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PRACTICAL WIRELESS

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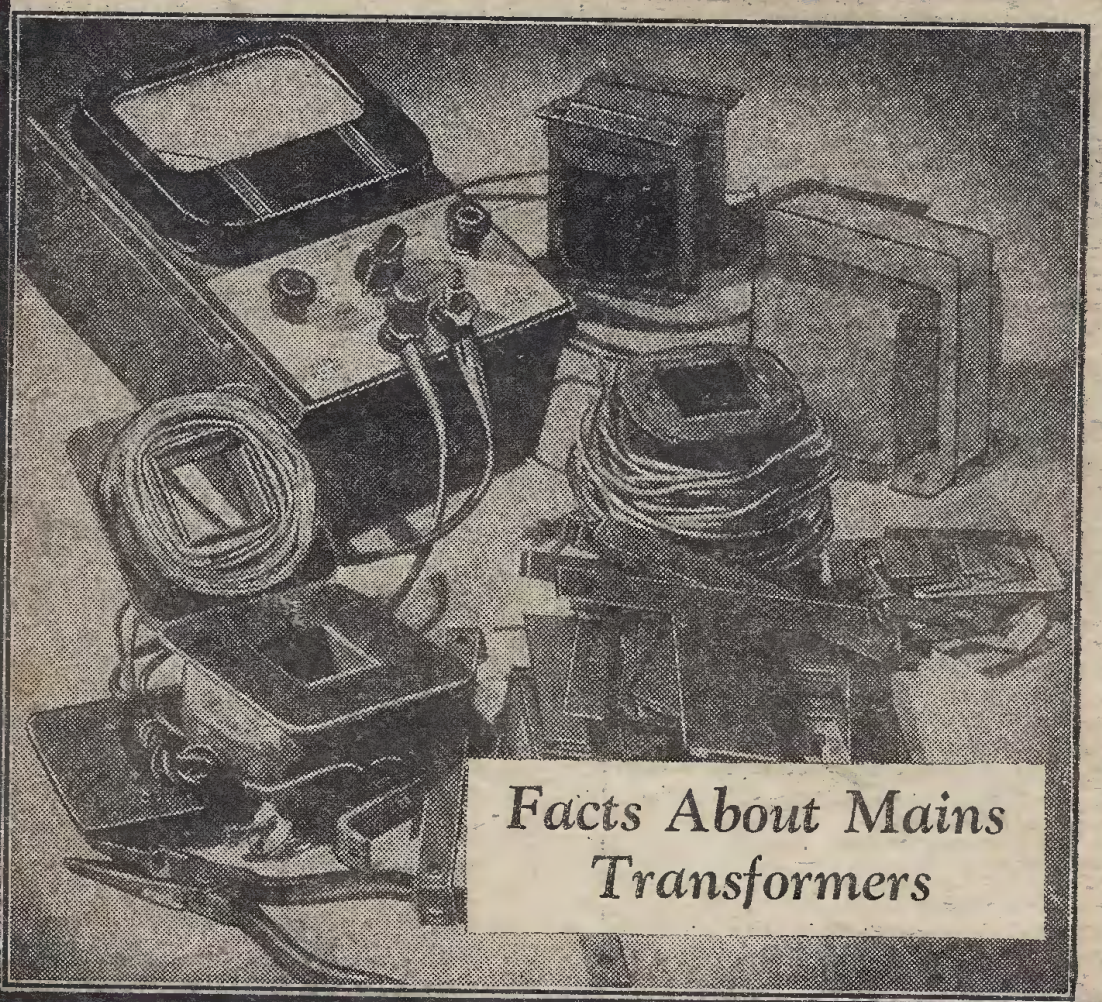
EDITOR:
F. J. CAMM



Facts About Mains Transformers

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19th YEAR OF ISSUE

EVERY MONTH.
VOL. XXVII. No. 537. JULY, 1951

Editor E. J. CAMM

COMMENTS OF THE MONTH BY THE EDITOR

The TV Accident

IN the early days of radio one or two accidents were caused due to electric shocks. One person was killed because there was a flash of lightning at the particular second that he went to connect his aerial lead. Another suffered a fatal shock by touching the earth terminal.

In the early days of television an engineer was electrocuted at Alexandra Palace when he happened accidentally to touch the positive and negative terminals of a 2 Kv. supply. Milder accidents have been caused by inexperienced people placing their hands inside a wireless set for the purpose of making some adjustment whilst the set is switched on. In all of these cases the newspapers endeavoured to make the public's blood curdle by representing a wireless set as a lethal machine, the operation of which imposes great risks.

The number of accidents during the past 30 years could be counted on the fingers of one hand, and the very rarity of these occurrences is an indication of the minuteness of the risk.

In a recent case, a small child had its feet on a metal curb in front of an electric fire which was plugged into the same point as the set. By a million-to-one chance he happened to touch the curb and the metal grille of the set at the same time, and was killed. This was, undoubtedly, a freakish circumstance which might not happen again in a lifetime, and it is one against which no manufacturer could safeguard.

The circuit used in this particular receiver is one which is common to a number of manufacturers, and, doubtless, now that the accident has happened steps will be taken to see that it does not occur again. The public should not presume from some of the lurid statements made in the newspapers that television sets are dangerous. The design of the receiver in question is in accord with standard radio and TV practice, and at least 300 sets at present in use employ the same circuit. Undoubtedly some defect had occurred since the receiver was sold because the accident could not have happened on a factory-tested receiver.

All manufacturers submit their sets to a soak test, under load, and are then rechecked to see whether any of the vital components, such as resistances, condensers and transformers, have broken down or altered in value.

In the case in question it was disclosed that the baffle holding the speaker was in contact with the metal chassis, and this could not have been so when the receiver passed its final factory test. The contact was caused by a protruding metal screw in the speaker, which was touching the metal grille, which had probably been dented by a blow.

All forms of electrical apparatus have at times caused accidents, sometimes fatal, and it would be wrong to assume that television receivers are more dangerous than, say, an electric hair-drier. However, we learn that manufacturers are making the necessary adjustments to design to prevent a recurrence of this infinitesimally remote risk.

V.H.F.

V.H.F. was demonstrated to the Parliamentary and Scientific Committee, and following this the Postmaster-General was asked in Parliament when plans are to be announced for nation-wide V.H.F. broadcasting coverage. He replied that the B.B.C.'s proposals for a V.H.F. system using F.M. were being examined. The proposals are far-reaching and it was, therefore, too early for him to make a statement.

The impression we have gained from our own enquiries is that the rearmament programme, and the general worsening of the international situation, will cause these plans to be postponed for a considerable time.

Up and Up

Nearly 12½ million broadcast receiving licences, including nearly 764,000 for television, were current in Great Britain and Northern Ireland at the end of March, 1951. Absorption point has by no means yet been reached, but we must expect to see the television licences go up and the ordinary broadcast receiving licences slow up within the next five years.

The number of television licences has more than doubled within the past year.—F. J. C.

ROUND the WORLD of WIRELESS

Broadcast Receiving Licences

THE following statement shows the approximate numbers of licences issued during the year ended March 31st, 1951.

Region	*Number*
London Postal	2,364,000
Home Counties	1,650,000
Midland	1,754,000
North Eastern	1,906,000
North Western	1,609,000
South Western	1,065,000
Welsh & Border Counties ..	729,000
Total England & Wales	11,077,000
Scotland	1,120,000
Northern Ireland	207,000
Grand Total	12,404,000

The above total includes 763,767 television licences.

Complaints are sometimes made that it is inconvenient to put down the whole licence fee (£1 for sound; £2 in the case of television and sound) when a licence has to be renewed. The Stamps Saving Scheme allows money to be accumulated in small amounts for encashment later; one sixpenny stamp a week would more than provide for the renewal of a sound licence. Savings stamps may be purchased at any post office; books to take the stamps may be had free of charge.

The Morale Raiser

A RADIO device which is causing a lot of comment and amusement in the Lion and Unicorn Pavilion of the Festival of Britain is the "Morale Raiser," a machine which steadily pats its wearer on the back and vociferates words of encouragement. It was described by Brian Johnson in "In Town To-night," and we understand is shortly to be shown upon the television newsreel.

The Morale Raiser incorporates a Scophony-Baird Home Recorder, made by the manufacturers of Baird television. This was chosen after a number of comparative tests and will now be in use continuously throughout the Festival.

P. G. A. H. Voigt

NEWS of this well-known personality in the field of high-quality sound reproduction has reached us from Canada, where Mr. Voigt, B.Sc., A.M.I.E.E., F.B.K.S., is part-time instructor in electronics at the Ryerson Institute of Technology in Toronto.

On March 15th last at the University of Toronto he gave a lecture on high-fidelity reproduction to the Wireless Association of Ontario, including a demonstration of his re-matched diaphragm loudspeaker with 22,000 gauss field magnet. The equipment used was an American version of the Williamson amplifier, the Voigt moving-coil pick-up with diamond stylus and his latest P.M. loudspeaker. Decca 78 r.p.m. "London" "ffrr" records were used for the demonstration which was attended by a large audience, including Frank Murphy, now resident in Toronto.

Mr. Voigt has expressed the opinion that this was the best demonstration he has ever given, largely due to the application of technical developments of recent years. He adds the comment that the 33⅓ slow-speed is definitely regarded as the best speed for handling all serious music recordings, but the 45 r.p.m. speed is considered an unfortunate innovation. Even with long-playing records automatic changers are popular, so as to permit one to load up a batch of records and obtain a long period of music uninterrupted by commercial announcements in the radio programmes.

Mr. Voigt is making a slow recovery in his health, which was the main reason for his emigration to Canada.

Marconi Veterans' Reunion

THE Fifteenth Reunion and Annual General Meeting of the Marconi Veterans' Society was held on Saturday, May 5th, 1951, at Caxton Hall, Westminster. The qualification for membership is 25 years' service with the Marconi Companies, and of the total membership of 2,200 no less than 1,900 are still serving. At noon 160 veterans gathered to talk over old times, and at lunch H. E. Watterson (1902) presided, with W. I. McGhee (1904) as deputy. In support were C. E. Rickard (1898), H. M. Dowsett, C. S. Franklin, and Andrew Gray (1899), W. Davies, A. A. Kift, H. T. Round, G. E. Turnbull, and W. M. Sampson (1902), W. Platt (1904), F. Beatson, A. J. Chesterton, Sir Ernest Fisk and C. C. Howe (1906). R. C. A. Kroes and L. F. Meyer were present representing the Dutch members and received a very cordial welcome.

The chairman proposed the health of New Veterans, to which R. H. G. Cox replied, and F. H. Lansbury proposed the toast to Absent Friends.

Radio-sonde

ONE of the many interesting exhibits shown by the General Electric Company at the Festival of Britain is the Radio-sonde Mark II. It is on view in the Dome of Discovery, and was manufactured by Salford Electrical Instruments, Ltd., a subsidiary company of the G.E.C. The Radio-sonde was developed in conjunction with the British Meteorological office. Elevated by a hydrogen-filled balloon it measures pressure, temperature and humidity up to a height of about 65,000ft. The instrument comprises, in the main, a radio transmitter, amplitude modulated by three units which convert pressure temperature and humidity into audio frequency. Each meteorological unit is successively switched in the modulation circuit of the Radio-sonde, and is picked up by

means of a radio receiver and the frequency determined by an interpolation oscillator on the ground.

Mr. H. J. Leak

H. J. LEAK, M.Brit., I.R.E., managing director of H. J. Leak & Co., Ltd., is visiting his European agents. While in France he has been asked to call upon the President of the Association des Amateurs de l'Enregistrement Sonore, and in Switzerland on the President of the Association Suisse des Amateurs de l'Enregistrement Sonore to convey fraternal greetings from the members of the British Sound Recording Association, and to discuss the proposals from these Associations to affiliate with the B.S.R.A.

Engineering Services Group

THE B.B.C. announce that Mr. L. W. Turner, A.M.I.E.E., has been appointed assistant head of the Engineering Services Group in succession to Mr. E. L. E. Pawley, who is now head of that Group. Mr. Turner joined the B.B.C. in 1936 from the International Marine Radio Company. After four years at the Daventry short-wave station he was made responsible for the aerial system there, and in 1943 became assistant engineer-in-charge. In 1948 he was transferred to Head Office and appointed an assistant to the Superintendent Engineer Transmitters.

British Transmitter for Sweden

A FURTHER contribution to Britain's export drive in hard currency areas is the recent addition to the broadcasting services in Sweden of a "Standard" medium-wave broadcast transmitter at Gothenburg. This transmitter has a power output of 150 kW. with two radiators giving a directional field pattern with maximum field strength on the landward side and minimum towards the sea.

To minimise interference, the signal is reduced in the direction of N. W. Africa, where a broadcast transmitter is working on the same frequency.

It is interesting to note the growth of Gothenburg station. Built in 1925, it was one of the first radio broadcasting stations in Sweden, and was equipped with a transmitter of 500 watts power; in 1928 it became a 10 kW. station serving a public of about 400,000 and now in 1951 the new 150 kW. transmitter is serving about 750,000 of the Swedish population. In each case the equipment was manufactured by Standard Telephones and Cables, Ltd., a tribute to British workmanship.

N.F.G.S.

THE second conference on the gramophone and its repertoire, organised by the National Federation of Gramophone Societies, was held at High Leigh, Hoddesdon, Herts, in March, 1951. The first conference of this kind was held at High Leigh in 1938.

About 70 representatives of gramophone and recorded-music societies from all over Great Britain attended the week-end activities. Speakers included Mr. Julian Herbage (of B.B.C. Music Magazine), who opened the conference, Lionel Salter on record criticism, Ian McPhail and A. C. Cameron on the gramophone in education, and a technical session by K. R. McLachlan and R. Yorke, of the University College, Southampton. Demonstrations of high-quality record reproduction were given by Mr. H. J. Leak, Mr. P. J. Walker (Accoustical Manufacturing Co., Ltd.), and Col. F. G. G. Davey (E. M. G. Handmade Gramophones, Ltd.).

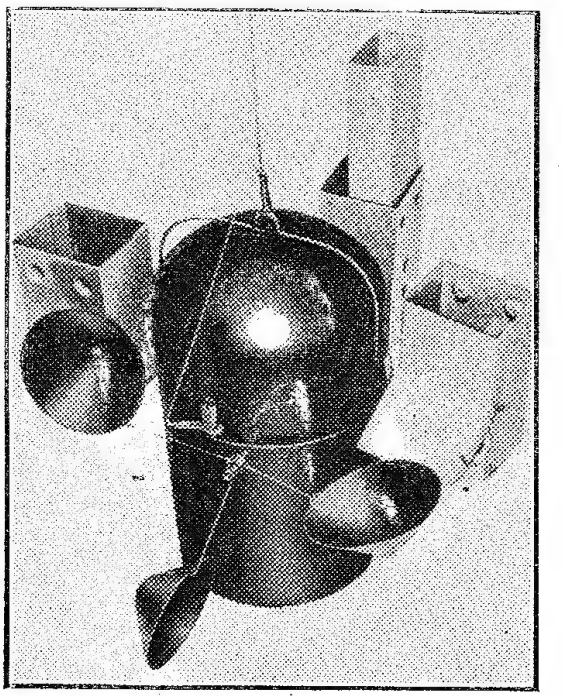
Mr. W. J. Chalk

MR. W. J. CHALK, B.A., has joined the staff of the Overseas and Engineering Information Department of the B.B.C. to deal mainly with work connected with the allocation of wavelengths for broadcasting, and to take part in international and other conferences on this and related subjects.

Faraday Medal Award

THE President of the Institution of Electrical Engineers, Sir Archibald Gill, M.I.E.E., together with a large number of members, attended at the Marconi Works, Chelmsford, recently to present the Faraday Medal to Mr. T. L. Eckersley, B.A., B.Sc., M.I.E.E., F.I.R.E., F.R.S.

Owing to illness Mr. Eckersley was unable to attend a London function and, such is the esteem in which he is held by brother members, the unprecedented step was taken to hold the ceremony near his home.



The Radio-sonde equipment which is exhibited at the South Bank Exhibition.

B.B.C. Networks

SPECIAL telegraph equipment has been designed, including test gear and a switchboard, all of which incorporate many novel features and enable a very rapid and accurate transmission of scripts, news, etc., to be achieved. One telegraph channel has been allocated as an engineering teleprinter network, connecting the control rooms in London, Tatsfield, Birmingham and Manchester together, on an "omnibus" circuit (later on Glasgow, Bristol and Bush House will be added) primarily for the transmission of service messages.

Electrify Your Portable Gramophone

A Miniature Amplifier for Record Reproduction

By L. FURTH

THE recent release of a new Mullard valve, type ECL80, a triode/output pentode combination, opens up new fields for the miniature equipment enthusiast. One of its many possibilities is described in this article, which deals with the construction of a small, entirely self-contained amplifier for use with a pick-up. It can easily be accommodated in the cabinet of a portable hand-wound gramophone.

The amplifier has a two-stage circuit of conventional design, using the triode-section of the valve as voltage amplifier, with resistance/capacity coupling to the output pentode.

In considering the details, let us begin with the heater supply for the valve. As A.C. mains are now almost standard everywhere, a heater transformer delivering 6.3 volts is best suited, mainly on account of its small size, cool operation (as against mains dropping resistors or line cords, which will still have to be used with D.C. mains), and—not a point of small importance these days—cheapness. An indicator lamp may be added as a refinement and should, of course, be paralleled with the valve-heater.

The A.C. input to the metal rectifier—also cheaper as well as cooler than a valve—is taken from the mains via a ½-watt 150 ohms surge limiter (R9). The wattage, being quite sufficient for normal operating conditions, ought not be exceeded. Should the smoothing condenser develop a short-circuit, replacement of the 150 ohms resistor (which will burn out) will be found more economical than replacing the rectifier.

C.R. smoothing is employed in this model, but a smoothing choke could be used with correspondingly smaller associated condensers. As the maximum D.C. voltage on the triode-anode should be limited at 200 volts, the value of R9 might, in that case, have to be increased, and the values of the two bias resistors modified.

Precautions

Taking the rectifier A.C. input direct from the mains necessitates the use of the mains as return circuit, since no separate H.T. transformer winding is provided. Following the usual practice of using the chassis as the common "earth," certain safety precautions will have to be taken.

The pick-up, the control spindles and other metal parts which may be exposed might carry the full mains voltage with respect to true earth. It is therefore imperative to use isolating condensers in the pick-up leads, a type of indicator lamp whose exposed metal portion is not connected electrically to any part of the circuit (no, not even chassis!), and a screened, insulated speaker cable. The grub-screws securing the plastic knobs must be sunk so that they cannot be touched. And remember that all these precautions are wasted efforts if you use chassis bolts which raise their ugly heads on the outside of the cabinet. Use plastic or wooden mounting blocks secured—inside the cabinet—by wood screws. It's safer and neater.

Almost any type of high-impedance pick-up can be used as shown in the diagram, but other types will probably require an input matching transformer. In such cases the makers' instructions regarding the input circuit should be followed. In the case of crystal pick-ups the tone-control will, as a rule, take the form of a scratch filter (with its property of high-frequency attenuation), and that type of tone-control will then be part of the input circuit. There again, the pick-up manufacturer's recommendations should be observed regarding the choice of component values.

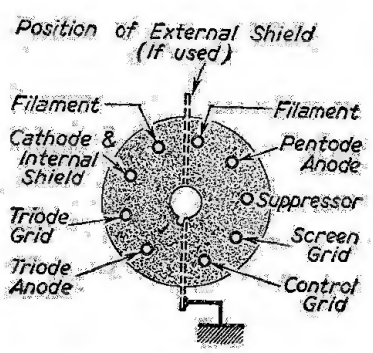


Fig. 2.—Details of valve base for the ECL80 valve.

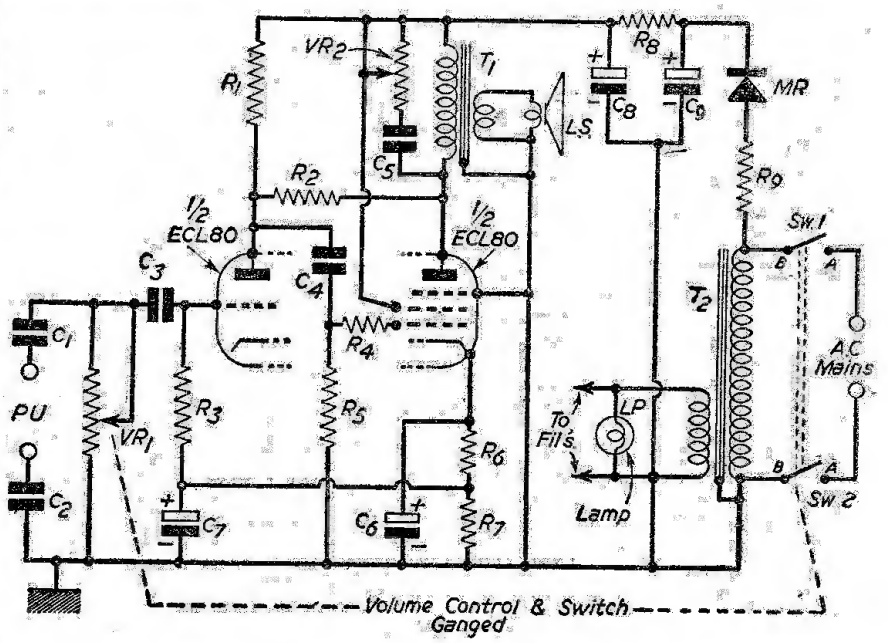


Fig. 1.—Theoretical circuit of the amplifier.

At the same time, however, a fixed C.R. shunt should be left across the output transformer primary so as to prevent a rise in the load impedance (and consequent distortion) at the high audio-frequencies. The choice of values for this shunt is best determined experimentally and will depend largely upon how much you value fidelity in the matter of high-frequency reproduction.

A simple form of negative feedback is employed by putting a resistor (R2) between the two anodes. Its omission, though increasing the gain, will have detrimental effects on the quality, especially at low frequencies.

