviewing two books, each of which indicts the B.B.C. and endeavours to prove that so far from Cæsar's wife being above suspicion, Cæsar's wife was very much all things to all men.

The first book, by Maurice Gorehan, is entitled "Sound and Fury," and it is published by Percival Marshall (a new venture for that house which has specialised in technical handbooks), and the other is entitled "Cæsar's Mistress," written by Wing Commander Geoffrey Cooper, M.P., and published by Venture Publications, Ltd.

This second volume has as a sub-title "The B.B.C. on Trial," and in some respects it is a tendentious book in spite of the author's evident desire to be impartial in his criticisms.

You will remember the words of William Shakespeare, "Cæsar's thrasonical brag of 'I came, saw, and overcame,'" a variant of *veni, vidi, vici*.

The B.B.C., of course, was one of the earliest examples of nationalisation; or rather it is a development of the nationalisation of the Post Office after Sir Roland Hill had introduced the penny post in 1840. The theme running throughout the book is a warning that if no effective curb is placed on the extending bureaucratic control of Government departments and quasi-Government departments into which these nationalised corporations are developing, we shall stifle the initiative of the individual workers employed in them and the vigour of our national life, resulting in seriously retarding progress of our economic recovery. There may be some who feel that this is a strange doctrine to be promoted by one who won the Middlesbrough West election for Labour in 1945. Not that I quarrel with his decision. It must be admitted that the author speaks with some authority. He first raised the subject of the defects in the B.B.C. organisation during a debate on it in Parliament on December 11th, 1946.

This debate, which was widely reported, and the report which followed the investigations carried out by Sir Valentine Holme, K.C., brought in much evidence, and many letters requesting a fuller investigation than it was possible for Sir Valentine to make. Therefore, Wing Commander Cooper undertook the investigation himself, and his book is the result. The B.B.C. is peculiarly liable to attack. Indeed, when it ceases to be, it will not be doing its job.

It is impossible for a service of this kind to be planned to please all of the people all of the time. There is, in my view, too much broadcasting. You cannot expect to go to the theatre three times a day every day in the year and not become sated with it. Therefore, the question arises as to whether we need radio programmes from seven in the morning until midnight every day in the year.

As one of the very first people in this country to build a radio transmitter and a radio receiver (I am speaking of the days of the coherer, and before transmitting licences were required), I cannot help feeling that there was greater joy in listening to the infrequent programmes of atrocious radio and musical quality than there is to-day.

I see no reason why there should be centralised education through the schools by the B.B.C. I see no reason why so much programme time should be given to dance music, nor to classical music. In fine, I suggest fewer programmes and on certain days of the week evening programmes only.

Wing Commander Cooper stresses the need for the integrity of officials to remain unimpaired. He endeavours to make a case to show that B.B.C. officials have departed from what is commendable in its practices. It is impossible to read his book without coming to the conclusion that he makes out a case against the B.B.C., charging them with partiality, favouritism, prejudice, victimisation, interference with the private lives of the B.B.C. staff, and he demands a public inquiry.

As a consistent critic of the B.B.C. myself, I have confined my attention to the programmes and have not been concerned with the inner workings of the B.B.C.

This book presents the case for the prosecution, so to speak, and it invites a reply from the B.B.C. through a public inquiry.

When Julius Cæsar divorced his wife, Pompeia, but declared at the trial that he knew nothing of what was alleged against her and Claudius, the co-respondent, he was asked why in that case he wished to divorce her. He replied, "because I would have the chastity of my wife clear even of suspicion." We must remember also that having rid himself of Pompeia, he took unto himself a mistress, Circumstancia, and as the author points out he made her mistress of the senses of seeing and hearing, of the spoken word of music and of song. It may be that the inquiry for which we ask would rid Cæsar's wife of suspicion and in that case the B.B.C. would be free of the necessity for taking unto itself a mistress.

What would happen, however, if the charges are established? The B.B.C. is now such a vast intricate organisation, built on the sandy soil of muddle and incompetence in its early days, that it would be quite impossible, in my view, to reorganise it. An entirely new establishment would be necessary.

And here I am at the end of my space, so I must defer commenting on Maurice Gorehan's book until next month. In the meantime I think it important to say that one should not read one book, but both.

The Diode Detector

The Functions of the Diode and Its Various Circuits Explained

By "EXPERIMENTER"

THE diode is probably the most popular type of detector in use to-day: it is employed in practically all superheterodyne receivers and in quite a number of straight sets. The fact that it gives very little distortion and can easily provide a negative voltage suitable for A.V.C. purposes are two of its most attractive features. There are, however, a number of occasions when the diode circuit connections are not quite obvious; for example, in a T.R.F. receiver the diode section of a double-diode-triode may be required to give an A.V.C. voltage and, at the same time, to permit one side of the tuning capacitor to be earthed. This article has been prepared with the object of suggesting suitable circuits to meet such requirements.

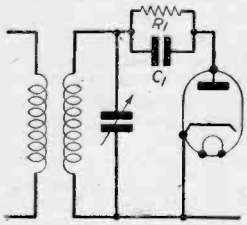


Fig. 1.—Fundamental circuit of series-fed diode detector.

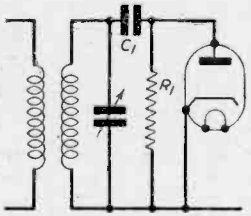


Fig. 2.—Fundamental circuit of parallel-fed diode detector.

It is convenient to begin by considering the two basic diode detector circuits shown in Figs. 1 and 2. In Fig. 1 the diode load R1 is in series with the diode valve; this is accordingly known as the *series-fed* diode circuit. In Fig. 2 the diode load is in parallel with the diode valve and this is therefore known as the *parallel-fed* circuit. The two circuits are almost identical in performance, the only difference being that the damping imposed on the tuned circuit is greater in the parallel-fed circuit than in the other. The damping imposed by the circuit of Fig. 1 is equivalent to a resistance of R1/2 connected across the tuned circuit, and the damping of Fig. 2 is equivalent to a resistance of R1/3. Two features of Figs. 1 and 2 are important: the first is that one side of the tuning capacitor is earthed; the second point is that, during conduction, the diode anode is driven negative with respect to the cathode. Thus, an A.V.C. voltage can be taken from the diode anode if required.

Series-fed

A practical series-fed diode detector circuit is shown in Fig. 3. The circuit is particularly suitable for use in T.R.F. receivers because it allows one side of the tuning capacitor to be earthed, and hence permits the tuning capacitor of the detector circuit to be ganged with others in the receiver. The A.F. output of the detector is developed across the diode load R1, but, as one end of R1 is connected to earth via the tuning inductor, the A.F. output may be taken between diode anode and earth. To suppress R.F. components in the output it is usual to couple the detector to the A.F. amplifier by way of a simple R.F. filter. R2 and C2 constitute the filter in Fig. 3 and in all the other circuit diagrams given in this series. In operation the diode develops a D.C. potential across the load which should not, in general, be fed to the A.F. amplifier, and a blocking capacitor is included in the coupling to the amplifier to suppress it. In Fig. 3 and all other diagrams C3 is the blocking capacitor and R3 may be taken as the grid leak or the gain control in the first stage of the A.F. amplifier. The negative D.C. potential at the diode anode may be used for A.V.C. purposes, and to suppress all modulation frequency and R.F. components present in the detector output a simple low-pass filter is included in the A.V.C. lead. R4,C4 is the filter in Fig. 3 and in all the other circuit diagrams. The component values given in Fig. 3 are suitable for medium- and long-wave reception and apply to all the diagrams in the article.

Sometimes it is desired to obtain a positive voltage proportional to carrier amplitude from a diode detector, to operate a tuning indicator. This can be achieved by inverting the valve in Fig. 3, connecting the anode to earth and cathode to the diode load. The positive voltage desired is then developed across C4.

If the diode is part of a multiple valve, such as a double-diode-triode, the cathode, which is common to all three valves, is not usually connected directly to earth but includes an automatic bias resistor and decoupling capacitor; this may introduce difficulties in the design of detector circuits. If, as in superheterodyne receivers, neither side of the tuning capacitor need be earthed, the circuit can

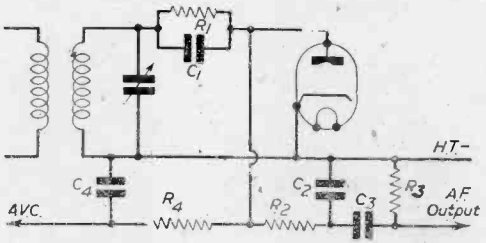


Fig. 3.—Practical circuit for a series-fed diode detector using a separate diode valve. Component values for high-quality M.W. reception are: R1, 100kΩ, R2, 50kΩ, R3, 0.5MΩ, R4, 1MΩ, C1, 100pF, C2, 100pF, C3, 0.01μF, C4, 0.1μF.

be arranged as in Fig. 4 which is typical of detector stages of commercial superhets. The arrangement is really that of Fig. 1, with the tuned circuit and diode load interchanged and the diode load returned to cathode instead of to earth. Severe harmonic distortion will result if the anode of a signal diode is biased negatively with respect to the cathode; it is, however, quite common for the anode of an A.V.C. diode to be so biased; this is, in fact, the method of "delaying" A.V.C. In Fig. 4 all components are labelled in the same way as in previous diagrams; R5,C5 are the bias components for the triode A.F. amplifier. It is usual to make R3 the gain control of the receiver, as indicated in

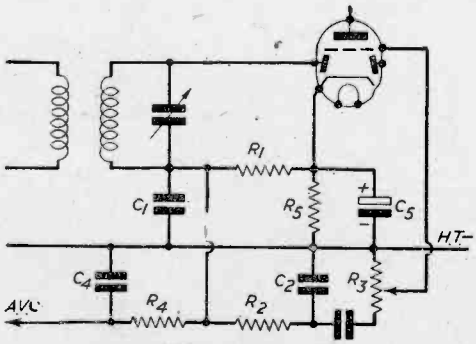


Fig. 4.—Practical circuit for a series-fed diode detector, using a double-diode-triode. Component values are given in the table in Fig. 3.

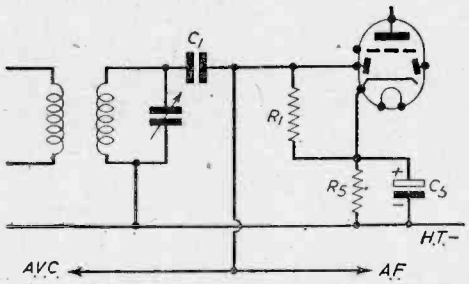


Fig. 5.—Practical circuit for a shunt-fed diode detector, using a double-diode-triode. Component values are the same as before and the circuit arrangement under the earth line is the same as in Figs. 3 and 4.

Fig. 4. A point which is sometimes overlooked in circuits such as Fig. 4 is that in the absence of a signal the A.V.C. line has a positive bias equal to the cathode voltage of the triode amplifier. This is not a disadvantage provided that the A.V.C.-controlled valves have a cathode bias greater than that of the triode, so that their control grids cannot become negative with respect to their cathode even in the absence of an A.V.C. voltage.

With Earthed Condenser

Suppose that a diode detector, part of a multiple valve, is required in a T.R.F. receiver in which one side of the tuning capacitor must be earthed? Two possible circuits are given in Figs. 5 and 6. Fig. 5 is very similar to Fig. 4, except that R1 and C1 are arranged in the shunt-fed circuit of Fig. 2. Notice that R1 is returned to the cathode

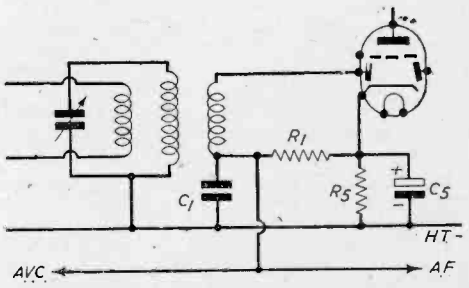


Fig. 6.—Practical circuit for a series-fed diode detector, using a double-diode-triode in which the tuning capacitor may be earthed.

and not earth. The circuit of Fig. 6 is preferable to that of Fig. 5 because it imposes less damping on the tuned circuit, but it is more troublesome to construct because it requires an additional winding on the coil former. The additional winding is untuned and should be coupled to the tuned winding as closely as possible. In general, it should have the same number of turns as the tuned winding, but if particularly high selectivity is wanted, and a little gain can be sacrificed, it is permissible to give the untuned winding half the number of turns in the tuned winding.

To avoid needless repetition the circuits of Figs. 5, 6, etc., are deliberately left incomplete. The arrowheads labelled "A.V.C." and "A.F." indicate that the circuit arrangements used here are identical to those shown below the earth line in Figs. 3 and 4.

Fig. 7 illustrates a method of feeding a diode detector directly from the anode circuit of the previous R.F. amplifier. Such a circuit might prove necessary in a tuned anode coupling and is

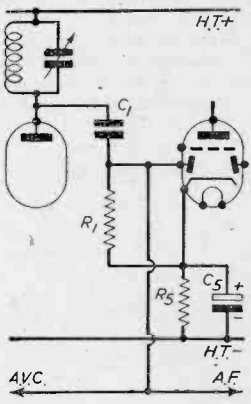


Fig. 7.—A shunt-fed diode detector connected in the anode circuit of an R.F. amplifier.

used in practically every superheterodyne receiver for feeding the A.V.C. diode from the anode of the last I.F. amplifier. It is assumed in this diagram that the diode is part of a multiple valve and

that the tuning capacitor need not be earthed. If the diode is used for signal rectification the diode load must be returned to cathode as shown in Fig. 7, but if the diode is used to provide an A.V.C. voltage it is desirable to return the diode load to H.T.— as shown in Fig. 8. This circuit is typical of those used for A.V.C. purposes in commercial superheterodyne receivers. The diode anode is biased negatively with respect to the cathode by a voltage equal to the cathode potential of the triode A.F. amplifier (usually about 2 volts).

