RADIO SHOW PREVIEW

1/-

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SEPTEMBER, 1952

EDITOR:
F. J. CAMM

PRACTICAL WIRELESS

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DESIGNING THE OUTPUT STAGE
TRANSMITTING TOPICS

Practical Wireless

EVERY MONTH
VOL. XXVIII, No. 551 SEPTEMBER, 1952

Editor F. J. CAMM

20th YEAR OF ISSUE

COMMENTS OF THE MONTH

By THE EDITOR

Transmitting Licence Amendment

THE Post Office announces that it has decided to amend the licences under which the operators of amateur wireless transmitting stations may transmit from alternative addresses or under portable conditions. A new licence will be available, at a charge of 10s., entitling an amateur to operate for a period of up to one month at a temporary address. This licence is designed to cater for amateurs who wish to carry on their transmitting experiments during annual holidays or at other times when they are away from home.

Alternative Address and Portable Station licences will continue to be available at a charge of 10s. a year, but in their new form they will permit certain additional facilities. For example, the holder of the new licence will be permitted to operate from his alternative address and at another temporary address as well, and he may operate his portable station within five miles of any notified location for a period of 48 hours, provided that in both cases the Post Office Engineering Department has been notified in advance by registered letter or telegram of the particular location. The use of a portable transmitting station on certain inland waters and lakes will also be permitted. This new licence is an experimental measure and the position will be reviewed early next year.

There is an ever-widening interest in amateur transmitting and that is why we regularly feature amateur transmitting topics in this journal.

NATIONAL RADIO TRAINING SCHEME

THE Radio Industry Council, with the approval of the Ministry of Labour, is, as announced elsewhere in this issue, introducing a scheme of training for radio, technical and laboratory assistants which may qualify them for deferment from military service. Under the scheme trainees will register with the Radio Industry Council at the age of 16 or up to 17 and each will be issued with a nationally-recognised certificate on completion of training at the age of 21. The trainee will apply for deferment of military service in the normal way and will be supported in his application by the R.I. Council.

This is the first real effort made by the industry to people the industry with those who are qualified and trained within it. Somewhat belatedly it is following the system which has become general practice throughout the engineering industries, of which the radio industry is but a small part. It is our view that because of the lack of skill in the radio industry the cost of components and receivers is far too high. The industry grew out of amateurs who, whilst they have excellent technical knowledge, had practically no workshop experience and little knowledge of how to modify a design for production purposes. Many of those have now attained most important positions, but they are still without manufacturing experience. The effect of the new scheme, of course, will not be felt for at least four or five years.

Most leading manufacturers now insist upon training courses for their dealers before agencies are granted, and, whilst the position of radio servicing throughout the country is in need of improvement, the position is far better to-day than it was 10 years ago. The ranks of radio dealers has, to some extent, been purged of the charlatans.

GERMAN RADIO SHOW POSTPONED

THE postponement of the German Radio Show (which was scheduled to take place from August 22nd to August 31st) to February 27th to March 8th, 1953, will enable the German radio industry to display its wares at a time which coincides with the introduction of a chain of television stations throughout Western Germany. This was a wise move, for it will enable television manufacturers to reap the maximum benefit from the publicity given by the exhibition.

SPONSORED TV BROADCASTING

THE first step towards sponsored TV broadcasting in this country has been made. A company has been formed to develop the special equipment which will be needed for a station specialising in commercial broadcasts. The company will provide services in accord with the terms laid out in the Government's White Paper. From the discussions which have taken place on this subject it is clear that these programmes will be unlike the American pattern : rather a diluted version of them.—F. J. C.

ROUND the WORLD of WIRELESS

Broadcast Receiving Licences

THE following statement shows the approximate number of licences issued during the year ended May 31st, 1952.

Region	*Number*
London Postal ..	2,402,000
Home Counties ..	1,679,000
Midland	1,781,000
North Eastern ..	1,963,000
North Western ..	1,654,000
South Western ..	1,087,000
Welsh and Border Counties ..	749,000
Total England and Wales	11,315,000
Scotland	1,161,000
Northern Ireland ..	213,000
Grand Total ..	12,689,000

Radio Audience Increase in Hungary

A HUNDRED thousand radio relay loudspeakers will be installed in Hungary during 1952, it is announced by the Hungarian postal authorities. In 1951, 45,000 were installed, many of the relay systems being set up in new industrial areas.

In addition, the number of ordinary wireless sets increased by 129,000 during the year ending March, 1952, while the sale of sets in the first quarter of the year was nearly 90 per cent. over that of a year ago.

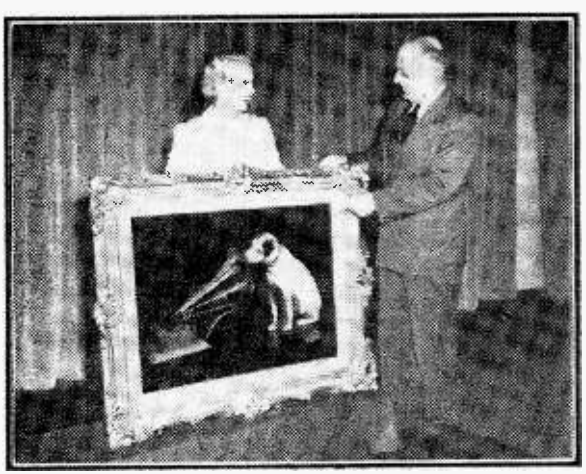
January marked the biggest monthly average of sales with 30,000 sets, February coming second with 21,000.

Wireless Installations for Yemen

WIRELESS equipment of British design and manufacture will give the Kingdom of Yemen, 74,000 square mile territory on the eastern shore of the Red Sea, a basis for its first permanent internal and external communication system. An order for the equipment has been placed with Marconi's Wireless Telegraph Co. Ltd. by His Majesty the Imam.

The main installations will be at Taiz, an inland town, and at Hodeida on the coast. At Hodeida will be a 100-watt "Oceanspan" transmitter, permitting constant communication with shipping passing through the Red Sea to and from Suez, and two all-frequency receivers for incoming messages from other countries. At Taiz, Marconi's have already installed a 200-watt transmitter and this equipment will be augmented with two receivers of the same type as installed at Hodeida.

A high-frequency receiver is to be installed for commencement of an internal communications system, and two 100-watt high-frequency transmitters will be placed at other centres to provide subsidiary internal services.



The original "His Master's Voice" trade mark painting which, as mentioned on P. 402, accompanied Mr. J. D. Bicknell, artistes manager for the Gramophone Co. Ltd., to New York recently in connection with the launching of a new H.M.V. record series in America.

BBC Technical Appointments

AS previously announced, the following appointments have been made in the Technical Services of the BBC and become effective from August 1st, 1952.

Mr. H. Bishop, C.B.E., B.Sc.-(Eng.), F.C.G.I., M.I.E.E., M.I.Mech.E., becomes director of Technical Services in succession to Sir Noel Ashbridge, who is retiring.

Mr. R. T. B. Wynn, C.B.E., M.A., M.I.E.E., has been appointed chief engineer in succession to Mr. Bishop.

Mr. F. C. McLean, M.B.E., B.Sc., M.I.E.E., succeeds Mr. Wynn as deputy chief engineer.

Mr. Bishop joined the BBC from Marconi's in 1923 as senior superintendent engineer and became assistant chief engineer in 1929 until 1943, when he was appointed chief engineer. Mr. Wynn became head of the BBC Engineering Information Department in 1926. In 1935 he was appointed senior superintendent engineer and became successively assistant chief engineer in 1943 and deputy chief engineer in 1950. Mr. McLean, who joined the BBC in 1936, became head of Engineering Services Group in 1949 and of the Engineering Projects Group in 1950.

New Ekco Factory

PRODUCTION started recently in a new E. K. Cole Ltd. works near the main factory at Southend-on-Sea only three weeks after taking over the building.

The new building in Kenway Road, Prittlewell, has a total area of 17,000 square feet and a manu-

facturing area of 14,200 square feet.

Ekco engineers moved in while the builders were still completing the factory shell. In the three weeks at their disposal they modified parts of the building already erected, laid in power supplies to all parts of the factory, built conveyor lines, installed general services, provided fluorescent lighting, erected special test cabins and accommodated stores which were entering the factory before the assembly lines had even been laid down.

Greenland Expedition

THE 25 members of the British North Greenland Expedition who recently left Britain for a 26-months investigation of the ice cap, 800 miles from the North Pole, took with them four new-type high-frequency transmitter-receivers for intercommunication when the group is working as separate units.

The wireless equipment will be fitted to sledges used in traversing ice and snow, and one great advantage is that operating power is generated by a hand crank, so eliminating the need for batteries.

Power is about two watts, two "spot" frequencies on the 2.5-8.5 Mc/s band can be used in operation and a single transmitter-receiving dipole is fitted as an aerial.

The equipment has been designed and manufactured by Marconi's Wireless Telegraph Co. Ltd. and has been loaned to the expedition, which is under the leadership of Commander Courtland J. W. Simpson, D.S.O., R.N.

Glider Walkie-talkies

THE world gliding championships were won by Mr. Philip Wills, and Flt. Lt. R. C. Forbes, R.A.F., was third.

This year, for the first time, the British team used radio-telephone equipment for direct and continuous communication between the airborne gliders and their attendant cars.

In the past, communication between pilots and car crews has been rather limited, but this year requests from the pilots for ground assistance were met quickly and their whereabouts were known to the car crews at all times.

The radio-telephone equipment, which was being loaned by Pye, consisted of (a) one of the new Pye walkie-phones (walkie-talkie) weighing only 8lbs. fitted into each sailplane and (b) a Pye mobile radio-telephone unit (similar to that installed in London taxis) installed in each of the attendant cars.

Mr. P. V. Hunter, C.B.E., Hon.M.I.E.E.

THE directors of the British Insulated Callender's Cables Limited announce that they have accepted with regret the resignation of Mr. P. V. Hunter, C.B.E., Hon.M.I.E.E., as a deputy chairman as from August 31st, 1952. At that date Mr. Hunter will be in his 70th year and is desirous of reducing his commitments. He will, however, continue as a non-executive director and at the request of the company will remain on the boards of several of the subsidiary companies where his long experience and technical knowledge are of special value.

R.S.G.B. Amateur Radio Exhibition

THE sixth annual Radio Society of Great Britain Amateur Radio Exhibition, will be opened by Lt.-Col. Sir Ian Fraser, C.B.E., M.P., a past president of the Society, at 12 noon on Wednesday, November 26th, this year.

Sir Ian is the Member of Parliament for the Morecambe Division of Lancashire and president of the British Legion.

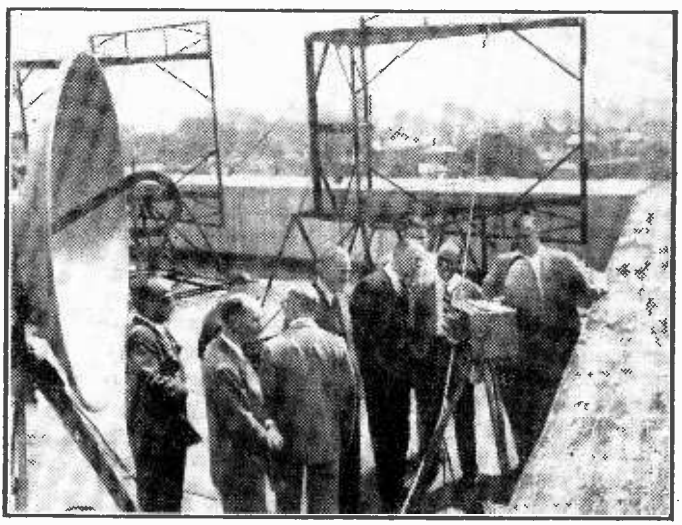
Certificates for Amateurs

THE R.S.G.B. state that the Netherlands National Amateur Radio Society (VERON) is to issue a certificate, to be known as PACC, to any licensed amateur able to give sufficient proof of having been in two-way contact with 100 different Dutch amateur stations since 1946. There are no restrictions and any amateur band may be used. Confirmations should be sent to VERON Traffic Bureau, 77, Middenduinerweg, Santpoort, The Netherlands.