Speaker

Correct matching to the speaker is important. Here a word of advice to all who, as I, like to play about with midget parts : be midget-minded in all respects if you must. But do not sacrifice quality of reproduction to a couple of cubic inches. It will bring you no joy, nor pats on the back from others. That means use a decent-sized speaker (not less than a minimum of 5in.) and an output transformer which is not only correctly matching output valve to speaker but also constructed on more generous lines than the smallest one you can buy. The speaker can easily be accommodated in the cabinet lid (suitably protected, and facing outwards so that you can play the gramophone with the lid closed), so why not use 6½in. at least ? Flat (" wafer type ") speakers of that diameter are available.

Now a word about the bias network. The ECL80 has a common cathode, but the two grids require different standing bias voltages. Although there are a number of ways in which they can be obtained, the simplest is by tapping the cathode resistor as shown. The value of C6 will seem unusually high. Its purpose is the prevention of feedback through the common cathode resistor, which may give rise to low-frequency distortion or even continuous oscillation.

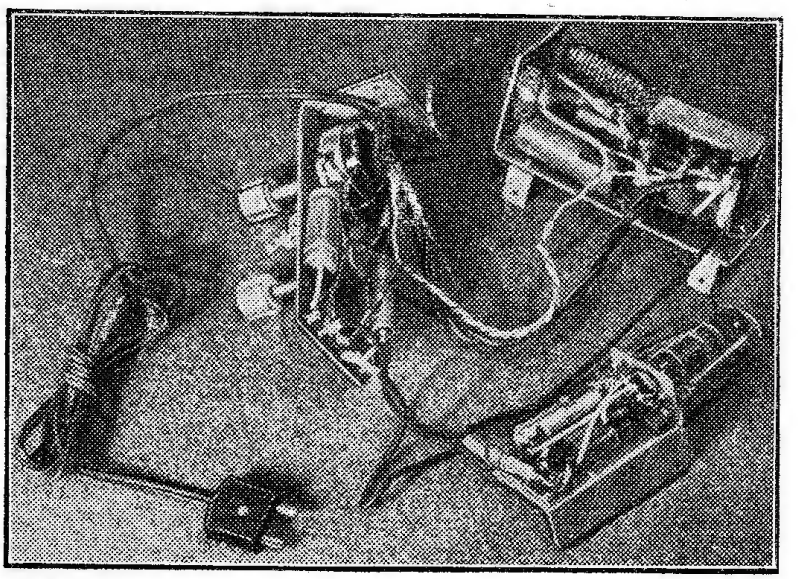


Fig. 3.—The separate units as depicted in Fig. 4.

To prevent feedback at the valve socket, a shield may be placed across the socket between triode and pentode pins. This shield, which is easily made from tinplated iron sheet, is soldered to the centre spigot (which, incidentally, should be earthed, anyway) and pin 5, and bonded to chassis. It may not be required at all, but should be tried if no other method of combating feedback succeeds.

PARTS LIST FOR MIDGET GRAMOPHONE AMPLIFIER

No.	Function	Value	Rating or Specification	Remarks
C 1	Isolating	0.1 μF	500 v. wkg.	Pref. Metallised
2	,,	,,	,,	,, ,,
3	DC-Blocking	0.005 μF	350 v. or more	
4	Coupling	500 pF	500 v. wkg.	Pref. Mica
5	Tone Control	0.02 μF	350 v. wkg.	
6	Decoupling	100 μF	12 v. wkg.	Electrolytic
	Bias Reservoir			
7	,, ,,	20 μF	12 v. wkg.	
8	Smoothing	32 μF	350 v. wkg.	,,
9	Reservoir	8 μF (max.)	350 v. wkg.	,,
R 1	Triode Load	0.22 MΩ	¼ W or more	,,
2	Feedback	0.68 MΩ		
3	Triode Bias	0.22 MΩ	,,	
4	Grid Stopper	10 kΩ	,,	
5	Gridleak	0.68 MΩ	,,	
6	Common Bias	230 Ω	,,	
7	,, ,,	275 Ω	,,	
8	Smoothing	3.3 kΩ	1 W or more	Pref. Wirewound
9	Surge Limiter	100 Ω	¼ W	
VR 1	Vol. Control	0.25 MΩ	Log	With DP switch
2	Tone Control	10 kΩ	,,	
LP	Indicator	6.3 v.	0.15 or 0.3 A.	
T1	Output	Z prim = 11 kΩ		Ratio 66 : 1 for 2.5Ω Speech coil impedance
T2	Filament	6.3 v.	3 W or more	
MR	Rectifier	250 v.	30 mA.	

Twin and single insulated screened lead, connecting wire, nuts, bolts, woodscrews, B9A valveholder and valve retainer, 1 ECL80 valve, 2 control knobs, P.M. speaker, mains lead and plug, pick-up, indicator lamp holder, tag strips.

Layout

The general physical layout is not too critical and will, in most cases, have to be guided by the available space. Along with the speaker its transformer might best be mounted in the lid, and the whole apparatus could, if necessary, be split up into a power pack and the amplifier proper. A separate control panel carrying tone- and volume-control as well as indicator lamp might be found suitable where space is really restricted.

Constructing and installing the particular amplifier on which I carried out experiments necessitated this splitting up into separate units. Screened leads, soldered to tag panels on each individual unit, form the connections. Details of

them are given in the unit block diagram. All the screening braids are themselves insulated.

Concerning the question of screening, I would say, as a general rule, when in doubt—screen it. Leads which carry A.C., whether they be heater wires or the connection between output-anode and output transformer, are liable to radiate, and induce hum or feedback voltages in adjacent parts. It is therefore clearly necessary to prevent them from doing so.

Equally, connections and components in the early stage of the amplifier are vulnerable, and should be protected from unwanted radiation. It may be advisable to screen C1 and C2; and certainly the metal casings of the tone and volume controls should be bonded to chassis. In the amplifier illustrated in the photograph, the input (isolating) condensers have a metal casing which facilitated connecting them to chassis. Such practice may be of doubtful merit in some R.F. circuits, but can usually be followed with impunity and advantage in audio work. Excessive heating up during soldering must be avoided. If a metal pick-up is used, the pick-up casing must not be connected to chassis directly, but via another isolating condenser. 0.1 μF./500 v. is a suitable value.

address amplifier. With care in the construction, especially with adequate screening and discriminating choice of output transformer, very good quality can be obtained. And there is absolutely no microphony present.

All important voltages and currents have been

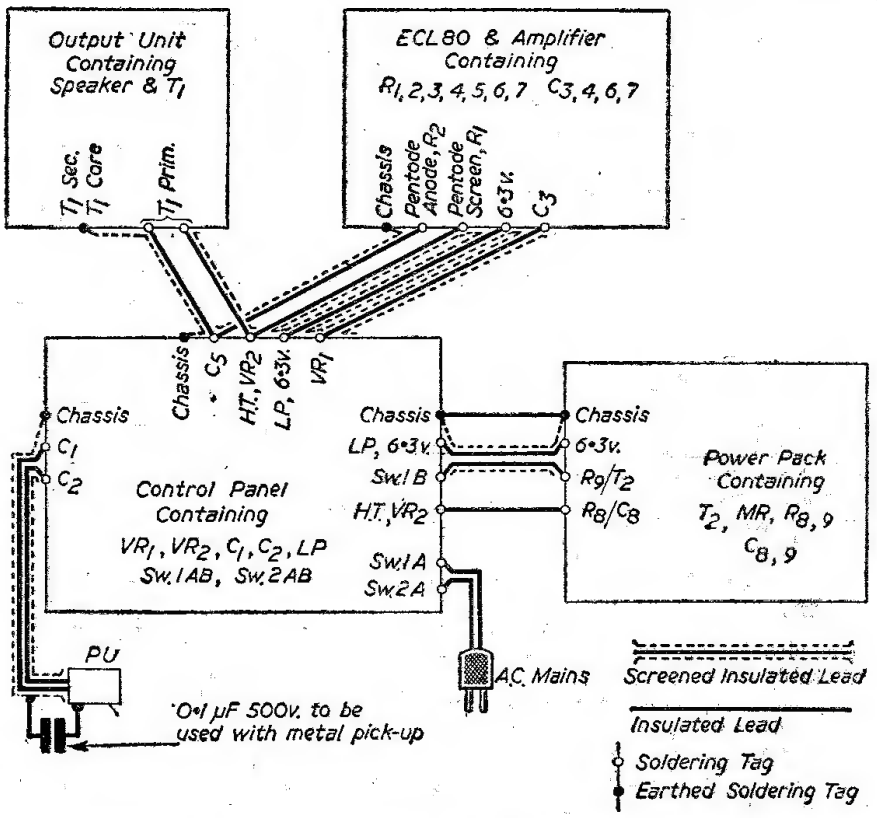


Fig. 4.—Unit block diagram of the amplifier. The parts are shown in Fig. 3.

Final Details

The ECL80 operates at a pretty high bulb temperature, so provide some airflow by drilling a few holes below and above its mounting place in the cabinet. The holes on top may be hidden by the turntable, and should be covered with metal gauze or some textile material. Gramophone needles have a nasty habit of disappearing through such holes and causing trouble in the "works."

The amplifier is meant to be portable, and a valve retainer will, therefore, be found useful. The power output is definitely more than adequate for normal home requirements; but this is not a public

tabulated, and should be regarded as guiding values. No serious view need be taken of slight departures from them. The same applies to the component values. In the design of this amplifier, the valve makers' application data and published valve characteristics have been studied, and it is recommended that this should be done by anyone using a type of valve which is new to him.

Basically, the circuit described here lends itself to various adaptations, especially for intercom. installations, midget radio sets, or small recording apparatus.

TEST VOLTAGES AND CURRENTS

Avo 7 Range	Volts	Milliamps	Measured at—
400 v. D.C.	120	—	Triode Anode
400 v. D.C.	198	—	Pentode Anode
400 v. D.C.	207	—	Pentode Screen
10 v. D.C.	4.2	—	Junction R7/C7
10 v. D.C.	7.8	—	Cathode
0.01 A. D.C.	—	4	Triode Anode Pin
0.1 A. D.C.	—	11	Pentode Anode Pin
0.01 A. D.C.	—	1	Pentode Screen Pin
0.1 A. D.C.	—	16	Junction R8/MR-C9

Readings were taken with supply volts=210 A.C., vol. contr. max., no signal input, E_F=6.3 v.

Radio-controlled Models

Constructional Details of a 3-stage Lightweight Receiver

By R. SANVOISIN, B.Sc.

NOW that the Hivac sub-miniature valves are available at reasonable prices from many dealers the field of radio control for model boats and 'planes is opened to many people who otherwise would never bother, due to the outlay on equipment which is exposed to the danger of complete destruction in a runaway model.

The writer had for some time been experimenting with the usual single-valve super-regenerative receiver operating in the band 26.96-27.28 Mc/s, but without much success in the case of these sub-miniature valves. With their low value of mutual conductance and low maximum anode voltage (30 volts) complete super-regeneration was found almost impossible to attain, whatever the other circuit values were. Although the receiver was quite sensitive, the change in anode current on switching on a carrier was not of sufficient magnitude to operate a relay, nor was the operation very stable.

Slight changes in filament voltage would throw the circuit into or out of oscillation quite unpredictably.

Hence, experiments were carried out to see if it were possible to employ a modulated carrier at the transmitter and amplify the modulation tone in the receiver to a sufficient level to operate a trigger circuit and then a relay. This was found to be highly successful, giving greatly improved results with only slight increase in the overall weight of the receiver.

The Circuit

In order to operate a relay from the tone an A.F. pentode biased to cut-off, and positive feedback to the grid, was employed. Fig. 2 gives the final circuit. The tone is impressed on the grid of the valve from the anode of the preceding stage at A, while a negative bias is also applied via the resistance R and is of sufficient magnitude to prevent the valve from drawing anode current.

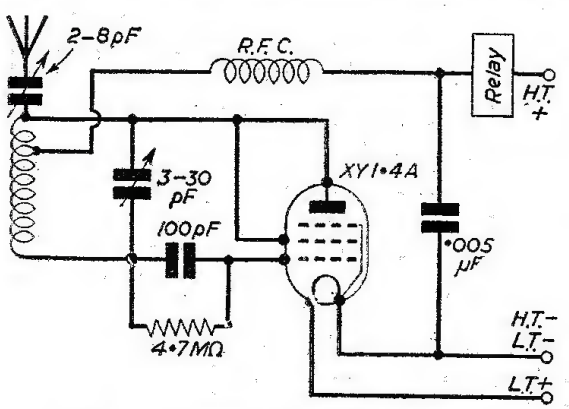


Fig. 1.—Detector stage of the receiver.

If the amplitude of the tone exceeds that of the bias the tips of the A.C. wave will bring the grid sufficiently positive to allow anode current to flow. A.C. will then flow in the anode circuit and be communicated to the rectifiers X1 and X2. These rectifiers rectify the A.C. to produce a D.C. voltage drop across R, which opposes the bias and so drives the grid positive. This causes more anode current to flow and so by a cumulative action causes the valve to conduct and pass its maximum anode current, limited only by the emission of

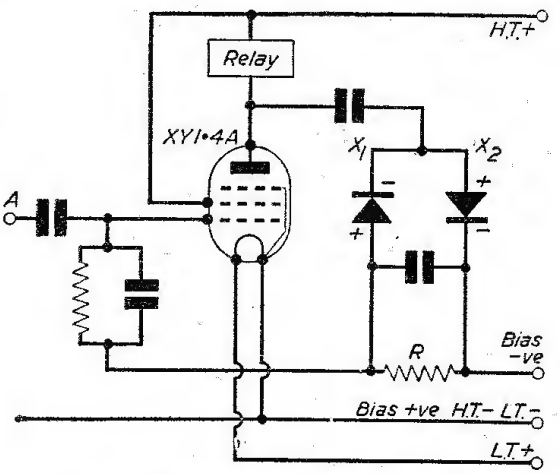


Fig. 2.—Final circuit of the A.F. stage.

the filament. In the case of the sub-miniature valve type XY1.4A, this was about 2 mA., and was quite sufficient to hold in the relay a sensitive, high-impedance type as used in the American SCR522 receiver as squelch relay. When the tone ceases the circuit returns to its original condition, no current flows in the valve, and the relay drops out.

This circuit was employed with the original super-regenerative detector, plus an intermediate audio-frequency amplifying stage to form the final receiver, which was mounted on a piece of bakelite, 3in. by 4in. by 1/16in., the whole receiver weighing 4.7 oz. Fig. 3 shows the circuit.

Constructional Details

The coil is wound with 15 turns of 18 S.W.G. enamelled wire, and is ¾in. diameter and 1in. long, tapped 6½ turns from the anode end. To keep down the weight no former is used, but the finished air-spaced coil is thoroughly soaked in polystyrene cement to make a really firm, rigid assembly that will not vibrate and change frequency with the movement of a model. With the tuning condenser specified—a Phillips concentric trimmer—the complete 27 Mc/s band allowed for radio control of models plus part of the 28 Mc/s amateur band is

covered, and once the centre of the band (27-12 Mc/s) is found the trimmer may be locked in position with a spot of Durofix to prevent frequency shift with the movement of the model. The R.F. choke employed is not very critical—about 50 turns of 38 S.W.G. enamelled wire wrapped round a $\frac{1}{8}$in. diameter paper tube is quite satisfactory, and this should be mounted at right angles to the axis of the tuning coil to prevent coupling, since all the components are necessarily very closely spaced.

After the detector stage a perfectly normal A.F. amplifier follows, with slight modifications to suit the tiny valve which, in this case, has a 0.75 volt filament. To drop the other 0.75 volts from the 1.5 volt filament battery, a 22 ohm $\frac{1}{8}$ watt resistor is employed. From the anode of this stage a .005 μF condenser couples the output to the positive feedback trigger circuit with the relay in its anode circuit. Two of the new germanium crystal diodes were employed for X1 and X2, but the cheaper Westinghouse midget Westectors will be quite satisfactory and much less expensive.

As far as mechanical considerations go, the only facts that need to be taken into account are to keep the tuned circuit as far away from the relay, etc., consistent with the compactness of the whole receiver, which, of course, has to be mounted inside a model, supported on elastic bands or springs to damp out vibrations.

Aerial

The aerial is most satisfactorily a length of about 18in. of fine wire connected at a convenient point on the model, though this may be varied to suit the layout of any particular model. The aerial coupling condenser has to be adjusted for optimum operation when the receiver and transmitter are well separated. Quite loose aerial coupling is usually found to give best results.

Batteries are carried in a separate compartment in the model to give an even distribution of weight. A 30-volt deaf-aid layer-built battery, type B23, for H.T., and half of a pen torch battery for L.T. The filament consumption of these tiny valves works out at about 25 mA. each, so the load on the pen-cell is not unduly great, although it is not advisable to allow the cell to run down too much, and it should be replaced after four to five hours' use at the outside. Three or four pen-cells are the most convenient bias supply and last indefinitely, as they are not used to supply current. To conserve weight here it is possible to strip one of the B21 15-volt deaf-aid batteries and take out four sections, so giving a 6-volt battery. Contacts to the end faces may be made by wires held in place by rubber bands and then the whole assembly may be dipped in warm (not hot) wax and allowed to set, forming quite a serviceable unit.

Operation

The receiver requires for its operation an R.F. signal modulated at between 300 and 15,000 c.p.s. from the transmitter. Each time the modulation is switched on the receiver relay closes ; each time the modulation is switched off the relay opens, the carrier being left on the whole time. The opening and closing of the relay is then used to operate the intermediate mechanical equipment for moving the model's control surfaces and adjusting its engine, etc. The mechanisms employed in this connection are infinitely varied, and it is not the purpose of this article to discuss them.

This receiver as it stands is suitable only for the radio control band at 27 Mc/s, and not for the other permitted band at 465 Mc/s. These Hivac valves will not work at this high frequency, but there is another battery valve in surplus that can be persuaded to oscillate at 400-500 Mc/s—the American acorn type 958-A. This, however, requires a somewhat higher value of H.T.—60 volts. For model boats this higher value is of less importance as weight is of less consequence than in a 'plane, and a satisfactory unit can be built without much trouble by the experimenter interested in V.H.F. work. Such a unit will be described in a future article, also the transmitter equipment for both receivers and the mechanical control equipment.

The writer hopes that this short article will inspire those who have not previously considered radio control of models as a worthwhile subject for experiment to take up this fascinating work and construct a really lightweight, stable receiver having a long range. All mechanical equipment can be hand made, and there is endless variety and interest in the different designs that can be made to fit any specific model.

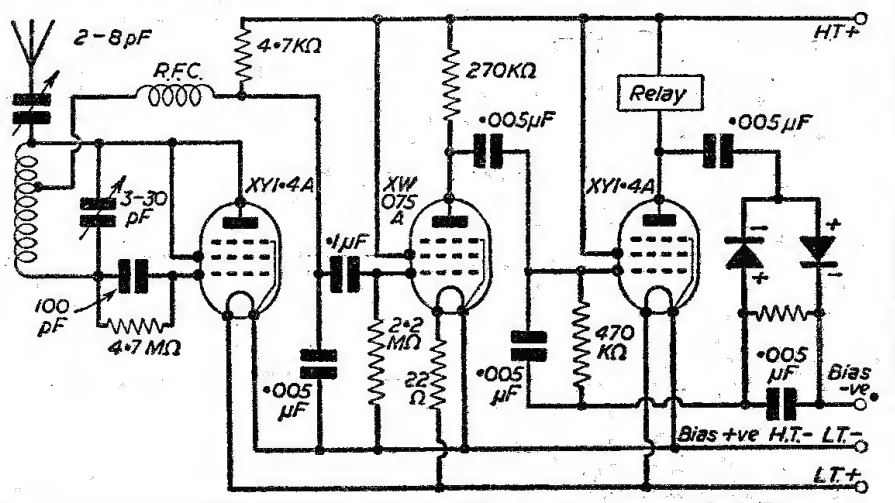


Fig. 3.—Three-valve receiver circuit with the tone-operated A.F. stage.

On your Wavelength

by THERMION

Jewel-tipped Gramophone Needles

A READER asks me whether I think that jewel-tipped gramophone needles cause less wear than steel ones. My own experience of them is that they do not. I have never believed in fancy gramophone needles, and, having conducted tests on most of those which have appeared on the market during the last 30 years, I can say that the normal gramophone needles give as good a service as any.

With motor cars there are those who think that a special lubricating oil, or a special make of sparking plug improves the performance. The results may be real or imaginary. With gramophone needles I am certain that they are imaginary.

Quite apart from the question of the expense of jewel-tipped needles, which is not inconsiderable, I have found that they scurf up the grooves worse than steel ones. If the claim is that sapphire needles last longer than steel ones I would be inclined to agree, but I think it is at the expense of the records on which they play. Everyone who has any knowledge of engineering knows that soft materials lap harder ones. It is the hardened shafts which wear most, not the white metal bushes in which they run. In fact, if you wished to lap a hardened steel bush a lead lap would be used.

I should like, therefore, to know how many manufacturers can claim that the process becomes inverted when a comparatively soft record is rotated against a jewelled needle point. Theoretically a steel needle can be made to a higher degree of accuracy than say a sapphire.

The sharpened steel point, however, can dig into the bottom of the groove whereas with the jewel it is claimed they are accurately ground to the correct theoretical angle and contact only the sides of the groove. I have played a particular record with which I am well acquainted with both types and have noted no audible difference in the quality of reproduction.

I have noted, however, in a destruction test I conducted a few years ago that the record on which the steel needle had been used lasted longer than a record of the same composition on which a sapphire had been used. Therefore, the relative merits of both types is concerned with cost, with the mild advantage in favour of the jewel that one does not have frequently to change the needle as with the steel one.

You may have noted that after two or three playings the steel point of a needle becomes blunt, which proves my statement that the soft material laps the harder. I do not know the relative Brinell Hardness Numbers of sapphire and steel, but the same lapping action must apply. Whether sapphires or other jewels give a more faithful reproduction is a matter for personal opinion, and mine is that it is largely a matter of imagination.