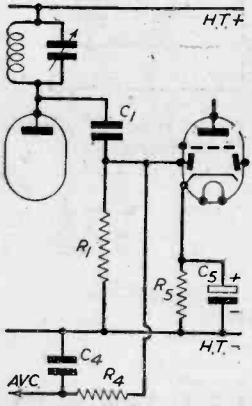


Fig. 8.—Typical A.V.C. diode circuit.

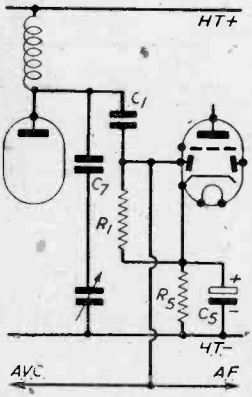


Fig. 9.—Modification of the circuit of Fig. 7 to allow the tuning capacitor to be earthed.

Conduction cannot occur until the peak R.F. voltage applied to the diode anode exceeds this bias, and no A.V.C. voltage is obtained until the signal at the diode anode exceeds a certain value. In this way the A.V.C. is automatically "delayed."

If required, the circuit diagram of Fig. 7 can easily be modified to permit one side of the tuning capacitor to be earthed; the arrangement is shown in Fig. 9 and is suitable for use in T.R.F. receivers. It is recommended that an additional fixed capacitor C7 be included in this circuit to isolate the fixed plates of the tuning capacitor from H.T. C7 should not be less than 0.01 μF and should be capable of withstanding the full H.T. supply of the receiver.

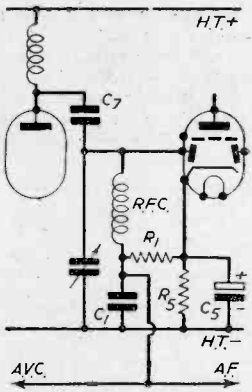


Fig. 10.—Modification of the circuit of Fig. 9 to include series-fed diode detector.

If particularly high selectivity is wanted from the circuit of Fig. 9, it can be modified so as to include a series-fed diode load. The circuit is given in Fig. 10. To complete the necessary D.C. path between diode anode and cathode it is necessary to include an R.F. choke.

The author does not claim that this article exhausts all possible circuit arrangements of diode detectors, but hopes that the majority of problems involving such detectors can be solved by inspection of the circuits given.

City & Guilds Examinations, 1949

STUDENTS who propose to enter for the 1949 City and Guilds Examinations should make their entry through their local technical college or the office of a Local Education Authority not later than the dates given below:

Subject 50. Telecommunications Engineering
Last date of entry: March 1st.

Subject 53. Radio Service Work, Intermediate
Last date of entry: March 1st.
(Candidates must have completed an approved course at a Technical College or in H.M. Forces.)

Subject 53. Radio Servicing Certificate Examination (Final)

Candidates should apply to the Secretary, Radio Trades Examination Board, 9, Bedford Square, London, W.C.1, not later than February 1st upon a special entry form obtainable either from the City and Guilds of London Institute, Department of Technology, 31, Brechin Place, London, S.W.7, or from the Radio Trades Examination Board. Applications should include the entry fee of two guineas and documents supporting statements made on the entry form. After candidates' eligibility has been confirmed by the R.T.E.B., they should enter for the written papers in accordance with the normal City and Guilds procedure, i.e., through a technical college or office of a Local Education Authority.

Subject 54. Radio Amateurs' Examination
Entries to be made through a technical college or office of a Local Education Authority not later than March 1st.

Note.—These dates relate only to candidates in Great Britain and Ireland.

A "Utility" Four

An A.C./D.C. Receiver Which Can be Fitted With Any Desired Type of Tuner

By W. J. DELANEY (G2FMY)

As mentioned last month, this receiver was designed on more or less standard lines, but with a view to enabling various tuning arrangements to be incorporated according to individual preferences. The receiver has been kept on the small side to be more or less a personal model —thus it can be built for short-waves only for the young enthusiast who wishes to listen when the rest of the family is using the standard domestic receiver, or it can be built as a standard receiver for pre-set use on two or three stations.

The Circuit

The circuit is shown in Fig. 1, from which it will be noted that no tuning facilities have been shown beyond the tuning condenser and a pre-set. The four points in both H.F. and Detector stage are intended for connection to the coils used. Thus, if two pre-set stations are required, Wearite "P" type coils could be used, and the second condenser switched in as indicated. As an alternative, a two-position switch could be used so that either of the tuning condensers could be chosen, and these could be pre-tuned to the desired stations. If one of the modern T.R.F. coil-packs is used, the appropriate connections will be indicated on the leaflet supplied with the pack, and it should not be a difficult matter to identify the free points in this circuit and couple them up with the coil-maker's instructions. The isolating condensers in aerial and earth leads are for protection when the receiver is used on D.C. mains and should have a value between .0001μF and .001μF—it is not critical. It should also be remembered with any receiver of this type, that is, one in which the chassis is live to one side of the mains, that all control knobs should be chosen with sunken grub screws. Look to this point, and if necessary cut them short so that they go well inside the knob, and, as an added precaution, fill the hole above them after attachment with a little Chatterton's Compound. Some people are very susceptible to shocks, and under certain conditions a shock could be felt due to the fingers touching the locking or grub screws on controls.

The coupling between H.F. and Detector is of the H.F. transformer type, so make certain that that type of coil is obtained when using single coils. The type of valve used in the Detector stage is not critical, but very high gain is obtained with the values of grid condenser and leak chosen, provided a suitable valve is selected. Both the 12K7 and the 12F5 have been used, the latter, of course, being a triode with a very high *mu*. As the 12K7 is now readily available as ex-Service surplus, most constructors will, no doubt, prefer to use that type of valve. The rectifier is also not critical, and whichever type is most easily obtained may be used. It will affect the resistance of the line-cord, but only to a very small degree.

Construction

The chassis used is a standard commercial model obtainable at most retailers for about 3s. 6d. For those who wish to make their own, full dimensions

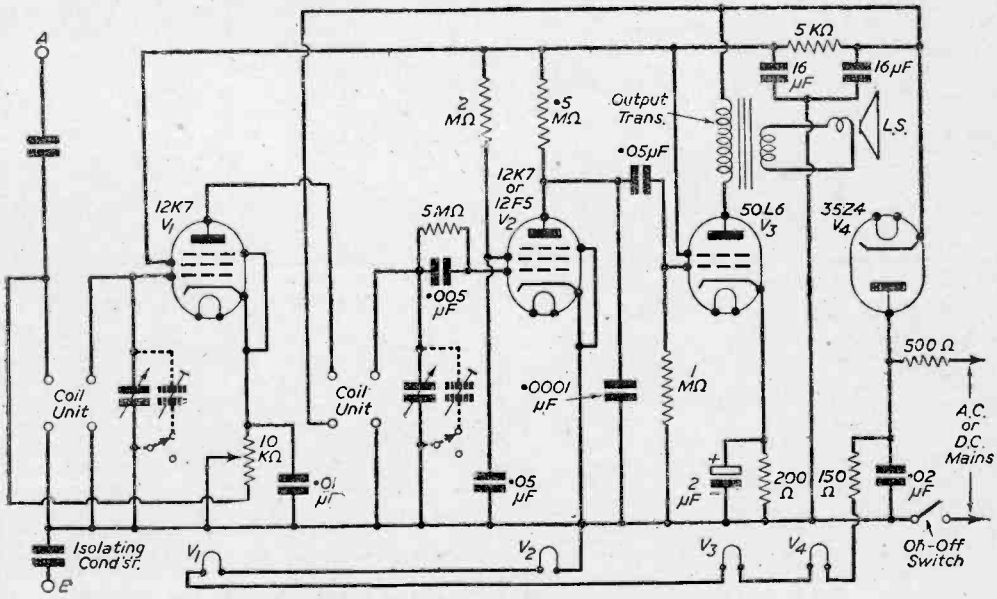


Fig. 1.—Theoretical circuit of the "Utility" Four.

are given in Fig. 2. The centre hole is to accommodate one of the double electrolytics (16—16μF) —again a fairly popular ex-Service surplus. In view of the small number of components, no point-to-point wiring diagram has been given, but it should be a very simple matter to wire up from the theoretical, the resistors and condensers being incorporated in the wiring and not mounted on a group board. The speaker may be any preferred model, the W.B. 5in. being used in the original model and giving very good quality on the locals—comparable almost, when in the cabinet, with many larger commercial broadcast receivers.

Line-cord

A hole will be found in the rear of the chassis, or should be drilled, if you make your own, to accommodate a line-cord. A ⅜in. rubber grommet should be inserted in the hole to avoid the cord becoming frayed or cut by the chassis. There are several alternatives in the method of obtaining power for these A.C./D.C. receivers, and probably the simplest is that indicated by the circuit in Fig. 1, namely a "tapped" cord. The simplest way to carry out the tapping is to employ two lengths of cord, one at least being of the 3-way variety. (They can both

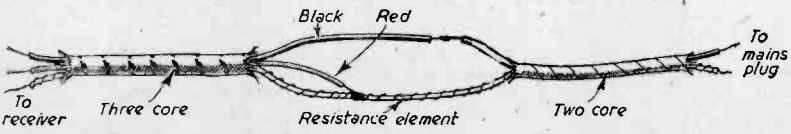


Fig. 3.—How to make up the "tapped" line-cord.

be 3-way if desired as there is very little difference in price, but one length of flex is not used in the first section of cord.) Obtain the two lengths, one having a resistance of 150 ohms (three-core) and one of 500 ohms: this is the length which may be two-core. Fig. 3 illustrates how the cords are joined together to provide the desired tapping. The two-core or 500-ohm length is fitted at one end with the mains plug. At the other end, the two lengths of resistance wire are soldered together and then well taped. At this joint the red wire in the three-core length is also joined, whilst the black wire is joined to the other lead in the first (500-ohm) section. Tape each joint and then lay a short length of thin wood (two matchsticks are ideal) over the jointed parts and tape over these to make a stiff connecting point, which will avoid breakages when the receiver is moved about (Fig. 3). At the receiver end the resistance wire is joined to one valve-heater terminal, the black wire to the on/off switch on the combined volume-control and switch, and the red wire to the rectifier anode terminal. It will thus be seen that the black wire runs straight through the two lengths of cord from the mains plug to the switch, whilst the anode of the rectifier goes through the red wire to the junction of the two lengths of cord and then goes through the 500-ohm resistance wire to the other side of the plug. By using line-cord in this manner all the heat is kept outside the set, but if that is not an important matter, and a fair-sized cabinet is to be used, then the second section of the line-cord may be replaced by a fixed resistor of suitable rating, and a length of ordinary two-core cord used for the mains connection. The fixed resistors should be capable of dissipating at least 4 watts, and no doubt again one of the small vitreous ex-Service components may be found of suitable value and rating.

Aerial

The aerial should be a length of single flexible, about 15ft. or 20ft. in length, attached to the first isolating condenser. It may be kept wound round a piece of cardboard, or, if the receiver is being

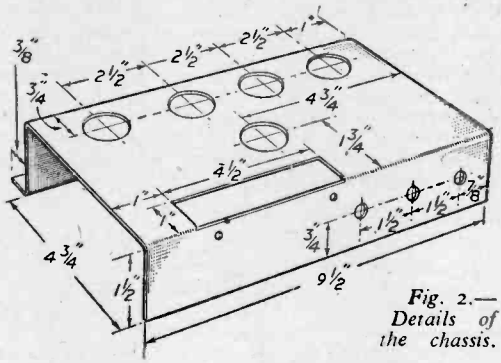


Fig. 2.—Details of the chassis.

installed, in a permanent or semi-permanent position, it may be fixed round the picture rail or along the skirting board of the room. If additional signal strength is required, it may be hung out of a window or an outside aerial connected to it, but then selectivity difficulties may be experienced in view of the simple tuning circuits which are used. Similarly, no earth connection should be required under normal conditions, but, if greater signal strength is called for, the addition of an earth connection may be found worth while and is quite safe with this receiver in view of the isolating condenser.

Cabinet

A suitable cabinet may be constructed from thin wood or ply, and in view of the small amount needed it may be obtained from some sort of discarded box, etc., as it is not readily obtainable in the shops. The type of wood is quite unimportant and it may be finished with white cellulose paint to resemble plastic. Alternatively, sheets of plastic can now be obtained, and, provided that one is used to working in that material, quite a neat cabinet may be built up. If the receiver is built for local use only, then instead of a tuning dial four small metal "chapters" may be attached to the cabinet front and an ordinary pointer-type control knob used. To cover the loudspeaker opening the louvred covering is preferable to the use of fancy materials or silk. Thin strips of wood or plastic may easily be cemented at an angle, and if not too widely spaced no covering of any sort is required. In the interests of safety, of course, a back should be fitted to the receiver, and to provide ventilation this should be cut out or drilled and, again, plastic may be employed or even stout card. Finally, remember that the line-cord runs at a fairly high temperature and therefore keep it away from french-polished surfaces.

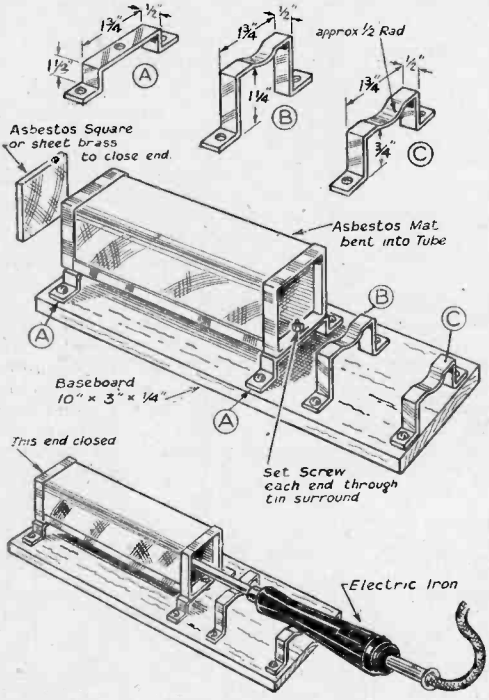
Practical Hints

Quick-heating Device for Electric Soldering Iron

FOR sound soldered joints a really hot soldering iron is usually advised.