Decca Recordings

DECCA announce that they are producing an album of records entitled: "The Second Elizabeth," a history of modern times, introducing the voices of H.M. King George VI, H.R.H. Duke of Windsor, the Rt. Hon. Winston Churchill, President Roosevelt and many other famous people.

At 45s., including P.T., the album is available in three standard 12in. discs or one 12in. L.P., in a pictorial sleeve with notes.



During the Commonwealth Broadcasting Conference recently held in London delegates paid a visit to the works and research laboratories of Marconi's Wireless Telegraph Co. Ltd. at Chelmsford. Right to left: Lt.-Col. Charles Moses, general manager, Australian Broadcasting Commission; Mr. J. P. Gilmour, senior engineer, Canadian Broadcasting Corporation; Mr. R. E. Santo, transmission and development engineer, Canadian Broadcasting Corporation (behind Gilmour); Mr. B. N. MacLarty, deputy chief engineer, Marconi's; Mr. R. T. B. Wynn, deputy chief engineer, BBC; Mr. W. L. Harrison, chief engineer, New Zealand Broadcasting Service.

THE NATIONAL RADIO SHOW

A PRE-VIEW AND ADVANCE INFORMATION ON SOME OF THE EXHIBITS

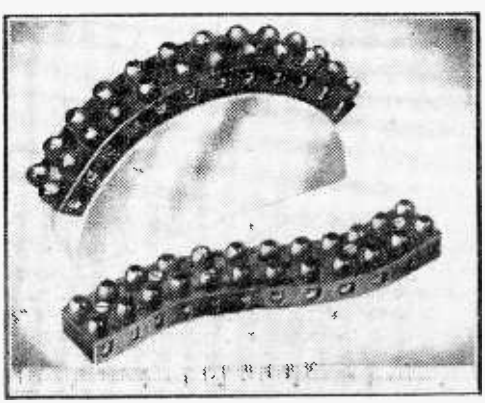
DUE to our early press dates it is not possible in this issue to deal with any "surprises" which might appear at this year's Radio Show at Earls Court. As most of our readers know, manufacturers vie with each other in producing something novel or outstanding at the annual exhibition, and in the past some remarkable secrets have been kept right up to the opening hour. Due to our national economy, it is not expected that anything untoward will be revealed this year, unless it be in the field of television and this subject will, of course, be dealt with in our companion paper.

Information released up to the time of going to press indicates that certain interesting lines will be followed in the general design and appearance of radio receivers. With the growth of television the ordinary sound receiver is not having such an appeal to the public, and endeavours to make it more attractive are reflected in the general appearance or material from which the cabinets are made, rather than in the actual circuitry or performance of the receiver. On page 393, for instance, is a radiogram from the Pilot factories, which, whilst it incorporates the sliding drawer idea for the gramophone auto-changer, is finished in a modern light wood. This idea is seen in many modern furnishing houses and is well suited to the up-to-date flat or home. In this particular model (No. R.G.A.61 or R.G.A.63, with three-speed mechanism), the exterior is in walnut veneer, but when opened ready for use all exposed surfaces are seen to be in sycamore, which, with the white control knobs, presents a most pleasing appearance.

Collaro A.C. 3/514 gramophone unit. It is a 3-speed model.

Table Models

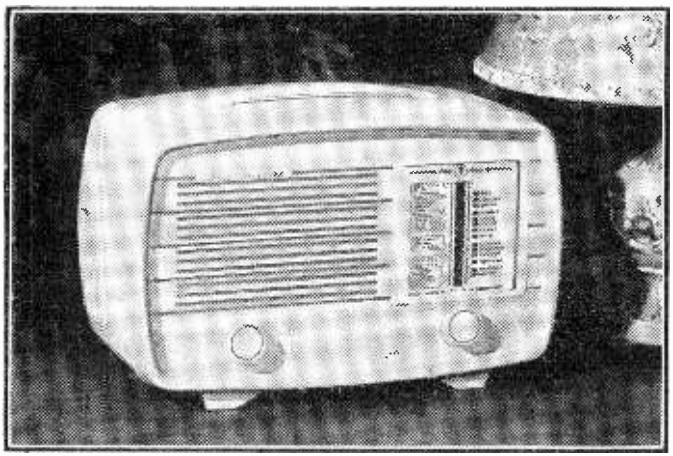
In the table models it will be found that the general trend is towards smaller models, generally of the self-contained and A.C./D.C. type. Many of these are also of the battery/mains type and come into the category of the "Personal" receiver. Again, the design will be found to be "modern" and the finish, usually in plastic, very clean and bright. We show a Pilot model illustrating this feature, the receiver being the latest version of the Little Maestro, a 5-valve superhet which has been brought up to date each year now, whilst still possessing its main original features. This particular model is available in brown, cream or green. Some of these new models have the speaker so placed that the sound is audible on both sides of the cabinet, whilst in at least one instance the tuning and controls are also made available from either side. As these models do not require an external aerial this means that they may be placed on a table in the centre of a room and the programmes may be heard anywhere in the room. The battery supplies make this type of receiver suitable for outdoor use.



Flexible terminal mounts in the Belling-Lee range.

De-luxe Models

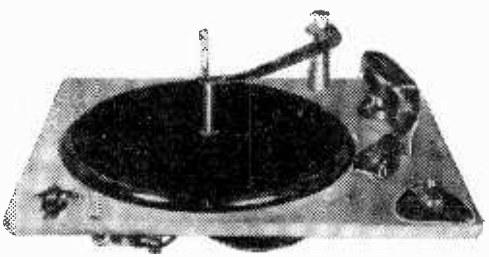
Among the combined or de-luxe types of receiver may be mentioned the McCarthy combined radio-gram-television, which has optional F.M. switching for the new high-quality broadcasts if and when they take place. This receiver is of the 8-valve type with gramophone compensating network and push-pull output stage, three wavebands, combined television and F.M. receiver (15-valve circuit) and a triple loudspeaker unit with cross-over network. The cabinet houses a built-in horn and shelves for record-storage albums.



The latest version of the Pilot Little Maestro.

Components

No doubt the majority of our readers are more interested in the constructor component market, and most of the well-known names will be found at Earls Court. The Belling-Lee items, for instance, will be found this year to be augmented by certain components which have primarily been produced for the television market, but which will still have application to the normal radio equipment. A valuable item is the thermal-delay switch, one of which is illustrated on page 394, whilst the flexible terminal block will immediately appeal to the experimenter as forming a very useful item for inclusion in certain types of equipment. This is of P.V.C., and the terminal screws are securely gripped by the resilient moulding and cannot be shaken out or dislodged accidentally, even when the block is mounted upside down. The illustration shows two mounting positions, and it will be obvious from this that it may be mounted on the most uneven or irregular surface (without fracture). The well-known Belling-Lee terminals and aerial equipment will also be exhibited.



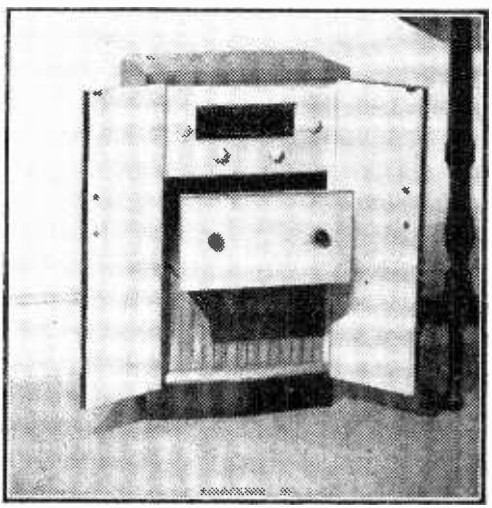
One of the Collaro playing desks.

Loudspeakers

A special demonstration room is being taken by Goodmans to demonstrate their high-fidelity speakers, and these may be heard reproducing from tape, disc and radio. Included in this demonstration will be the Axiom 150 Mk. II and the Axiom 22 Mk. II, both of which have a bass resonance of 35 c.p.s. In addition there will be seen for the first time some new elliptical speakers with 7in. x 4in. and 10in. x 6in. cones.

The well-known Stentorian speakers of the Whiteley Electrical Co. will also be demonstrated in a sound-proof room on their stand, and the duplex models which incorporate their own tweeter will undoubtedly attract those who are interested in high quality and do not have the space to mount two separate speakers. There is, of course, also the point which is favoured by many enthusiasts that the sound source becomes one central point with this type of speaker rather than two as when separate speakers are employed. For high powers the 12in. model should be used. There will be seen the complete range of W.B. speakers from the small 3in. model to P.A. and industrial models.

On this stand will also be seen the special Radio Sonde transmitter used in conjunction with balloons for transmitting weather reports, A.M. and F.M. transmitters and similar equipment.



Another Pilot receiver—a radiogram with sycamore panelling inside.

Other Components

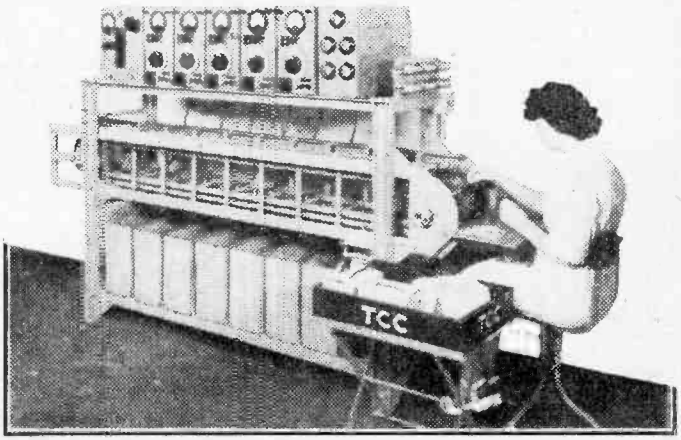
Amongst the other components to be seen are the various condensers—mica, ceramic, electrolytic, etc., features by Dubilier and T.C.C. In this connection the novel tester shown opposite should be inspected as it shows how condensers are tested and sorted into relative capacities according to tolerances, and this is only one of the five special machines which T.C.C. are showing.

Special rectifiers, such as the SenTerCel by Standard Telephones and Cables, and the metal rectifiers by Westinghouse company, will attract attention as these are now being produced with much smaller physical dimensions and certain types will withstand overloads which previously could not be tolerated. One particularly interesting item on the Westinghouse stand is a "Transbooster," which is a constant potential rectifier capable of holding a set D.C. output voltage to within limits of plus or minus one per cent., irrespective of variations in load, notwithstanding a mains input voltage variation of plus six or minus four per cent.

On the Stratton stand will be seen the specialised short-wave items and complete receivers which have been popular for years under the "Eddystone" trade-mark. An interesting feature of the items shown and which is included in the receivers is the die-cast chassis, providing mechanical rigidity and enabling more efficient screening to be carried out.

Gramophone pick-ups and motors, together with complete units, consisting of changers, three-speed players, etc., will be features by Collaro, Decca, Garrard. etc., and items are shown on pages 392 & 393.