If the gramophone companies thought that sapphire needles gave a better reproduction, surely they would recommend them? There was a myth amongst gramophone fans a few years ago that fibre needles gave better reproduction, just as in the early days of radio the ignorami thought that the reproduction from a crystal set on a pair of headphones was better than that of a valve set. The correct answer, of course, is that if the signal received on a crystal set were to be amplified to the same output wattage as the valve set, the quality would be indistinguishable. With fibre needles the output in decibels is much less than with a steel needle, because fibre is more flexible.

Therefore, it was thought that the lesser volume was necessarily of higher quality. Precisely the same effect could be obtained by reducing the volume on a radiogram; this is not possible on the ordinary acoustic gramophone.

There are still cranks who make learned dissertations on quality receivers, when they cannot possibly know what quality is, because you cannot listen in to the transmission and the reception at the same time. Fortunes have been made out of fancy needles. For myself I am content to use the needles recommended by the record manufacturers, and leave the high quality, less record wear, improved reproduction boloney to those who like to talk about it.

Disc-less Recording

YOU will remember my comment on disc-less recording and my reference to the Ozaphone. One of my readers, Mr. D. G. Newman, of Chester, has sent me a catalogue of this machine entitled, "Music from a Beam of Light." The company had showrooms in Albemarle Street, Piccadilly. The catalogue states that the Cell-o-phone, which was the trade mark used by the Ozaphone Company, "Uses a beam of light instead of a needle—a ribbon instead of a disc. This fascinating new instrument enables you, for the first time, to enjoy continuous home entertainment of your own choosing. Six to 60 minutes of uninterrupted programme at the turn of a switch." The recordings available at the time included symphonies, opera, variety and dance, by well-known artists. The catalogue is very complete and interesting. It seems a great pity that the production of this instrument ceased, as with the many improvements in sound-on-film technique by now we should no longer be using steel needles, or jewelled ones.

No R.S.G.B. List of Members

I WONDER why it is that the Radio Society of Great Britain does not issue to its members a list of its members? Every other society of which I am aware does this, for it enables members to write to one another, and to check up on addresses. Every member of a society is entitled to know who his fellow members are. If a society claims a membership of so many thousands they should be supplied in printed form. I suggest that the Council of the R.S.G.B. should include such a list in its printed rules.

LINING LOUDSPEAKER CABINETS

A Useful Idea for Avoiding Cabinet Resonance

By B. D. SIMMONS

READING the article on loudspeaker cabinets in the April edition of PRACTICAL WIRELESS has prompted me to write about a recent discovery of mine which, although not claimed to be novel, does provide a very cheap and effective method of lining loudspeaker cabinets. It is primarily intended for use in acoustic chambers of the reflex or infinite baffle type having cabinet volumes of several cubic feet. The entire interior wooden surface of the cabinet is lined with a layer of papier mâché egg crates, as illustrated in the accompanying sketch.

Egg crates are very easily obtainable from any grocer and it was my experience to find that retailers were only too glad to dispose of them. It is difficult to give quantitative treatment on the effectiveness of this method. Owing to the widely different forms of cabinet shape and volume, which individual readers may possess, and to the varying stiffness of the egg crate material, no simple mathematical generalisation can be made. Thus, brief qualitative reasoning will be taken only.

Unlike the usual materials used, i.e., glass fibre, felt, etc., this lining is of a more solid texture but, due to certain physical properties it possesses, acoustic absorption and damping is obtained.

Here, as in most considerations of power transfer from source to load, a maximum amount of energy will be transferred when source impedance matches load impedance. In this particular case, total absorption by the cabinet lining of all energy radiated from the back of the speaker cone is the ideal condition. This means that the impedance of the lining material should match the impedance of the air delivering the energy to eliminate box resonance caused by the unabsorbed energy reaching the woodwork.

Unlined Cabinet

Consider first an unlined cabinet. Here there is a large mismatch. Typical figures for the characteristic impedance of air are 41.5 C.G.S. units (acoustical ohms) per sq. cm. as opposed to that of wood which can have from 1×10^5 to 4×10^5 units, depending on its density. Now the higher the ratio of the two impedances between which energy is being transferred, the smaller will be the energy absorbed and consequently the greater will be the reflection. This will result in standing waves in the cabinet, one of the most likely causes of cabinet resonance.

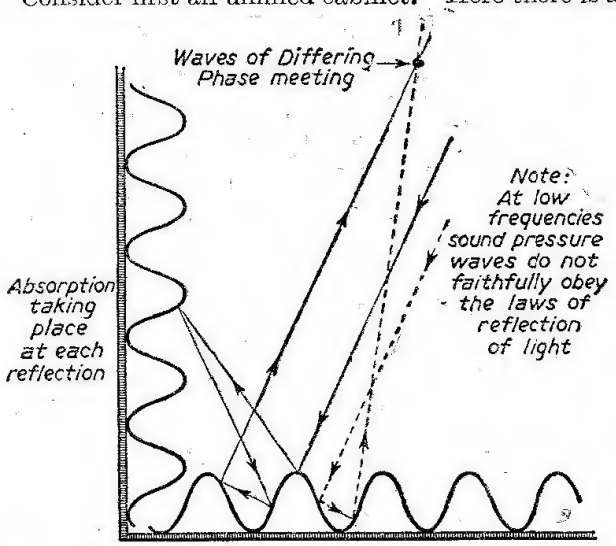


Fig. 2.—Part cross-section of lined cabinet showing possible paths of sound waves from loudspeaker.

Energy can also be dissipated by causing frictional losses. A rough, fibrous surface of large area over which the sound waves must travel will result in energy being lost in the form of heat over the surface. The effective area can be increased by making the material in the form of a series of small pockets and this also aids absorption by virtue of the fact that a wave reflected from the back of a pocket must, on reflection, pass over the same surface which it originally did on entering. An extreme example of this is given by considering the anechoic chamber where numerous pocket-forming wedges of highly-absorbent material line the entire chamber.

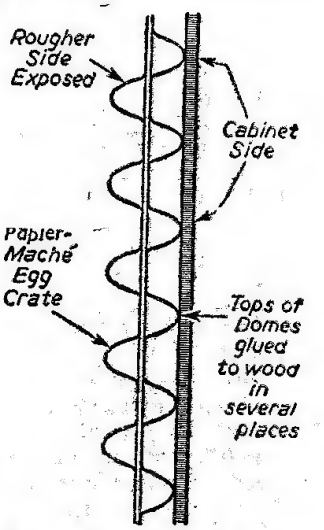


Fig. 1.—Method of fixing lining.

An apparent way of removing unwanted energy is by phase cancellation. This can occur if any two or more reflected waves meeting at a point have an algebraic sum of zero (for complete cancellation) or whenever any degree of cancellation takes place there will be a corresponding reduction in energy. This phase difference will be caused by waves reaching a point via paths of different lengths. A highly-irregular surface will reflect waves at numerous angles and thus enable the "split up" in phase to be considerable. It must be appreciated that in a similar way certain build-ups of energy will take place thus the net effect is likely to result in no overall reduction, although at each reflection absorption will take place.

Absorption also varies with frequency. This unfortunately means that whatever material we use to line the cabinet, there will be less attenuation of the lower frequencies (the troublesome ones in this case) than of the higher.

Advantages

It is now possible to enumerate the advantages to be gained by using papier-mâché egg crates:

(1) The fibrous, porous material gives good

impedance matching and therefore good absorption.

(2) The large, rough surface area with numerous pockets causes frictional losses which dissipate unwanted energy.

(3) The highly irregular surface causes much random reflection.

The overall effect is a considerable improvement in cabinet performance with negligible expense and trouble.

It must be noted that primarily a speaker with large piston displacement must have the fundamental cone resonance damped by low amplifier output impedance and suitable cabinet design to gain full advantage of this method of reducing unwanted cabinet resonances.

Surplus Neon Voltage Stabilisers

Details of Cold Cathode Discharge Tubes, or Regulators

By E. G. BULLEY

VALVES of this nature are sometimes known as cold cathode glow discharge tubes, voltage regulators or voltage stabilisers. These should not be confused with valve voltage regulators, as they usually comprise a high vacuum or gas-filled triode incorporated in a suitable circuit, and the valve being capable of passing fairly large anode current.

The cold cathode types, however, consist of two or more electrodes assembled on to a glass stem which in turn is sealed into a glass envelope. The finished product being gas-filled with neon to specified pressure.

It can therefore be stated that when a voltage is applied between the electrodes, ionisation of the gas occurs, that is to say, such valves give a constant voltage drop over a wide range of current. This can be explained by the fact that owing to the applied potential to the electrodes, the electrons present in the gas collide with the gas molecules and cause the release of ions which in turn collect and form a positively charged cloud near to the cathode electrode. Now it is this positively charged cloud and its ability to carry large currents that causes more electrons to be released from the cathode. This phenomena acts very quickly and furthermore, as the conduction property of the gas increases between the electrodes, so the current flow increases. It will therefore be appreciated that the gap between the electrodes of such valves is an important parameter of their design.

However, there are quite a selection of these stabilisers on the surplus market and use can be made of them by the radio amateur where stabilised voltages are required.

Equivalents

Many of these valves have commercial equivalents and perhaps the most well-known type is the "Stabilovolt" (trade mark of M.O.V.). This type of regulator is composed of several electrodes sealed into the same envelope, thus enabling various values of stabilised voltages to be taken from the one valve.

It is as well to mention, however, that an external resistance must always be connected in series with the stabiliser, and must be capable of carrying the maximum input current continuously. Likewise, the resistor should be able to absorb approximately half the voltage of the valve in question, thus preventing a heavy current density through the valve. It is therefore essential that the filtered D.C. supply to the valve must be approximately 50 per cent. higher than the actual working voltage of the regulator. Such valves of this nature that are at present available from surplus are shown in Table 1, with their commercial equivalents. Before proceeding to deal with other types, there is an important point to remember; that is, when using such regulators as just described, one must ensure that a suitable resistor is incorporated in the supply line of each electrode. The presence of these resistors enables the regulator to be struck at a much lower voltage than if each electrode was struck in turn.

There are, of course, various types of American regulators available as will be seen on page 302; these are of a different design from the multi-electrode type and contain two electrodes. Nevertheless, a resistance must also be used in series with these types to limit the current through the regulator.

Circuits

Typical circuits using such types are shown in Figs. 1 and 2, the former being a straightforward stabiliser circuit, whereas the latter shows two such valves in cascade. By this method, two values of stabilised voltages can be obtained, which is more or less what the "Stabilovolt" does, the difference being that the latter has all the electrodes in one envelope, whereas the former utilises two or more valves to get the same result.

It is as well to mention at this stage, however, that if these surplus stabilisers have at some time or other been used, the regulating characteristic

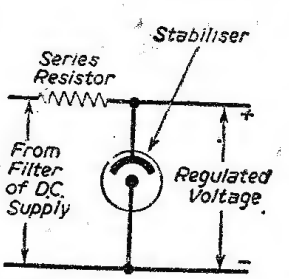


Fig. 1.—Circuit of straightforward stabiliser circuit.

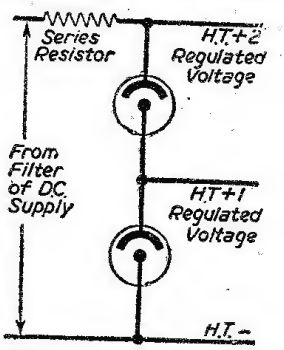


Fig. 2.—Stabilising circuit using two valves in cascade.

may have changed, or on the other hand, a long idle period may also have affected their characteristics. One is therefore advised to give these valves a suitable ageing before incorporating them for good in their particular piece of equipment.

The ageing of such valves is quite simple, and is the operation of the valve in question at the ratings one wants and should continue until the regulator develops a steady condition; one must also remember to operate the valve at or within its ratings and not overload it.

SURPLUS NEON STABILISERS

Surplus No.	Comm. Equiv.	
CV45	S13OP	British
CV188	ST11	British
CV216	OD3/VR150	American
CV643	874	American
CV686	OC3/VR105	American
CV3712	STV280/80A	British
CV3798	OA3/VR75	American
CV3799	OB3/VR90	American

Safety Device

Many of these stabilisers, and especially the American types, have what is known as a " jumper " incorporated in them. This, in fact, is a connection within the actual base of the valve between two pins and thereby acts as a switch, the connection forms a part of the A.C. supply line, so that should the valve be removed from the equipment whilst operating, the A.C. supplies to the transformer are broken and the equipment made inoperative and thereby safeguarded. Reference to Fig. 3 will, it is hoped, assist the reader and clarify this point of discussion.

To conclude this article, one must bear in mind that voltage regulators must not on any account be operated without a series resistor, otherwise a direct short will occur through the regulator which will in turn cause damage to the power unit.

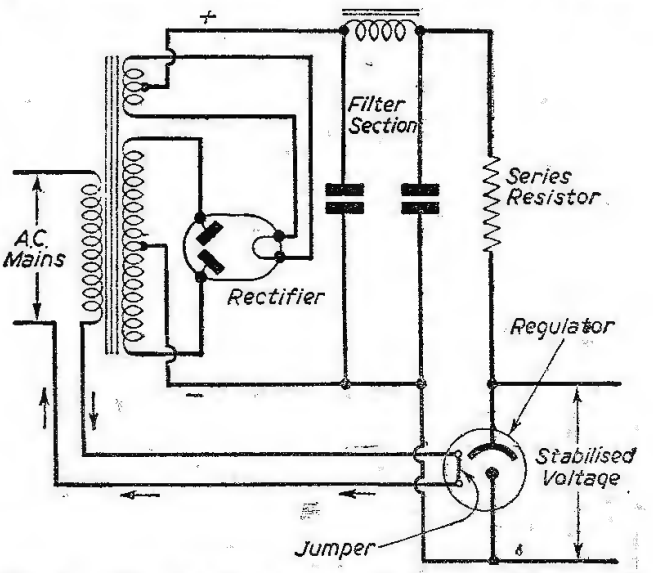


Fig. 3.—Circuit of a mains unit showing " jumper " connection.

New Transmitter Technique

A NEW type of high-power air-cooled broadcasting transmitter is announced by Marconi's Wireless Telegraph Co., Ltd. It embodies the perfection of a technique, known as " Ampliphase," which is a great advance in transmitter design. " Ampliphase " allows higher power medium-frequency installations to be completely air cooled, greatly reduces size-to-power ratio and effects a considerable saving in capital outlay.

One of the greatest advantages of this technique is that by eliminating the modulation transformer and reactor, the use of iron and other valuable material is reduced by approximately eight tons for a 100 kW. transmitter.

Testing Period

For the past 12 months a Marconi 60 kW. experimental " Ampliphase " transmitter has been on trial in the service of the British Broadcasting Corporation, carrying the Third Programme.

" Ampliphase " minimises valve stages and other equipment and is a technique which combines extreme reliability with greater freedom from technical faults. Basically " Ampliphase " gives a normal audio-modulated carrier by internal phase modulation in the transmitter. Since the phase modulation is effected at a low power level, the audio-frequency stages are of low output and contain very few stages of amplification. The radio-frequency stages deal only with phase modulated energy and they work at a high efficiency at all levels of modulation. The result is a high-power transmitter of great simplicity, electrical efficiency and reliability.

Reliability

Performance figures obtained during the B.B.C. trial period vividly illustrate these claims. Out of a total programme time of 2,012 hours, only 12.5 minutes were lost due to breakdown of the transmitter itself, or .01 per cent. on a purely experimental development model.

Operation and maintenance of " Ampliphase " transmitters is simple and parallel working, or unattended working, is entirely practicable.

Facts About Mains Transformers

Choosing and Testing New and Surplus Components

By BERNARD BARNARD

IN the days before the war the purchase of second-hand apparatus was usually a fairly safe business because almost every component bore the maker's label, and it was only necessary to look up that manufacturer's specification to see if the item in question was fit for some particular job.

To-day, however, it is all very different. Most of us are always on the look out for a bargain, and, of course, we do not have to look very far, for the market is still flooded with very excellent ex-Government apparatus. The only snag is that we have to find some way of deciding, often merely by the appearance of a component, whether it is suitable for our requirements.

Apart from obvious external defects, there is only one way in which we can hope to do this and that is by having a fairly complete knowledge of the fundamental principles on which the component in question operates.

Let us suppose, then, that we have been offered a mains transformer at a very tempting price and that we have to make up our minds on the spot whether to buy it or let it go. We therefore consider the problem in the light of basic principles of transformer action and our line of thought will run something like this.

The shape, size, weight—in fact everything about a mains transformer—depends finally upon the basic principle that a wire carrying an alternating current has around it a magnetic field which also alternates in strength and direction and that any other conductor which is close enough to be affected by this magnetic field will have an alternating voltage induced in it.

The frequency of this induced voltage will, of course, be the same as the original one but its magnitude depends on a number of factors, some fixed and some controllable.

The magnetic field is conveniently considered as consisting of "lines of force" in the form of concentric circles around the first wire and we may think of them as expanding and contracting around the wire as the applied voltage rises and falls.

The magnitude of the induced voltage in the second wire depends on the *rate* at which the lines of force cut the second wire. And from this it follows that this voltage depends on frequency, strength of the field and the length of the second wire that is influenced by the field.

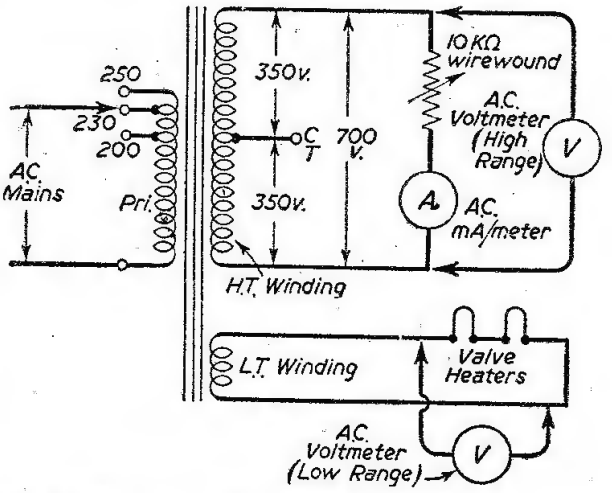
In our mains transformer the frequency is, of course, fixed at 50 cycles per second but the strength of field is determined by the number of primary turns (analagous to the first wire) and the design and size of the iron core. The "length of the second wire" becomes, of course, the number of turns on the secondary winding.

We cannot find out very much about the windings of a transformer by simple inspection beyond the obvious conclusions to be drawn from the bulk of the component. But quite a lot can be deduced from the size and construction of the iron core.

The Core

The purpose of the core is to confine the magnetic field set up by the primary to the narrow path offered by the soft iron and so to ensure that all the lines of force do useful work in cutting secondary turns. Without this iron path, we should have to have an enormous number of secondary turns to get a given induced voltage because most of the magnetic field would be lost in the space surrounding the transformer. A good transformer will have, then, a very generous iron core which will pass through the centre of the windings and will loop round to form a complete ring around the outside of the transformer.

Another point about the core is that it should be made up of laminations, that is, thin strips of E- or L-section which are insulated one from the other by paper or varnish, and bolted together. This is very necessary to avoid the very heavy power loss which would otherwise occur due to eddy currents. The principle of induced voltages applies to the iron as well as the copper of the secondary winding and voltages are in fact induced in the iron. These would cause strong currents to flow



Circuit of a typical Mains Transformer and method of testing.

were it not for the high resistance path set up by the layers of insulation between the iron laminations.

There are on the market to-day very many ex-Government "high-cycle" transformers which are quite unsuitable for mains use. They were designed for use at a frequency of approximately 500 and therefore produced the required secondary voltages with comparatively few turns and a small iron core, the high frequency being depended upon to give the necessary "rate of cutting lines of force." These are easily recognised by their small bulk and scanty iron core and will be avoided by the discerning purchaser.

Testing

Now, to get a little further in our study of the behaviour of the transformer, let us assume that we have one on the bench for test. First of all we will connect the primary to 50 cycle A.C. mains of the correct voltage and, with no connections whatever to the secondary, we will note what is going on inside the windings.

When we switch on the supply, a good transformer will pass a very small primary current—and that is all. This current is merely doing the job of maintaining the magnetic field and, if the losses in this transformer are small, practically no power will be drawn from the mains. In point of fact, no power at all is used in establishing a magnetic field and therefore any that is taken from the mains must be due to losses, such as the resistance of the windings and eddy currents in the core. A first-class transformer will have its windings of fairly generous gauge copper wire in order to keep the resistance down, and the core will also be generous in size and carefully laminated.

The " no load " primary current is small because the primary winding has a large inductive reactance; that is to say, it offers a very large opposition to the flow of alternating current; the better the transformer, the smaller this current will be because the good component will have a very large number of primary turns, and, therefore, a very large primary inductance.

Now we will see what happens when we connect a load across the secondary. This can be a resistance, an inductance or a capacitance—or a mixture of all three. In our work it is nearly always a resistance, so we will look at this case in some detail and merely mention the others for the sake of information.

As soon as we connect a resistance across the secondary, a current will flow in the secondary circuit whose magnitude will be found by dividing the total resistance of the circuit into the induced secondary voltage. This current will cause a magnetic field to be set up around the secondary windings which will interact with the primary field; this field is in opposition to the primary field and will, therefore, reduce the total magnetism in the core. As a result, the primary now has less magnetism and its inductive reactance falls—and, of course, the primary current rises.

The effect, then, of loading the secondary is to increase the primary current and the transformer now draws power from the mains. Ignoring losses again, the power consumed in the secondary circuit will be exactly equal to the power drawn from the mains by the primary.

But we cannot ignore losses when testing our transformer. If the secondary winding has been wound with too fine a gauge of wire, or wire of poor quality, then it will have an unnecessarily high resistance and we shall lose a lot of watts in this winding. The transformer will get hot when in use and will be very inefficient. The windings will also probably break down after a time due to this heat causing excessive temperature rise.