With some electric soldering irons it takes some minute or so to get the tip up to the required heat, and in a cold workroom or out of doors in cold weather it may well be impossible.

The writer has used the device shown for some time, and finds the arrangement very satisfactory. It merely consists of a small rectangular container made of asbestos sheet, having one end closed. When the iron is placed in this, and is switched on, the air surrounding the tip of the iron is quickly warmed, and this assists in the ultimate heating of the copper bit, the latter not being affected by the outside atmosphere.



A soldering-iron hint.

The construction of the device is simplicity itself, and the cost is but a few pence. The main item is a square non-burn asbestos mat, as used for placing over gas rings, and these can readily be purchased from the local sixpenny stores. That used measured 6¾in. square.

First the mat is carefully bent in three places to form a long narrow rectangular tube. This bending must be done fairly carefully, as there is a tendency for the material to crack. It might be possible to ease matters somewhat by first wetting the mat, although the writer has not tried this.

The container is then mounted on to a plain wood baseboard by means of two small brass brackets "A," a hole for a small setscrew being drilled through the tin surround of the mat at each end. The far end of the tube is closed by means of a square cut from another asbestos mat, or maybe a piece of tin or brass sheet. Brackets "B" and "C," also made from strip brass, are for acting as a rest for the electric iron. These sizes may vary according to the make of iron, but they should allow the iron to project centrally into the tube.

One important point must be mentioned here. The arrangement is not an oven in the strictest sense of the word, and on no account must any heating device be incorporated when using an electric iron, or the latter will soon be ruined.

The iron used by the writer is a standard "Solon," and is found to heat up very quickly in the device. Care should, of course, be taken to guard against overheating, or the iron will have to be re-tinned. Use the iron normally for light work, as little heat is then dissipated, and the iron may often then have to be switched off to save overheating.—R. L. G. (Chelmsford).

THAT DODGE OF YOURS!

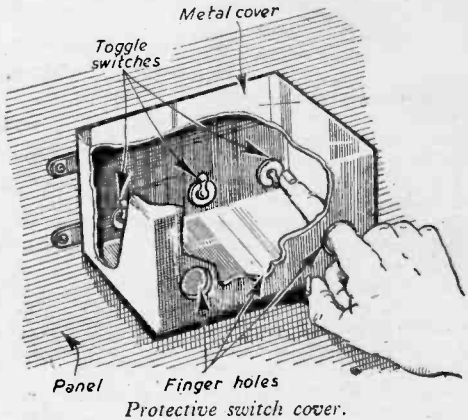
Every Reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay half-a-guinea for every hint published on this page. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL WIRELESS," 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.

Safety Switches

IN order to save my young daughter, who is very inquisitive, from possible danger, I designed the safety switch shown in the sketch for my power pack and other lethal "lash-ups." It is simply a series of toggle switches mounted on a panel, accessible only through finger holes. The distance from the end of the switch to the hole is 2½in., which distance is too long for those small probing digits.—K. N. BROWN (Hendon, N.W.9).



Protective switch cover.

Building a Tel

A Unit-constructed Modern Receiver.

By S.

THE television receiver which is the subject of this series of articles has been built up with the following points in mind:

(a) Comparative ease of construction.

(b) Adaptability of the vision chassis for different ranges of reception and vision frequency.

(c) Adaptability to experiment. .

(d) Keeping the cost as low as possible without sacrifice of reliability.

(e) Ease of alignment.

In order to comply with the first point a unit system of construction has been adopted, a system which strongly recommends itself to home-construction where experiment can be easily carried out on individual chassis. The receiver accordingly consists of five separate chassis, inter-connected by cable. These chassis are as follows:

1. *Vision chassis*, a 10-valve unit giving two outputs, one to modulate the tube grid, the other to feed the synchronising circuits.

2. *Sound receiver chassis*, a five-valve unit feeding a normal speaker output.

3. *Synchronising and time-base unit*, a six-valve chassis, feeding line and frame-scanning coils.

4. *Tube unit*, housing the C.R.T. and all scanning and focus components.

5. *Power unit*, a two-valve (rectifiers) chassis supplying normal H.T., extra H.T. and all heaters.

The total number of valves used is thus 23, which may seem excessive, but in certain areas this number is essential, while in others it can be slightly reduced, as will be shown later.

To meet the requirements of point (b), a super-het circuit was chosen for the vision receiver, since this is probably the best circuit from the point of view of the home constructor, and it is most easily converted to another vision frequency, since all I.F. circuits (where the bulk of the amplification is carried out) then require no modification. Again, it is much easier to get stability with plenty of gain from a row of valves operating at a comparatively low intermediate frequency than it is from an equivalent number of R.F. stages all working at 45 Mc/s.

The cost of the receiver has been kept down by the use of ex-W.D. valves as far as possible. These valves work perfectly provided they are bought unused, and by this means one of the main money-swallowing items in any television receiver is considerably reduced. It only remains to say, before getting down to details, that there is nothing to prevent anyone from duplicating this receiver, although the would-be constructor should have had some little experience in set building and aligning, and should have the general ideas of radio theory in his head. The rest is then a matter of care—and common sense.

Vision Receiver Theory

The valves used mainly in the 10-valve vision chassis are S.P.61s, the Service equivalent being V.R.65. These are high-slope television pentodes with top-cap grid connections and Mazda-Octal bases.

Referring to the circuit below, this may at first glance appear to be a little "crowded" with components, but in theory and actual construction it works out very easily and conveniently. The aerial feeder (which must be 80 Ω co-axial type) is coupled to the first tuned circuit L1 by a 1½-turn loop, the main coil being damped by R1 (4kΩ), and the whole circuit being tuned to cover both *vision and sound* frequencies, about a mean 43 Mc/s. V1 provides initial R.F. amplification, but in view of its low anode load R3 (2 kΩ) this does not exceed three or four times, and R3 damps, in addition, the second

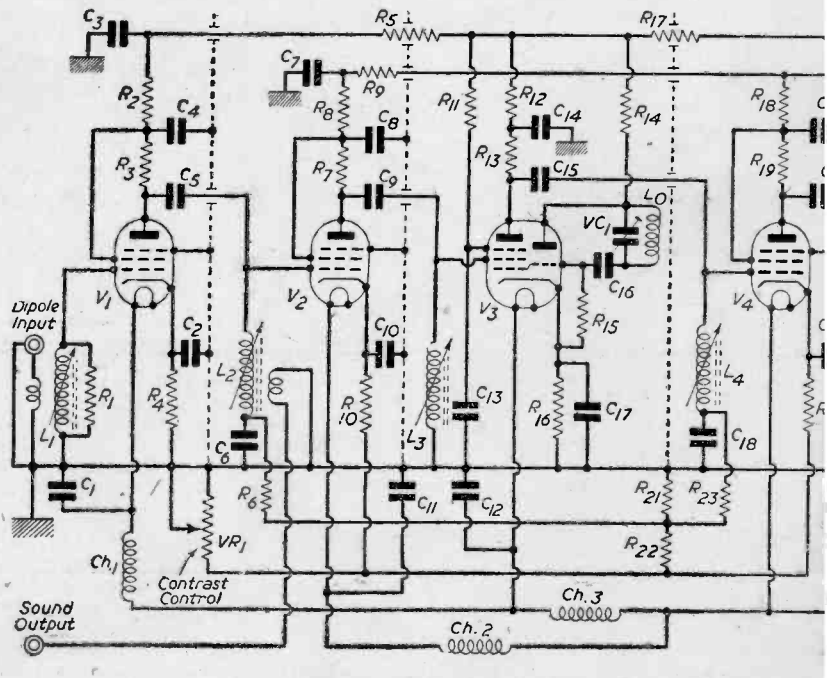


Fig. 1.—Theoretical circuit of the vision unit. A l

ision Receiver

Month the Vision Section is Described
NIGHT

tuned circuit L2, this also being tuned through both vision and sound frequencies. The sound signal is taken from this coil by means of a single-turn loop, of which more will be said later. V2 provides further amplification and the vision signal is tuned by L3 to provide the input signal to the frequency-changer stage V3. This valve is a triode-hexode type ECH 35 (or V.R.99A), and its oscillator section operates at 58 Mc/s. thus giving an I.F. output of 13 Mc/s. Circuit values here are critical and should not be altered.

V3 provides practically nothing in the way of amplification and it is sufficient if it does not attenuate. The I.F. output appears across R13 in the anode of the hexode section, and is passed through C15 to the first I.F. tuning coil L4. Variable bias on V2 and V4 by means of VR1 (contrast control) prevents over-loading of the I.F. stages, the bias on the suppressors of these valves being varied in addition to that on the grid (in the ratio of R21 to R22), so that there is negligible change of input capacity with change of grid bias—remembering that the valves are non-variable-mu.

V4, V5 and V6 are the three I.F. stages, and are "stagger-tuned" to provide an adequate bandwidth for good definition. The mean I.F. is 13 Mc/s, as has already been mentioned. The output from V6 is developed across the last I.F. coil L7 and is rectified by V7, a television type diode. The rectified output is developed across R30 (2.2 kΩ) and is filtered by L8 and L9 before being passed to the grid of the video-amplifier valve V8.

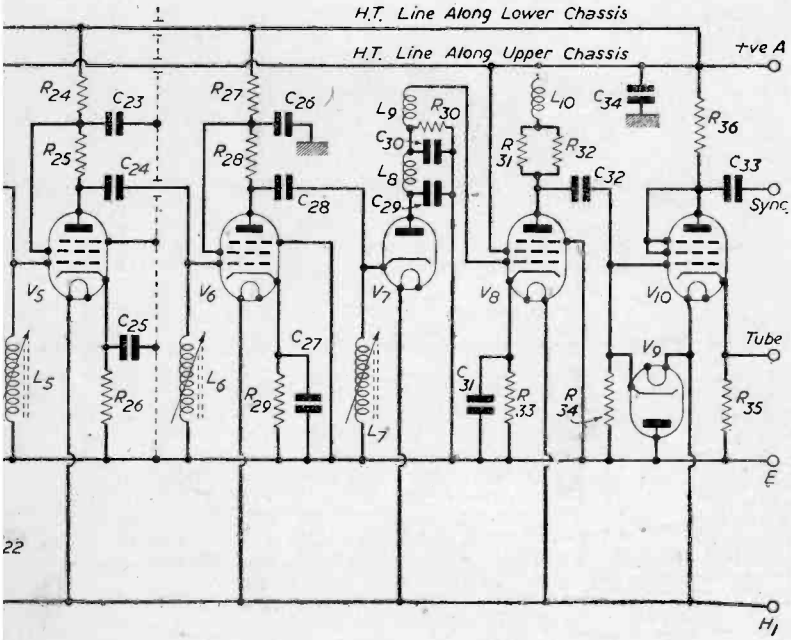
V8 receives a negative-going signal from V7 and consequently is arranged to have a very small bias so that the maximum swing of the grid in the negative direction can occur before serious over-loading sets in. C31 is merely included to bolster up the high-frequency response of the amplifier by preventing feed-back at the highest modulation frequencies. A compensating choke (L10) has also been included in the anode circuit of this stage for the same purpose.

V9 is a D.C. restoring diode, and V10 is a phase-splitting stage that provides signals in opposite phase for feeding the tube grid with a positive signal and the synchronising circuits with negative signals.

Construction

The actual design is a little unorthodox, as an inspection of the cover illustration showing the valve side of the chassis, will reveal. This view is drawn in Fig. 2, and it will be seen that the valves are connected base-to-cap all along the line. This form of construction is very suitable for the valves used, where the top cap is the grid connection, for then the lead from the preceding anode is kept as short as possible, and further, the screening is extremely complete between the stages.

The chassis is built up from three pieces of aluminium, the general shapes being given in Fig. 3. How these pieces are bolted together will be obvious from the photographs, but there are one or two small points to think about. It is advisable, when marking out the holes for the valveholders, to mark out first one strip only, as shown in the figure, then to arrange for the holes in the opposite strip to fall between them. This method thus allows for any slight inaccuracy which might result if separate marking out is attempted. Then again, although there is plenty of room between the chassis for the easy insertion of the S.P.61s and the solitary E.F.50 (V.R.91 Service), the



components and values will be found on page 69.

frequency-changer is somewhat taller and may not "go." This matter of height must be checked before the chassis are bolted to the back plate, for if the frequency-changer is too tall, a further large hole must be cut in the opposite strip to allow for the projection of the top cap. This idea can be easily seen in the photograph on p. 70, first compartment on the right. All other grid leads go through grommets to their respective top caps. All other holes are drilled in the most convenient places, as dictated by the components, and are therefore not shown in the sketch in Fig. 3.

Referring to Fig. 2, this diagram is designed to show which components are to be wired into the separate compartments into which the strip chassis are divided. These partitions are made up from thin aluminium (copper will do), and bent to fit closely across the chassis, reaching completely to the bottom and coming up to the level of the side flanges. The screens between the valves are similarly made up. Inside each compartment the components are wired as conveniently as possible, care being taken particularly in the two R.F. and mixer compartments. This latter section is very important, and a sketch of its layout is given in Fig. 4. The valveholder is a ceramic type, and the oscillator coil is a Wearite type PA4. This coil is prepared by stripping off the small coupling winding which consists of a few turns of very thin wire wound at the end of the thick main winding. It must be completely removed, and the tags to which it was attached should be cut off short so as not to interfere with the other parts. The main winding is now wired directly to the oscillator tuning condenser, which is a 20 pF maximum ceramic trimmer, air-spaced type. It *must* be insulated completely from the chassis.