Multicore Solders will again have a working demonstration, showing how their three-core flux is used commercially, and this year the demonstration will take the form of a section from the Pye factory where engineers will be assembling television camera units. The makers point out that the manufacture of each camera involves more than 10,000 soldered joints. Some of the equipment which will be made up on this stand at the show will be exported by air to the U.S.A.

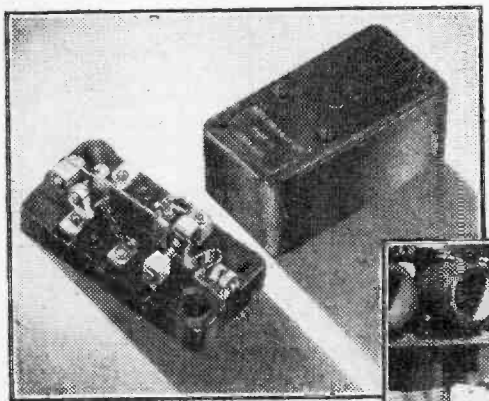


One of the T.C.C. condenser testing machines. See this on Stand No. 72

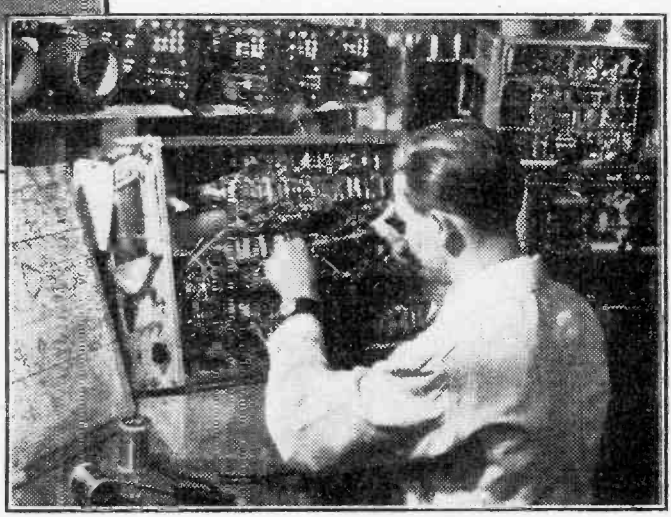
New Dry Batteries

Among the batteries will be seen seven popular new all-dry low-tension batteries in attractive new-style cartons from the G.E.C. Blue Label range. Also, two new layer batteries which have been added to the Red Label range of The General Electric Co., Ltd.

All of these batteries are designed for the latest battery portable and combined mains-battery operated receivers referred to on page 392.



A Belling-Lee thermal delay switch.



See the technicians wiring up a television camera (over 10,000 *joints) on Multicore Stand No.* 32.

Guide to the Exhibitors

List of Exhibitors in Alphabetical Order, with Stand Numbers

Name	Address	Stand No.
Aerialite, Ltd. ..	Castle Wks., Stalybridge, Cheshire	50
Amplion (1932), Ltd.	230, Tottenham Ct. Rd., London, W.1	54
Antiference, Ltd. ..	67, Bryanston St., Marble Arch, W.1	22
Automatic Coil Winder & Elec. Equip. Co., Ltd.	Winder House, Douglas St., S.W.1	46
Balcombe Ltd., A. J.	52, Tabernacle St., London, E.C.2	35
Belling & Lee, Ltd.	Cambridge Arterial Rd., Enfield, Middx	25
Bulgin & Co., Ltd., A. F.	By-Pass Rd., Barking, Essex	1
Bush Radio, Ltd. ..	Power Rd., Chiswick, W.4	16
Chloride Batteries, Ltd.	Publicity Dept., 6/10, Whitfield St., W.1	94
Cole, Ltd., E. K. ..	Ekco Works, Southend-on-Sea, Essex	24
Collaro, Ltd. ..	Ripple Wks., By-pass Rd., Barking, Essex	91
Co-operative Wholesale Society, Ltd.	1, Balloon St., Manchester, 4	12
Cossor, Ltd., A.C. ..	Cossor House, Highbury Grove, N.5	37
Decca Record Co., Ltd.	1/3, Brixton Rd., London, S.W.9	61
Dubilier Condenser Co. (1925), Ltd.	Ducon Wks., Victoria Rd., North Acton, W.3	79
Dynatron Radio, Ltd.	Perfecta Wks., Ray Lea Rd., Maidenhead, Berks	40
Econasign Co., Ltd.	92, Victoria St., London, S.W.1	21
Edison Swan Elec. Co., Ltd.	155, Charing Cross Rd., W.C.2	62
E.M.I. Sales & Service, Ltd.	Hayes, Middx	68
English Elec. Co., Ltd.,	Queens House, Kingsway, W.C.2	67
Ever Ready Co. (G.B.), Ltd. ..	Hercules Place, Holloway, N.7	57
Felgate Radio, Ltd.	6, Studland St., London, W.6	7
Ferguson Radio Corporation, Ltd.	105, Judd St., London, W.C.1	88
Ferranti, Ltd. ..	Hollinwood, Lancs	14
Garrard Eng. & Mfg. Co., Ltd.	Newcastle St., Swindon, Wilts	92
General Elec. Co., Ltd.	Magnet House, Kingsway, W.C.2	26 & 78
Goodmans Industries, Ltd.	Lancelot Rd., Wembley, Middx	41
Gramophone Co., Ltd.	Head Office, Hayes, Middx	89
Hunt (Capacitors), Ltd., A. H.	Bendon Valley, Garratt Lane, S.W.18	56
Imhof, Ltd., Alfred	112, New Oxford St., W.C.1	19
Invicta Radio, Ltd.	Parkhurst Rd., Holloway, N.7	71
J.B. Mfg. Co. (Cabinets), Ltd.	86, Palmerston Rd., Walthamstow, E.17	9
Kolster-Brandes, Ltd.	Footscray, Sidcup, Kent	28
Lee Products (G.B.), Ltd.	90, Gt. Eastern St., E.C.2	77
Linguaphone Institute, Ltd.	207/209, Regent St., W.1	96
Livingston Laboratories, Ltd.	Retcar St., Dartmouth Park Hill, N.19	93
McMichael Radio, Ltd.	190, Strand, W.C.2	69
Marconiphone Co., Ltd.	Hayes, Middx	87
Masteradio, Ltd. ..	10/20, Fitzroy Pl., N.W.1	63
Mullard, Ltd. ..	Century Hse., Shaftesbury Ave., W.C.2	17
Multicore Solders, Ltd.	Maylands Ave., Hemel Hempstead, Herts	32
Murphy Radio, Ltd.	Welwyn Garden City, Herts	15
Newnes Ltd., Geo.	**Tower House, Southampton St., W.C.2**	**52**
Pamphonic Reproducers, Ltd.	Westmoreland Rd., Queensbury, London, N.W.9	85
Peto-Scott Elec. Instruments, Ltd.	Addlestone Rd., Weybridge, Surrey	23
Philco (Overseas), Ltd.	Lion House, Richmond, Surrey	38
Philips Electrical, Ltd.	Century Hse., Shaftesbury Ave., W.C.2	59 & 60
Pilot Radio, Ltd. ..	31/37, Park Royal Rd., N.W.10	58
Plessey Co., Ltd. ..	Vicarage Lane, Ilford, Essex	80
Portogram Radio Elec. Industries, Ltd.	"Preil Works," St. Rule St., S.W.8	20
"PRACTICAL WIRELESS" & "PRACTICAL TELEVISION"		52
Pye, Ltd.	Radio Works, Cambridge	36 & 84
Radio Gramophone Dev. Co., Ltd.	Pale Meadow Print Works, Bridgnorth, Shropshire	29
Roberts' Radio Co., Ltd.	Creek Rd., East Molesey, Surrey	39
Rola Celestion Ltd.	Ferry Wks., Summer Rd., Thames Ditton, Surrey	73
Regentone Products, Ltd.	Eastern Avenue, Romford, Essex	13
Scophony Baird, Ltd.	Lancelot Rd., Wembley, Middx	33
Sculptured Sound-Sali, Ltd.	79a, St. Leonard's Rd., Windsor, Berks	121
Selmer & Co., Ltd., Henri	114/116, Charing Cross Rd., W.C.2	10
Simon Sound Service, Ltd.	48, George St., London, W.1	47
Sobell Industries, Ltd.	Langley Park, nr. Slough, Bucks	34
Standard Telephone & Cables, Ltd. (BRIMAR)	Footscray, Sidcup, Kent	6

Name	Address	Stand No.
Standard Telephone & Cables, Ltd. (SenTerCel)	Connaught House, Aldwych, W.C.2	55
Stella Radio & T/V Co., Ltd.	Oxford Hse., 9/15, Oxford St., W.1	27
Stratton & Co., Ltd.	Eddystone Wks., Alvechurch Rd., West Heath, Birmingham, 31	124
Skarsten Mfg. Co., Ltd.	21, Hyde Way, Welwyn Garden City, Herts	48
Taylor Elec. Inst., Ltd.	419, Montrose Ave., Slough, Bucks	53
Telegraph Condenser Co., Ltd.	North Acton, W.3	72
Telegraph Con. & Maintenance Co., Ltd.	Telcon Wks., Greenwich, S.E.10	42
Telequipment Electronic, Ltd.	73a, Beresford Rd., Hornsey, N.8	83
Telerection, Ltd. . .	Antenna Wks., St. Pauls, Cheltenham, Glos	11
Ultra Electric, Ltd.	Western Ave., Acton, W.3	70
Valradio, Ltd. . .	New Chapel Rd., Feltham, Middx	122
Vidor, Ltd. . .	West Street, Erith, Kent	90
Westinghouse Brake & Signal Co., Ltd.	82, York Way, King's Cross, N.1	49
Whiteley Elec. Radio Co., Ltd.	Victoria St., Mansfield, Notts	95
Wolsey Television, Ltd.	75, Gresham Rd., Brixton, S.W.9	76

Radio Technicians May Get Deferment

DETAILS OF RECENT CORRESPONDENCE AND AN OFFICIAL DESCRIPTION OF A "RADIO TECHNICIAN"

TO increase the number of technicians available in the radio industry, the Radio Industry Council, in agreement with the Ministry of Labour and National Service, is introducing a scheme of training for radio technical and laboratory assistants which may qualify them for deferment of military service. Trainees will register with the R.I.C. at the age of 16 or up to 17 and will be issued with a nationally recognised certificate on completion of training at the age of 21. Trainees will apply for deferment of military service in the normal way, with R.I.C. support. In a letter to member-firms the Secretary of the R.I.C. states:

"Not only will the long-term effect of the R.I.C. scheme be beneficial to the industry, but, in the short-term, the fact that the scheme has the approval of the Ministry of Labour means that trainees under it will be eligible for deferment from military service, thus maintaining the members already in training."

In a memorandum to its officers throughout the country the Ministry of Labour states that:

"Trainees are to be given progressive training through workshops, followed by a period in test departments and/or laboratories. The trainee should not normally be employed on lengthy repetition work except where such work is progressive and only as a stage in the training. The final year should be spent in the laboratories or test-room or on test-equipment maintenance or prototype construction; all work being arranged in stages so as to provide an orderly course of training to the technician level as defined.

"Trainees are to be released from one day or two half-days per week for training in (1) *A National Certificate Course in Electrical Engineering,* (2) *An Internal Grouped Course of the City and Guilds of London Institute in Telecommunications Engineering, or* (3) *Such other course for the training of radio technicians as may be later determined by the Technical Training Committee of the Radio Industry Council in conjunction with the Ministry of Education."*

The scheme, which has been approved by the four constituent associations of the R.I.C., lays down only the broad lines on which training should progress and does not supplant any training scheme operated by individual companies and recognised by local offices of the Ministry of Labour, the intention being to provide a national scheme embracing existing ones.