As a matter of interest—and a point which throws further light on transformer action—we will see what happens if either an inductance or a condenser are connected to the secondary.

In the first case, a secondary current is established but no power is used. This is because the current will lag on the voltage by 90 deg., as is always the case when A.C. is applied to a pure inductance. The effect in the primary will be exactly the same, that is a large lagging current will flow but, due to the 90 deg. lag, the power consumed ($V \times I \times$ cosine 90°) will be zero.

The effect with a pure capacitance would be similar except that, in this case, the phase angle would be 90 deg. lead.

We can now complete our investigations by assuming that the seller of the transformer has been kind-hearted and allowed us to take the component home to test before we make our final decision. In the light of the foregoing we can very easily carry out exhaustive tests which will decide whether the instrument is suitable for any particular purpose.

The only test gear necessary is a voltmeter and ammeter which will read A.C. These can be combined in the one instrument for we shall not require both readings at the same time.

Practical Work

Connect the transformer up as shown on page 303. We will assume that the rated secondary voltage is 350-0-350 and that we require this voltage to be maintained at 100 milliamps. Start by connecting the A.C. milliammeter in series with the variable wire-wound resistance and adjust the resistance until the meter reads 100 mA. Now take the meter out of circuit, switch it to the appropriate volts range and connect it across the secondary terminals. It should read approximately 700 volts. Leave the transformer connected in this way, with the supply on, for at least an hour. At the end of this time if the transformer is up to the job, the voltmeter reading will not have altered and the transformer itself should not have become appreciably warm. If it is hot to the touch or if the voltmeter reading has fallen then the component should be rejected.

It is also worth while to connect the A.C. milliamps range into the primary circuit and to note the primary current. It should be greater than the secondary—somewhere about 1½ times—and the primary watts (mains volts × primary current), will be similarly greater than the secondary watts (secondary watts × secondary current). The lost watts are, of course, accounted for by the fact that the best of transformers are considerably less than 100 per cent. efficient and the resistance of the windings and other sources of loss that we have noted have added their quota to the total power drawn from the supply.

Although the L.T. windings seldom cause trouble, the test can be extended to include these if desired. The heaters of some spare valves of suitable voltage rating form the most convenient load and the number chosen should be that which it is proposed to use when the transformer is put into service. A voltage test is made under load.

One further useful and informative test can be made after the above has been completed. This is to use the voltmeter to check that the voltage either side of the centre tap is really 350. In some cases you may find that you will get as much as 370 volts one side and only 330 on the other. Such a transformer should be rejected as the unbalanced voltage will play havoc with reservoir condensers in a full-wave rectifying circuit.

A CHASSIS PUNCH

A Useful Tool for Metal Chassis Constructional Work

By V. MANNOOCH

WHEN drilling radio chassis for the insertion of screens, as in the P.W. vision receiver, one often finds that the drill wanders or tears the metal, producing a ragged hole which is difficult to clean up. The gadget described here is simple to make and proves very effective in making holes which are clean, in perfect alignment and quickly produced. Holes up to ½in. diameter in 16-gauge aluminium have been successfully produced using this method.

The gadget consists of two plates which are drilled in conjunction with one another, bolted together, and spaced apart by washers on the bolts. Short lengths of silver steel rod, which may be obtained from most ironmongers, are used for the punches. These are sawn off to a convenient length and faced off square with a file. It is not necessary to harden the punches or punchplate unless a large number of holes are to be produced.

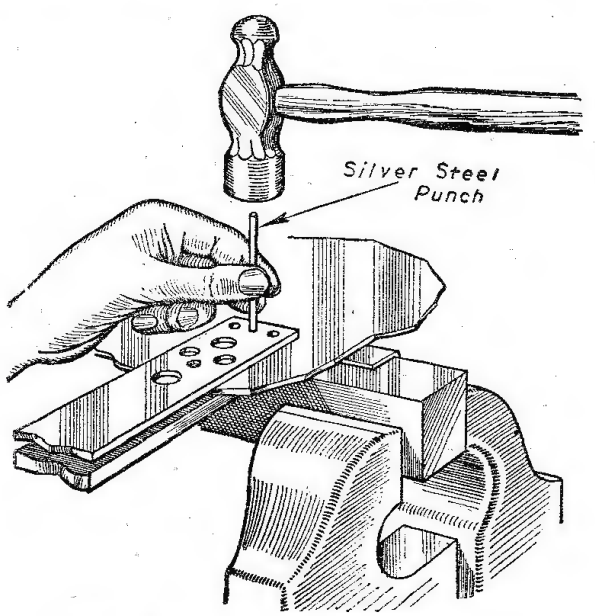
The distance from the punch to the nearest assembly bolt should be sufficient to allow holes to be punched in the centre of the chassis, and the distance between assembly bolts should not be less than about 3in. to 4in.

Holes in the punchplate should be opened out on the underside to allow clearance for the blanked-out piece to fall away, by drilling half way through its thickness with a drill 1/32in. larger than the punch hole. Drilled holes are quite suitable and it is not essential to ream.

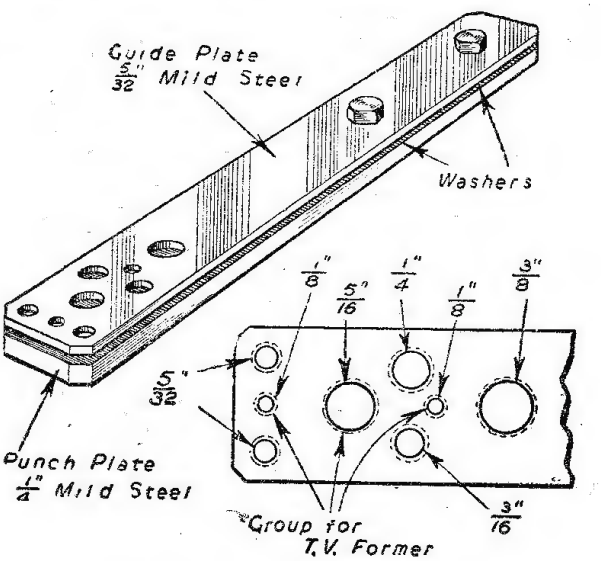
Holes can be arranged in any combination, such as ½in.—5/16in.—⅛in. for TV coil formers, and the holes then punched in the correct relation to one another.

When using this device the punchplate should be well supported in line with the punch on a good solid piece of metal arranged to project sideways from the vice.

There should be no difficulty in producing good clean holes, and one or two good blows with a hammer on the punch should be sufficient for any size hole.



How the punch is used on the chassis.



Details of construction of the punch.

R.S.G.B. CALL BOOK

THE Council of the Radio Society of Gt. Britain has decided to publish, towards the end of this year, an "R.S.G.B. Call Book," containing the call signs, names and addresses of licensed amateurs in Great Britain, Northern Ireland, Isle of Man, and the Channel Islands.

Any licensed amateur who wishes his call to appear in the first edition is asked to write his full call sign, name and address on a postcard and send it to:

Mr. J. P. P. Tyndall, 174, The Drive, Ilford, Essex.

Postcards cannot be acknowledged, but for changes of address to appear in subsequent editions notification of receipt will be sent. Non-members of the R.S.G.B. are asked to send changes of address direct to Mr. Tyndall on a prepaid postcard.

An announcement with regard to details of the publication of the first edition will be published in these pages in due course.

Using Multiple Valves

Hints on Modernising Old Receivers and Building New Experimental Circuits

By W. J. DELANEY (G2FMY)

THERE is a wide range of multiple valves now available in both surplus and new ranges, and in view of the increased purchase tax any scheme designed to save valves is obviously worth while. Generally, valve economy means cutting down the efficiency of a circuit, but by making use of a valve of the type which contains two or more assemblies in a single glass envelope it is possible to use a single valve unit for two or more stages without loss of efficiency—indeed, in some cases it may even be possible by doing this to improve the performance.

The types of valve referred to are generally those of the frequency-changing type (except those which have both sections internally inter-connected), single and double diode, triodes, and double triodes.

Double Triodes

Dealing with the latter class first, it will be seen that these may be used in re-designing or "hotting up" an old receiver or in building a new one. In the case of an old set it may be found that, say, the detector or L.F. valve is in need of replacement. If a modern double triode is purchased instead of the necessary single triode, the wiring may be modified so that the replaced valve and the next stage are both incorporated in the single valve and thus a spare triode is provided, should it be needed for replacement. The receiver may consist, for instance, of H.F., detector, L.F. and output stage. The detector or L.F. may have gone, and the two stages are, therefore, incorporated in the single stage so that a double triode may be used to supply both stages. In building a new receiver of this type the same idea would, of course, be used, and it may be found that the shorter inter-stage wiring which results by using one valveholder for the two stages will enable a more stable circuit to be built.

Amplifiers

In the case of amplifiers, either P.A. or domestic, the double triode may also be found extremely useful. The popular Williamson amplifier, for instance, may be built with one double-triode fulfilling the function of the two separate input stages, whilst another similar valve may be used for the first push-pull stage, thus reducing the actual number of valves in that amplifier to only four instead of six. This also enables a smaller chassis to be employed, cuts down wiring difficulties, and often produces better stability. There is, of course, the drawback that if one section should fail a replacement for two stages has to be obtained, but over the long run there is an obvious economy in using the double valve.

Frequency Changers

Some valves of this type consist of a triode and a pentode not internally connected, and it is possible to use one of these valves for an H.F. stage, followed by a rectifier, but care must be taken that the valve is not of a type wherein provision has been made for intermixing the electron stream. Such a valve would, of course, lead to all kinds of trouble if an attempt were made to use it for two separate stages, such as H.F. and detector. An experimental amplifier has been built, using the pentode section as an input stage, with the triode functioning as phase inverter, and an efficient tone control circuit may be included with the pentode valve without losing too much amplification.

Diode-triodes, etc.

The diode-triode is, of course, a typical example of a multi-valve used for separate functions, as it is usually employed with a diode as rectifier, followed by the triode section as L.F. amplifier, and if two diodes are included in the valve the second diode is generally used for providing A.V.C. voltages. It is not, of course, essential to use this type of valve in a superhet, and the keen experimenter might like to try the effect of using a double-diode-triode with the two diodes operating as a full-wave rectifier in a straight receiver. In the American range of valves there may sometimes be found a type in which a pentode is combined with a diode, the latter being designed to withstand mains voltages and it is sometimes incorporated in A.C./D.C. receivers, providing the necessary half-wave rectification of the mains supply on A.C. As a point of interest, in an A.C./D.C. receiver which has been built round one of these valves used in this manner, and the valve has failed, if a replacement cannot be obtained the circuit should be modified so that a metal rectifier replaces the diode section of the valve.

Class B and Q.P.P.

Some readers may have an old receiver lying idle in which a Class B or a Q.P.P. valve is employed. These valves were double triodes and double pentodes, and if the valves require replacement separate valves may be used if it is not desired to change the circuit, but if the receiver is being redesigned, and the valves are in good order, then they may be used as separate stages in the manner just described, ignoring the Class B or the Q.P.P. feature. The only difficulty which might arise here is in the use of the two pentode sections of the Q.P.P. valve. It will generally be found that if these are used for two separate L.F. stages the output from the first will be too much to be handled by the second, and therefore there should be a reliable volume control between the two sections to take care of powerful signals. The high gain may be useful for weak signals.

"Modern" Radiogram Control Amplifier

An Extra Unit for This Popular Receiver or any Similar Circuit

By R. HINDLE

MANY who build the "Modern" or similar amplifier will wish to use it with a tuner chassis already available. They will require a subsidiary audio-control chassis giving gain and tone controls operative on either radio or gram input and, if the recommendation to avoid all controls on the main amplifier as was done in the case of the "Modern" amplifier is followed, mains switching. The following is a unit designed expressly for this purpose.

Some constructors of the "Modern" superhet tuner will find it more suitable for their cabinet layout to use the unit now being described in place of the subsidiary tone-control unit included in the tuner design. In this case they will need to omit the audio amplifier stage from the tuner, connecting the output coaxial lead to the point previously connected to the volume control. The controls on the tuner will then be tune, wavechange and on/off switch, and a volume control without switch will be used on the control amplifier in place of the one specified in the list of parts. An additional power socket to supply the heater and H.T. voltage to the control amplifier will have to be provided either on the main amplifier or the tuner; only a three-way socket and cable is needed if switching is carried out on the tuner.

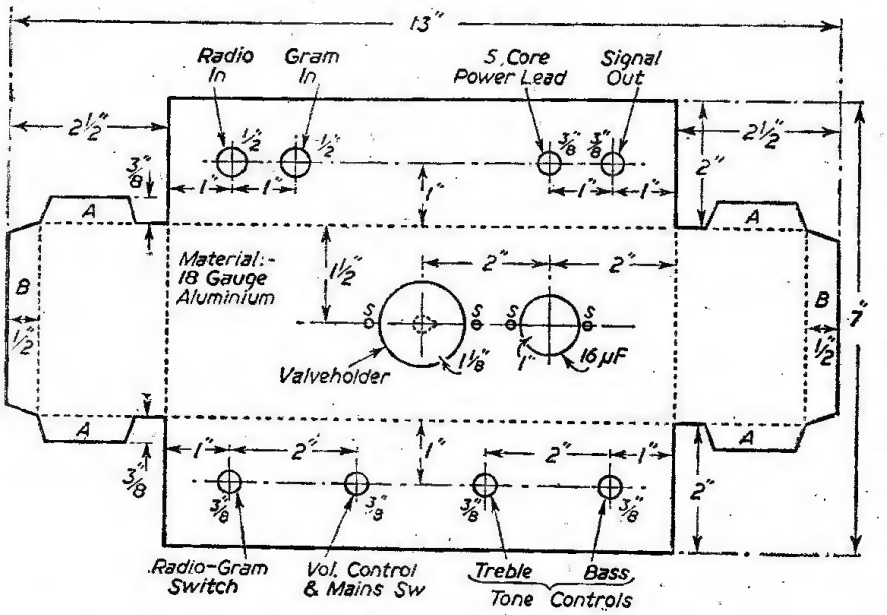


Fig. 2.—Chassis layout and drilling data.

The circuit used is similar to the audio amplifier circuit of the original tuner and is given in Fig. 1. The same wide-range treble and bass controls are provided. This circuit does not give sufficient gain for the very low output pick-ups that some quality enthusiasts use, but is adequate for the more normal variety of modern pick-ups giving upward of .05 volt and is suitable for crystal as well as the armature type. Any input filter recommended by the particular pick-up manufacturer (as in the case of some crystal pick-ups) should be incorporated in the chassis between the gramophone input socket and the radiogram switch where it will not affect radio reproduction. The purpose of the audio stage is, of course, mainly to make up for the loss inevitably introduced by a tone control network.

LIST OF COMPONENTS

R1 : ¼ MΩ potentiometer with switch.
R2 : 10 KΩ, ½ watt.
R3 : 47 KΩ, 1 watt.
R4 : 1 KΩ, ½ watt.
R5 : 100 KΩ potentiometer.
R6 : 100 KΩ, ½ watt.
R7 : 1 MΩ potentiometer.
R8 : 10KΩ, ½ watt.
C1 : .1 μF 350v. wkg.
C2 : 50 μF 12v. wkg.
C3 : 16 μF, 350v. wkg.
C4 : .25 μF, 350v. wkg.
C5 : .003 μF, 350v. wkg.
C6 : .02 μF, 350v. wkg.
C7 : .005 μF, 350v. wkg.
C8 : .02 μF, 350v. wkg.
Valve : 6SJ7.
Sw. 1 : 2-pole, 2-way rotary.

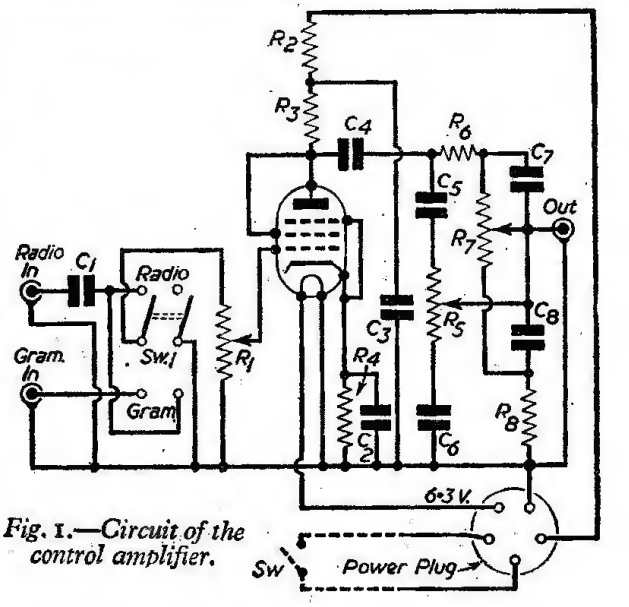


Fig. 1.—Circuit of the control amplifier.

Construction

The chassis used measures 8in. x 3in. x 2in. deep and is shown in the "flat" in Fig. 2. The position of the holes is indicated. The size of the holes will be determined by the particular components used, but the size for the original components is indicated. The direction in which the octal valve-holder points is also shown. Soldering tags for earth connection are required on the holding-down bolts in the holes indicated by the letter "S," and care should be taken to ensure that a good, clean electrical contact is made. The aluminium is folded so that the markings as given are inside the chassis. Flanges marked "A" are bent upwards and go inside of the front and back pieces to which they are bolted or riveted, giving neatness and strength to the corners. Flanges marked "B" are bent outwards to form fixing flanges.

Avoid tag-boards by connecting resistors and condensers direct to the major components and valve-holder tags. In this way hum pick-up will be minimised. It will be realised that the part of the receiver built on this chassis is most vulnerable to hum pick-up and, as it is not included in the feedback loop of the main amplifier, automatic cancellation is not available. Screened leads should be used for pick-up and tuner to control amplifier and from control amplifier to main amplifier. Coaxial plugs and sockets are used and the most convenient and satisfactory link is coaxial cable.

Building and Buying S.W. Receivers

Points of Interest in Receiver Design and Construction

By A. W. MANN

AMONGST the readers of this journal there are perhaps some who are contemplating the purchase of a second-hand communications type receiver.

In the second-hand market, there are bargains to be had. There are also reputable firms who specialise in the overhaul and realignment of second-hand communication receivers, which are later advertised for sale. As these firms handle only the best types and do not offer obsolete models, the prospective buyer is assured a fair deal.

The same applies to most of the private advertisers, especially in the case of post-war models.

In pre-war years, however, a considerable number of American makes were sold in this country. Amongst them are quite a lot capable of good service and for which the original types of valves are still available.

There are some makes which have, over a period of years, been redesigned and improved, the valves used being of a more up-to-date type.

The manufacturer, in advertising his products, usually follows the trade name with a type number. Unfortunately, some private advertisers who wish to dispose of a receiver made by one particular firm, do not quote the type number at all.

This may or may not be in good faith, according to the individual. The prospective purchaser who takes too much for granted and who sends cash without making inquiries, may find that he has one of the later pre-war models, and a good one, or on the other hand that he has bought a much earlier model, with the result that at a later date it may be difficult to obtain spare valves of identical type. He may even be dismayed to find that the valves he requires are no longer manufactured.

Rather than clinch a deal for what appears to be a good bargain, the prospective buyer would be well advised to obtain the fullest particulars as to type, year of manufacture, full specification, and the position so far as the spare valves situation is concerned.

The reply to his inquiries may be satisfactory in which case he can go ahead.

Replacement Alternatives

Suppose, however, that he is informed that the model is sufficiently obsolete to make the replacement of the valves difficult. My advice is take no further action.

It may be that a list of modern valves are quoted along with the suggestion that they can be used to replace the original types around which the receiver was designed. In the writer's opinion such an idea should not be entertained.

Modern valves, being much more efficient, instability is to be expected. As a result, quite a lot of experiment and modification might be necessary, and in the end, the results may well prove that neither the time and money expended has been justified.

Complaints are sometimes heard over the air that while the receiver in use is satisfactory, the user is handicapped through lack of an instruction book, service data and theoretical circuit diagram. If possible the user should at least obtain the latter.

Here again we have recognised firms who cater for our requirements. The receivers are of various types, some for A.C. mains operation and others for use with battery and accumulator.

Lists, catalogues and advertisements give a considerable amount of detail, and the receivers are graded in price according to their condition. Such receivers are sold in their original form. Thus we know exactly what to expect according to the price asked.

Quite a lot of this apparatus has been sold after modification by firms who specialise in such work. Thus a reliable job has been made available for use straight away, at an extra charge.

A considerable number of these receivers have been bought by enthusiasts for modification purposes with a particular purpose in view. In a number of instances the work, as described by various writers, has been carried out successfully.

Unsuccessful Modification

As is always to be expected, a departure from recommended procedure and the introduction of

original ideas, has at times resulted in failure, due to complications which, owing to lack of knowledge, could not be overcome.

These include conversions from battery to mains operation and the use of A.C. type valves; band spread—followed by attempts at realignment by ear; and the incorporation of built-in power supplies, etc., on original lines. Had the individuals realised their limitations and followed published modifications, as carried out successfully by others, satisfaction would in all probability have been obtained.

The apparatus which has been modified under the above circumstances is of little value to anyone. It is obvious, therefore, when contemplating the purchase of modified ex-Service receivers, that full details as to the success of the modifications should be obtained, together with a copy of the theoretical differences as compared with the original. Not only will the genuine advertiser benefit by the opportunity offered him to provide full details, but the buyer will avoid the risk of paying for the dabbler's mistakes.

Home Construction with a Difference

In the days of KDKA, the writer, like many others, built short-wave receivers in which were incorporated modified and unmodified broadcast receiver components.

The reasons why this procedure was followed was because specialised components as we know them to-day were few, and very expensive. Under present-day circumstances, when highly efficient components (especially tuning condensers which are silent in operation on the highest frequencies) are obtainable for a few shillings, it is surprising to find that a considerable number of beginners follow the same procedure.

The idea is, of course, to explore the short-wave field at the minimum of expense, with a view to finding out if further expense is justified. Such methods of procedure are a waste of time, and the results obtained will prove far from satisfactory.