The following points are of extreme importance and *must* be observed completely:

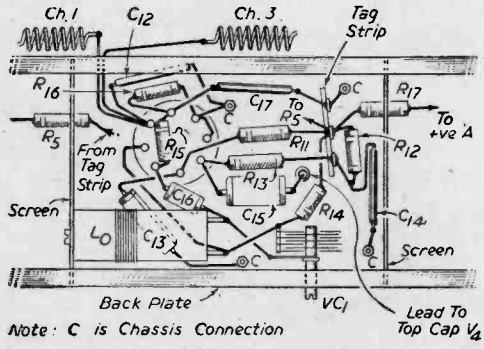


Fig. 4.—Layout of the frequency-changer stage. In this illustration the parts appear more spaced out than they are in practice.

Certain resistances pass *through* the dividing screens in a manner such as can be seen from the second photograph. The resistances which must thus pass through are: R5 from compartment 1 to 3, R9 from compartment 2 to 4, R17 from compartment 3 to 5. Resistance R20 also passes through from compartment 4 to compartment 2, where it connects with R10 and then passes out through the back plate to VR1 and the associated resistances. The second photograph shows this part clearly. The Contrast control is mounted on a small component bracket, and an extension spindle is later fitted so that control can be easily effected from the end of the chassis.

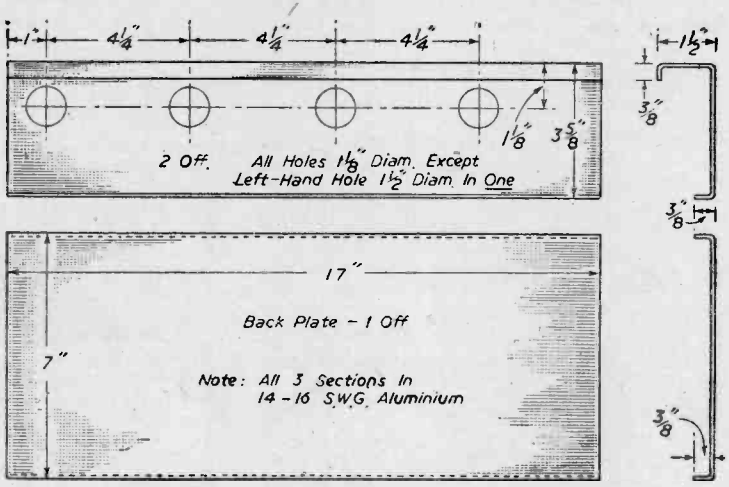


Fig. 3.—General details of the vision chassis sections.

The heaters of the first three valves have chokes included in their wiring, these chokes being situated on the outside of the strip chassis (see photo 1). These are wound from 20 S.W.G. enamelled copper wire, 14 turns each on an ordinary pencil shaft, afterwards being pulled out to a length of about 1⅜in. They are then wired through grommets to the heater pins of the valves concerned. Note carefully that C22 is shown in Fig. 2 as *two* condensers, one on the upper and one on the lower strip chassis. Each has a value of 500 pF though on the theoretical diagram only *one* C22 is drawn. The other heater by-pass condensers not located on the outside of the chassis with the chokes are C1 and C12; these are wired directly from the appropriate heater pins to earth inside the compartments. The other sides of all heaters are tied directly down to chassis.

The detector valve V7 is mounted horizontally in compartment 6 along with the last I.F. coil L7. The rectified output passes through a grommet to chokes L8 and L9 and the diode load R30 and by-pass condenser C30. The D.C. restorer diode is mounted similarly near the base of the video-amplifier V8, the compensating coil L10 also being mounted at this point. There is nothing about this part of the circuit that requires lengthy description, apart from the fact that the H.T. and heaters supply are fed from the upper chassis to the lower through a ⅜in. diameter aluminium tube connecting

both chassis (see the right-hand end of photograph 1) and the grid lead of V10 is brought up similarly through another tube, the self-capacity being kept as *low as possible*. To conclude, H.T. leads and outputs are brought to a 5-way tag-strip at the end of the upper chassis. The actual connections are seen on the right of Fig. 1, the letters used for designation being similarly marked on the other chassis to which connection has later to be made.

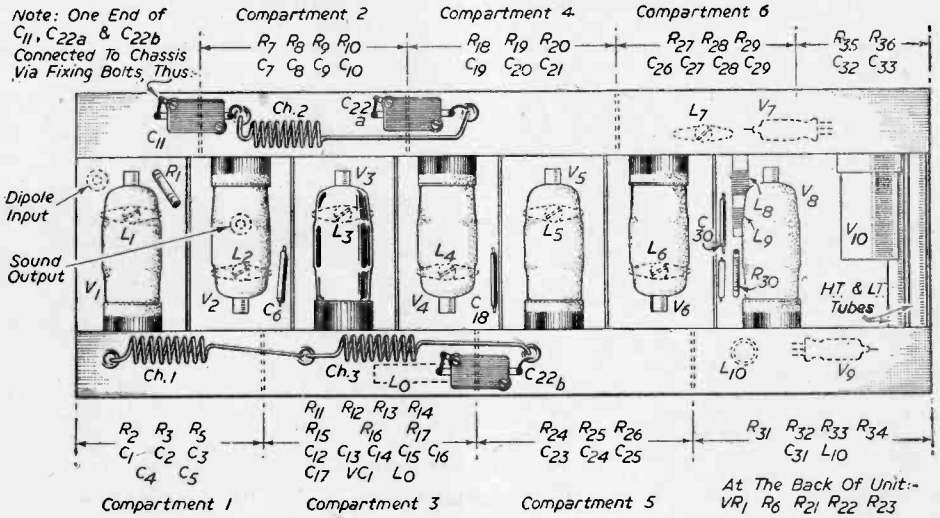


Fig. 2.—Chassis layout showing components wired in the separate compartments.

The Tuning Coils

Tuning in the receiver is carried out by iron-plungers, circuit capacity being kept at a minimum

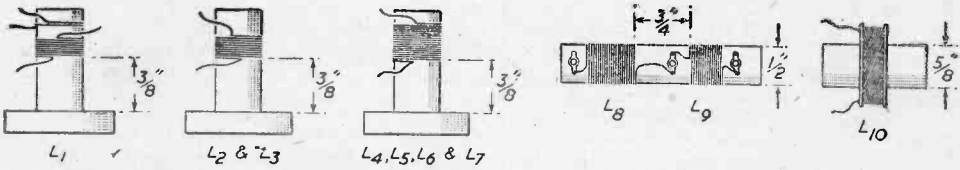
LIST OF COMPONENTS

R1, R35—4kΩ.
R2, R12, R24, R27—470Ω.
R3, R13—2kΩ.
R4, R26, R29—160Ω.
R5, R9—1kΩ.
R6, R19, R22, R23, R25, R28—4.7kΩ.
R7—8.2kΩ.
R8, R18—3.3kΩ.
R10, R20—100Ω.
R11—40kΩ.
R14—27kΩ.
R15—47kΩ.
R16—220Ω.
R17—1.5kΩ.
R21—68kΩ.
R30—2.2kΩ.
R31, R32—6.4kΩ.
R33—30Ω.
R34—1MΩ.
R36—7.5kΩ.

Erie Ceramic, etc.
(All resistors ½ watt type except R31 and R32, which are each 1 watt.)

C1—.0003μF.
C2, C4, C8, C10, C13, C14, C17, C19, C21, C23, C25, C26, C27, C31—.01μF.
C3, C5, C6, C7, C9, C15, C18, C20, C24, C28—.001μF.
C11, C12, C22—.0005μF.
C16—15pF.
C29, C30—10pF.
C32, C33, C34—.1μF.
T.C.C. mica, silver-mica, etc.
(All condensers up to V8 are moulded mica or silver-mica.)

VR1 (contrast control)—10kΩ wire-wound.
Oscillator tuning condenser—3-20 pF air-spaced ceramic trimmer.
Oscillator coil, Lo.—Type PA4, Wearite.
Valveholders—6 Mazda Octal, paxolin; 1 International Octal, ceramic; 1 Belling-Lee B9G; 2 midget diode type.
Coil Formers (plain or wound)—Midco Radio, Wellingborough.
Valves—Six SP61 (or VR.65); one ECH35 (or VR.99A) (mixer); one EF50 (or VR.91); two E.A.50 (or VR.92).
Co-axial Plugs—two, Belling-Lee type L604P.
Co-axial Sockets—two Belling-Lee, type L604S.
Chassis sections prepared by Electro-Acoustic Developments, 13, Bence Lane, Darton, Nr. Barnsley.



L1 { Main: 6 turns. Coupling: 1½ turns. (Coupling spaced 1/16in.) 34 S.W.G.

L2.—6 turns. **L3.**—5 turns. 34 S.W.G.

L4, L5, L6.—16 turns. **L7.**—18 turns. 36 S.W.G.

L8.—55 turns. **L9.**—25 turns. 38 S.W.G. enamelled.

L10.—55 turns pile-wound between cardboard cheeks. 3/16in. apart. 34 S.W.G.

Note.—All coils, with the exception of L10, are close-wound, the wire being enamel/single-silk covered except where otherwise indicated.

Fig. 5.—Coil winding details.

to increase bandwidth. The coils are wound on small bakelite formers into which an iron core threads, and they are fixed down by two bolts through the base. The R.F. and I.F. coils of the receiver are mounted in the compartment close to the appropriate valve top-cap as shown dotted in Fig. 2, adjustment of the cores being carried out for coils L1 to L6 through the back plate (see photograph 2). There should be at least ¾in. space between the coils and any surrounding metal. Coil L7 is tuned from the front of the upper chassis —this coil can be clearly seen in photograph 2—and coils L8, L9 and L10 are untuned.

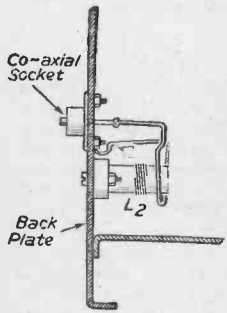


Fig. 6.—The sound pick-up loop wound over L2.

Full winding details are given in Fig. 5, where wire sizes, etc., are also given. There should be no difficulty in winding these coils, but they can be supplied in sets ready wound by the manufacturer listed on page 69. L8, L9 are wound on a ½in. former, L10 on a ⅜in.

The coils L1, L2 and L3 are wound to cover the range 41 to 46 Mc/s and L1 is further flattened by R1 to receive both sound and vision. Sound signals are picked off L2 by means of a coupling loop which consists of one turn of 22 tinned copper wire, self-supporting, ¼in. diameter, placed over one end of L2 and soldered directly to the co-axial output socket mounted on the back plate behind V2 (see Fig. 6). The I.F. coils are wound to give an I.F. of 13 Mc/s, the oscillator of the mixer working accordingly at frequency of 58 Mc/s (=45+13 Mc/s).

The earthy end of each coil (where it is directly connected to chassis) is wired to a tag fixed under one holding-down bolt, the grid ends going by as short a route as possible to their respective top caps. In the cases of L2 and L4, the earthy end goes to a condenser in each case (C6, C18 respectively), and these condensers are firmly mounted in the valve compartment beside the coils. The resistances R6 and R23 pass respectively from L2 and L4 and C6 and C18 through the back plate to the Contrast control and R21 and R22, see photograph 2.

Going back for a moment to the coil winding, the turns are held in place with some such adhesive as polystyrene solution, although they may be held with very narrow strips of insulating tape fixed lengthwise along the former. The wire is thin in all cases and so no trouble should be experienced.

General Considerations

For those resistances which have to pass through the screens, Erie ceramic type are particularly suitable since they are of a uniform diameter requiring only a ¼in. hole, and no insulation (i.e., a grommet) is required.

Condensers.—All condensers up to V8 stage should be of the moulded mica or silver-mica type. These are readily available at present, and exact values are not essential. For example, some ex-Govt. silver-mica condensers have odd values such as 9,810 pF (=0.009810 μF). Such condensers are perfectly suitable in place of the 0.01 μF (10,000 pF) for screen and cathode decoupling. C32, C33 and C34 are ordinary paper tubulars of adequate working voltage (500 volt).

Wiring.—Connecting wire should not be less than 22 S.W.G. covered with systoflex, but a thicker gauge such as 20 S.W.G. is recommended for the heater leads. The leads to grid caps may be flexible. The circuit lends itself to simple wiring, the anode resistances lying conveniently across the valve-

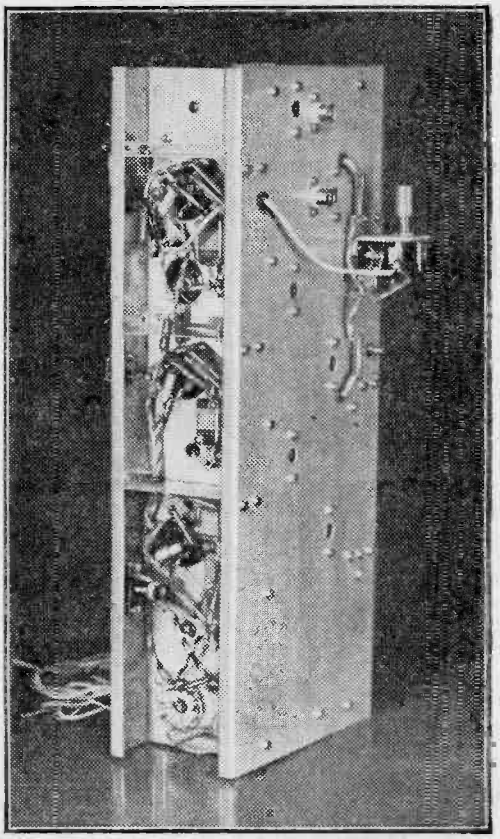


Fig. 7—This alternative view of the chassis should be studied in conjunction with the cover illustration.

holders, pin 6 of which may be used as H.T. anchoring tag.