The Ministry of Labour defines a radio technician thus:

"A radio technician is a person who carries out in a responsible manner approved techniques which are either common knowledge amongst those who are technically expert in his branch of industry or specially prescribed by professional radio engineers. These techniques are not those of the craftsman, though they may involve manual skill; in many cases they include the skilled use of delicate and complicated instruments and may also require the intelligent and accurate use of approved methods of calculation. They involve practical experience of some limited branch of radio-engineering combined with the ability to complete the details of a project using well-established practice.

"To become a radio technician a person must have received a technical education up to a standard at least, and preferably beyond, that of the Ordinary National Certificate in Electrical Engineering, and in addition must have had training and experience in the particular sphere of radio-engineering in which he is to work."

A Bench Power Pack

A STABILISED SUPPLY FOR THE WORKSHOP

By R. Hindle

IN the February, 1952, issue steps taken to prepare for a season's work were described and a simple method of condenser testing was explained. This requires a D.C. source, which could be the H.T. supply of an ordinary receiver. There are many purposes, however, for which a power supply is required for testing and for supplying items of test gear, and it is soon realised that a suitable supply should be made permanently available on the work-bench, specially designed for the purpose, sufficiently versatile and providing the necessary facilities for any reasonable requirement.

The specification of such a pack should cover the following factors :

1. *Voltage.* A nominally 350-volt supply is cheaply provided by means of standard components and probably represents the minimum for the purpose. A higher voltage is occasionally an advantage, but unfortunately the cost of additional volts (other factors being equal) rises steeply. It is desirable also to arrange for lower voltage outputs either by adjustment to the main output or by the provision of alternative outputs.

2. *Current.* This will vary considerably for different purposes from zero upwards. The maximum that can be provided by standard components of reasonable price is 150 mA. and this will probably be found adequate.

3. *Regulation.* An ordinary power pack, even assuming an unvarying input mains voltage, will vary considerably in D.C. voltage output depending on the current drawn by the load applied. Using a 350-0-350-volt mains transformer feeding a standard rectifier circuit the output will rise to nearly 500 volts when no current is being drawn from it, falling to 350 volts on normal load. The smoothing condensers form part of the load and if electrolytics are used the leakage current is appreciable. The change in voltage with varying load is called the regulation of the supply, which is said to be good when the voltage change for a given change in current is low. The regulation is conveniently measured by calculating the equivalent resistance represented by the change in output voltage caused by a change in load current and the aim is to design for a minimum equivalent resistance. For instance, a change of 100 volts in output for a change of 100 mA. in load current is (by Ohms Law) equivalent to a resistance of 1,000Ω, but if the output voltage can be regulated so that for the same range of current change the output voltage change is only 1 volt the equivalent resistance is only 10Ω.

To combine in a single output all these requirements, i.e., a variable voltage with a high maximum, providing a large current and giving an equivalent resistance in the region of unity, is likely to prove expensive and complicated, but by providing different outputs for different purposes an almost equally useful pack can be produced at a reasonable cost. In practice it is unlikely that the full output voltage or the full current output will be required for use when exceptional regulation is called for and so the arrangement is to feed out the unregulated full voltage capable of giving the maximum current and to provide an alternative regulated source giving somewhat lower power.

Adjustment of Voltage

It is not easy to provide facilities for continuously variable voltage output from an unregulated source in a predictable form to operate over a wide range of current outputs and in practice it is easier to arrange for voltage dropping in the individual pieces of equipment to be connected to the pack. The regulated supply serves the purpose, however, of a voltage tap in cases where regulation is not required, and consequently it is as well to design the regulated output to supply a reasonably high current. The regulated output can be made continuously variable over a limited range.

Basic Power Circuit

The design of the basic power supply circuit follows conventional lines. A full-wave rectifier is used in preference to a half-wave circuit, as is customary when a mains transformer is used, because it is then easy to provide the required centre-tapped alternating voltage source. The advantages of the full-wave circuit are :

1. The peak current flow through the rectifier for a given load current is less and consequently when the load is drawing up to maximum current rating there is less strain on the rectifier cathode.

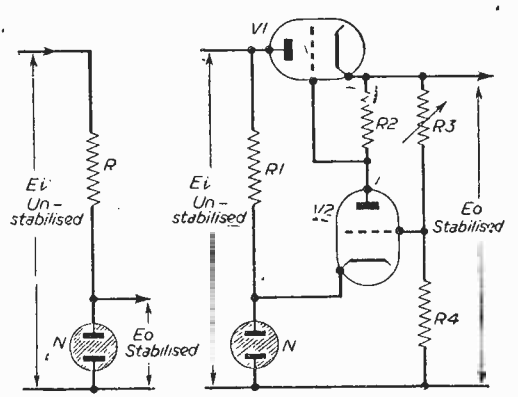


Fig. 1 (left).—Parallel neon stabiliser, and Fig. 2 (right).—Series valve stabiliser.

2. The peak current referred to in 1 is determined by the size of the reservoir condenser as well as by the load. It is possible, therefore, to use a larger reservoir condenser with full-wave than with half-wave rectification without fear of damaging the rectifier.

3. Smoothing is more effective with full-wave rectification because the fundamental hum frequency is 100 c/s whereas with half-wave rectification it is 50 c/s (assuming 50 cycle mains).

Of the alternative reservoir condenser arrangements the choke input circuit (i.e., where the reservoir condenser follows the first smoothing choke) gives better regulation but it also reduces the output voltage and as more effective regulation (or stabilisation, as it is alternatively called) is planned the more conventional condenser input circuit is adopted.

Regulation Design

Two methods of regulation are available. The first is to introduce a variable current device in parallel with the load which will draw more current from the supply as the load takes less, so counteracting the tendency for the supply voltage to rise. Similarly, if the supply voltage tends to rise because of an increase in mains voltage the device draws more current, holding down the voltage supplied to the load. Thus the regulating device takes care of both load fluctuations and mains fluctuations.

The second method is to put in series with the load a device the resistance of which varies inversely as the current flowing through it. When the load current increases the unregulated supply voltage tends to decrease but the resistance of the regulating device decreases and, therefore, the voltage dropped across it decreases, tending to hold constant the voltage applied to the load. On the face of it this method would seem to be useless in cases of mains voltage fluctuations because an increase in mains causes an increase in rectified supply voltage which would generally cause an increase in current drawn which, by the above argument, would cause a decrease in resistance of the regulating device, so accentuating instead of counteracting the voltage increase presented to the load. This is not the case, however, because though the regulation is due to a change in voltage drop caused by varying the resistance, the degree of that change is controlled, not by the current flowing, but, as will be seen later, by feeding back the voltage change as presented by the load, much in the same way as the more familiar A.V.C. operates.

The simplest example of the first type of regulating device, or stabiliser, is the neon tube which tends to keep the voltage across it stable by drawing more current as the voltage increases and vice versa. The simple circuit is given in Fig. 1. An increase in load current increases the voltage drop across R, decreasing the voltage presented to the load and to the neon N. N now draws less current, however, and as its current also flows through R the total current through R tends to be stable and consequently the voltage across it tends to stabilise and the voltage change across the neon and the load is largely counteracted.

This method is reasonably effective but it is not good enough for many purposes. Its equivalent resistance is about 300Ω, a long way from the 1Ω stipulated in the specification at the beginning of this article. The current range over which it can work is also limited. The stabilised output voltage of a neon tube is fixed by the voltage at which the tube burns after it has struck (i.e., when the gas content glows), and cannot be adjusted, but stabilisation at multiples of the burning voltage can be achieved by using neons in series and connecting a high resistance across each neon to ensure voltage distribution. The Stabilivolt is, in fact, a number of neon cells in one envelope, giving regulated outputs in steps of 70 volts, the burning voltage of the individual cells.

Hard valve circuits of the parallel type are practicable but for normal use the second (series) type is generally preferable when more complicated regulating circuits are to be used. A valve takes the place of the series variable resistance element, its resistance (r_a), which varies with its grid voltage (e_g), being controlled by a second valve which serves to amplify the fluctuations in the stabilised output, feeding them back negatively to the controlling valve.

Circuit

The basic circuit is given in Fig. 2. It will be seen that the grid bias between grid and cathode of V1 is provided by the voltage across the load resistance (R2) of V2. This voltage is determined by the anode current of V2, which flows through R2 and this current in turn is determined by the grid bias which, it should be remembered, is not the voltage of the grid with respect to earth but the difference in voltage between the grid and the cathode.

R1 and N form a stabiliser of the simple type previously discussed. V2 draws its current through N, interposed between its cathode and earth or H.T. negative. The cathode is thus held steady at the burning voltage of N. A proportion of the output voltage (E_o) selected by the potentiometer formed by R3, R4, is applied to the grid of V2. The difference between this grid potential and the neon burning voltage is the effective bias to V2 which determines the valve current and, therefore, the voltage across R2 which is the bias to V1. Any variation in E_o is applied in part to the grid of V2, changing the bias of V1 and so changing the effective resistance of V1 to compensate for the output voltage change. Suppose the voltage output tends to increase. Then the grid of V2 goes more positive (i.e., the effective grid bias is less negative). V2 now draws more current and there is a greater voltage drop across R2. This is the bias to V1, which is thus increased, increasing the effective resistance of V1, increasing the voltage drop across V1 and so counteracting to a large degree the increase in E_o that would otherwise take place.

If V2 is arranged to give a high degree of amplification the voltage at the grid of the valve (i.e., across R4), will need to vary only slightly to run V1 through a wide degree of control and so the voltage can be considered to be comparatively stable and about equal to the burning voltage of N. The current through R4 to sustain this voltage is drawn through R3 from the stabilised voltage source. The voltage output can thus be said to be determined by the ratio of R3 to R4 because the current producing approximately the burning voltage of N across R4 is the only current through R3 and by Ohms Law the voltage across R3 is in proportion to the resistance of R3.

(*To be continued*)

On your Wavelength

by THERMION

On Choosing a Receiver

PRIOR to and during every Radio Show I am asked to give advice on the choice of a receiver. I have some decided views on the matter. I always advise those who consult me to prepare a short list of makes by a process of elimination which I will now describe.

The first consideration is service after sales. A receiver may look most attractive and its price may appeal, but if it is backed by unreasonable service or by service conditions which convert a comparatively cheap receiver into a dear one after a year or so, don't buy it. If there is not a dealer in your district, for example, handling that particular make, you are going to be put to some expense in collection and delivery fees when the set goes wrong. I do not say that receivers made by small firms are unsatisfactory; what I do say is, that in some cases their service is unsatisfactory and their charges exorbitant.

The next point to ascertain is whether the manufacturers supply with the receiver reasonable technical data to enable the skilled owner to carry out the simpler adjustments and repairs on his own. For this purpose he will need a circuit diagram and a list of component values and their makes. Typical voltage and current readings should also be given. This is the first snag the would-be purchaser will come up against. There are some firms (in the majority I am afraid) who do not supply such data, except to their recognised agents. They want to force the purchaser into the agents' hands, and, unfortunately, the reputation of some dealers in the matter of excessive charges is too well known to need further stressing by me. I have never been able to understand this stupid attitude on the part of some manufacturers in refusing to disclose values and circuitry.