If a manufacturer produced a short-wave receiver without any other consideration but that it should be sold at a ridiculously low figure, the people who bought it would soon complain because they could not get the results expected.

The manufacturer realises that in order to achieve the necessary standard of all-round efficiency his production costs must not be set below a certain figure. By adhering to this policy his clients get what they pay for, and in most instances expect.

Exactly the same thing applies to the home constructor of short-wave receivers. Unless he is prepared to invest a sufficient sum of money, in order to obtain components specially designed for the purpose he has in mind, he cannot expect to build an efficient receiver. There is no room for make-do and bodging in short-wave radio, and the sooner this is realised the better for the pastime as a whole.

The writer follows with interest the monthly DX logs as published in various short-wave publications, and is especially interested in those sent in by users of home-constructed receivers. I would not believe for one moment that these DX operators use junk receivers and haywire assemblies. Undoubtedly they have in the first place used suitable components, taken care with the layout and wiring, and by their reports give convincing proof that the results achieved fully justify the outlay.

Proof

Money invested in first-class components is well spent. Proof of this is found in the fact that the writer has in use Eddystone and Raymart components dating back to some years before the war. Post-war products of the same types are also to hand, and were chosen because of the long and satisfactory service given by those of pre-war days which are still in use.

Ways and Means

There are ways and means whereby the costs of the first short-wave receiver can be kept comparatively low. Chassis consisting of two side runners, with a plywood top can be used, and either the top or underside covered with aluminium sheet. Such chassis are easy and cheap to make. Chassis type valve-holders can be used, and are at present cheaper than the pre-war baseboard type.

While low-loss principles of construction should be the rule, there is no need to carry it to extremes. This, in my opinion, applies especially in the case of valve and coil holders respectively.

While it is admitted that the ceramic types are the most efficient from the low-loss point of view, it does not follow that if the paxolin type is used, an inefficient receiver will be the result. The Services incorporated a considerable number of the latter type in their equipment.

I have referred in previous articles to the inadvisability of using old valves. Taking into account the comparative cheapness of ex-Service valves of all types, and which, by the way, had to conform to definite standards of efficiency or be rejected, it is surprising that some experimenters and beginners adhere to this practice.

Poor Results

Much has been written about dead spots in tuning, lack of regeneration, low-level amplification and the like. In many instances there is no doubt but that the root cause of such troubles could be traced to the use of valves whose bases should long ago have been used as coil formers.

It is quite possible to wind efficient coils on old discarded valve bases. The windings of these may be close wound. Such coils will give good service until the highly efficient commercial types can be obtained.

Always Remember

You may be a beginner with very little practical experience, but at the same time an avid reader of magazines of short-wave interest. In time you will accumulate a considerable amount of reference material in the way of circuits, layouts and technical information.

Thus you will have on hand the work and advice of many authors upon which to draw, and apply in practice. Not only what they think, but what they have proved by practical test and experiment to be the correct procedure to follow. Whatever personal preferences and ideas they may have individually, they have one thing in common. They do not use junk components or expect those who attempt to duplicate their work to do so.

THE "ALIGN

A Servicing Aid Using

Described by

THE frequency-modulated oscillator (or wobbulator) and oscilloscope is, of course, the recognised instrument for aligning the tuned circuits of radio sets. Many repair shops are, unfortunately, not equipped with these costly instruments and even when they are, more often than not the separate units just form an imposing decoration of the "Lab." Connecting them up and having to change over the various leads when the signal generator or 'scope is to be used, or reverting from wobbulator to aerial for reception test seems to take too long for the harassed service engineer. Out of long experience, a most useful gadget was designed, utilising ex-Government surplus units. Its cost will therefore be only a fraction of the price of commercial instruments, while its simple operation should make it most desirable for any service or test department.

What It Does

The unit was modified to carry out the following operations by the setting of two switches:

1. Supply I.F. frequencies variable between 440-480 kc/s.

2. Give indication of resonance on 3in. cathode-ray tube.

3. Supply calibration frequencies of 600 and 7,500 kc/s plus harmonics.

4. Supply frequency-modulated carrier of approx. 1,350 kc/s for visual alignment of R.F. and I.F. stages.

5. Give visual indication of hum in sets, showing amplitude and frequency and effect of improved smoothing. Especially useful in noisy workshops where hum might otherwise pass unnoticed!

6. Connect aerial direct to set for reception tests. No unnecessary and untidy leads!

Construction

It is best to strip down the unit 198 except for the following:

Leave in place:

The ganged switch on right-hand side. The controls on front panel marked "Brilliance," "Focus," "2M" on-off switch, all the valveholders and the 0.1μF. condensers on the same panel. Also the two 0.1μF. 2,500 V. condensers on the paxolin strip at the rear left side of set. Then the four 4μF. condensers and the resistors on the panel beneath the C.R.T. Leave in place the two Pye sockets as shown in Fig. 3a.

LIST OF PARTS

Indicating unit 198 or 73 with VCR138, 4 SP61s, etc.
Two E.H.T. rectifiers J50.
Mains transformer sec. 350-0-350V. 60 mA., 6.3V. 3A., 5V. 2A.
Small variable condenser 80 pF with long spindle and pointer.
Potentiometers with insulated spindle and knobs 1,000 and 5,000 ohms.
Rectifier valve 5Z4 or similar.
Heater transformer 4V. 1A. for cathode-ray tube, 2,000 volt test (if no such winding is on mains transformer).

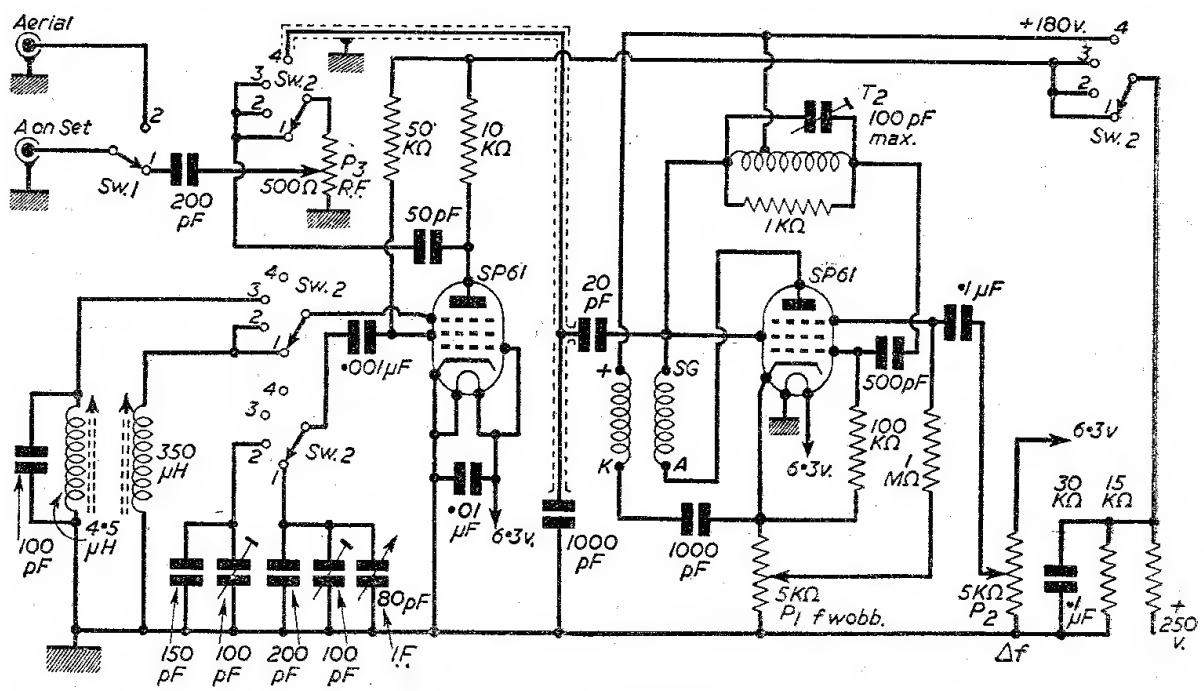


Fig. 1.—Circuit of the wobbulator section.

NOSCOPE"

the 198 or 73 Unit

PETER LEWIS

Remove :

All wiring, the transformers, the various coils (which must be rewound), the 18-point connector, the controls marked " 8M," Gain, " B-amp." All the controls at rear left-hand side. Also the 0.1μF. 2.5kV. condenser (front left) and trimmer from rear of unit.

Modify :

The switch " HT " by cutting off the lugs actuating the spring which returns lever to mid-position.

Remove and strip down the coils, rewind the I.F. coil with 140 turns 34 S.W.G. in short multi-layer fashion to give an inductance of 350μH. (Fig. 5a). The other coils are rewound as follows : 75 turns of 34 S.W.G. single layer, close wound, tapped at 50 turns (Fig. 5b).

On the other former 100 turns 34 S.W.G. and on top of this layer interleaved with waxed paper another 100 turns of the same wire wound in the same direction. Dope the coils with wax or polystyrene solution to keep the wire in place (Fig. 5c). S.W. Coil : 20 turns $\frac{1}{4}$in. dia. Fig. 5d.

Assembly

Fix the mains transformer in position at the rear of unit (Fig. 3b). It might be necessary to provide a metal screen around it if the external field causes any deflection of the cathode-ray.

If used, the separate heater transformer should be mounted immediately behind the C.R.T. base. The two J50's are mounted on the panel with the two 0.1μF., 2.5 kV. condensers. The third 0.1 μF. is placed just behind the focus control.

A metal plate 3$\frac{1}{2}$in. x 3$\frac{1}{2}$in. (Fig. 3c) is made to cover the hole left by removal of the 18-pin connector, and an 80 pF. variable condenser is mounted on a bracket so that its spindle protrudes through the $\frac{1}{4}$in. hole in the plate. The 100 pF. trimmer is mounted nearby. (Trimmer is already in place on the 73 unit.) Fix a potentiometer 1 kΩ in place of control " 8M " and one of the black volume

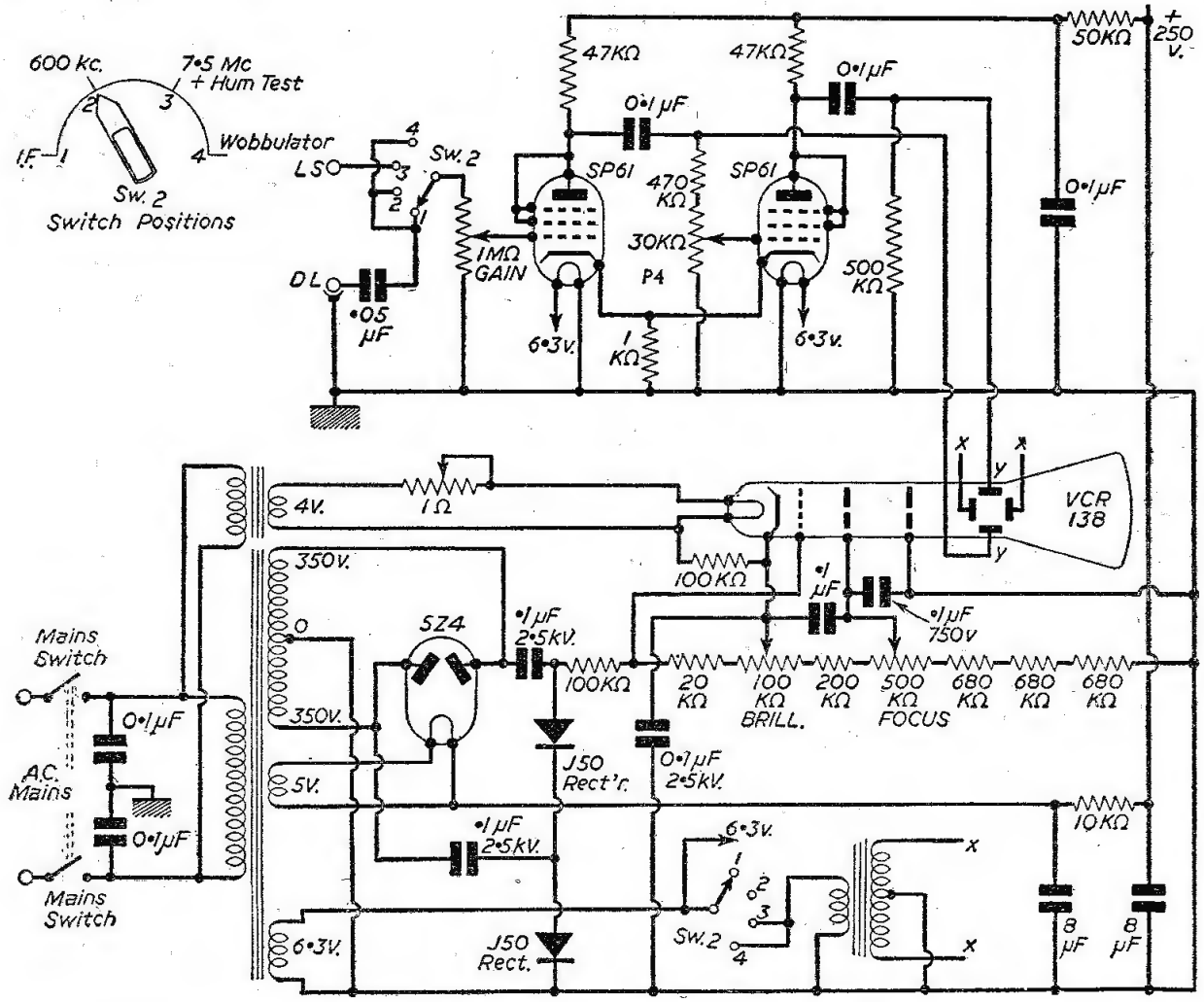


Fig. 2.—Tube and power supply circuits.

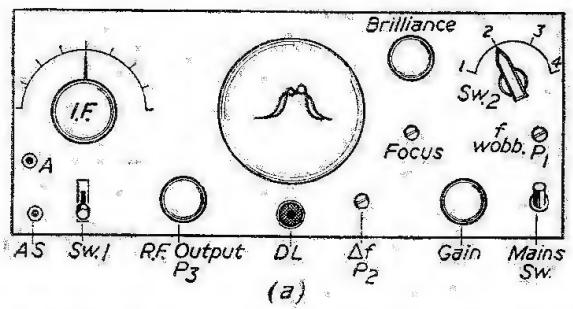
controls (marked "Shift") instead of the wire-wound potentiometer marked "Gain."

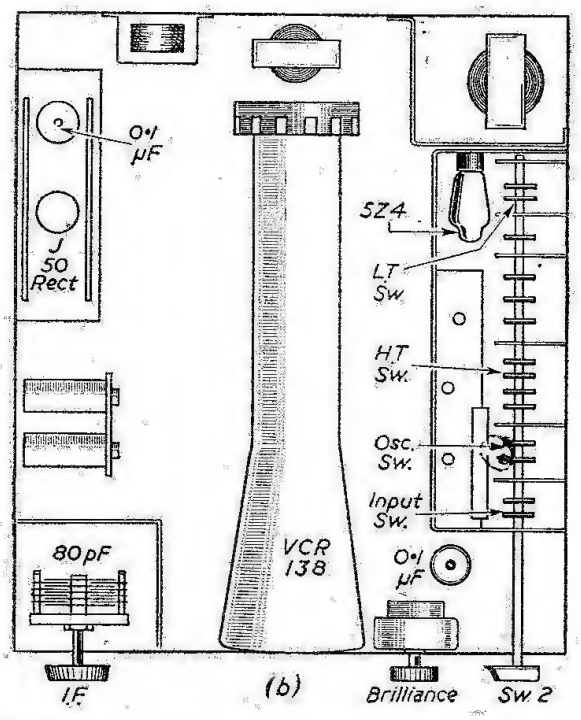
Replace control "B-amp" by a 5 kΩ potentiometer. In case the rectifier valve does not fit in the space formerly occupied by the 6H6, the socket for the 5Z4 must be mounted on a bracket beside the ganged switch, as shown in Fig. 3b. The A.F. transformer is mounted at the rear of unit wherever its field will cause no deflection of the C.R. beam.

One of the existing transformers in the unit can be used with about half of the primary turns removed to give higher ratio (Fig. 5). The mounting for the coils is also beside the switch, as seen in Fig. 3b and 5d. The two wobbulator coils should be at right-angles to each other, and the other coils screened. Coil b is fixed to a paxolin strip attached to side of mount.

Pieces of white card or ivorine should be fitted to the controls to be calibrated when the instrument is working. For the I.F. control a size of 2½in. x 3½in. is needed; for the ganged switch, 1½in. x 2½in., and for the gain control, 1½in. x 1½in.

After these mechanical preparations the wiring and calibration of the instrument can be carried out.





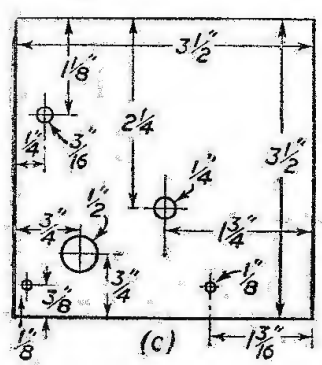


Fig. 3.—Details of the layout, etc., showing components which are left in place.

Wiring

The wiring should be carried out according to the diagram, giving especial attention to keeping H.F. connections as short as possible and very rigid, and using very good insulation on all E.H.T. leads. H.T. and E.H.T. potential dividers or smoothing resistors are mounted on the paxolin strip beneath the C.R.T. All earthing points of one stage are taken to one point, pin 6 on the valveholders, and thence to chassis. One side of the heater winding is earthed. The "live" side is used to modulate the I.F. oscillator and supply horizontal deflection for the C.R. beam. The A.F. transformer steps up the voltage and provides a symmetrical supply to the X-plates. On position 1 and 2 of the ganged switch the A.F. transformer is cut off from the supply. In position 1 the I.F. oscillator is operating. On position 2 the same valve is used to generate 600 kc/s; and on position 3 7,500 kc/s are supplied. In this position the input to the Y-amplifier is taken from the loudspeaker leads of the set under test, and the X-plates receive a 50 c/s supply, so

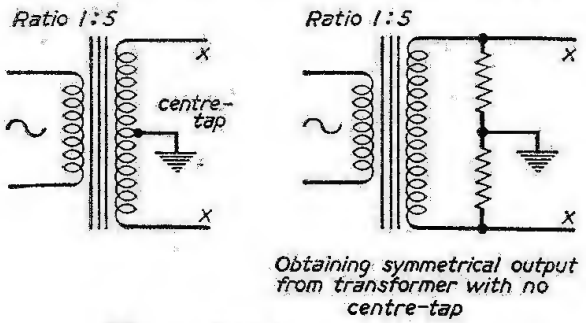


Fig. 4.—L.F. transformer data.

that any hum from the set will show up as a horizontal figure of eight if the hum frequency is 100 c/s; 50 c/s will show up as a loop. On the fourth position of the switch the wobbulator is brought into operation and the input of the deflection amplifier is as in position 1 and 2 again taken via Pye-plug and cable to the diode load resistor of the set under test. The switch beside the socket (S.W.) for the lead of the "Aerial" and "Earth" terminals of the receiver allows this lead to be connected to the oscillators in the unit or to an outside aerial.

E.H.T. for the tube is generated by a circuit similar to the Westeht system. H.T. is smoothed by the four 4μF condensers and a 10,000 ohm resistor. Additional decoupling is provided for the oscillators. The horizontal deflection amplifier uses two S.P.61s wired as triodes in push-pull, phase-shift being obtained by feeding a small portion of the signal from the anode of the first valve to the grid of the second. Amplitude is adjusted by means of the 20 kΩ potentiometer mounted on the valve panel.

The I.F. generator utilises another S.P.61 in which the tuned circuits are switched between suppressor grid and chassis in a Transitron circuit. Thus no tickler-coil is needed. For I.F. and 600 kc/s the same coil is used and the capacitors are switched; for 7,500 kc/s a trimmer tuned S.W. coil is used, Fig. 5d. R.F. is taken from the anode via 50 pF, and changes of load have negligible effect on frequency. The wobbulator also makes use of a VR65 (S.P.61), and has proved to be very effective and stable in operation. The operating frequency can be varied slightly by adjusting D.C. bias by means of a potentiometer. Frequency deviation is controlled by the A.C. voltage fed to grid 1 through potentiometer 2. These controls can be preset and need not be touched after initial adjustment. Trimmer t2 across coil b should be set for minimum current through the valve. The centre frequency obtained with the coils described was approximately 1,350 kc/s, but any other similar frequency can be used as long as there is no strong station on it. Strong harmonics are produced and the unit has been used for aligning S.W. receivers, the tenth harmonic (22 m.) being strong enough to give a clear indication.

The capacitive attenuator in the anode of the wobbulator prevents changes in the load from affecting the oscillator. A fine control of the R.F. output is possible by means of potentiometer P3. Normally this output should be as low as possible in order to render the A.V.C. in the set inoperative.

Check-up

On completing the wiring according to the diagram a careful check of all connections is advisable. The voltages at the socket of the C.R.T. should be measured before the C.R.T. is inserted. A high-resistance voltmeter must be used. Note that in this circuit the anode of the C.R.T. is earthed. The grid of the C.R.T. should show the highest negative potential, the cathode is about 10-50 volts more positive according to the setting of the "Brilliance" control. The first anode will be about 250 volts positive in relation to the cathode, depending on the setting of "Focus" control. After switching off and discharging the condensers the C.R.T. can be inserted and the unit tested. Make sure that the filament voltage of the C.R.T. when warmed up is exactly 4.0 volts. Switch to position 3 and slowly advance "Brilliance" control clockwise. A horizontal line should appear across the screen and the "Focus" control can then be adjusted. Advance "Gain" about half-way and touch the input terminal; a loop will appear owing to hum pick-up.

To set push-pull amplifier for symmetrical output switch to position 1, apply 1-4 volts A.C. to input terminal and adjust "Gain" for trace 1in. long, making sure that potentiometer 4 is set to zero. Then slowly advance potentiometer 4 until the length of the trace is exactly doubled.