It might be added that for those constructors living within 25 miles of London, V1 may be omitted from this circuit, since it is added primarily for cases of extreme range, i.e. up to 70 miles from London. If it is not included, the aerial coil is transferred from L1 position to L2, the bias arrangements (i.e., C6 and R6) remaining as now, and the sound signal is taken directly from the aerial input in a manner to be described later. The coupling loop is then no longer required.

(To be continued)

New Developments in Broadcasting

Précis of the Presidential Address Delivered Recently at the Junior Institution of Engineers by SIR NOEL ASHBRIDGE, F.K.C., B.Sc.(Eng.), M.I.C.E., M.I.E.E., F.I.R.E.

THE title of this address is wide and could well be divided into a number of headings, but my intention is to pick out two outstanding developments and endeavour to deal with them as fully as possible within the limited time available. What I am going to say cannot, I am afraid, be much more than a kind of progress report. I am conscious, moreover, that the great majority of my audience are not radio engineers, and I therefore propose to try and treat the subjects in such a way as to be of interest to engineers engaged in other branches of the profession. Fortunately, broadcasting is of interest to a very large proportion of the population, so that I hope what I have to say may be of interest to a large number of the members of this institution. The subjects I have chosen are first, television and, secondly, ultra-high frequency or, if you prefer it, ultra-short-wave, broadcasting.

Television To-day

First, with regard to television it might be said that this is not a new development, and in a sense this is true, because a regular service of television using the existing system was initiated in this country as far back as 1936, while television in a more rudimentary form was being transmitted by the B.B.C. for some years before that. Nevertheless, from the point of view of technical finality, it is still definitely in its early stages and can therefore be regarded as a new development. Moreover, a great deal of expansion is still necessary before it can be said that the service is on a nation-wide basis.

Let us consider, then, where we stand at the present time. There is one station working in London which, in fact, has been working on a regular service basis since November, 1936, with a hiatus due to the war from September, 1939, to June, 1946. The peak power of its vision transmitter is 17 kW., while the carrier power of the sound transmitter is 3 kW. The average working range is approximately 40 miles although, of course, reception is possible in some directions well beyond this distance. The television frequency band in which this transmitter is working extends from 41 Mc/s to 66.5 M/cs so far as this country is concerned, but from the international point of view the band could be extended to 68 Mc/s. This allows sufficient space for four complete vision and sound channels, with a possible fifth if the band could be extended to the upper international limit.

Transmitters using frequencies of this order are not normally subject to interference from other transmitters at great distances, as is the case when using lower frequencies. Nevertheless, in certain circumstances long-distance transmission by reflection from both the ionosphere and the troposphere can, and does, take place for short periods on these comparatively high frequencies. If, however, we ignore the possibility of occasional interference for brief periods from stations outside the United Kingdom, we have the possibility of using four, or perhaps five, high-power stations on separate wavelengths. There is also, of course, the possibility of using the same channel for stations at opposite ends of the country, but although the technique of sharing channels is well known for sound broadcasting, the possibilities in connection with vision have not yet been fully explored. It is known, however, that the prospects of being able to share vision channels are not very promising unless the distance is roughly 300 miles or more.

Range of Reception

Again, the range of future stations can to some extent be increased over and above that attained by the existing London station at Alexandra Palace by the use of greater power and a higher mast for supporting the radiator.

For example, the new station (at Sutton Coldfield) to serve the Birmingham area will have double the peak power for its vision transmitter—that is to say, about 35 kW.—and four times the carrier power for the sound transmitter—that is, 12 kW.—as compared with the equivalent transmitters at the Alexandra Palace in London. At the same time, the height of the mast at Sutton Coldfield will be 750ft. instead of 300ft. at Alexandra Palace; as a result, the average range may be perhaps 50-60 miles, but stress must be put on the fact that this will be an all-round average and that the range in different directions will vary considerably, due to the character of the intervening country.

It may be possible to use higher power still for some of the future stations, but while this might considerably improve the general quality of reception, it is unlikely to increase the maximum working range materially. Even if it became possible to use five channels it is unlikely that the population coverage would exceed, say, 70-75 per cent. of the total population. I need hardly point out that the percentage of area coverage would be very considerably less. This is not, however, a carefully calculated figure, since the sites and conditions of working for future stations are not yet fully known.

Nevertheless, it is evident that a considerable population coverage is possible while still working

in the band at present allocated for television in this part of the usable frequency spectrum and without taking into account the possibility of using more than one transmitter on a single frequency channel. Doubtless when the possibilities in this band have been exhausted consideration will be given to the possibility of working in other bands allocated for television of higher frequency. There is, of course, the possibility that at the next International Telecommunications Conference, which is due to take place in Buenos Aires in about four years' time, some expansion of television bands may be made. For the present the higher frequency bands already allocated will be used by secondary transmitters for linking outside broadcasts to the main transmitters and possibly for radio links connecting one station with another.

Picture Quality and Definition

We must now consider the possibilities with regard to the quality of the picture using the system at present in operation, on which, of course, must depend the scope of the programmes undertaken. Very broadly the definition depends on the number of lines used in scanning the object to be televised. If other factors remain constant this in turn determines the width of the modulation band to be transmitted, which again is limited in practice by the frequency of the carrier wave.

Working in the frequency band at present used, we might say that the maximum modulation band-width on economic and practical grounds is in the neighbourhood of 3 Mc/s. It is commonly assumed that the definition in a horizontal direction across the picture should be equal to that in a vertical direction, although this is by no means final. The present system transmits 25 pictures per second interlaced 2-1 (50 frames per second) with 405 lines per picture. The band-width required for these conditions is 2.8 Mc/s, which is not far from the maximum which is economically feasible. It should be borne in mind that the wider the band-width to be received, the higher the cost of the receiver.

In other countries a somewhat larger number of lines is being used while still working in this waveband; for example, in U.S.A. 525 lines per picture are in use. This means in practice that the vertical definition is frequently greater than the horizontal, depending on the design of the receiver. It could be argued that for a certain modulation band-width this has some overall advantage in that the line structure of the picture tends to be less visible. There may be something in this argument, but it is doubtful whether it is of real practical importance from the point of view of the average person making use of the service, which is, of course, the most important consideration. The whole problem amounts to the striking of a balance between vertical definition and horizontal definition, and the cost of the receiver. It is interesting to note that the picture characteristics chosen for this country more than 12 years ago still remain reasonably sound on an all-round basis.

The next question is whether the present-day television, ignoring the comparatively slight variations in different countries, represents finality so far as picture definition is concerned. The answer is undoubtedly "yes" for many years to come; but at the same time the answer is certainly "no" if we are considering the distant future. Considerably higher definition for a black and white picture, as distinct from colour, is already technically quite feasible, but this would necessitate a higher carrier frequency, which would, in turn, bring with it coverage difficulties of various kinds, but what is even more important is that the cost of the receiver, already high, would be considerably higher.

Television in Colour

Again, if we are considering the comparatively distant future we cannot ignore the possibilities of colour. More than one system of colour television has already been demonstrated on a laboratory basis; it is generally admitted, however, by those working on television, that it is not a practical and economic proposition at present. It would, of course, involve the same difficulties as would be encountered with considerably higher definition in black and white, but so far as can be seen at present it would also involve additional difficulties and much higher costs both in connection with the production of the programme and the cost of receivers to the public. It is frequently argued that with colour the intrinsic definition of the picture itself does not need to be so high as with a straight black and white picture and therefore the extra modulation band-width arising from the use of colour need not be much higher than would be necessary with higher definition in black and white. This, of course, is mainly a psychological effect arising from the fact that with colour there is added information in the picture which is not present in the case of black and white pictures.

The logical conclusion, therefore, is that present-day television as used in this country is not out of date, as some people have suggested. On the other hand, it is clear that all present systems as used in any country do not represent the maximum ultimate possibilities of television, especially if the economic side of the problem is ignored. At the same time it is clear that from the public service point of view, developments of a major kind are very unlikely to be made for many years ahead.

Economics of Television

It cannot be emphasised too strongly, moreover, that costs will enter prominently into any consideration of new systems. Already the overall economics of a television service are much more difficult than in the case of sound broadcasting. To such an extent is this the case that the smaller countries are faced with a difficult problem of how best to introduce a service of television on a self-supporting basis; a problem in which, incidentally, the actual distribution of population is an important factor. A further important economic consideration arises from the restricted rate of production of television receivers due to existing economic conditions. For example, the number of receivers in use in this country is at present limited almost entirely by the rate of production, which, in turn, is limited mainly by the availability of materials. For this reason the actual number in use is about 60,000, which is far below what would be possible with greater production.

(*To be continued.*)

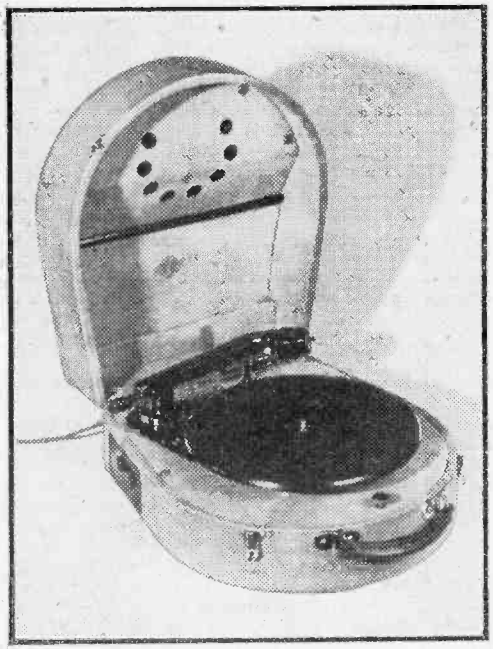
New V.S.E. High-fidelity Portable Record Reproducer

A Self-contained Mains-operated Unit With a High-quality Output

DESIGNED exclusively for the flat dweller and other record enthusiasts who have neither the space nor the capital to purchase a full-sized instrument, the new V.S.E. high-fidelity portable record reproducer is a truly portable record player which gives high-fidelity reproduction, and is suitable for 200-240 volts A.C. mains operation.

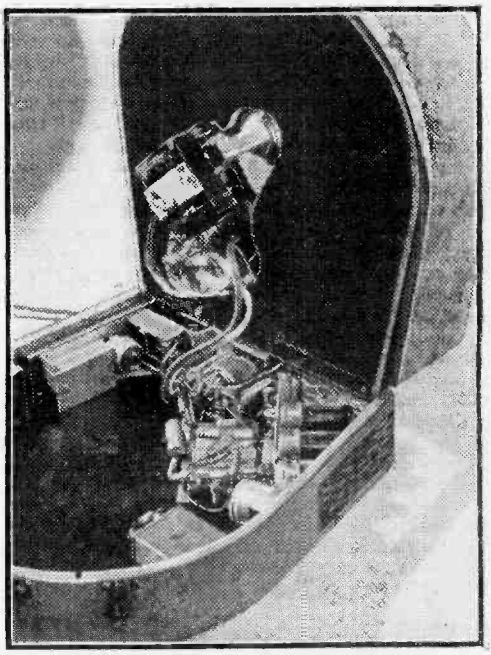
Due to the horizontal speaker position in conjunction with a specially designed grille, the sound distribution is omni-directional and the case exhibits acoustical properties usually found only in much larger models. A 6½in. flat type moving-coil speaker is used.

The curved shape of the case allows both 10in. or 12in. records to be played with the lid closed, thus eliminating surface noise from the pick-up. Both volume and tone controls are located on the side of the case, allowing adjustments to be made without opening.



The "Karrigram" opened showing the speaker housing.

A lightweight Garrard turntable unit is used and the high-quality magnetic pick-up feeds a three-valve amplifier, using the new Mullard all-glass B8A miniature series valves, and employing a bass boost circuit of 3.8 db per octave. The frequency response is reasonably level from 40 to 15,000 c.p.s.



Interior of the "Karrigram," showing the compact layout of the amplifier.

The novel circuit design incorporates a capacitor as a wattless voltage dropper, ensuring surge-free operation. The hum level, both from mains and pick-up input, is inaudible owing to special care in electrical design. Negative feed-back of 14 db ensures the maximum output of approximately 2½ watts, with the minimum distortion obtainable from the valve combination used.

The whole instrument is readily portable, weighing only 16¾ lb., for a case size of approximately 14in. by 13½in. Adequate ventilation is provided and the layout is planned to facilitate servicing. The case is finished in Rexine grey lizard skin, designed to blend with any interior. The price of the "Karrigram" is 18 gns. plus £8 1s. 8d. Purchase Tax.

SAVE THAT CARTON

Every empty breakfast-food, sugar, cigarette, soapflake packet is urgently needed for salvage.

Programme Pointers

This Month Our Critic, MAURICE REEVE, Discusses Some of the Feature Programmes

WHAT an age ago 1906 seems! It is a long time, of course, by any standard of reckoning—42 years. Even if it were the year of one's birth, it would still be 42 years ago. But when one possesses even childish memories of it, it not only seems to take on an historical and far more distant aspect, but a sort of "time marches on" feeling creeps on one as well. I wonder if any other period of history has witnessed such revolutionary changes in every single walk of life without there having been a forcible turning over of society and government to bring them about. The period covering the change-over from horse and sail to steam must have been pretty staggering and all-embracing, seeing that the former had lasted since the creation of the world. The adoption of electricity and the internal-combustion engine were largely supplementary, in the way the cinema is to the theatre, rather than institutional and fundamental. It must have been the supplanting of the uncertainties of the winds and the human elements by mechanical science that was the all-important thing, and that took place long before 1906. To go to one's factory instead of one's loom, or to catch the train at the newly-built station in Euston Road instead of the stage in the courtyard of the Rose and Crown, must have wrought more social changes than anything before or since.

"Scrapbook"

The B.B.C.'s "Scrapbooks" are so interesting and so uniformally good that I venture to make two suggestions for their enlargement and the widening of their scope. One is that they be remade into "second editions" with new features bound to have been left out or treated secondarily in the original; and the chief events of the year, which obviously couldn't be left out under any circumstances, rehashed and re-edited.