Another point concerning servicing is this: before buying a receiver ascertain whether it is the policy of the maker to ask for an examination fee. This can amount to as much as 30s., even more. Such a charge, in my view, is unjustifiable, and I would not, myself, buy a receiver from such a manufacturer. This examination fee has to be paid, in some cases, *whether the repairs are finally put in hand or not.* The unsuspecting purchaser writes to the maker complaining of some defect and the manufacturer then collects the receiver. Within a week or so (!) the owner will receive an estimate for repairs to which has been added the examination fee. I do not advise the purchase of a receiver where the policy of the manufacturer is to dip into your pocket on service charges throughout the life of the receiver. I take it that the would-be purchaser has made up his mind whether he requires a table model or a console, whether he requires a radiogram, all-wave or two-wave coverage, quality reproduction or an "ether roamer" set. The size of the room in which the receiver is to be installed and the nature of its furnishings, particularly the timber employed, will, of course, decide to some extent the cabinet style. It is a simple matter with these facts in mind to go through makers' lists and to prepare a short list. From that point, investigate the various points I have enumerated above, when you will find that the short list becomes even shorter! Manufacturers should understand that we are not still in the twenties. Most people to-day have a reasonable knowledge of radio. It would seem the policy of some firms to manufacture sets and sell them at a small profit or at cost and rely upon service charges to make their profits!

There is not a receiver on the market, the performance of which cannot be equalled or excelled by a well-designed, home-built receiver. The most recent design published by this journal—the "P.W." Three-speed Autogram—is a good example. I listened to a demonstration of this and I can say with certitude that there is not a receiver on the market of equivalent quality. Certainly, by building a set yourself, you save that monstrous deodand, 66⅔ per cent. purchase tax, which the merciless State imposes on all commercial radio receivers. It is possible, too, to buy very cheap components to-day, thus effecting a further saving.

The "P.W." sponsored designs are backed by a better technical advice service than that of many manufacturers. It is free, too, and prompt. The service this journal gives to builders of its receivers is excellent and highly valued—even by dealers, many of whom avail themselves of it.

Whilst I am dealing with the choice of a receiver it is interesting to observe from recently published statistics, that the average number of sets sold per shop continued to show a decline. The restriction on hire purchase imposed in the Budget probably has something to do with this, although I observe that the profits of one or two manufacturers are up.

The BBC Governors—Selection Plan Dropped

I AM glad that the Government has dropped its plan to set up an independent committee responsible for the selection of BBC governors. I would like to see all of the governors sacked as well, for I do not like the system. The BBC is not a university and it should be run on straight-forward commercial lines with a board of directors, a chairman, each of whom is working full time. I have not liked in the past the choice of governors.

Shape of Things to Come

THE recently announced formation of a company to develop equipment for sponsored broadcasting is a straw indicative of the changing pattern of broadcasting in this country. The company intends to provide the type of service approved by the Government's White Paper on broadcasting and which Parliament has endorsed. The first programme will be awaited by your humble scribe with more than ordinary interest, and I shall await with even greater relish the comments of those radio critics, so-called, who are under the mistaken impression that criticism automatically implies evisceration of the person or the subject criticised. At best they praise with faint damns.

Surplus Tuning Indicators

AN EXPLANATION OF THE VARIOUS TYPES AVAILABLE AND HOW THEY SHOULD BE USED

By E. G. Bulley

VARIOUS types of these indicators are now available on the surplus market, being of both British and American manufacture. However, these indicators are extremely useful in radio receivers as well as in experimental gear and measuring equipment.

The indicators are, in effect, a valve, consisting of a triode unit upon which a fluorescent target is assembled. Furthermore, they are designed to give a visual indication by means of this target of the effects caused by the change in the applied control grid voltage or bias. Both the anode of the triode unit and the target are operated at positive potential, the cathode being common to both. Now as the target is at positive potential, the electrons emitted from the cathode are attracted toward this electrode, the latter being shaped like a cone. The electron emission, in this instance, is controlled by what is known as an auxiliary or ray control electrode, and is internally connected to the anode of the triode unit, but located between the cathode and the target. Reference to Fig. 1 will clarify this point.

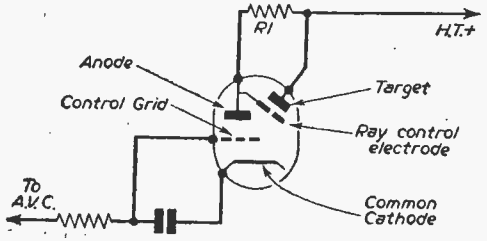


Fig. 1.—General arrangement of a tuning indicator.

Glowing Target

The electrons that impinge themselves upon the coated target cause it to glow, and the extent of the fluorescent area is, as already mentioned, controlled by the ray control electrode. However, when the voltage on this control electrode is increased from a low positive value to a fairly high positive value, the area of shadow is reduced. That is to say, that the lighted area is increased. Likewise, if the control grid of the triode unit is made more negative, the anode and the ray control electrode become more positive with respect to the cathode, due to

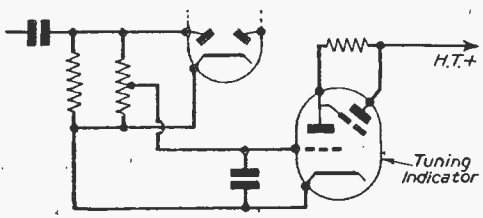


Fig. 2.— Feeding the indicator from a detector stage.

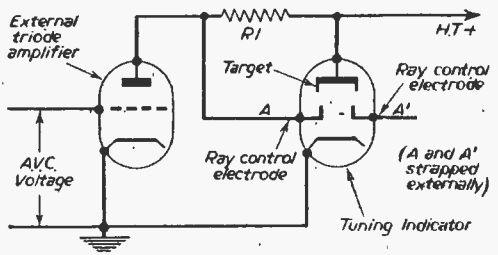


Fig. 3.—Basic diagram for indicator with separate amplifier.

TABLE ONE

Surplus No.	Comm. No.	Heater Volts	Amps. Heater Current	Max. Anode Volts	Max. Target Volts
CV843	*6AB5/6N5	6.3	.15	180	180
CV847	*6AF6	6.3	.15	—	100
CV51	E1320	6.3	.30	250	250
CV504	*6U5/6G5	6.3	.30	250	250
CV1077	EM631	6.3	.20	250	250
AW6	EM631	6.3	.20	250	250
CV1103	Y63	6.3	.30	250	250
NR69	Y63	6.3	.30	250	250
CV1359	ME41	4.0	.45	250	250
CV1412	TV4	4.0	.30	250	250
CV1434	EM4	6.3	.20	275	275
CV1756	*1629	12.6	.15	275	275
VT138	*1629	12.6	.15	275	275
CV1906	*6E5	6.3	.30	250	250

* Mainly American manufacture.

the decrease of the voltage drop across R_1 (see Fig. 1), R_1 being a resistor externally connected between the anode and the target.

The fluorescence has a somewhat fan-like movement and it is therefore entirely dependent upon the biasing of the control grid.

In actual circuit use the controlling voltage is sometimes taken from the A.V.C. circuit (Fig. 1) and thus an indication of resonance is given when the unlit portion of the target is at minimum. Alternatively, some types are recommended to have their controlling voltage taken from a detector circuit and not the A.V.C. diode circuit. This enables visual tuning to be obtained below what is termed a delay point (Fig. 2).

For Measuring Equipment

As a point of interest, the majority of the surplus indicators have one ray control electrode and the triode unit in one envelope, but one type, namely the CV847, has two ray controlling electrodes and requires a separate triode valve to act as the amplifier. However, these two controlling electrodes can be strapped together in parallel and used as one element (Fig. 3) and with a separate triode they can be used in a conventional circuit.

The types available on the surplus market are listed in Table One which also includes their electrical characteristics; this table should, however, prove useful to the experimenting amateur as well as the constructor. Furthermore, these valves lend themselves admirably to the amateur who likes to construct measuring equipment. One such piece that can be constructed is that of a valve voltmeter, wherein the indicator replaces the conventional meter.

For measuring equipment it is advisable to adopt the most sensitive types for reasons of accuracy. In conclusion, one must not forget that the cost of such valves against that of a good quality micro-ammeter is very small.

VHF Broadcasting in the U.S.A.

A REPORT ISSUED BY MESSRS. PYE, LTD.

AS stated in our Editorial page last month, a report has been circularised in this country covering the position of VHF in the U.S.A. and as this is of great importance in view of the findings of the Beveridge Committee, we feel that readers would like to have the opportunity of reading the report, a copy of which is given below:

"It is paradoxical that while Britain is apparently about to embark on VHF broadcasting, in America where FM VHF broadcasting has been in existence for fifteen years many people are wondering whether it can survive much longer. In the belief that the facts about U.S. FM broadcasting are insufficiently well known in this country we have compiled the following report. It is based mainly upon a survey carried out by two of our executives who have just returned from a two months' visit to the U.S.

The facts and figures given in the report have been obtained from four sources:—

(*a*) The FCC personnel and records.
(*b*) The American Radio and Television Manufacturers' Association.
(*c*) The American journal 'Broadcasting.'
(*d*) Interviews with manufacturers and station operators in many parts of the U.S.

Receiver Production

In 1952, 15 years after the establishment of the first FM stations, only 5 per cent. of all sound radios and only 2 per cent. of all TV sets currently manufactured incorporate FM Sound Broadcasting.

An indication of its importance in the eyes of the American public is obtained from the fact that three times as many 'clock' radios and seven times as many car radios are sold as are FM models.

The largest radio receiver manufacturer stated that about 5 per cent. of his sets had an FM range and the biggest and most 'loyal' FM manufacturer stated that about 12 per cent. of his output had FM. Many manufacturers have dropped FM altogether.

Receiver Price

AM table radios retail at from 12 to 40 dollars. A typical table model sells at about 30 dollars. A similar model, including an FM range, sells at about 60 dollars. The cheapest FM model sells at 55 dollars, and the FM table model may be priced as high as 90 dollars.

If similar circuits were adopted by British manufacturers the typical table model now costing £15 would cost £30 with FM, plus tax in both cases.

The cost of receivers has undoubtedly been one important factor in inhibiting the sales of FM radio in the U.S., but in spite of this, past efforts to produce really cheap FM have failed and been dropped.

The super-regenerative receivers and convertors now being tried out in Germany have disappeared from the market entirely. Those American manufacturers who still market FM have come to the conclusion that an FM receiver must have high sensitivity, good limiting, low drift and low distortion even if these features make the resulting receiver expensive.

On the retail side we could find little enthusiasm for FM, most models being sold at a discount. At Macey's radio department we counted 130 radios on show. Only five had FM.

There is no such thing as an FM portable or an FM car radio. This is presumably because the cost would far outweigh the advantages, if any, of FM in these spheres.

Station Operation

The position here is equally gloomy. There are some 600 FM stations licensed compared with 2,700 AM. The number has dwindled from 800 at the peak period and it is expected to continue to decline. Many existing FM operators have submitted appli-

cations to FCC asking to be allowed to reduce their hours of operation.

Of the 600 stations in existence only 65 represent independent operations. The others are affiliated to AM stations and merely duplicate the AM programme. Of the independent stations only six claim to have shown a profit in 1951. The majority of the others lose money heavily. Twenty-one such stations were closed down in the year 1950-51 alone.

No separate figures are available for the affiliated stations, but most of these seem to represent a 'holding down the channel' operation. The comment of the station manager of WHAM Rochester was typical. He stated that if his AM outlet broke down his telephone switchboard would be inundated with complaints within a half-minute. The FM outlet conveying the same programme could fail for half an hour and no one seemed to mind, and no calls would be received.

The position of FM has not been greatly influenced, as one might think, by television. This is shown by the AM station revenue figures. In TV-developed areas AM revenue was down by only two per cent. in 1951. In non-TV areas AM revenue was up by 10 per cent. It is interesting to note that TV is so far showing little sign of ousting AM sound radio in the U.S. It is merely changing its character and the listening habits of the public.