Test and Calibration of Oscillators

Turn switch to position 1 and aerial switch upwards, connect a receiver to the aerial cable from the unit and tune set to 900 kc/s. (333.3 m.) (Milan 1), connect the amplifier input to the diode load in the set and try to receive signal by adjusting the I.F. tuning on the unit by the 80 pF condenser or the 100 pF trimmer. The pointer on the 80 pF tuner should stand slightly to the left of centre position. Providing the calibration of the receiver is accurate, this position can be marked 450 kc/s. In the same manner adjust 880 kc/s (check with Welsh Reg.), 940 and 960 kc/s.

The 600 kc/s oscillator can be checked against Lyons (602 kc/s) and on the S.W. band the second harmonic of the 7.5 Mc/s frequency should fall on WWV (15 Mc/s).

Of course, if an accurate signal generator is at hand or can be borrowed, calibration becomes very easy indeed.

Test and Calibration of Wobbulator

On switching to point 4 the wobbulator should start working and a strong signal should be obtained with the attenuator set half-way. Tune the receiver connected to the unit between 900 and 1,500 kc/s and listen for the signal or watch for it on the 'scope. Should no signal be found, check whether unit is oscillating by connecting a high-resistance voltmeter to point "T," that is the tapping on the phase-shift coil of the wobbulator.

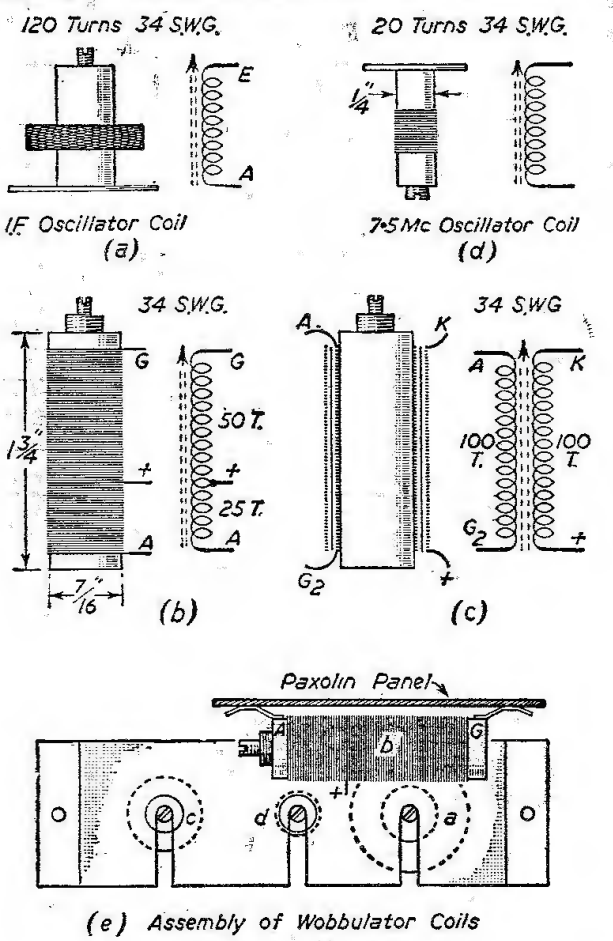


Fig. 5.—Details of the coils.

About 180 volts should be at this point. Adjust potentiometer 1 until a sudden increase in voltage occurs and then adjust trimmer T2 for maximum voltage. The bandwidth covered can be set by potentiometer 2, and this might alter the frequency slightly. Make a note of the final working

frequency, and make sure it is not too near that of a strong broadcast station or interference will result.

The figure on the 'scope will generally show two peaks as the flyback is not suppressed. The tuned circuits of the receiver should be adjusted to give a symmetrical pattern. Owing to the slight delay in the voltage build-up in a tuned circuit the leading edge will be slightly lower. Fig. 6a shows the correct trace.

Fig. 6b gives a picture of a set which is unstable and on the verge of oscillation. Fig. 6c was obtained from a set in which a volume-control of too low a value (50 kΩ) had been used.

Make sure that all the mica condensers used in the oscillatory circuits are really beyond reproach, as leaky condensers will make operation most temperamental!

The Alignoscope at Work

Connect set to unit, Aerial and Earth terminals, and "DL" to diode load resistance (Fig. 6d).

Set switch 1 to position 1 and switch 2 to position 1, adjust I.F. to required value, tune receiver to approximately 550 kc/s and short-circuit oscillator section of tuning condenser. Turn potentiometer 3 and "Gain" up until a vertical line ¼in. long is obtained, and align I.F. transformers for maximum length of trace. After this set I.F. trap (if fitted) for minimum deflection. Turn switch 2 to position 2, remove short-circuit from oscillator of set, and align set at 600 kc/s. Now switch to position 4 and tune in to centre response curves on 'scope. Adjust I.F. and R.F. trimmers for correct figure. See that frequency indicated on receiver dial corresponds with that of the wobbulator. Otherwise adjust by setting oscillator trimmers in the set and re-aligning the R.F. trimmer. Receivers with variable selectivity must be aligned with the selector in the "narrow" position and then checked accordingly on "wide" to see whether response curve widens accordingly without becoming lop-sided.

For this kind of work the Alignoscope is indispensable!

For alignment on shortwaves the frequency of 7.5 Mc/s (40 m.) and 15 Mc/s. (20 m.) is used. Harmonics from the wobbulator are, of course, also available. As all indications are visible on the 'scope, the volume-control on the set can be turned down, thus causing less irritation to the other occupants of the workshop!

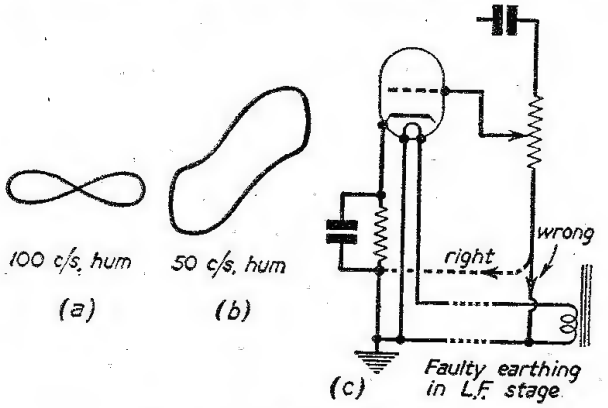


Fig. 7.—Hum tracing.

Test for Hum

Connect lead "LS" of 'scope to low-impedance output of set (secondary of output transformer). Set switch 2 to position 3, a horizontal line or very flat loop should appear on the 'scope with "Gain" turned full up. Undue 100 c/s hum will show as a horizontal figure of eight, and denotes insufficient reservoir capacity (Fig. 7a). Effect of added smoothing will result in a marked flattening of the figure.

An ellipse denotes 50 c/s hum pick-up due to faulty screening or earthing in the A.F. stages, cathode-heater short in a valve, etc. (Fig. 7b).

This method of hum-detection and its cure is especially valuable in noisy workshops where aural methods fail.

If, when turning up the volume-control, the hum increases, the fault is in the circuit preceding the control. If the loop widens on returning the volume-control to zero, a bad earth connection for the latter is indicated (Fig. 7c).

Hardly any trouble should be experienced in building this instrument, but its constant use in the workshop will save a lot of time while ensuring that every receiver tested on it is properly aligned and shows no sign of instability or hum.

This unit should soon have its place on the bench of every test and service department.

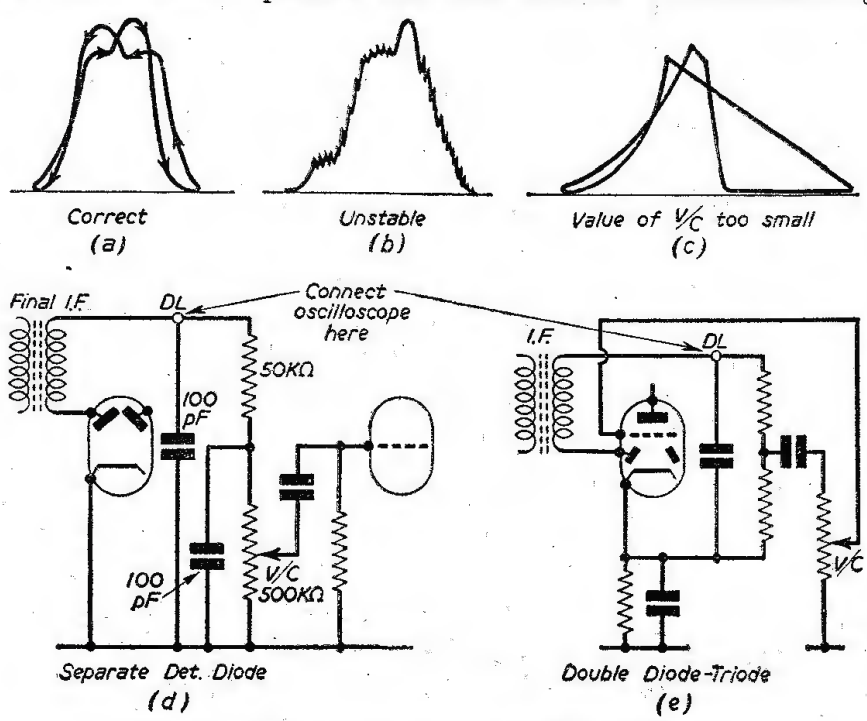


Fig. 6.—A.F. testing, showing typical oscillograms.

Hum Problems in Low-level Amplifiers

Overcoming a Difficulty in the Heater Supply of Modern Equipment

By GORDON J. KING

A HIGH-GAIN head amplifier is often necessary for microphone, or tape playback pre-amplification, and also where the output voltage obtainable from the generator source is insufficient to drive fully a standard power amplifier system. Most medium-quality moving-coil and crystal microphones deliver adequate output voltage, thus enabling connection to be made direct to the microphone input terminals of a standard amplifier; maximum output is realised at normal speech levels when the announcer is situated a few inches from the microphone. Owing to the diminutive output from the better quality microphones of the ribbon variety, a stage of high-gain head amplification is required between the microphone and the main amplifier. Again, the output from a good quality tape recording is usually very small and does not often exceed about 1 mV. This minute voltage is of insufficient magnitude to drive a standard amplifier for satisfactory tape playback service; also the attenuation caused by the inclusion of the tape corrector circuits further reduces the effective output voltage. It will be necessary, therefore, to introduce a stage of high-gain voltage amplification.

The Hum Factor

A head amplifier designed to have an amplification of between 100 and 200 times is usually sufficient to enable the main amplifier to be fully driven. The overall amplification is thus the product of the two amplifier gains, and at these low input levels when using A.C. mains to power the system special precautions are necessary in order to keep the mains hum at a minimum. Indeed, the usable amplification is governed by the ratio of hum to amplification. It has been proved by the writer that a large percentage of the hum is injected into the amplifier from the A.C. used to supply the heater of the first valve, and is a combination of three factors: emission from the heater to the cathode; capacitive coupling from the heater connecting leads and the valve heater to the anode and grid electrodes; and also to the slight leakage between the heater and the cathode. In order to eliminate completely the hum factor due to the above effects, it is essential to feed the heater of the first valve from a D.C. supply.

A Source of D.C.

A supply of D.C. for this purpose may be obtained from a low-impedance bridge rectifier circuit, and may be energised from a separate L.T. winding on the mains transformer, or a special heater transformer may be utilised. The voltage drop across the rectifier must be taken into consideration when computing the output voltage required from the heater transformer. This circuit arrangement is shown in Fig. 1. The very large capacity condenser shunting the heaters is necessary to rid the L.T. circuit of any ripple voltage, and may be a 6-volt working electrolytic type.

Alternative

An alternative arrangement for obtaining the D.C., and a system used by the writer to reduce the hum in a tape playback amplifier is shown in Fig. 3. It is clearly seen that the potential for the heater of the head amplifier valve is derived from the rectified H.T. voltage in the main amplifier. It will, of course, be appreciated that the total H.T. current of the amplifier is passing through the heater of the valve, and to ensure that the voltage across the heater is correct a valve must be selected that requires a heater current similar to the total H.T. current of the amplifier. The heater voltage is not so important, although it should be remembered that the voltage dropped across the valve will reduce the main H.T. voltage by the same figure. If it is desired to use a valve that has, say, a 22-volt heater at a current of 0.1 Amp., and the total current consumption of the amplifier is found to be 150 mA., the surplus 50 mA. may be passed through a resistor that is connected in parallel with the valve heater, R1 in Fig. 3. The value of R1 is readily calculated from the Ohms law formula: thus $R1=\frac{E}{I}$ where E= the heater voltage, and I=the surplus current, in the case illustrated the value of the resistor $R1=\frac{22}{0.05}=$ 440 Ohms. If on the other hand it was found that the current was only 90 mA., it would then be necessary to arrange the amplifier to pass an extra 10 mA. by shunting the main H.T. line by a resistor, R2, Fig. 3, of value $\frac{E}{I}$, where E=the

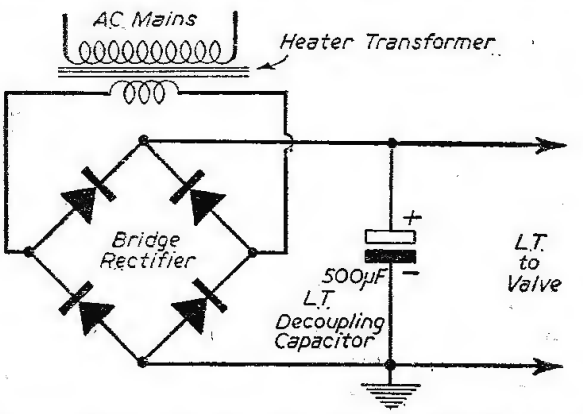


Fig. 1.—Method of obtaining D.C. for the first valve, using a Bridge Rectifier.

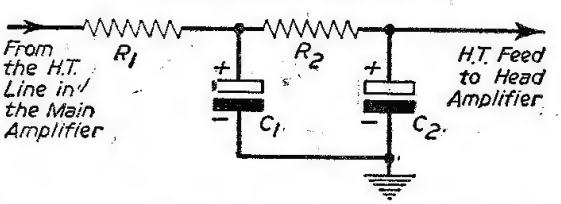


Fig. 2.—Circuit of the H.T. filtering.

main H.T. line voltage, and I=the additional current required to bring the total consumption to 0.1 Amp. (in this case 100 mA.—90 mA.= 10 mA. or 0.01 Amp). The wattage rating of the resistors may be computed from the formula $W=I^2 R$, where I= the current flowing through the resistor in Amps., and R=the value of the resistor in Ohms. Two electrolytic capacitors C3

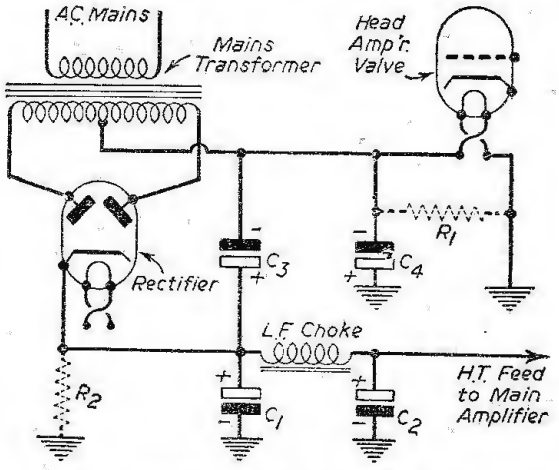


Fig. 3.—Another method of obtaining D.C. for the first valve.

and C4 are employed to decouple any ripple voltage that may be otherwise present in the L.T. line. The value of C3 should be at least 8 μF. and of a working voltage higher than the main H.T. voltage, C4 should be about 50 μF., and the working voltage should not be less than the valve heater voltage. In most instances a 50-volt cathode decoupling capacitor is suitable. Most high-fidelity amplifiers use a push-pull output stage bringing the total H.T. current to between 100 and 150 mA., thus rendering the system suitable for this type of L.T. feed. Breaking the H.T. circuit at the point indicated in Fig. 3 is very convenient, since one side of the valve heater may then be at earth potential. This method of obtaining D.C. for the head amplifier valve should not be used on amplifiers other than those employing an output stage that is biased to class " A " conditions, since the fluctuation of the H.T. current will vary the heater voltage of the valve continually, with dire consequences. Valves of the 12J7 and 12SJ7 class are very suitable for this mode of operation if sufficient H.T. current is available. A very satisfactory high-gain head amplifier employing a high Gm. television pentode, and obtaining the heater voltage by the above method, is in use by the writer, functioning in front of a standard amplifier which can now be used as a tape playback and microphone amplifier. Very high gains are possible from this type of valve with very good frequency characteristics.

High Tension Filtering

A smaller percentage of the hum may be caused by insufficient H.T. filtering for the first valve, and if the H.T. for the head amplifier is derived from the main amplifier H.T. supply, two stages of resistor—capacitor filtering should be used, keeping the values of C1 and C2 as large as possible, preferably 16 μF electrolytics, see Fig. 2. The combined value of R3 and R4 should be made approximately one-fifth the value of the anode load resistor, or greater if the supply voltage is sufficiently high. The total value of resistance may be calculated thus:

$$R1+R2=\frac{Ed\times 1{,}000}{Ic}$$

where Ed=the required voltage drop in R1+R2 and Ic=the cathode current of the head amplifier valve in mA.

Unwanted Coupling

Owing to the extended low-frequency response of a high-fidelity audio amplifier, the effects of hum due to electrostatic and electromagnetic coupling can present a serious problem when dealing with low level equipment. Electrostatic coupling is usually caused by the leads that are carrying A.C. being in close proximity to the signal input leads. Judicious component and circuit arrangement reduces this effect, which may be further minimised by the use of screened leads. These should be earthed at a common point, and care should be taken to ensure that they do not make random connection with the chassis, since the small potentials so produced will be greatly amplified, thereby increasing the residual noise of the amplifier. It should be borne in mind that screened wire has a considerable capacitance and serious attenuation of the upper frequencies is possible if long, high-impedance screened signal leads are used. These should be avoided wherever possible in favour of separate screened compartments.

Electromagnetic coupling is usually caused by the external field from the power transformer and choke embracing the low-level input transformer. A noticeable reduction of hum due to this cause can be achieved by screening completely the input transformer with mu-metal, and before finally securing to the chassis it should be oriented for minimum hum pick-up. It is advisable to construct the head amplifier on a separate non-magnetic fully-screened sub-chassis, and should be mounted well away from the power equipment. It should be wired very rigidly, using short leads; a busbar earth should be avoided and a common " grounding " point made available for the earth returns.

Books Received

RADIO CIRCUITS.

By W. E. Muller, M.A. (Cantab.), M.Brit.I.R.E. Third Edition. 120 pp., 64 illustrations. Published by The Trader Publishing Co., Ltd. Price 5s.

MAGNETIC TAPE RECORDING.

By P. A. Tarry, A.M.Brit.I.R.E. Fourth Edition. 70 pp., 12 illustrations. Published by Audigraph, Ltd., 74, Gt. Hampton Street, Birmingham, 18. Price 6s. 6d.

WIRELESS AND ELECTRICAL TRADER YEAR BOOK.

22nd Edition. Published May 22nd. 292 pp. Price 10s. 6d. (with a reduction to subscribers of the " Wireless and Electrical Trader ").

RADIO AND TELEVISION RECEIVER CIRCUITRY AND OPERATION.

By A. A. Ghirardi and J. R. Johnson. 669 pp., profusely illustrated. Published by Rinehard Books Inc., 232, Madison Avenue, New York, 16. Price $6.50.

EX-R.A.F. INDICATOR UNIT TYPE 62. Containing VCR-97 CRT with mu-metal screen ; Xtal unit and valves 16/VR65 (SP61), 2/VR54 (EB34), 2/VR92 (EA50), etc., etc. ; two deck chassis in metal case, 18 x 18½ x 11½ins. New condition, **67/6** each. Plus 7/6 packing and carriage.

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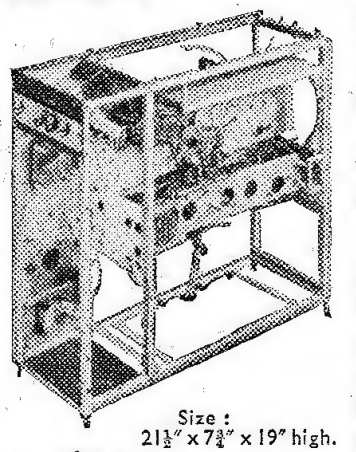
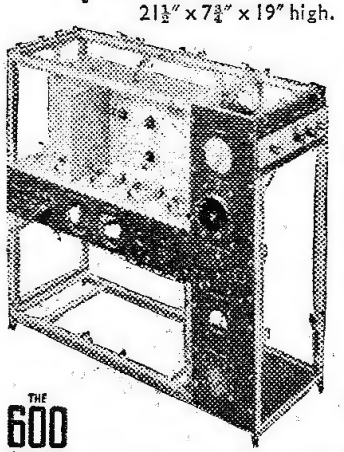


Size : 21½" x 7¾" x 19" high.



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4 100 ohm 1-W Resistors
2 600 V 1 mf. Condensers.
9 High-voltage Condensers 0.001 to 0.01.
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2 H.F. Chokes.
1 Relay Switch.
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QUALITY STRAIGHT THREE

An A.C./D.C. Receiver With A.V.C. and Negative Feedback

By W. GORHAM

THE receiver is a conventional straight three stage plus rectifier, with a few refinements to improve the quality, and designed for operation on A.C. mains. The author prefers this type of supply to the A.C./D.C. types. By use of ex-Government valves and components the original model was built for under £4.

The Circuit

Great liberties can be taken with the layout and wiring, but it is better to use short leads and an "in line" layout for stages.

The first stage, a conventional R.F. amplifier, is tuned by C2, one half of the twin-gang tuning condenser. R1 acts as a combined volume and "throttle reaction" control, first varying the bias on the grid of V1 and altering the damping on the aerial circuit.