The second, and more ambitious, suggestion is the composition of scrapbooks from history and before the recollections of anyone now living. Scenes depicting Boswell and Johnson, Gray writing his Elegy and Wolfe reciting it on his way up the St. Lawrence. Pepys' work and gallantries, the opening of the first railways, the passage of the Reform Bill, etc., *ad infinitum*, opens up visions of enchanting programmes and scope for genius and talent on the part of compilers and producers. A programme for each year of British history is not in my mind, but events could, with dramatic skill, be telescoped so that half a dozen programmes for each century would be feasible. The exploits and hanging of Dick Turpin, the first productions of "The Beggar's Opera" and the "Pickwick Papers," and the opening of the Great Exhibition of 1851: such events make their years memorable by any standards.

The Saturday-evening Music Hall programmes seem to me to have fallen off very considerably recently. Some of the more household names, or top-liners, are not what they were, nor do many of the "debutantes" to Music Hall seem likely to make variety history. Six minutes of fair to feeble stories concluding with an appalling song "which," we are invariably assured, "you are sure to like," get a bit boring week after week, as do most of the crooners, whose glamour and "poisonality" often have to be presumed present. It was a thousand pities the Command Performance was not put over, the more so as it made a regrettable reversal from the normally accepted procedure of making the difficult or impossible easy and possible.

The Brains Trust

Another feature, hitherto enormously popular, but which doesn't seem to be quite what it was, is the Brains Trust. Extraneous circumstances apart, there seems to be an air of unreality pervading it; the old spontaneity is not there to anything like the same degree, whilst the questions are sometimes enough to tax the patience of Job himself in their imbecility and fatuousness. If people cannot differentiate between what is suitable for putting before the Trust, and consequently the public, and what is best answered by reference to "The Children's Encyclopædia" or "Everybody's Book of Household Management," then the Trust will only be rescued from obloquy by a careful vetting of the questions before it goes on the air.

The Trust is always at its best when expressing opinions. In my opinion it should be used for nothing else, and all inquiries eliciting facts should be barred from it. Do they think the lyrics of Gilbert or the music of Sullivan play the predominant part in that firm's operas? not—Is Sullivan a great musician or Gilbert a great lyricist? is the type of question most suited for public entertainment. Is Socialism a good or a bad thing for mankind? not—Is it good or bad to water the garden in the sunshine? Is State-aided art a good or a bad thing? not—Is art good or bad? When at its best, the Brains Trust is a first-class show; I used to look forward to it as eagerly as I now switch on The Critics. I think there is easily room for both.

I enjoyed Kenneth Horne's amusing skit, "Fools Rush In," on October 30th, in which every conceivable, and inconceivable, deterrent to marriage is packed into three highly diverting acts. It is so convincing, too, that I know of one young lady who, toying with the idea of following in her mother's footsteps, immediately abandoned all such on seeing the original production at the Fortune. I never heard whether she remained grateful to Mr. Horne for rescuing her from the abyss, but I do know he saved her from falling over it at the time.

As with most light comedies of its type, one misses the high-speed action of a stage production. No amount of door shutting and motor-car engine

running ever quite succeeds as a substitute for the movements of the characters on, off and across the stage. To hear an angry wife say, for instance: "All right, you horrid, selfish thing, if you won't take me out I'll get George to," followed by the bang of a door and the noise of a car starting up, cannot carry either the same dramatic or farcical weight as if we see the flash of her eye, the scornful twist of her lip and her contemptuous sweep out of the room. The same, of course, applies even more forcibly in scenes of dramatic intensity such as putting poison into a cup of tea or loading a revolver with sinister intent.

"The Planets"

There were some notable concert broadcasts last month. I wonder how long Holst's glittering "Planets" suite will really live. For all its wizard scoring and fine imaginative sweep, I cannot help feeling that it is rather being kept alive, and that, were it not to be seen in programmes for some time, there wouldn't be a flood of requests for its immediate rehabilitation.

There was some magnificent playing by Gieseking and Backhaus in Debussy and Beethoven, and some not so good by Backhaus in Chopin. Both artists are, of course, not only pre-war stars, but pre-1914 stars as well: at least Backhaus is. I never liked Backhaus' Chopin playing; it lacks the requisite dash and fire. But in Beethoven, and most German music, he is extremely powerful and authoritative. Gieseking is as perfect a player of French music as anyone living.

The B.B.C. does a real service with its opera broadcasts. The loss of the visual side is not felt to the same extent as with a play, as the music is such an enormous element for which the eye is not required. Much more important, however, is the fact that they are, for the most part, productions of works which could not be heard any other way. Stanford Robinson's work in connection with them is some of the best in the programmes.

Verdi's Force of Destiny, and Wolf's probably quite unknown Der Corregidor added to the reputation of all concerned. The latter made most of us realise how much more successful Manuel de Falla was in his handling of precisely the same story as a ballet; I mean the incomparable "Three Cornered Hat."

"Calling London Tower"

An Interesting Account of Modern Airliner Landing Technique

MANY people have heard of the Tower of London, famed for its history, crown jewels and beefeaters, but there is another tower in London of growing significance. It is "London Tower," the air traffic control tower, at London Airport, which captains and radio officers of B.O.A.C. Speedbirds and other aircraft call by radio-telephone as they fly in over England from all parts of the world.

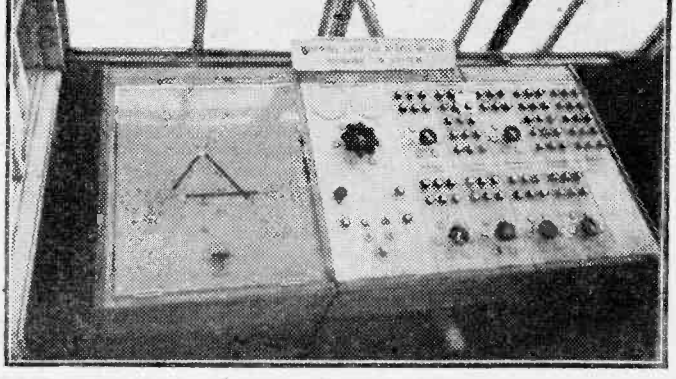
At safe heights above hills and clouds, as directed by "London Tower," they "home" on a radio beacon on the outer perimeter of London's air traffic control zone, the circumference of which is roughly 30 miles from the centre of London.

Inside the B.O.A.C. airliner is an air of expectancy always associated with the end of a journey. Passengers may be sipping the last of their refreshments; one or two of them are shutting the hand-baggage they have used on the flight; steward and stewardess are giving help where they can and are busy answering questions.

Some passengers are idly looking out of the window at the wide blanket of cloud below them, and one or two of the more knowledgeable among them are wondering what method the captain will use to descend through the mist and land on the runway.

The aircraft's radio compass shows that the 'plane is over the beacon. Out goes a radio-telephone call from the captain: "Calling 'London Tower.' Speedbird George Oboe Charlie here. Over beacon. Request weather and altimeter setting."

"London Tower" hears this message in its loud-speaker in Approach Control on the first floor of the building, where officers and their men and



The Airfield Lighting Panel in the Control Tower at London Airport.

women assistants control by radio the passage of aircraft through the control zone.

Above them in a glass "pent-house" on the roof is "Landing Control" where officers regulate the air-traffic movements in the immediate vicinity of the airfield and manipulate the elaborate airport lighting system; meanwhile, at the beginning of the runway, is a caravan containing the airfield controller. He is a "last-minute traffic cop," whose job it is to check that two aircraft do not use the runway at the same time and to warn the pilots by red lights if they show signs of doing so.

Last, but not least, near the runway is another caravan for the Ground Controlled Approach Radar apparatus and the controllers who operate this "Talk you down" system.

Which System?

Approach Control answer Speedbird George Oboe Charlie, tell him the height of the low clouds, the visibility, wind direction, and the setting for the aircraft's altimeter so that it will record the height above the airfield.

Weather conditions are poor. The B.O.A.C. captain has to decide whether he will divert to another airfield or land at London. If he decides to land he must make up his mind about which method he will ask "London Tower" to operate for him in order to bring George Oboe Charlie safely down through the misty blanket between him and the runway.

The G.C.A. Controller talks an aircraft down safely through the mist.

Available to him if he wishes to land at London are the Radio Range, S.C.S.51, BABS or G.C.A.

The first two are systems that enable the captain to tell, by sounds in his earphones or visual indications on his instrument panel, whether he is correctly following a radio beam. BABS stands for Beam Approach Beacon System, and enables aircrew to find their own way in by following indications on a radar screen.

In the G.C.A. "Talk you down" system, the ground controllers watch the radar screens and pass landing directions to the pilot by radio-telephone.

If the pilot in Speedbird George Oboe Charlie chooses G.C.A., he will say "Hullo! 'London Tower.' Request G.C.A."

In the meantime, under instructions from Control, he has been reducing height to 3,000ft. The passengers find themselves in a world of opaque whiteness; the steward and stewardess go quietly about their duties under the cabin lights; and then the sign "Fasten seat belts" appears on the indicator in the cabin.

Lights are on in the G.C.A. caravan, too, but only enough to shed a glow in the darkness through which the controllers and the men and women assistants peer at the translucent screens of their radar instruments along one of the walls.

The radar screens supply three distinct types of information: a general plan view of the surrounds of London Airport up to a maximum of 30 miles and, on the precision screens, having a maximum range of 10 miles; the plan and elevation information concerning the later stages of the aircraft's approach, down to the immediate approach to the runway.

The London director notes the Speedbird as a "blip," a small moving light mark, on the screen.

A Double Check

He tells the pilot of George Oboe Charlie to alter his course by a given number of degrees, double checking that the "blip" moves in this same manner on the screen: thus he confirms that the "blip" does beyond doubt represent George Oboe Charlie.

George Oboe Charlie's captain follows the directions from the ground as he nears the airport, while the operators check the aircraft's movements on the distant and medium screens. Then, when the 'plane is some 10 miles from the airport, its path is plotted on screens of a greater scale, one showing its progress relative to a plan of the runway, and another, operated perhaps by an ex-W.A.A.F., indicating whether the aircraft is approaching at the correct angle of glide. She uses a scale which tells the "talk-down" man whether the aircraft is too high or too low.

The captain, his hands on his controls and his eyes on his instruments, hears the voice of "talk-down" in his earphones. "You are five miles from the touchdown. Turn right three degrees. . . . Turn right one degree. . . . Hold that heading. . . . You are 50ft. too high . . . two miles to go . . . lose 30ft. . . . You are O.K. . . . Left one degree. . . . Hold the heading. . . .

In the G.C.A. caravan the "blip" approaches the runway. The voice continues: "Half a mile from touchdown. You are correctly lined up. Look ahead."

The captain looks up from his instruments. Ahead is the broad line of the runway. Through the aircraft cabin windows passengers suddenly see grass, distant buildings and roads. There is a musical squeak as tyres touch the runway. Control-room clerks enter the time on a board.

Underneath the Dipole

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

TELEVISION seems to have "caught on" in no uncertain manner in the U.S.A. There are about 40 television stations already sending out regular programmes, quite apart from occasional transmissions from experimental stations. During the next 12 months, another 80 American stations will come into operation, with long-distance land-line relay or radio links organised on a most ambitious scale. Consternation reigns in the American show business, particularly in Hollywood, where everyone agrees that television is going to change the face of the motion-picture industry, though opinions widely differ on the manner of the change.

American box-offices provide the first definite answer, however. The first effect seems to be a 20 per cent. fall in the box office receipts of the cinemas, with theatres and other entertainments affected to a lesser extent. In some areas which are particularly well served with television stations, the average receipts compared with similar periods in previous years has decreased as much as 30 per cent. This is a serious matter for the film people, and may be more serious when the standard of American television entertainment reaches the quality of our British programmes. On the other hand, the volatile Americans, with much more money to spend, are much more susceptible to crazes and to the persuasive publicity of high-pressure salesmanship.

250 Years of Progress

It is not surprising that the British cinema exhibitors have expressed alarm at the prospects, though they may derive some comfort from the fact that, at the present rate of progress, it would take 250 years for the state-owned B.B.C. to erect the same number of stations the free-enterprise Americans have put up within one year! Mr. E. J. Hinge, a prominent North of England cinema owner recently said: "You cannot stop it. You cannot even retard its development. The Cinematograph Exhibitors' Association will campaign for reasonable control. Otherwise every workmen's club, village hall, big store and 'pub' may become a competitor." Another exhibitor said: "This is going to be serious. Watch your pockets!" In view of the high taxation imposed in one way or another upon the entertainment industry, it is entitled to some consideration. It is small wonder that some of the exhibitors are averse to showing some of the highly partisan films produced by the Central Office of Information, many of whose documentary film technicians are known to have an admiration for the Kremlin. The Fifth Column has infiltrated into a number of industries which have a special significance in their effect upon the population as a whole, and films and broadcasting are not the least important. (That grand institution, the English Music Hall, remains immune from the blandishments of the Quislings disguised as arty-crafty intellectuals.) My own opinion is that the entertainment industry in this country will not suffer from the competition of television to anything like the extent it has in America, and that it is in a strong position to negotiate for fair protection. Television could be harnessed to assist the show business, to publicise stage and screen stars and to arouse interest in forthcoming productions. It could be used to neutralise the arrogant opinions and venomous wisecracks of some of the newspaper, dramatic, and film critics. Television viewers would like to see, for instance, specially prepared trailers of forthcoming releases, providing the traditional extravagant adjectives were omitted!

Cinema Television

Meanwhile, the two largest cinema circuits, ABC and Odeon, are actively developing big screen television with a view to its installation, in the first place, in a few selected theatres in the London area. I have myself seen the excellent results on the experimental set-up at Odeon's Palais de Luxe, Bromley, and this convinced me that far from killing the film business, television may prove its salvation. Capt. A. G. D. West, technical director of Cinema Television, Ltd., a Rank group company, demonstrated a crisp and clear picture, 16ft. wide and 12ft. high, having a screen illumination of 8ft. lamberts reflected by a silver screen, which compares with an average of 10ft. lamberts reflected by the normal white cinema screen, perforated for sound purposes. With the television screen, the loud speakers were below the screen instead of in the more normal position behind it.