Public Reaction

No official estimates were available of the number of listeners using FM but it is probably less than one per cent. The average listener does not have it on his set. Of those who do, many just do not use the FM band.

FM does make a limited appeal to certain minorities such as :—

(*a*) High quality reproduction enthusiasts.
(*b*) Rural listeners in those areas where night-time reception of AM is bad.
(*c*) The smalltown local station listener whose daytime only AM station closes down at night.
(*d*) Foreign language and educational broadcasts to minority groups in the metropolitan areas.
(*e*) Specialised broadcasting such as broadcasting background music to restaurants.

None of these functions constitutes a primary public service and few have any commercial attraction. FM in the U.S. is at best a gap-filler for the AM services. It has met with no success when trying merely to do what the AM stations do already, but to do it a little better. Such success as it has had has been in tackling those specialised fields which the AM stations neglect. It is largely in the hope that these special functions may grow to flourish that FM is warding off the threat of extinction.

Conclusion

One is led to conclude that in the U.S. at least, FM receivers are much too expensive in relation to what they offer the public in terms of improved reception or alternative programmes. In the eyes of the public the FM band is probably worth about as much as the inclusion of a short wave band is to a British listener.

On the other hand all attempts to meet this low price bracket have been abandoned by the American manufacturers. One has the impression that their problem would have been substantially easier and the position healthier if the modulation choice had been AM, but the overall impression is that any form of VHF sound broadcasting has a very difficult furrow to plough.

So far as Britain is concerned there is reason to fear that VHF broadcasting may suffer a similar or a worse fate. If we stumble into it without benefiting from the American experience it probably will.

It is certainly incumbent upon those who promote it to advance logical reasons why it may be expected to fare better.

J. R. BRINKLEY, J. O. STANLEY,
Pye, Ltd., Radio Works, Cambridge.
3rd June, 1952."

British L.P. Discs for U.S.A.

FURTHERING the close co-operation which has existed for so many years between R. C. A. Victor (U.S.A.) and the Gramophone Company Ltd. (England), the companies have made a joint announcement in America that a new series of English records is to be launched on the United States market.

This distinctive new series will be composed entirely of H.M.V. Long Play 33⅓ r.p.m. records and the new 45 r.p.m. 7in. microgroove records. The series will present those world-renowned artistes and conductors who are under contract to the Gramophone Co. Ltd.

The rapidly expanding market for Long Play records and for the 45 r.p.m. microgroove records in America gives every hope that the introduction of this new series of British recordings will prove a most valuable contribution to the dollar export market.

Behind this interesting announcement lies the fact that there has always been in America a considerable section of the music-loving public who like to have British recordings and also, of course, the fact that many artistes and conductors of world repute are under contract to the Gramophone Co. Ltd.

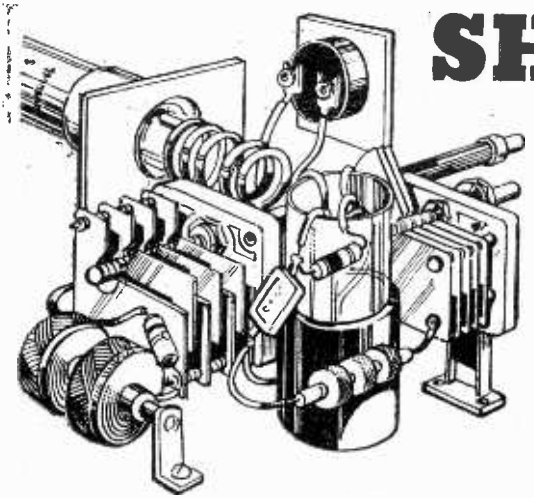
All of the recordings involved have been made in England or European countries on British equipment, which ensures artistic performance and recording quality without superior in the world.

As a gesture which proved of especial interest to Americans, the Gramophone Co. Ltd. flew the original "His Master's Voice" trademark painting to New York for the launching of these important new records. It was exhibited at the Press conference held in New York when the introduction of the new series was announced.

This is the first time that this world-renowned picture has been to America and the interest on its arrival was quite remarkable. Arrangements were quickly put in hand for television and radio programmes to be broadcast featuring the romantic story behind this painting.

J. David Bicknell, "His Master's Voice" artistes manager, who accompanied the picture on this flight to New York, recorded a half-hour interview for subsequent transmission over an important American radio network and the picture was in great demand by American Press photographers.

Painted by Francis Barraud before the turn of the century, this picture has left the company's board room only once before in 50 years. This was on the occasion of its exhibition at the Royal Easter Show in Sydney, Australia, in 1950.



SHORT-WAVE SECTION

SHORT-WAVE LOGS AND LISTENING

By A W. Mann

TO-DAY the short-wave bands have much to offer the active short-wave listener. Time was, however, when the frequency channels were much less congested, transmitter power relatively low, and receivers less sensitive than is the case to-day.

In spite of such handicaps there was much of interest to be heard on the broadcast, commercial and amateur bands.

Most of the broadcast stations were of an experimental nature, and were engaged in collecting data as to suitability of wavelength according to the time of day.

The coming to light of a number of old log books brings to mind much that has been heard at the writer's location and since forgotten.

The American pioneer KDKA, for example, transmitted on a wavelength of 62.5 metres, while 2XAF was on 32.77 metres, 2XL 90 metres and WRB on 70.74 metres. In the writer's opinion the programme material of those days was superior in many ways to some present-day broadcasts from the U.S.A.

There were, of course, a considerable number of European stations on the air, and anything heard outside of Europe was regarded as DX.

Africa

African broadcasters on the air now are in some instances using comparatively high power, and are thus more or less consistently received throughout the world. During the period under review, however, there was but one low-power transmitter. This was the first colonial short-wave station 7LO Nairobi, Kenya Colony, transmitting on a wavelength of 100 metres.

Until the wavelength was changed to 31 metres all my attempts to receive those transmissions failed. We did eventually hear an outside broadcast from a lions' drinking place.

There are now several stations transmitting programmes from various parts of the African continent, but QRM in the case of Nairobi and other low-power ones makes reception difficult.

The reception of these stations is a good test by the way for those interested in directional aerials and specialised reception. All are listed from time to time in short-wave listener publications.

Canada

Canada has, in the writer's opinion, one of the best and most consistent short-wave broadcast networks. During the greater part of the year the transmissions radiated by the CBC can be heard on various frequencies when directed to this country. This applies to all types of receivers used. The high-power transmitters used to-day in conjunction with beam arrays account in large measure for such consistent reception.

While there were several low-power transmitters on the air during the periods covered by the old log books, receiving the transmissions radiated was by no means easy or consistent. Among a total of twenty stations listed as of then high-power, not one Canadian station was included. CFCX Montreal and several others listed were heard, but generally at poor volume and with bad fading. VE9DR Drummondville, however, was the most consistent and relayed main station programmes.

VE9DR was a Canadian Marconi station, and the QSL card pictured a gigantic control room with a number of transmitters lining the sides.

Australia

So far as Australian transmissions are concerned reception of the early low-power transmissions was usually good. Amongst those verified were 3LR 600 watts, 2FC and VK2ME, the latter using 20 kW.

Nowadays, America, Canada and Australia radiate regular scheduled programmes which are received with ease under normal receiving conditions, and this being so can no longer be regarded as DX.

Rocky Point, which had a forest of aerials, a large number of transmitters, and a long list of assigned frequencies was a hot favourite, and could be heard working 'phone with ships, including *Empress of Britain* GMBJ, *Olympic* G2GN, a call by the way now held by a Chelmsford amateur, and several other big liners.

The chief interests so far as these ship-to-shore transmissions were concerned centred on the technical conversation which ensued during the contacts.

Usually, when tuned to a ship transmission the position of the vessel was given to the shore station operator. This enabled the listener to refer to his world map and find out just how far across the Atlantic it happened to be at the time.

One liner regularly gave the position on schedule at 9 p.m., and the distance covered in 24 hours was surprising. The writer remembers hearing the *Olympic* working WOW when in Lat. 44°, 58″ N., 35°, 81″ W.

All the big liners, as they were fitted with ship-to-shore telephony apparatus, were followed during the testing-out period. *Leviathan, Majestic, Aquitania*

Monarch of Bermuda. The SS *Belganland* being followed in this way while on a world cruise. The *Berengaria* was also heard.

Included in the list were the well-known Italian and French liners, as well as those of Germany. The French *Normandy* on her maiden trip was heard when 600 miles out from Southampton.

Little Ships

In due course both ships and shore stations were fitted with speech inversion apparatus, and apart from occasions when the operator used position B in which the inverter is out of circuit, one seldom heard those stations or verified them with certainty.

Having in the meantime discovered the trawler 'phones, attention was paid to the smaller craft. These included *The Rudyard Kipling* and *St. Roland* which, I believe, are still to be heard. There were dozens of others, some of which were at times off Bear Island, the coast of Greenland and Iceland respectively, together with some up in the White Sea area.

The modern counterpart to this type of listening is to tune for maritime mobiles which are American 10 metres amateur stations aboard ship, as per *Flying Enterprise*.

Outstanding Broadcasts

Amongst what the writer considers the most outstanding short-wave broadcasts heard, considering the period and receivers used, was the arrival of the German Graf Zeppelin at Lakehurst, Los Angeles. The outside broadcast was radiated from 2XAD on 19.56 metres. Three 'planes were flying over the hangar ready to meet the airship as it approached in an easterly direction with a fine bank of cloud behind it.

Three biplanes and eight monoplanes completed the escort, one of the former being a five-engined machine. 'Phone conversation was a little later heard in German, and was thought at the time to be from the airship to ground.

It was at this period of listening activity that I turned my attention to the building of a three-valve receiver using triode detector, R.C.C., and transformer-coupled L.F. stages, also to directional aerials.

This combination provided reasonably good loudspeaker reception under favourable conditions. Later, this set was rebuilt into a metal cabinet. Other events of interest via 2XAD was the arrival of the multi-engined German aircraft DO-X in New York harbour, also the arrival of the Italian so-called air armada at Chicago. When the England to Australia flight was under way, news as to the progress of the competitors was received through various channels.

During my years of active, consistent listening, many famous personalities were heard, including several pioneer airmen and other record-breakers. The most outstanding of all was the Marchese Marconi heard on two occasions during the testing out of HVJ, and at the official opening of that station. M. Mathieu, who was associated with Marconi in his experiments aboard his floating laboratory, the steam yacht *Electra*, was also heard on occasion.

Listening to test transmissions from new stations used to be very interesting, especially when working duplex with others in this country, U.S.A., Australia, Canada, and South America, the listener as well as the engineers gaining an idea as to the potentialities of the transmitter in use.

Aircraft

Unlike American listeners who had trans-continental air service 'planes and ground stations to search for, our listening depended on picking up a chance transmission from service aircraft.

Among those logged were some tests between aircraft and ground while the former were flying over Dublin Bay at 2,000ft. and 6,000ft. This was in June 1930. Signals were at R4QSA3 at 2,000ft.; a complete fade-out occurred at 6,000ft.

If this was a service aircraft, I wonder what type of low-power transmitter was in use. The TR9, I believe, dates back to that year. The wavelength used, however, was between 150-160 metres, and it may be that a preceding model was in use or a special variant of the TR9. Not bad for low power in any case.

Good Conditions

Receiving conditions generally were much superior than in recent years due, of course, to the fact that we were in a more favourable phase of the eleven-year cycle. This enabled one to obtain loudspeaker reception of the transmissions radiated by Dutch East Indies' stations PLE and PMA, etc.