After amplification through V1 the signal is fed via the H.F. transformer, a Wearite PHF2 coil, whose "hot end" of the coupling winding is decoupled to earth via C8, to the diode of V2 via coupling condenser C9. The transformer is tuned by the second half of the twin gang C3, the "bottom end" of the secondary winding being returned to the cathode of V2. R4 and R5 act as the filter and diode load respectively, and C11 is the R.F. decoupling condenser.

A.V.C. is taken from the junction of R4 and R5 via R7, decoupled by C12, to the "bottom end" of the grid winding of the PA2 aerial coil. If the reader feels that A.V.C. is not required on his model, just omit C12 and R7 and return the bottom end of the grid coil to chassis.

The A.F. feed is also taken at the junction of R4 and R5 via C10 to the grid of the triode. R8 is the grid resistor. Bias is obtained by R6 in the cathode circuit. It will be noted that this resistor is not "by-passed" by the usual condenser. The author found that by omitting this condenser a good degree of negative feedback was obtained across the resistor and so improved the quality of the receiver. By the use of a diode for detection the receiver had the crisp, clear tone of a superhet receiver as against the harsher tone from the usual "leaky grid" detector. The other diode is not used, and is connected to chassis.

After amplification of V2 the detected signal is passed into the anode circuit and developed across R9, its load resistor, which is decoupled by R10 and C13. The signal is fed via coupling condenser C14 to the grid of the output valve, amplified through this valve and passed via the output transformer to the speaker. In the diagram it will be noted that a condenser is shown in dotted lines between chassis and grid of V3. Its purpose is to modify the tone of the receiver and in the author's model a value of .001 μF was found to give the best results.

The Power Pack

This is a conventional half-wave rectifier circuit employing a 6X5 with its anodes "strapped." The anodes are fed direct from the mains, one side

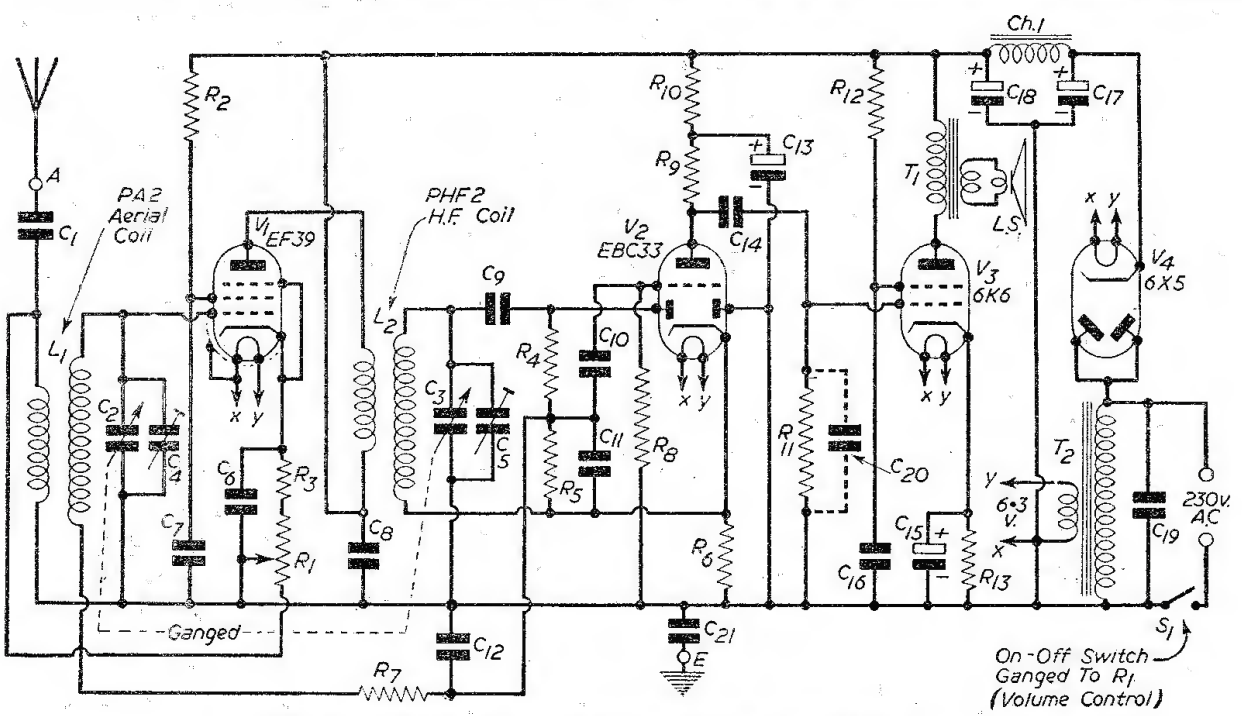


Fig. 1.—Theoretical circuit of the Quality Straight Three.

of which is connected to chassis via the On-Off switch S1. One side of the secondary of the filament transformer T2 is connected to chassis and one side also of all filaments. C19 acts as a filter across the mains and should be a good quality component. Note that as one side of the mains is connected to chassis the set must always be earthed via a condenser (C21).

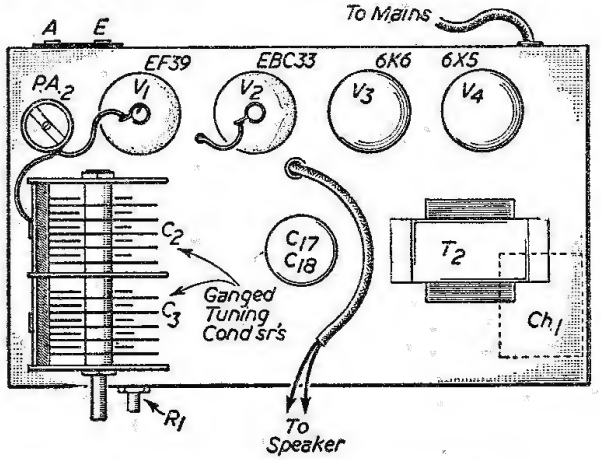


Fig. 2.—Layout of the receiver.

The Chassis and Cabinet

The chassis was four sided, bent up from 18 s.w.g aluminium sheet, being 9in. x 7in. x 2in. deep. The speaker and transformer together were mounted on the cabinet. The cabinet was made from five-ply and enamelled cream. The dial was drawn in Indian ink on pink paper which was then covered with nail varnish and stuck on the cabinet. The tuning knob used was a 2½in. pointer type.

LIST OF COMPONENTS

R1—10,000Ω vol. control.
R2—4,700Ω ½ watt.
R3—200Ω ½ watt.
R4—47,000Ω ½ watt.
R5—22,000Ω ½ watt.
R6—2,200Ω ½ watt.
R7—100,000Ω ½ watt.
R8—470,000Ω ½ watt.
R9—220,000Ω ½ watt.
R10—22,000Ω ½ watt.
R11—470,000Ω ½ watt.
R12—4,700Ω ½ watt.
R13—470Ω 1 watt.
C1—.001 μF. 350 v.w. Mica.
C2, C3—.0005 μF. twin gang.
C4, C5—60 pF. stamp trimmers.
C6, C7, C12, C16—.1 μF. 350 v.w.
C8—.5 μF. 350 v.w.
C9, C11—100 pF. Mica.
C10—.01 μF. 350 v.w.
C13—8 μF. 350 v.w. Electrolytic.
C14—.05 μF. 350 v.w.
C15—25 μF. 25 v.w. Electrolytic.
C17, C18—8 x 16 μF. 450 v.w. Electrolytic.
C19—.01 μF. 1,000 v.w. Sprague.
C20—Up to .001 μF. Mica (see text).
C21—.01 μF. 1,000 v.w. Sprague.
T1—60 : 1 output trans.
T2—230 v. input. 6.3 v., 2-3 Amp. filament trans.
CH1—20 H. 60 mA. 400Ω smoothing choke.
S1—On-off switch ganged to R1.
V1—VR53 (EF39).
V2—VR55 (EBC33).
V3—6K6.
V4—6X5.
1 6in. 2-3 ohm. Rola P.M. speaker.
4 International octal valve bases.
L1 PA2 aerial coil, L2 PHF2 aerial coil.

News from the Clubs

GILLINGHAM TELECOMMUNICATIONS SOCIETY

Hon. Sec.: C. E. Pellatt (G2FAQ), 101, Boundary Road, Chatham, Kent.

DURING April, a lecture was given on "Electronic Interval Timers," by G2FAQ. Lectures arranged for June and July include, "Home Production of QSL Cards by Photographic Methods (G2CM); "Frequency Modulated Oscilloscope (G3GSP); "Superhet Aligning" (G2HAW); "Oscilloscope Construction, with Particular Reference to Power Supply" (Mr. Walker).

The N.F.D. transmitter has been modified as a result of lats year's experience, and is all ready for use. New members are welcome—meetings alternate Tuesdays, 7.30 p.m., Medway Technical College, Gardiner Street, Gillingham, Kent.

READING RADIO SOCIETY

Hon. Sec.: L. A. Hensford (G2BHS), 30, Boston Avenue, Reading, Berks.

AT the A.G.M. in March the new committee were elected, mostly consisting of the 1950 committee.

It was voted that there be two meetings per month instead of the three which were held last year, the first to be held on the second Saturday of the month and run as an Instructional Section by Mr. Woodhouse (G2AHY); the other meeting to be the main meeting and held on the last Saturday on the month and consist of lectures and demonstrations, etc.

At the main meeting in April a film meeting was held; this ending with questions and answers.

Lectures and demonstrations for future meetings are now being planned and will be given in future publications.

CLIFTON AMATEUR RADIO SOCIETY

Hon. Sec.: W. A. Martin (G3FVG), 21, Brixton Hill, Brixton.

CLUB meets every Friday evening at 7.30 p.m. at 225, New Cross Road, New Cross, London.

Meetings during April were: 6th.—Demonstration of the Decca long-playing record system, given by Mr. A. Gilham, of Decca's. 13th.—Demonstration of top band 'phone cabinet TX by G3FNZ. 20th.—Debate. Subjects were QRO v. QRP; Are SWL's necessary to the working of the amateur movement? Is aerial design neglected in favour of transmitter design? 27th.—Valve theory lecture given with the aid of 35 mm. film strips.

Average weekly attendance is now 30, but all new members, visitors and old friends are sure of a welcome.

SHEFFORD AND DISTRICT RADIO SOCIETY

Hon. Sec.: 308959 S.A.C. Raby, R. D., Radar Link, T. Division, R.E.U., R.A.F., Henlow, Beds.

SEVERAL members under the watchful eye of G2DPQ, who is noted for his QRP work, have suddenly gone QRP mad.

Mr. Stan Edney recently gave a very interesting lecture on the alignment of superhets, and R. D. Raby has concluded his chats on radar and centimetre technique. Future events include a junk sale and it is hoped to give a demonstration of the 13 cm. gear mentioned in last month's report. Recently the club was granted affiliation to the R.S.G.B.

The club's QTH is Wharf Buildings, Shefford, Beds. Meetings are held every Friday evening at 19.30 hrs. and new members and visitors can be sure of a hearty welcome.

TORBAY AMATEUR RADIO SOCIETY

Hon. Sec.: Mr. W. A. Launder, B.Sc., (Eng.) (G3FHI), 15, Cambridge Road, St. Marychurch, Torquay.

REPORTS of the year's working were presented at the A.G.M. held in April, including a special review of Field Day, 1950. Statements of accounts were received and adopted, the financial position of the Society permitting a reduction in the annual subscription, which is now: full members 5s.; junior members 2s. 6d. per annum, and visitors 6d. per visit.

Principal officers elected were: president, W. B. Sydenham, B.Sc. (G5SY); chairman, F. J. Wadman (G2GK); treasurer, F. D. Cawley (G2GM); experimental manager, K. J. Grimes (G3AVF); auditor, G2BMZ.

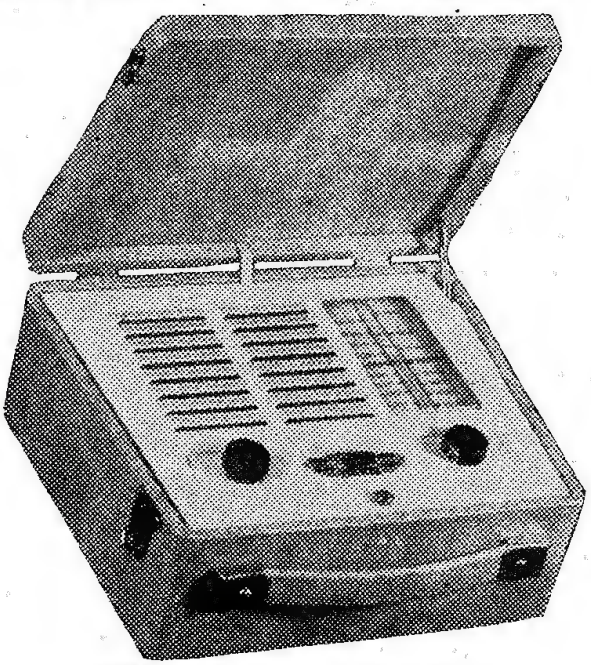
On the relinquishing of the post of secretary by G3AVF, Mr. W. A. Launder, B.Sc. (Eng.) (G3FHI) was elected secretary. He will attend to enquiries of membership and normal business of the society.

Meetings at Y.M.C.A., Castle Road, 7.30 p.m., every third Saturday in the month. Visitors welcomed.

TRADE NOTES

New Vidor Portable

THE illustration below shows the general appearance of the new Vidor Portable, a battery-operated attaché type receiver incorporating some novel features. The most interesting of these is the automatic switch which is fitted so that the set is automatically switched on when the lid is opened. As a result, the set cannot easily be left on when not required and battery economy is thereby effected. The circuit incorporated is a four-valve superhet, and it will be noted that the usual unsightly battery compartment has been eliminated. The receiver is completely accessible for battery replacement, and servicing is effected by raising the hinged front panel. The price is £15 10s. including P.T. but without batteries. These cost 12s. 5d. for the H.T. (Type L.5512) and 1s. 4d. for the L.T. (L.5040).



The new Vidor battery portable.

"Elpico" Car Radio Aerials

LEE PRODUCTS (GT. BRITAIN) LTD., 90, Gt. Eastern Street, London, E.C.2, regret that due to increased prices of raw materials the list prices of their range of car radio aerials are amended as follows for all future deliveries 1951: Model CA/2 39s. 9d., CA/2E 63s., CA/5 43s. 9d., CA/7 42/-, CA/7E 65s.

Cossor Change

A. C. COSSOR LTD. announce that Mr. L. L. Roberts, general manager of this company and director and general manager of Cossor Radar Ltd., resigned from these posts as from March 1st, 1951. Mr. Roberts left to take up an important position with Messrs. Rootes Ltd. in connection with their export business.

The Philco "Richmond" Radiogram

THIS contemporary design, which has been chosen for the Festival of Britain Exhibition, is the outcome of close collaboration between two of the leading furniture designers and the Philco engineers, resulting in a specialised instrument of great beauty and technical refinement.

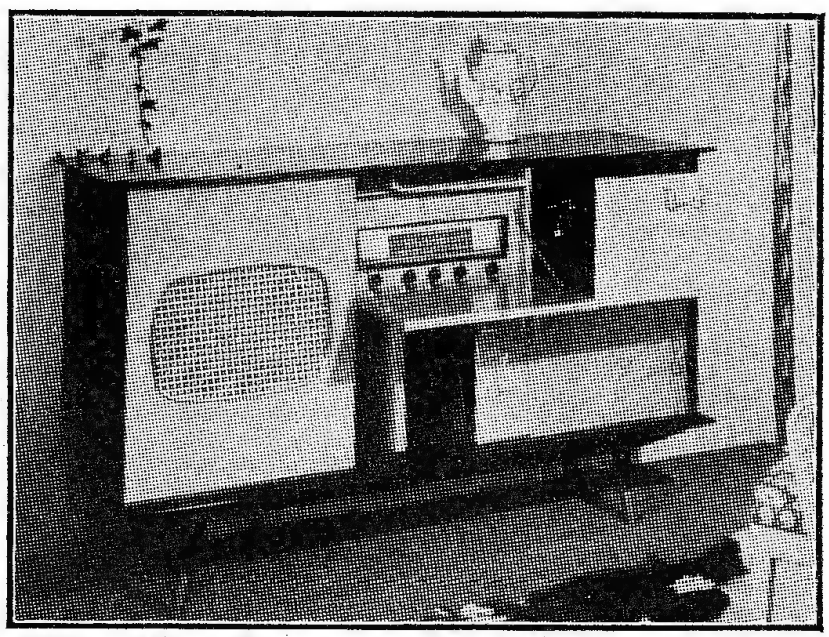
The cabinet is carried out in mahogany with bird's eye maple panels; the handles, ferrules on the legs and the bezel to the loudspeaker opening are of hand-made satin-finished brass. The loudspeaker grille is in hand-woven split cane.

The upper centre panel is a drop-front giving access to the tuning dial, radio and gramophone controls. The upper right-hand panel is a smoothly running pull-out drawer on roller bearings housing the automatic record changer. The two lower panels are sliding doors covering the record storage cupboards, giving accommodation for upwards of 300 records.

The technical equipment consists of a nine-valve radiogramophone combining all-wave radio and a record reproducer capable of handling all types of disc recordings.

A superheterodyne radio tuner chassis is coupled to a high quality audio amplifier with push-pull triode output. Provision is made for separate wide range control of bass and treble, so that satisfactory tonal balance can be obtained on both radio and recordings. The main amplifier has a peak output of 15 watts which is fed to a high fidelity 12in. speaker; overall negative feedback, in conjunction with triode-connection of the output valves, ensures a very low distortion level and a wide audio frequency response.

The price of the Philco "Richmond" radiogram, which is made to order only, is 275 guineas, including tax.



Philco "Richmond" radiogram which is on view at the Festival of Britain.

Programme Pointers

This Month MAURICE REEVE Deals with Some Recent Programmes

LET us leave plays till later, this month. I will start, as usual, with two grumbles. One an old one—studio audiences. I feel no qualms about this question as almost the entire national press condemns them root and branch. They give the impression that a considerable number of very idle people are in permanent session, somewhere or other, all marshalled up and awaiting the sergeant instructor's orders to beat hands together, with a cheer leader every here and there to whistle, fingers in mouth. Exactly the same volume and type of applause is meted out to every show. Whether it is 10 a.m. or 10 p.m., Home or Light, or a series of shows one after the other; there they are, hour after hour, all present and correct right down to the woman with the hen-rooster's laugh, right under the mike. It's terrible.

The other point is the pronunciation of certain foreign proper names and surnames. If a French announcer has to utter the names of "Elgar," "Sir Thomas Beecham," or "London" or "England," he does so as he would normally pronounce them as an ordinary Frenchman. And good enough it is. But not so for our people. The most frightful splutterings and gurglings go on when, in particular, Debussy, Ravel, and Monsieur Vincent Auriol are mentioned. I invariably make for my handkerchief when I hear Debussy's name—DAY-B*UU*ES-SSSSE—an incredible number of Ss; I feel spattered all over. Whilst I am certain RAVEL would have beaten G. B. S.'s 40-vowel alphabet as pronounced by most. Some of the announcers must get tied up in knots with their mikes.

Gieseking

And so to programmes. I heard that most distinguished pianist, Gieseking, play what are perhaps the two greatest of all concertos, Beethoven's "Emperor" and Mozart's in A, K488. The former the most sublime, magnificent, noble, lofty, whilst the Mozart is the most enchantingly, ravishingly and entrancingly beautiful. The Beethoven is the greater because it possesses Mozart's as well as its own qualities. Between the two of them they left nothing for Tchaikowsky, Rachmaninov or even Brahms to say. Gieseking was perfect in the Mozart and the second and third movements of the Beethoven. But the first part of the "Emperor" sounded strangely cold and rushed.

Mozart's Mass in C Minor and the "Jupiter" symphony made a glorious programme at the B.B.C. symphony concert, under Beecham. The over-worked orchestra has played better, but the combination was irresistible.

Memories

Arthur Askey and Kenneth Horne gave a very funny half hour of Band Wagon memories. It served to prove what a long way behind these old masterpieces the current variety programmes have fallen.

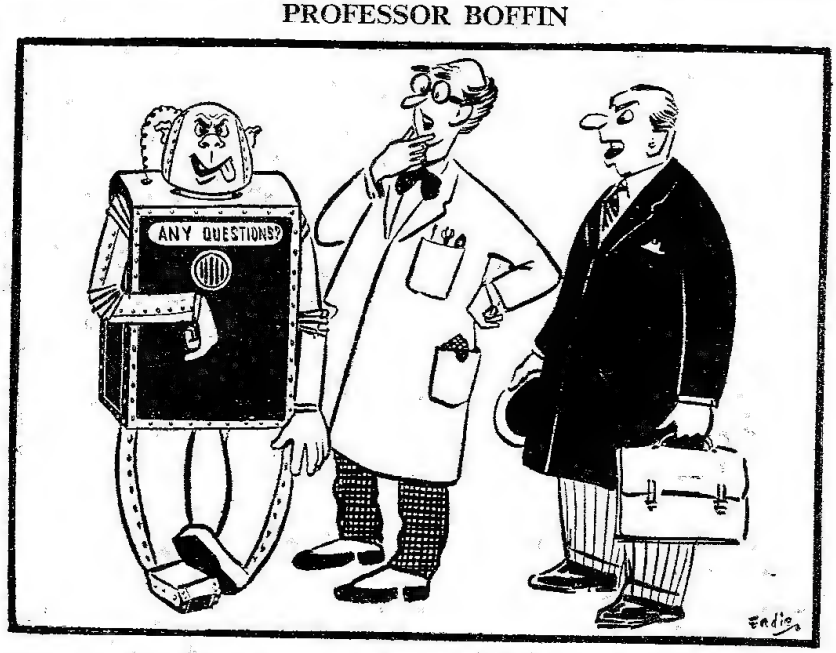
"We Beg to Differ"

A much-anticipated and looked-forward-to event was "We Beg to Differ" with, excepting the genial chairman, Roy Plumley, an entirely new cast. To wit, Margaret Rawlings, Margaret Lindsay, Helga Moray, Athene Seyler, Griffith Jones and Robert Henriques. I found it entirely satisfactory and delightful. Naturally, we do not like to part with old friends, especially when they have served us as well and faithfully as the old cast did. But there can be no doubt that it is the only way to keep these regular features vital and fresh. Perhaps a change of individuals, as with the critics, with return, at intervals, of everybody, is the best way. We would all enjoy meeting the others again, after they have had a break.