The ABC circuit has not yet announced the name of the system likely to be installed in its theatres, but its executives have been looking at all British, American and French systems. They are known to hold highly favourable opinions of the French system which scans 819 interlaced lines, and which naturally gives a higher definition than is possible with the British 405 lines or the American 525 lines. It would seem obvious that the highest possible definition should be the aim for big screen television, but owing to the limitations of band-width available for radio transmission, the use of 800-1,000 lines resolution systems will probably be restricted to transmission by co-axial land lines. I am sure that this will be the ultimate answer, though it is quite possible that equally good results could be obtained with a lesser number of lines and sequential scanning. This, again, would occupy a colossal band-width. In the meantime, 405 lines, interlaced, gives reasonably good results and its initial adoption by the cinema people would permit them to make direct relays of news items and sporting events transmitted from the Alexandra Palace. In any case, it is doubtful if the Post-master General would grant licences to cinema interests for the operation of television transmitters of their own. But if he did, the transmitting wave-lengths would not be kept secret for long and there

would result a terrific boom in "ham-made" sets.

I never cease to marvel at the high level of the B.B.C. television programmes, and having received information about the equipment and accommodation now being made available at the leading American television studios I marvel still more. A visit to the Alexandra Palace gives one the impression of the intense enthusiasm of the staff triumphing over congestion, chaos and technical obsolescence. Improvisation is the rule rather than the exception, and some of the lighting equipment is quite archaic. Parabolic mirror lamps with spill-rings, out of date in film studios some 15 years ago, are used alongside a few individual lamps of the latest design. And some of the transmitting gear, still doing fine work, reminds one of the magnificent Heath-Robinson hook-up at Marconi House, in the earliest days of 2LO. Increased studio accommodation is now long overdue. There are plenty of additional large rooms at the Alexandra Palace, not to mention several glass-roofed halls. The latter might be very useful for afternoon transmissions, when daylight could be used, mixed with the light from a few strategically placed lamps.

News from the Clubs

DERBY AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec. : F. C. Ward, 5, Uplands Avenue, Littleover, Derby.

THE society now have their own transmitter, constructed by Mr. G. White (G2OU), out of components donated by members. The necessary transmitting licence has been granted, the call sign being G3ERD.

Recent meetings included demonstrations of negative feedback by Messrs. W. A. Mead (G5YY) and F. C. Ward (G2CVV). Members were very interested in a complete set of home-constructed test equipment of unique design, described and demonstrated by Mr. J. Goodwin.

BARNSLEY AND DISTRICT AMATEUR RADIO CLUB

Hon. Sec. : R. Hickling, 179, Barnsley Road, Wombwell, Yorks.

THE club has now a membership of 30 and a varied syllabus has been drawn up which is hoped will suit the tastes of all members. Future lectures include those on Propagation in General, by G8WF (D. Westwood); Band-switched Exciter Unit, by G5KM (H. Eyre); 420 Mc/s. by G4JJ (J. A. Ward).

Meetings are held twice monthly at the King George Hotel, Peel Street, Barnsley, and the secretary will be pleased to furnish full details to any new prospective members on application.

WEST MIDDLESEX AMATEUR RADIO CLUB

Hon. Sec. : C.Alabaster, 34, Lothian Avenue, Hayes, Middlesex.

THE club continues to attract enthusiasts of varied radio and electronic interests. Recent meetings were given over to lectures by two club members—one on negative feedback and the other on the stroboflash. An interesting programme has been laid down for the next four months and should cater for all tastes. Meetings: Second and fourth Wednesdays of every month at the Labour Hall, Southall, Middlesex, at 7.30 p.m.

MIDLAND AMATEUR RADIO SOCIETY

Hon. Sec. : A. W. Rhodes, 135, Woolmore Road, Birmingham, 23.

THE October meeting was well attended. The lecturer, C. Naylor Strong, F.C.R.S., gave a lecture entitled "A New High Stability Oscillator," with practical models and demonstrations. His inimitable style ensured a most successful evening.

The R.S.G.B. Band Planning scheme was presented by the well-known DX enthusiast, D. A. G. Edwards, G3DO, Regional Representative R.S.G.B. Members voted upon various proposals.

A new and important feature is the forthcoming weekly classes for all members, old and new, desirous of acquiring a sufficient knowledge of radio to enable them to take the G.P.O. exam. for transmitting licences in May, 1949.

M.A.R.S. meetings are held every third Tuesday in the month at the Imperial Hotel, Birmingham.

For further information applications are cordially invited by the hon. secretary.

BRIGHTON AND DISTRICT RADIO CLUB

Hon. Secretary : Mr. F. Harrop, G3DVL, 12, Park Street, Kemp Town, Brighton, 7, Sussex.

THIS club has recently been formed as a successor to the old Brighton and Hove Group: meetings are held every Thursday evening from 7.30 p.m. at the St. Mary Magdalene Hall, Bread Street, Brighton. The club has its own transmitter and application has been made for a Club licence; morse classes are held every club night and constructional work is being organised. Membership is open to all with an interest in radio and electronics—further information from the hon. secretary.

THE GRAVESEND AMATEUR RADIO SOCIETY

Hon. Secretary : R. E. Appleton, 23, Laurel Avenue, Gravesend, Kent.

THE society was formed on October 20th, 1948, its object being to advance the status of amateur radio and to assist those interested in all non-professional radio and television activities. Meetings are held every Wednesday at the club-room, 30, Darnley Road, Gravesend, at 7.30 p.m.

Lectures are given by members and have included "Crystal Oscillators" by G6BQ; "Elementary Principles," by G8LZ; "BC221 Wavemeter," by G3EJK.

Beginners' classes are being arranged for subjects as required by members, and it is hoped to get a morse class under way shortly.

Anyone interested in the society and wishing to become a member will be welcomed any meeting night.

WALWORTH (MEN'S INSTITUTE) RADIO CLUB

Hon. Sec. : B. E. Symons, 100, East Dulwich Grove, S.E.22.

THE above club has now resumed its activities following the summer recess, the first club night being devoted to planning the coming session.

An ambitious programme has been laid down and with Mr. Winsford (G4DC) as instructor the club is looking forward to a very successful time.

New members are still welcomed and full particulars can be obtained from the club secretary.

HARROGATE RADIO SOCIETY

Hon. Sec. : A. Wilson, 16, St. George's Road, Harrogate, Yorks.

THE society which has been in formation since January, 1947, was known as the Harrogate and District 8-wave Radio Society, but the words "8-wave" have now been deleted in order to extend the scope and membership of the society.

The membership is well over 30 active members and provision is being made for all branches of radio as the occasion arises.

STOURBRIDGE AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Secretary : W. A. Higgins, (G8GF) 35, John Street, Brierley Hill, Staffs.

A MEETING of the above society was held on Tuesday, November 2nd, at King Edward's School, Stourbridge. Mr. Mclean (G2CLS) was in the chair, and a good attendance was recorded. The secretary reported on a very enjoyable visit to the G.P.O. station at Rugby and outlined future plans for visits to B.B.C. studios and Daventry Station.

A talk on "Home Recording" was then given by Mr. Dennis Roe, of B.S.R., Ltd., followed by a talk on "Disc Recording," by Mr. Muchlow (also of B.S.R.). The talks were illustrated by actual recordings and several members obtained records of their voices. The talks were most instructive and of tremendous interest to members. Both speakers were accorded a hearty acclamation.

Membership of the society is open to all persons over 15 years of age who are genuinely interested in radio and allied subjects. Details from the secretary.

READING AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec. : Mr. L. Watts, G6WO, 817, Oxford Road, Reading.

AT the meeting of the Reading Radio Society, on Saturday, November 13th, Mr. Pinchbeck, G5DF, gave a talk on balanced modulators. The methods of using balanced modulators, in speech inverters for secrecy in radio telephone circuits, and in the production of single sideband suppressed carrier transmission, were described.

On Saturday, November 27th, as the advertised talk on the quad beam was not available, the meeting was turned over to the discussion of members' technical problems.

The following is part of the programme for the New Year:—

January 8th.—Convertors, by Mr. F. Ruddle.

February 12th.—Oscilloscopes.

March 12th.—Pulse modulation.

LOTHIANS RADIO SOCIETY.

Hon. Sec. : I. Mackenzie, 41, Easter Drylaw Drive, Edinburgh, 4.

THE general monthly meeting will be held in the Chamber of Commerce Rooms, 25, Charolette Square, Edinburgh, on Thursday, January 27th, 1949, at 7.30 p.m. The society extends a welcome to new members, and further information may be obtained from the secretary. The society is planning an extensive programme for the coming season.

Impressions on the Wax

Review of the Latest Gramophone Records

THE final scenes of Wagner's "Die Gotterdammerung"—Brunnhilde's Immolation—have been recorded this month by Kirsten Flagstad, who sings in German, accompanied by the Philharmonia Orchestra conducted by Wilhelm Furtwangler on *H.M.V. DB*6792-4. Dr. Wilhelm Furtwangler was so delighted with this recording that he sent a note to the H.M.V. Company in which he said: "I had not even hoped that the superhuman splendour of Flagstad's voice, and the full sonority of the Wagnerian orchestra sound, could be so finely balanced and so faithfully reproduced."

Another interesting set of records this month is that of Tchaikovsky's "Symphony No. 4 in F Minor, Op. 36," recorded by Issay Dobrowen conducting the Philharmonia Orchestra on *H.M.V.* 3809-13. The symphony opens with a commanding fanfare in the brass, which Tchaikovsky called a theme of fate, overshadowing the whole composition with its menace. It is not too much to say that a comparison of this fanfare with Beethoven's terse opening theme in the Fifth Symphony reveals the great difference between the two men: Beethoven abrupt and violent, Tchaikovsky with one eye on the theatre and very much more prolix.

Miss Marjorie Thomas, contralto, makes her first solo performance for H.M.V. with a recording of "O Rest in the Lord" and "Verdant Meadows" on *H.M.V. C*3817. She is accompanied by the London Symphony Orchestra conducted by Stanford Robinson and the quality of her execution entitles her to rank among the leading contralto singers of Britain.

A version of the Midsummer Night's Dream Overture by Sir Thomas Beecham, Bart., conducting the Royal Philharmonic Orchestra has been recorded on *H.M.V. DB*6820-1. This work, which translates the spirit of Shakespeare's comedy into terms of music with astonishing faithfulness, is set out in orchestration so masterly that the highest talent in a conductor is needed for it. In this new recording Sir Thomas shows us what can really be done with Mendelssohn's score.

Ravel's Ballet Opera

Ravel's beautiful ballet-opera "L'Enfant a les Sortilèges," set to the words of Mme. Colette, has been recorded in the Théâtre des Champs-Élysées with the co-operation of Radiodiffusion Française, with very fine French soloists in the leading parts and the Radiodiffusion Choir and Orchestra, on *Columbia LX*1124-29. The argument of the play is, briefly, the revenge taken by the furniture and animals in the garden upon a naughty little boy who has tormented them. The chairs, the clock, the little people on the wallpaper come to life; the animals speak. These records gained the Grand Prix for the finest achievement in French recorded music for 1948.

The Philadelphia Orchestra conducted by Eugene Ormandy have made a delightful set of records of Zoltan Kodaly's "Hary Janos—Suite" on *Columbia LX*1130-2. Hary Janos, the hero of the comic opera from the music of which this suite is drawn, is a fantastic character. The opera is treated by Kodaly in the manner of a fairy tale, and magic mystery, folk-lore, naïve simplicity and fantastic humour are all to be found in the music.

Szymanowski's "The Fountain of Arethusa" coupled with Falla's "Danza Española" has been chosen by Tibor Varga, the well-known violinist, for his latest recording on *Columbia DX*1533. Szymanowski is considered by many of his countrymen the greatest composer Poland has produced since Chopin. "Danza Española" from the opera "La Vida Breve" is well known as an arrangement for solo violin, which medium it suits admirably.

Another Szymanowski composition, "Violin Concerto No. 1, Op. 35," is played by the Polish violinist Eugenia Uminska on *Parlophone R*20563-5. Uminska has all the violin works of this outstanding composer in her repertoire and is their most competent interpreter in Poland.

Variety

To commemorate the battle of El Alamein a celebration took place last October at the Albert Hall. To mark the occasion the original recording of "Lili Marlene," sung by Lale Andersen has now been issued on *H.M.V. EG*6993. Countless Servicemen will remember this record, and the voice of Lale Andersen, whose broadcasts launched the song on its triumphal career.

Two records for children, "Uncle Mac's Party Games" on *H.M.V. BD*1225-6, have now been issued together with a leaflet in which Uncle Mac explains how the games are played. These records solve the grim question which generally crops up at children's parties—"What shall we do now?"

Running briefly through an imposing list of variety stars we have Danny Kaye in his "Walter Mitty" film hit "Anatole of Paris" on *Columbia DB*2469; the Radio Revellers singing "Somebody Stole My Rose Coloured Glasses" and "Summer Sweetheart" on *Columbia FB*3440; "I'll be Seeing You" and "Anniversary Song," sung by Dinah Shore on *Columbia DB*2475; Frank Sinatra singing "A Fella with an Umbrella" and "It only Happens when I Dance with You" on *Columbia DB*2471; and finally "None but the Lonely Heart" and "I Love You," sung by Bill Johnson on *Columbia DB*2476.

Dance Music

Geraldo couplings include "Buttons and Bows" and "Dickey-Bird Song" on *Parlophone F*2326 and "In My Dreams" and "My Happiness" on *Parlophone F*2327—four first-rate tunes by Britain's tip-top "sweet" band. Other bands include Oscar Rabin and his Band with "Opus in Pastels" and "Painted Rhythm" on *Parlophone F*2325, and "Jolly Old Man in the Bright Red Suit" and "Worry, Worry, Worry" played by Joe Loss and his Orchestra on *H.M.V. BD*6208.