The same applies to a number of South American stations, including LSX Buenos Aires, 20 kW C.O.C.D., Habana Cuba, 48.92 metres, YVQ Maracay Venezuela, PRA3 Rio de Janeiro, Brazil, and dozens of others throughout the world. PRA3 and PRBA were run by the radio club of that country and the Companhia Radio Internaçional.

Simple Apparatus

This article, based on old log books as the source of reference, is but a fraction of what they contain in the way of entries. For example, long-period reports were appreciated at that time by station authorities, and we have data concerning such reports as sent to America, Australia, Java and others. The lowest-powered short-wave broadcast transmitter heard was VP3MR using 150 watts of Georgetown, British Guiana.

The aerials used covered almost everything from a 15ft. wire to a 2ft. sided frame, with set coupled end-on, all indoor types. I note a QSL card for VE-9HX, the Halifax short-wave relay of the Canadian CHNO. This dates with the putting into commission of the first directional aerial used at this location.

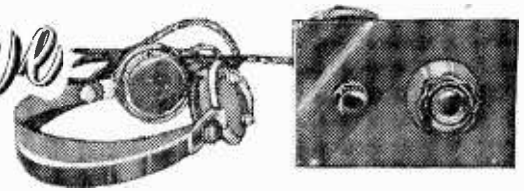
Some are apt to decry the relaxation of sitting down and tuning in short-wave broadcasts, and are all for listening to amateur transmissions, and would have everyone else do the same. To my way of thinking there is nothing like mixing one's interests and listening to all kinds of transmissions, building experimental receivers and trying them out, together with a few aerial experiments thrown in.

In addition, it helps to take a spell away from radio. One comes back to it with renewed interest and increased enthusiasm. Taking the radio press as a guide, it would appear that the specialist short-wave broadcast listener is in the minority so far as reporters are concerned.

Newcomers to short-wave radio are prone to regard compilers of call-sign lists common to specialised publications as super experts.

The fact, however, remains that getting to know one's receiver, how to handle it, when to listen and where, are the only qualifications necessary plus, of course, plenty of time to devote to operating.

A Dual-Wave CRYSTAL DIODE RECEIVER



AN IDEAL SET FOR THE BEGINNER

By F. G. Rayer

THE crystal set has always enjoyed a certain measure of popularity, and such receivers have undoubtedly been constructed in large numbers over a period of many years. Modern developments have enabled the old-fashioned crystal detector, which had to be adjusted by hand, to be eliminated, but before going on to consider the kind of results which may be expected, the factors which have made crystal receivers so popular should be noted. Such a receiver forms a stand-by always ready for use when required and is, of course, wholly independent of any mains or battery supply. It therefore allows local programmes to be heard when the main receiver is out of commission, either from power cuts or other breakdown, or because batteries have run down and no replacement is at the moment available. Such a receiver can also be used in a bedroom, or when it is desired to listen to a certain programme personally. There are *no* running costs, and no licence is required when this is already obtained for another receiver. The initial cost is low, while circuit and constructional details are such that no difficulty whatever should be experienced by anyone making up the receiver, even if they have done no work of this kind before. Furthermore, if some wrong connection *were* made no damage is caused, and the receiver would work correctly when the error was rectified. This is by no means so with valve receivers, where valves or other components may, in some cases, be damaged by the application of wrong voltages, or other errors in connecting up.

Results to Expect

The receiver is simply switched on, as with a valve set, when required, a 3-way switch providing "Off," "Medium Wave" and "Long Wave" positions. The range at which transmissions may be picked up, and the volume obtained, depends to a large extent on local conditions, and particularly upon the aerial and earth system. Used in the Midlands, the receiver picked up a few of the more powerful continental stations with surprising strength; it also provided "Light" and "Home" programmes at excellent volume, and the Third programme at sufficient strength for prolonged listening with ease. These results were obtained with a 50ft. outdoor aerial, plus the usual earth. With the aerial removed, Home and Light programmes were audible but weak. With an indoor aerial volume was restored to a perfectly satisfactory level. The long outdoor aerial, with no earth, gave rather poor volume, which was still further reduced when using the indoor aerial alone. It is, therefore, very desirable that an earth connection be arranged, even if the receiver is used upstairs. An indoor aerial would be satisfactory in many areas for local reception.

These details should serve as a guide, but reception conditions vary throughout the country. In some areas the Third programme transmissions are not well received, even with a valve set.

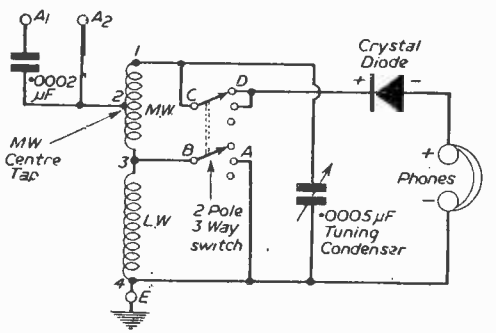


Fig. 1.—Circuit of the crystal receiver.

Circuit Details

An air-cored coil of fairly large size is generally best for such a receiver, and has the added advantage that it can be wound easily by the constructor who

COMPONENTS FOR THE DUAL-WAVE "CRYSTAL DIODE."

- **J.B. Standard .0005 µF. tuning condenser with mounting feet. (Coventry Radio.)**
- **Type C1065.S. 2½in. knob. (Coventry Radio.)**
- **7/8th in. diameter knob (Coventry Radio).**
- **2-pole 3-way wafer-type rotary switch. (Coventry Radio.)**
- **Five 4 B.A. terminals type C2512. (Coventry Radio.)**
- **.0002 µF. fixed condenser (Dubilier, etc.). (Coventry Radio.)**
- **Crystal diode with mounting brackets. (Post Radio Supplies.)**
- **Brown Bakelite Panel 6in. x 4in. x ¼in. thick. (Post Radio Supplies.)**
- **Terminal Strip 6in. x 1in. x 1/16in. (Post Radio Supplies.)**
- **Coil former 3in. by 1⅝in. diameter, 2 oz. 28 S.W.G. enamelled wire, and 2 oz. 34 S.W.G. D.S.C. wire. (Post Radio Supplies.)**
- **Wood for baseboard, screws, etc.**

wishes to make his own coil. A compromise has to be made between selectivity and volume, and two aerial terminals are fitted so that the user can select that most suitable for local conditions. When aerial terminal "A2" is used the aerial is taken to a centre-tap on the medium-wave section of the coil, and this gives fair selectivity and good volume. Using terminal "A1" brings in a fixed condenser of .0002μF. This particularly increases selectivity on long waves, and helps to prevent long wave break-through where the receiver is used close to a long wave transmitter.

The receiver is switched off when not required as mentioned. The correct polarity is indicated for the "Phone" terminals because a steady direct current of about 50 microamperes flows, when the receiver is tuned to a local transmitter, and with some types

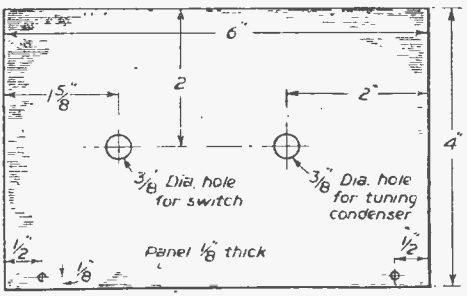
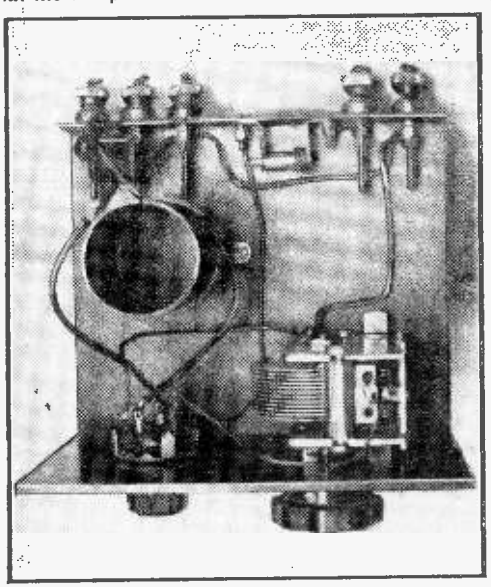


Fig. 2.—Details of the panel.

of headphones this could cause some slight eventual demagnetisation, if the phones were wrongly connected.

Points on Construction

The overall dimensions have been kept down so that the completed receiver can be housed in a small,



Plan view of the receiver.

neat cabinet. The panel is 4in. by 6in. and the receiver 5 3/16in. deep, excluding terminals. The polished brown bakelite panel specified ensures that the final appearance is satisfactory. No reduction drive is used with the tuning condenser, as this is scarcely necessary. The large knob, with skirt and engraved line, proves perfectly satisfactory for tuning. (The suppliers of this knob can also provide a knob with scale, and this could be used instead if the constructor prefers.)

In addition to the specified crystal diode, other similar detectors are available. The Sylvania 1N22 or CV102 may be used and have similar dimensions and characteristics. A second-hand detector (e.g., one taken from used ex-Service apparatus) is not

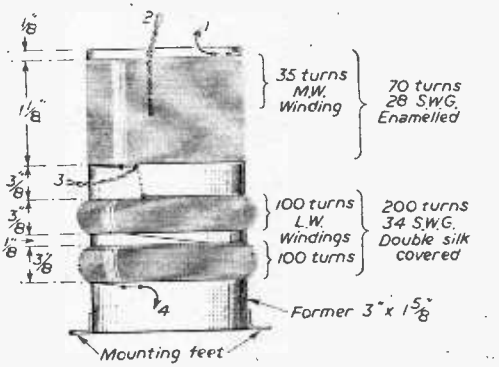


Fig. 3.—Coil data.

recommended, as it may have been misused, or had its sensitivity reduced. When using the 1N22 type, the large end may need scraping because these have a screw which is subsequently covered with hard varnish so that no electrical contact may exist between the detector and mounting brackets.

In order that the tuning control may be in a central position, the tuning condenser is raised by ¼in., and this can be done by placing ¼in. bushes under the fixing brackets, or by placing a piece of wood roughly 2in. square by ¼in. thick under the condenser before screwing it in position.

Rotary switches of the type illustrated are manufactured in certain sizes, and a lesser number of contacts than the maximum number which can be accommodated on the switch may be found. The same type of wafer is used for both 2, 3- and 4-pole switches. As only two poles are required, the other contact tags are ignored, if fitted to the switch. If they are not fitted, part of the wafer may appear blank. These points sometimes appear to confuse constructors who have never used this type of switch before, but if a 2-pole, 3-way switch is ordered they can be sure that this is suitable, and if extra contacts are found on the actual component, these are disregarded.

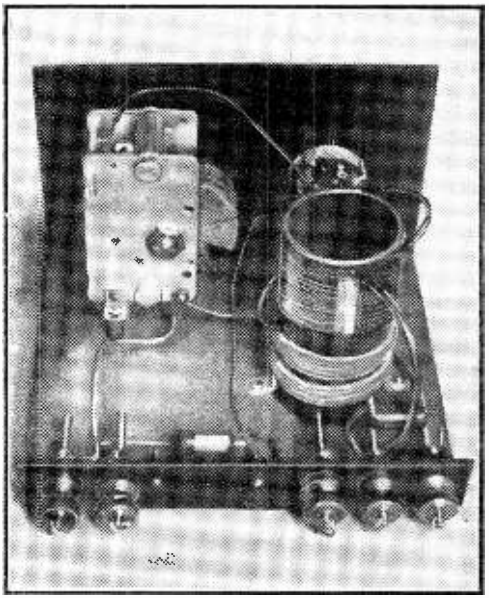
The diagram makes the construction of the coil quite clear. The dimensions between the respective windings are not critical, but given as a guide to the disposition of the windings. The ends are secured by passing them through small holes in the former, and should be left 4in. or 5in. long to reach to the various parts in the receiver. Point "2" is formed by making a loop in the wire, and point "3" will consist of *two* ends of wire, twisted together—the junction between medium- and long-wave sections of the coil. All turns must be wound in the same direction.