Clogging Narrators

The narrators in the Sunday evening serials are clogs in the machine, if ever there were clogs. Mr. Chapman and Mr. Hall—the original publishers of the Pickwick Papers—and the two narrators in the current serial of that immortal masterpiece, are, to put it mildly, blithering nuisances; worse, even, than "Mr. Thackeray" was in Vanity Fair. There is enough material for fifty-seven—let alone seven—thirty-minute instalments. Why waste half the precious time over two old sanctimonious

PROFESSOR BOFFIN



"I'm afraid your information robot for the Festival has slipped up somewhere between drawing-board and production, Boffin!"

so-and-so's trying to claim the credit for what was entirely and completely Dickens's.

Plays

Of the month's plays, two were unquestioned and proclaimed masterpieces. Shaw's "Heartbreak House" and O'Casey's "Juno and the Paycock." Although so different in many respects, the racial relationship of the two authors is plain for all to see. Captain Jack Boyle, Captain Shotover and, to go back a mere two hundred years, Captain Lismahago are brothers under the skin. And Irish, too, begorrah. It would be fascinating in the extreme to see "Juno" and "John Bull's Other Island" in equally close juxtaposition.

Most of Shaw's prefaces are as good as his plays. That to "Heartbreak House" probably greater, and the greatest of all. I would suggest that, in all future productions of Shaw plays, they be read and made to appear as—what they really are—part and parcel of the whole. Distinguished casts fully realised the greatness of their material.

"Cæsar's Friend" was an interesting dramatisation of the Crucifixion story. "Background" dealt with the evil effects suffered by children when parents divorce. "Love and Mr. Arkwright" proved the wisdom of the old adages that a fool and his money/heart soon part, and there's no fool like an old fool. "Housemaster" was another silly and unreal school story in which the gifts of Jack Hulbert were completely lost. The others were all good.

Serials

Should Sunday evening serials have a narrator? My own view is, emphatically no, or very, very, sparingly. In "Vanity Fair" and the recent "Pickwick Papers" I thought they stifled and clogged the pace of the story-telling horribly and most unnecessarily. The amount of "Pickwick" material—there were only, I think, eight instalments—might probably have been nearly doubled but for the twaddle of "Messrs. Chapman and Hall," to the benefit of all concerned.

The idea of devoting the whole of the Third Programme to events and items which took place in the year of "the" great exhibition—1851—was, on the whole, a great success. The music performed was that actually being played that year. The speakers, the best thing in the week, I thought, were those people who would undoubtedly have been "brought to the microphone" had microphones then been in use. And there were talks and descriptions of events of that year such as the exhibition itself, the *coup d'état* of Napoleon III, and, best of all, life among the London poor. News bulletins of the period were a feature.

The music was the least satisfactory. The masterpieces, up to and including Beethoven, were, of course, what we hear almost every day of the year. Without the presentation of them, both as to standards of performance and the visual aspect, they afforded little or no interest. The remainder were only fit for where they have lain ever since—and will doubtless lie till 2051—the rubbish basket. But they at least served to, at any rate, partially answer the vexed question why do we get so much Beethoven, etc., in our concert programmes by proving that there is little else worth listening to.

Chopin's Piano

It was a mistake to give piano recitals on Chopin's piano, as it only served to create the impression that that great composer-pianist played on an old bone-shaker of a tin-lizzie Ford, which is all it sounds like to-day. It was rather like christening a new baby in great-great-great-grandmother's christening robe—a sop to sentimentality.

It was strange, and sinister, that, no sooner was the ink dry of my praise of Gilbert Harding as the questionmaster in "Twenty Questions" than he was removed from that and other programmes. Poor Gilbert, "live" mikes have been unkind to many others, though that one dealt you a particularly scurvy blow.

The acoustics of the Royal Festival Hall were heard over the air for the first time in the concerts which helped to launch the Festival of Britain. They are not perfect, especially with strings. Percussion sounded very brilliant, whilst I have never heard such dazzling virtuosity in applause. One could almost count three thousand odd individual, separate hand-clapppers. Perhaps we are entering on an age of great applauders.

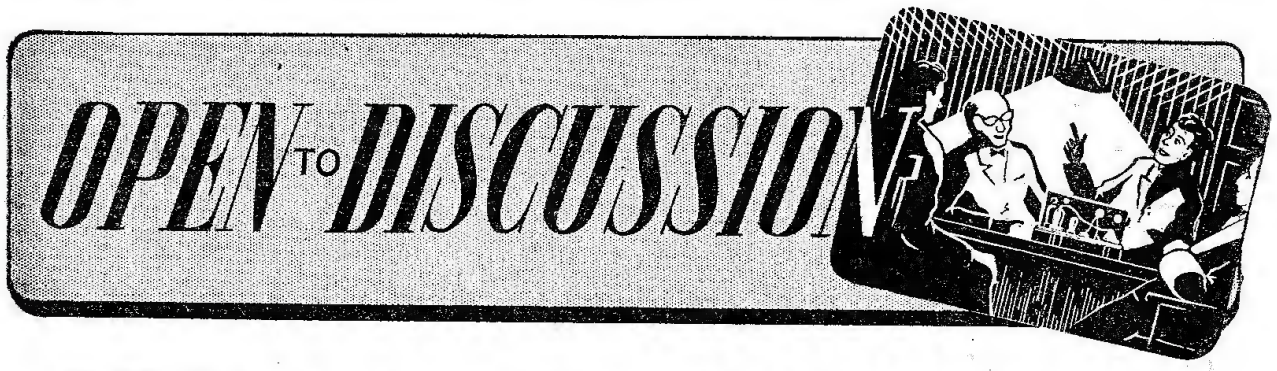
The Police Force

"... like any other Bobby," a dramatised impression of provincial police forces at work was a pleasant feature, an hour in length, about a body of men who go about their duties in the best possible way—quietly and unostentatiously, and who are, therefore, universally liked and respected. The programme, which was made with the co-operation of the Chief Constables of Devon and Plymouth, was built up round the escape of a convict from Dartmoor and his subsequent capture in a Torquay cinema. It had a refreshing air of reality as being something near to us in our ordinary daily comings and goings. The stories of shipwreck, mine disaster or earthquake cannot, of course, claim this quality, though they may be more stirring and dramatic in consequence. A good cast was headed by Paul Rogers as narrator.

A point in the story caused me the greatest astonishment, and caused me to ponder over such things as the "British Way of Life," etc. The convict, who must, by all standards, have looked a tough customer, sought, and obtained, asylum by hiring a room, early one morning, in a Torquay boarding house. When he is arrested in the cinema the same afternoon, in whose company should he be but that of the small daughter, a school child, of the woman owning the establishment! When the police first called there she gave them a full description of both her daughter and the man, so she was obviously fully aware of the fact that her child had "gone out" in the company of this perfectly strange, and doubtless unkempt, man. Is there any wonder that our children and young people meet with sticky ends?

Gladys Young's Jubilee

Gladys Young's jubilee of broadcasting was properly honoured by casting her in the title role of St. John Ervine's brilliant "The First Mrs. Fraser." She gave a very accomplished performance.



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).

P.A. for the Amateur

SIR,—With reference to Mr. Denney's article on P.A. Equipment in the May issue of PRACTICAL WIRELESS, and criticisms in the June issue.

May I suggest a remedy which would overcome the problem? The chassis can be made perfectly safe for all conditions by taking all the internal earth connections to a fairly heavy copper or otherwise conductive strip running the length of the chassis; the strip to be insulated from the chassis. This common earth can then be connected to the chassis via a .1 microfarad capacitor of an adequate voltage rating—preferably 1,000 volt working. The chassis is then externally earthed in the usual way. These remarks apply, of course, to both the main amplifier and the pre-amplifier unit.—T. W. BENNETT (Wisbech).

Service Engineers

SIR,—The correspondence on service engineers has provided much interest for me, and although not wanting to provoke a further intensification of argument prior to the correspondence closing, I feel that the following viewpoint should be ventilated. Radio has been my hobby for about 28 years, and, additionally, I have been employed in the industry, on manufacturing side, with my present firm since 1928. Having spent many years on the bench as service engineer, it has been my lot since 1945 to have charge of a section in what must be regarded as one of the leading manufacturer's service departments.

During the period from above date till now well over 100 engineers have passed through my hands —good, not so good and, frankly, bad. The standard of workmanship demanded in my department is high, and at the moment I am fortunate in having a pretty good selection of engineers; not always the case, however. I feel it must be stated that I have found during these years that the best types of engineer come usually from the keen amateur type, often with little or no previous commercial experience. Some have, however, had radio training in the Services. This seems to tie up with Mr. G. H. Gunter's experience. Ex. dealer's service engineers usually find it hard to work to our high standard, and seem to have the "patch it up" mentality.

My section is chiefly concerned with completely overhauling—sometimes completely rebuilding—pre-war sets of good type, sometimes very expensive ones. In the course of this duty, I regret to have to say, a large part of the unpleasantness of this work is in putting right the general mess that has occurred over the years due to repeated servicing—most of which I am satisfied can be accredited to various dealers' departments. In fairness to dealers, I should point out that their service, by its very nature, should be regarded as first-aid and, as such, should be judged. There are, of course, exceptions to this. But, and I am expressing my personal opinion based on much commercial servicing experience, I do feel that there are as many "quacks" (to quote Mr. Gordon King) in the trade as outside it, and I say this fully realizing the storm that may break over my head.

Mr. Gunter would have been well advised, as he knew what was wrong with his set, to have blown out the dust and changed the volume control himself. His lack of equipment would hardly have been a handicap for such a small job and, apparently, he would have saved £10.—R. W. BRYANT (Longford).

SIR,—I have been following with mixed feelings the various correspondence in "praise and condemnation" of the dabbler.

Now, I am a dabbler, an "honest dabbler"—I repeat the word "*honest*"—and I am not in the least ashamed of the fact.

I am a licensed amateur living in a very small village, consequently a fair number of the locals ask if I can help them out when their radio fails, and this I do with pleasure.

I make the usual voltage, current and resistance checks, check valve emission, etc., and inform the set owner of the trouble. I also tell the owner of the spares required which they buy themselves. My charge for all this? About 1s. an hour, partly to cover cost of electricity used during repairs, the remainder to help buy a new supply of solder! I think Mr. A. Harrison will agree with me that it is at least *honest*. I doubt also if he can accuse me of taking the bread from the mouth of the registered service engineer, because the number of radios I repair during a year would not give him much gain —not even at to-day's high prices which some of them see fit to charge.

I would also like to state that the greater part of my test equipment was built from circuits printed in PRACTICAL WIRELESS and they all work perfectly.

Long may you continue.—E. FORD (Kent).

Alternative I.F. Couplings

SIR,—Allow me to comment on W. Nimmons' article in PRACTICAL WIRELESS (June). His remarks on I.F. transformers and the loss of power in I.F. stages call for some comment.

First, the purpose of an I.F. stage is to increase the I.F. signal voltage, not the power (if that is what he meant).

Secondly, a circuit of high "Q" is selective and develops a voltage gain across it. (The normal I.F.T.s have a "Q" of at least 100.) The L/C ratio of these coils is made suitable for a reasonable voltage step-up and for good selectivity. The coils cannot be over-coupled or the resonance curve becomes peaked at two points, with a trough in the middle, reducing the voltage developed.

The transference of energy is quite sufficient for normal purposes.

In his circuit of the 3-valve superhet W. Nimmons puts the coil in the grid circuit. I suggest that it is put in the anode circuit to reject the unwanted frequencies at the source.—D. SULLY (Wimbledon).

The RX18

SIR,—Being a RX18 "fan," like your correspondent from Ceylon (S. Pathmanathan), I would like to let you know my own method of treating this superb little receiver.

I find that there is quite enough interesting transmission to listen to between 6 to 9 Mc/s (especially the 40-metre amateur band) so I have not altered the wave-band, but I have added a pentode valve to bring it up to L.S. strength.

This can easily be done as follows: construct a metal chassis to add on to the existing receiver.

It is all quite simple and now that I have painted the extra portion of chassis to match the receiver it is hard to believe the set was not made in one piece.

The results I get are really wonderful—all transmissions come through on the loud-speaker quite nicely—amateurs especially—as, for instance, the other morning a contact between two amateurs, one from Kingston-on-Thames and the other from Stockholm in Sweden; the Swedish station came in very little short of the English one.

Like your correspondent I do *not* use grid bias at all, it is not needed, even for the pentode.—H. R. MILLARD (Brentford).

Component Market

SIR,—The suggestion contained in your June number article that dealers and manufacturers should give attention to the component market is one that should not be ignored. However, when advertising their wares these people could too frequently give a little more honest attention to their customers. I have found many articles not as advertised and new components obviously packed unexamined and faulty.

Then with regard to ex-Government goods, some firms despatch immediately, others acknowledge receipt of cheque but it is weeks before the goods are despatched, while others send no acknowledgment at all and it may be many weeks after many inquiries that the goods are eventually received, yet these goods are in stock, surely, when advertised.

There is far too much casual indifference about advertisers these days.

The most glaring example was a Midland firm who advertise a 3-5 day repair service. I sent them a small motor by registered post; after 15 days I had to write to know if it had been received and after about four months it was returned "repaired." All but two segments of the commutator were "dis" and it was useless. The charge was £3 7s. 6d., more than twice the original cost of the motor. I was too disgusted to do anything about it, but vowed never to take further notice of advertisers.

Eventually it will be the advertising revenue of such journals as yours that will suffer through the ever increasing casual, if not dishonest, advertiser.—R. T. COWLAN (Rickmansworth).

Condenser Testing

SIR,—After having experienced several constructional failures due, as was found by an expert, to the use of faulty ex-Service condensers, I should like to pass on a tip which has saved me considerable worry. I could not afford a good condenser bridge, but I have made a small panel with two terminals to which any condenser may be joined and another pair of terminals to which I connect my multi-testmeter. The panel has two flying leads which I connect to the H.T. positive and negative lines of my broadcast mains receiver (250 volts). The flick of the meter needle on a high range gives me a very good indication of the condenser leakage, and a steady reading, of course, means "scrap it." Electrolytics should not be checked by this method.—D. ROYLANCE (N.W.9).

A Summer All-dry Portable

A NUMBER of queries have been received concerning the supply of components for this receiver which was described in last month's issue. We are informed by the author that the cabinet referred to was obtained from Alextone Advisories (Regd.), of Hillworth, Longdon, Glos, and that the coil unit was supplied by Howells, 29, McWilliam Road, Brighton, 7. For those who wish to make their own cabinet the following details are given.

For the front, back and sides ¼in. wood should be used. Front and back should both be 7in. by 4¾in. The sides will be 6in. by 4¾in., and overlapped by both front and back, when the pieces are secured together by small cabinet nails. (Glue can be applied beforehand to strengthen the joints.) The top and bottom, each of three-ply and 7in. by 6½in., should then be fixed on, using glue and short cabinet nails.

When the glue is dry the whole should be glass-papered thoroughly. A line is then drawn round 1¼in. from the top and the lid of the cabinet sawn off with a fine-toothed tenon saw. The edges are smoothed off and small hinges attached by ¼in. or ⅜in. screws. A thin coating of quick-drying varnish of a fairly dark colour is then applied. A fastening clip can be added at the front if required.

The frame upon which the aerial is wound should be a push-fit in the lid, and the four strips from which it is made should have an ⅛in. thickness of wood removed for about ¾in. width, in order to form a recess in which the aerial winding can be placed. This was shown in the end view of the frame in Fig. 4 last month. If ¼in. thick wood is used, two pieces 6½in. by 1in. and two 5½in. by 1in. will be required for the frame mentioned.

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Impressions on the Wax

Review of the Latest Gramophone Records

THE London Baroque Ensemble, conducted by Karl Haas make this month what is believed to be a first recording of Haydn's "St. Anthony Divertimento" on three sides of *Parlophone SW*81201. It is the work that provided Brahms with his main theme for his magnificent "Variations on a Theme by Haydn." The "fill-up" on the fourth side—Mozart's "Adagio K.580A," merits attention, too. It is a piece for cor anglais, two violins and 'cello, an unusual combination.

For ballet-lovers there is the ballet music of Arnell's "Punch and the Child," played by the Royal Philharmonic Orchestra, conducted by Sir Thomas Beecham on *Columbia LX*1391-2 and *LXS*1393. Londoner Richard Arnell, was really "discovered" in America where he has been resident since 1939. He was the B.B.C.'s Music Adviser in New York from 1943-1946. Sir Thomas Beecham was an early champion of Arnell's work. He has conducted this ballet in New York and he will perform it at the Royal Albert Hall on June 17th.

Other interesting orchestral recordings are the Hallé Orchestra, conducted by Sir John Barbirolli, playing "A Song of Summer," on three sides of *H.M.V. DB*9609. Mozart's "Andante" (from Cassation in G Major, K.65), appears on the fourth side. The Overture "Hansel and Gretel," by Humperdinck, played by Leopold Stokowski and his Symphony Orchestra on *H.M.V. DB*21256, the Overture "Pique Dame," by von Suppé, played by the Philharmonia Orchestra, conducted by Constant Lambert, and finally the "Hungarian Rhapsody No. 9 in E Flat Major," by Liszt, played by the Boston Promenade Orchestra, conducted by Arthur Fiedler on *H.M.V. C*4083.

Coming now to instrumentalists we have Chopin's "Scherzo No. 4 in E Major," a pianoforte solo, by Claudio Arrau on *Columbia LX*8792-3. On the fourth side is Chopin's "My Joys," arranged by Liszt.

Yehudi Menuhin needs no introduction and for his violin solo accompanied by Louis Kentner on the piano he has chosen Bach's "Sonata No. 1 in B Minor"—*H.M.V. DB*9607-8.

There is an interesting story behind the recording of intermezzo from the "Jewels of the Madonna" and "Valse Oubliée," by those two masters of the keyboard, Rawicz and Landauer on *Columbia DB*2851. In the B.B.C. programme, "Hullo There," a midday feature for older children, Marcel Stellman ran a short serial account called "In the Groove," a stage-by-stage story of how a record is made. It is this record of the Intermezzo that was involved.

Vocal

A fine young dramatic soprano, Amy Shuard, joins the ranks of Columbia. Her Santuzza, Marguerite, Musetta and Princess E foli (Don Carlos), are well known and much admired by Sadler's Wells audiences. Here she sings "You Here, Santuzza" and "Cavalleria Rusticana," as duets with James Johnson on *Columbia DX*1748.

The well-known radio tenor Harry Dawson, has chosen the popular "Life's Desire," coupled with "I'll Always Love You," for his latest recording on *H.M.V. B*10068, whilst Dennis Noble sings "The Frost-bound Wood," and "The Fox" on *H.M.V. B*10075.

Variety

A deeply rooted love throughout the world for the late Sir Harry Lauder, coupled with a marked revival of interest in this great Scottish character (the recent B.B.C. broadcast about him, for instance, and the tribute paid to him by Sir Thomas Beecham in his broadcast programme of "Records I Like"), have brought about the re-issue by *H.M.V.* of records of many of his famous songs.

A dramatised version of "Cinderella" told as a story, with Ilene Woods as Cinderella and the voices of the various characters as heard in the film has been recorded on *H.M.V. DB*1270-1. These records should not in any way be confused with the two records by Ilene Woods issued in October, 1950, which contained the song hits from the film. These latest recordings are just like listening to the sound track with a story-teller knitting the whole thing together.

If you desire just the orchestral selections from the film they have been recorded by the Melachrino Orchestra on *H.M.V. B*10064.

Dance Music

All the latest hit songs of the moment have been recorded by popular bands. That well-known combination of Billy Thorburn's, "The Organ, the Dance Band and Me," play "Beautiful Brown Eyes" and "Mockin' Bird Hill" on *Parlophone F*2460; Phil Cardew and his Corn Huskers play "Crackin' Corn—Square Dance" and "The Irish Washerwoman" on *Parlophone R*3391, and Joe Loss and his Orchestra play in dance tempo two quicksteps, "Festival Hop" and "Rose, Rose, I Love You" on *H.M.V. BD*6094.

Finally, a Festival of Britain record, displaying British artistic achievement, called "Columbia Cavalcade"—a salute to British artists and composers—appears on *Columbia DX*1750.

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R.S.G.B. "Amateur Radio" publications: Transmitting Licence, 32pp., **1/-**; Service Valve Equivalents, 32pp., **1/3**; Transmitter Interference, 32pp., **1/6**; Simple Transmitting Equipment, 52pp., **2/3**; Microwave Technique, 68 pp., **2/3**; Receivers, 96pp., **3/9**; Valve Technique, 104pp., **3/9**; V.H.F. Technique, 96pp., **3/9**; R.S.G.B. Bulletin, current issue, **1/6**. Five recent issues, **2/6**. Prices include postage. RADIO SOCIETY OF GREAT BRITAIN, 28, Little Russell St., London, W.C.1.

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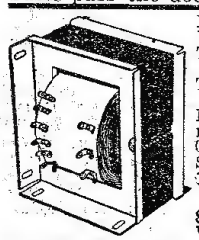

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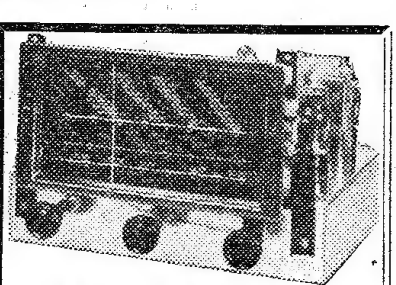

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