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).

C.-R. Tube Voltages

SIR,—With reference to the correspondence in your November issue regarding my remarks on the E.H.T. supply for the VCR97 type cathode-ray tubes—I quite agree with Mr. Etherden that the voltage on load will differ somewhat from that registered by an electrostatic voltmeter under open circuit conditions.

Yet with a power supply of good voltage regulation and with the very moderate load presented by a C.R.T. and accessories this drop will not be serious, and the expression "near enough 1000 volts" will still cover the case. (By the way, using two further decimals of $\sqrt{2}$, three extra volts can be squeezed out of the formula Peak $= \sqrt{2}$ R.M.S.)

I am not arguing about the correct operating voltages of the tube, they are clearly enough stated by the manufacturers; I am just relating my own experiences, and I can say I have had no trouble since I have raised my E.H.T. supply to 2,000 volts (less drops in the circuit, of course!). I could not get satisfactory results, however, with either of two VCR97 tubes when my supply voltage was of the order of 1,000. The tube was "viewed" in daylight. It may well be that there are some slight variations in the fluorescent properties of the powder used with various specimens to explain the discrepancy of results. But, to my mind, the gulf between the various opinions expressed is not really a wide one and a cease fire between the 800 volts, 1,200 volts and 2,700 volts electron guns may now be agreed upon. I can assure Mr. Rowell that I certainly did not try to discourage people from using a VCR97 or else how would I dare to shop in Lisle Street again, but I tried to encourage them to use what I think is the best power pack for the job—a 2,000 volts supply. (I note that "Old Church Laboratories" advertise a 2,000-volts transformer, in your November issue, to go with VCR97.)

Has any reader noticed that the filament transformer in the viewing unit (No. 6 series) is not doing its job? It not only overheats rapidly, but also only supplies 2.5 volts or so to the C.R.T. heaters. This I found both with a 6A and a 6E unit, and concluded that these transformers are not meant to be operated on a 50-cycle supply, but perhaps from a source of much higher frequency. As the power station would not change its frequency to, say, 2,000 c/s, in order to imitate semi-aeroplane conditions in my workshop, as an alternative I had to change the transformers.—PAUL TELCO, JNR. (Hampstead, N.W.3).

VCR97 E.H.T.

SIR,—With reference to Mr. Winckle's letter in the December issue, re the E.H.T. for the VCR97. This tube is the equivalent of the Mullard ECR60, whose operating conditions are 2,000 volts E.H.T. negative grid volts to fully modulate 0-100. This is far too much to expect from the average home-constructed television receiver; a commercial television tube only requires in the region of 0-40. But by reducing the E.H.T. to 800 the grid peak to peak volts is reduced proportionately. The voltage on A2 should be about 130 for correct focusing under these conditions. I have a VCR97 operating successfully with 900 volts E.H.T., giving adequate brilliance and good contrast. With only 700 volts E.H.T. the picture is still clearly visible in a darkened room.

If 2,000 volts are used, I imagine you would get much greater brilliance but very poor contrast with a normal receiver. Neither of the correspondents advocating this voltage have stated that they are receiving television pictures satisfactorily.—J. HALL (Harrow).

Radio Club for Egypt

SIR,—I am trying to form a radio society in the Canal Zone in Egypt. I was wondering if any readers in the Canal Zone might be interested in the formation of such a society.

Would readers who are interested contact me. All letters will be answered.—2353882 A.C. Fowle, G., c/o Post Office, R.A.F. Kabrit, Egypt, M.E.F.

Television in U.S.A.

SIR,—I am a reader of PRACTICAL WIRELESS and enjoy most of your articles. Reading "Underneath the Dipole," in December issue, I would like to voice my opinion in regard to television in this country.

I cannot honestly make a comparison between the two, having never seen any productions of British television, but I will attempt to put some of the American programmes down.

I own a 52 square inch RCA30 tube table model set. This is my second set, having built a 7in. one after I came out of the Navy. This set has provision for 13 channels, although this has been reduced to 12.

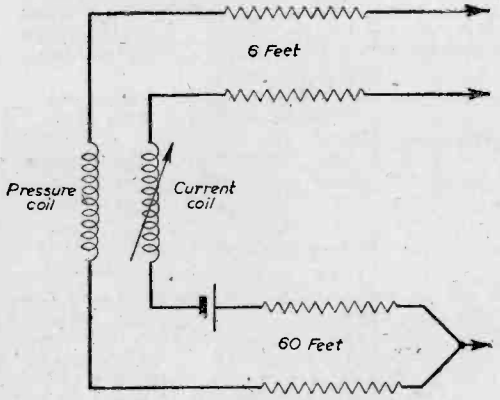
I live about 40 miles from New York City and every day of the week, seven days a week, I have the following channels to choose from: Channel 2, 4, 5, 7, 11, and under good conditions, 13. The latter is weak and reception is never too good. The rest come in fine.

All types of sports, news and entertainment of the best quality is available to those who own television sets in this area. As far as the plays go, I don't enjoy them too much, but they are improving.

Channel 9 will be in operation around April of next year. So you can see, we have quite a bit to choose from. Although it is very possible that some of our plays do not come up to your television standards we do not have government supervision of television. This alone would stop the quality of our television programmes. Naturally, we have a commission, but as far as the type of programmes goes, that is left to the stations and their sponsors.—H. C. OEFINGER, JNR. (Stamford, Conn., U.S.A.).

Bond Tester

SIR,—I should like to give the following technical data regarding the record bond tester. I have had so many inquiries since my letter in these pages a few months ago that I have been unable to answer them all and I think that this information will be of interest to many. This is all the particulars I have of this instrument. I do not know of any other use for it than that for which it was designed, i.e., for testing the continuity of aircraft frames during the war.



Circuit of the Record Bond Tester

The bonding tester is fitted with an ohmmeter 0–.1Ω, with a N.A. accumulator and two twin-core leads, one of 6ft. and one of 60ft. The short leads terminate in a two-prong test prod which acts as a switch. The long leads have a single prod. The tester uses a current coil of low resistance—about .1Ω—and a pressure coil of higher resistance—about 1.5Ω. The pressure coil supplies the operating force and the current coil supplies the controlling force. The resultant force is proportional to the resistance of the bonding under test.—W. M. MARSHALL (Clitheroe).

No. 18 Receiver

SIR,—Reference to the letter published in the November issue of PRACTICAL WIRELESS from L. H. Stevens. I disagree entirely with his remarks on the Ex-W.D. No. 18 Mark 3 receiver. I have had quite a bit of experience with this set and I have, on several occasions, had the receiver working separated from the transmitter. I connected leads for the power supply and aerial to the existing plug on the front of the receiver.

If, however, the transmitter and receiver are coupled together, as for normal use, the receiver will not work unless the microphone is inserted in the appropriate socket, as the power supply off/on switch is incorporated in the microphone circuit. Incidentally, the power supply is as follows: H.T. 162 volts, L.T. 3 volts, G.B. 12 volts. The receiver will, of course, work with 120 volts H.T. If anyone else would like further information on this set, I will be pleased to oblige.—P/JX403962 R. McKay, Tel., Mess 12, H.M.S. Bigbury Bay, c/o G.P.O., London.

Home-recording Equipment

SIR,—I was most interested to read Mr. Aldous' article on the long-playing records, and hope they will soon be obtainable here! I was in the middle of writing to you to ask you to tell us about them, when my wife brought in the January PRACTICAL WIRELESS. I wish we could be given a clue as to where we can get gramophone motors to run at either 78 r.p.m. or 33⅓ r.p.m., also recording heads. I had hoped the excellent "Recording Technique" would have helped us on that. Perhaps some manufacturer could let us know where they are available.—H. L. W. SIXSMITH (Guildford).

Ex-Service Equipment

SIR,—As a reader of the paper since its inception I have gained much knowledge and pleasure from the constructional articles which are published. During recent months I have used a large quantity of ex-service apparatus and have come across a number of snags. For instance, EF 50's have been my main source of trouble in experimental gear due to poor contact between the small pins and the valveholder (a fact which apparently has been experienced by the services, as locking rings are frequently used on some receivers using these valves). It would be interesting if readers could give their experiences of what I might call *recurrent faults*, that is, some troubles which the experimenter can be sure of experiencing with certain items of equipment, so as to help others who carry out experiments with this type of apparatus.—M. FRANCIES (N.W.5).

Three-valve Receiver—Generator

(*continued from p. 55*)

socket and tune the oscillator to the intermediate frequency. If the intermediate frequency is not known, place the prod on the grid or diode end of the last I.F. transformer and tune the generator until its note is heard.

The prod can then be moved backwards from point to point through the I.F. circuits, reducing volume if necessary by the left-hand control. This will immediately show whether any of the I.F. transformers or valves are out of order.

R.F. Circuits

To test these, tune generator and receiver to the same wavelength. The steady signal obtained is particularly useful for trimming, and the receiver tuning dial can also be adjusted so that it indicates wavelengths accurately, as shown by the generator.

With superhets, the trimmers should be adjusted at the low wavelength end of each band and the padders at the high wavelength end, repeating a few times, as trimmer settings slightly influence padder settings, and vice versa.

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Three-valve: Blueprints, 2s. each.		
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Summit Three (HF Pen, D, Pen)	—	PW37*
Hall-Mark Cadet (D, LF, Pen (RC))	—	PW48*
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-Wave Three)	—	PW49*
Cameo Midget Three (D, 2 LF (Trans))	—	PW51*
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	—	PW53*
Battery All-Wave Three (D, 2 LF (RC))	—	PW55*
The Monitor (HF Pen. D, Pen)	—	PW61*
The "Colt" All-Wave Three (D, 2 LF (RC & Trans))	—	PW72*
The "Rapide" Straight 3 (D, 3 LF (RC & Trans))	—	PW82*
F. J. Camm's Oracle All-Wave Three (HF, Det, Pen.	—	PW78
1938 "Triband" All-Wave Three (HF Pen, D, Pen)	—	PW84*
F. J. Camm's "Sprite" Three (HF, Pen, D, Tet)	—	PW87*
The "Hurricane" All-Wave Three (SGD, Pen, Pen)	—	PW89*
F. J. Camm's "Push-Button" Three (HF Pen, D (Pen), Tet)	—	PW92*
Four-valve: Blueprints, 2s. each		
Beta Universal Four (SG, D, LF Cl. B)	—	PW17*
Nucleon Class B Four (SG, D (SG), LF, Cl. B)	—	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C*
Battery Hall-Mark 4 (HF, Pen, D, Push-Pull)	—	PW46*
"Acme" All-Wave 4 (HF Pen, D (Pen), LF, Cl. B)	—	PW83*
The "Admiral" Four (HF Pen. HF Pen, D, Pen (RC))	—	PW90*
Mains Operated		
Two-valve: Blueprints, 2s. each.		
Selectone A.C. Radiogram Two (D, Pow)	—	PW19*
Three-valve: Blueprints, 2s. each.		
Double-Diode-Triode Three (HF Pen. DDT, Pen)	—	PW32*
D.C. Ace (SG, D, Pen)	—	PW25*
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow)	—	PW35C*
D.C. Premier (HF Pen, D, Pen)	—	PW35B*
Ubique (HF Pen, D (Pen), Pen)	—	PW36A*
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	—	PW50
"All-Wave" A.C. Three (D, 2 LF (RC))	—	PW54*
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	PW56*
Mains Record All-Wave 3 (HF Pen, D, Pen)	—	PW70*
Four-valve: Blueprints, 2s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20*
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	—	PW45*
Universal Hall-Mark (HF Pen, D, Push-Pull)	—	PW47
SUPERHETS		
Battery Sets: Blueprints, 2s. each.		
£5 Superhet (Three-valve)	—	PW40
F. J. Camm's 2-valve Superhet	—	PW52*
Mains Sets: Blueprints, 2s. each.		
A.C. £5 Superhet (Three-valve)	—	PW43
D.C. £5 Superhet (Three-valve)	—	PW42*
F. J. Camm's A.C. Superhet 4	—	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60
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Simple S.W. One-valver	—	PW88*
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Midget Short-wave Two (D, Pen)	—	PW38A*
The "Fleet" Short-wave Two (D (HF Pen), Pen)	—	PW91*
Three-valve: Blueprints. 2s. each.		
Experimenter's Short-wave Three (SG, D, Pow)	—	PW30A*
The Prefect 3 (D, 2 LF (RC and Trans))	—	PW63*
The Band-spread S.W. Three (HF Pen, D (Pen), Pen)	—	PW68*
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F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen)	—	PW65
Parvo Flyweight Midget Portable (SG, D, Pen)	—	PW77
Four-valve: Blueprint, 2s.		
"Imp" Portable 4 (D, LF, LF, Pen)	—	PW86*
MISCELLANEOUS		
Blueprint, 2s.		
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"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
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THESE blueprints are drawn full size. The issues containing descriptions of these sets are now out of print, but an asterisk beside the blueprint number denotes that constructional details are available, free with the blueprint.

The index letters which precede the Blueprint Number indicate the periodical in which the description appears: Thus P.W. refers to PRACTICAL WIRELESS, A.W. to *Amateur Wireless*, W.M. to *Wireless Magazine*.

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PRACTICAL WIRELESS. FEB. 1949

Published on the 7th of each month by GEORGE NEWNES, LIMITED, Tower House, Southampton Street, Strand, London, W.C.2, and printed in England by W. SPEAIGHT & SONS, LTD., Exmoor Street, London, W.10. Sole Agents for Australia and New Zealand: GORDON & GOTCH (A/sia), LTD. South Africa: CENTRAL NEWS AGENCY, LTD. Subscription rates including postage: Inland 10s. 6d. per annum; Abroad 10s. per annum. Registered at the General Post Office for the Canadian Magazine Post.