Aerial, Earth and Phones

The best aerial is a fairly long, outdoor one, situated as far as possible from buildings and other earthed objects, and as high as possible. However, circumstances often prevent such an aerial being erected, and good results can be obtained with other types. Whatever kind of aerial is used, it should be insulated by using one or two aerial insulators at the points of suspension. The down-lead should not descend against the house wall, but be kept a few feet away, if possible. Losses will then be avoided (and these can be severe in wet weather, if the down-lead is attached to brickwork), and signal pick-up increased. An average outdoor aerial could consist of about 50ft. of wire, this forming both the down-lead and horizontal portion. If space permits, a longer aerial can be used, with some slight increase in volume.

An indoor aerial can be made from any insulated wire, which is usually placed round the picture rail, against the wall. It is sufficient to take the wire along two walls of the room. If it can only be taken along one wall, sufficient volume may still be obtained, though the wire is then likely to be somewhat short. In a bedroom, results with the aerial at floor level will be found to be similar to those when the wire is near the ceiling. Under reasonable conditions an indoor aerial should be satisfactory. However, it cannot provide as much signal pick-up as a good outdoor aerial. If the building has a metal fabric or steel framework then an outdoor aerial is likely to be essential.

The earth lead should be taken to a metal object actually buried out of doors. Earthing spikes are obtainable for this purpose, or the wire may be securely attached to any metal object (preferably of a type not likely to corrode). In some cases an earthing point may be available in the house, or a descending water main can be used.



Another view of the receiver.

A wide variety of headphones can be operated with success, but *low* impedance headphones are *not* suitable. Balanced-armature headphones, now readily obtainable, are satisfactory; so are medium- and high-impedance phones of all types. Moving-coil phones are not suitable, being of low impedance. If it is particularly desired to use such phones, or other low-impedance types which may be to hand, then a matching transformer is required. The primary of this should be connected to the phone terminals on the receiver, and the headphones should be taken to the transformer secondary. The transformer *must* be of correct type for the phones used; if it is not, volume will be reduced. The usual speaker-matching transformer is *not* suitable for most moving-coil phones, as the latter are of somewhat higher impedance than the normal loudspeaker.

A ready-made cabinet for the receiver may be obtained from James Tallon & Sons, Ltd., Manor Works, Manor Road, Rugby.

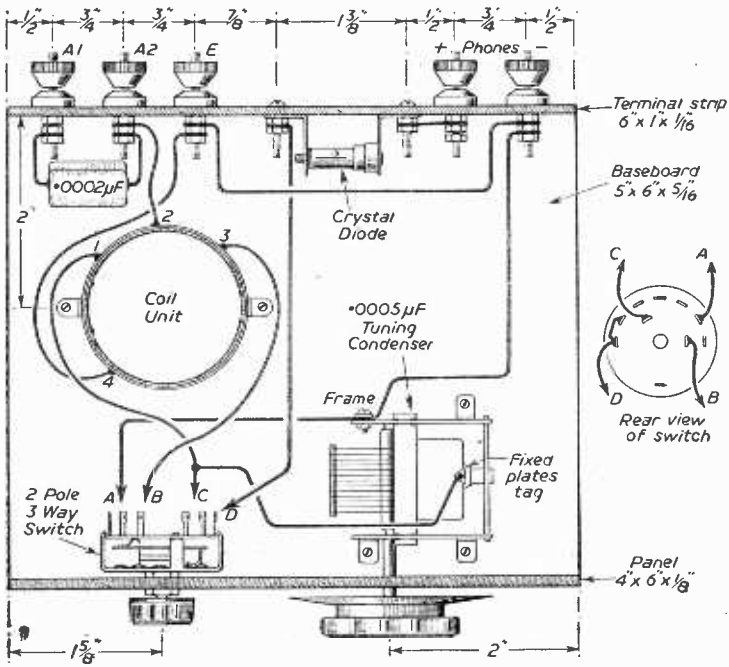


Fig. 4.—Wiring diagram of the receiver and switch.

TRANSMITTING TOPICS

MORE ABOUT SUPER-MODULATION By Wm. A. Hope

FOLLOWING the author's recent article in PRACTICAL WIRELESS, he has heard of the difficulties which have, unfortunately, dissuaded the potential constructor from using this system. The chief difficulty encountered is that of tuning up the transmitter and, at the same time, obtaining a good match between the aerial system and the P.A./P.M. stages. The purpose of this article is to clear up any difficulties on the subject.

Carrier Spreading

This is experienced when the aerial is over-coupled to the output stage of the transmitter; thus, there exists a mis-match between the radiating system and the P.A./P.M. stages. If the aerial coupling to the P.A./P.M. stages is too loose, the maximum P.M. efficiency will not be obtained. Thus, it will be seen that the degree of coupling which exists between the output stage of the transmitter and the aerial is a deciding factor when S.M. is to be used. If the P.A. valve is not operating under normal Class C conditions, the result will be a slight spreading of the carrier. Bad "splattering" off the side-bands can be remedied by checking that the R.F. drive and the audio volts to the P.A. valve are correct for the valve in question. When there is too little R.F. drive on the P.A. grid, this (assuming the audio volts input to be negative going) will cause the R.F. output to reach zero before the peak Ia of the P.M. valve has reached maximum.

Aerial Coupling

Now we come to the tricky part of the setting-up procedure—namely, the aerial coupling. The tank circuit should be tuned to resonance as indicated by the minimum of "dip." This "dip," in practice, is found to be higher than that of the normal P.A. The aerial loading is now increased until the P.A. draws maximum current and the drive and bias to the P.A. adjusted until the P.A. is operating at about three-quarters of its C.W. rating. It should be stressed here that these operations should be done with the transmitter output connected to a resistive load equal to the characteristic impedance of the aerial system. This ensures that the load on the P.A. stage is constant during the initial "loading" procedure. Once the P.A./P.M. stage has been correctly matched to the aerial system, the operator will find that readjustment is not normally required.

Transmitter Adjustments

Because of the "sharp" tuning of the P.A., any variation in the V.F.O. frequency will cause the tank circuit to be re-tuned. If R.F. ammeters are employed in the feeders, then it is only a question of tuning the P.A. until the feeder currents reach a maximum. On no account should the loading on the tank circuit be adjusted, as this will cause a mismatch and previous time and patience will have been wasted. The modulator should be switched on and the audio gain control advanced until there is an upward "kick" in the P.M. Ia as registered by the P.M. milliameter. It should be noticed, however, that this current reading must not reach a value greater than that stipulated for the valve in question. The reverse is the case with regard to the P.A. valve. There will be a decrease in Ia, which should not be less than one-quarter of the valve Ia under C.W. conditions. If this does happen, the audio volts must be reduced or, alternatively, the R.V. drive must be increased. This, however, should not be experienced if due care has been taken while setting up.

Final Points

The author, in writing this article, assumes that the V.F.O., buffer and P.A. stages of the transmitter are stable. This point should be ascertained before considering super-modulation, as instability can produce many phenomena when using this system; and much valuable time is wasted in trying to find a remedy. Critical voltages such as the Va of the oscillator and the S.G. potentials of the P.A./P.M. valves should, where possible, be well regulated, as this will help no end in the overall efficiency of the super-modulation system. Finally, the author hopes that some points, regarding the transmitter setting-up procedure, have been clarified here and will be glad to help anyone who comes up against any major problems dealing with the operation or construction of this modulation system.

THE PW Electronic Organ

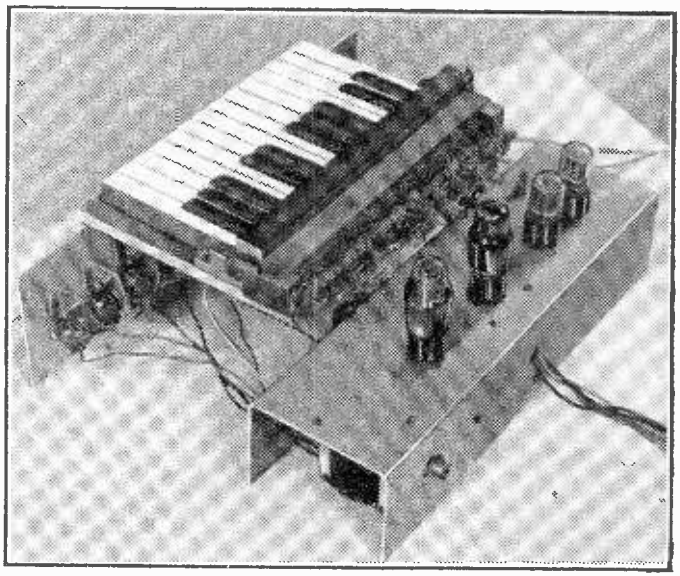
COMPLETE CONSTRUCTIONAL DATA FOR A MONOPHONIC 4-OCTAVE INSTRUMENT FOR DOMESTIC OR PROFESSIONAL USE

By W. J. Delaney (G2FMY)

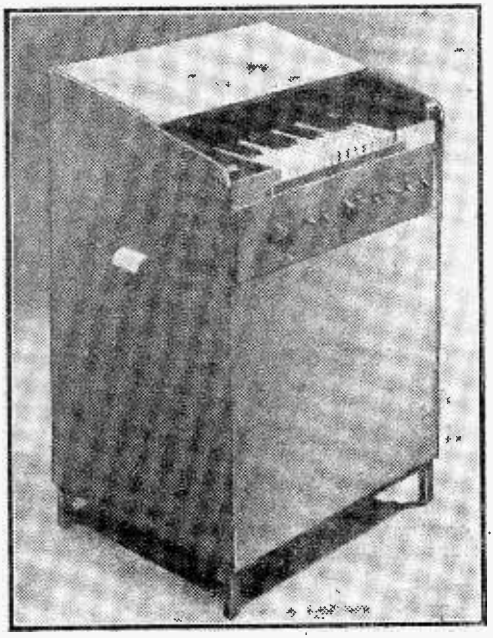
THE modern electronic organ is of two main types, the larger having a full-size keyboard similar to a piano or standard organ and capable of playing chordal effects, and the smaller having a fore-shortened keyboard and capable of playing single notes only. The first type is known as a polyphonic and the second a monophonic, and to increase the utility of the latter special tone circuits are associated with it, in most cases these being designed to resemble normal orchestral instruments. This type of instrument is primarily intended to be used by a pianist in conjunction with the piano, the right hand picking out the melody with suitable tonal effects whilst the left hand continues the piano accompaniment. In a small orchestra it may be used to augment the general tone of the instruments employed in the combination. We have received many requests from time to time for constructional details of an organ, and although we have in the past given general articles on the subject we have not so far published a constructional feature on either type. We have accordingly carried out some experiments with various arrangements, and in view of the economy of the monophonic type have produced a simple instrument which, for domestic purposes, needs only five valves plus rectifier, and it may be adapted for professional use with only three additional valves. The cost of the domestic model would be about £15, and the professional model a few pounds more. The main difficulty with any form of organ is, of course, the obtaining of a suitable keyboard, and although it may be possible for some readers to get hold of discarded accordion keyboards, it appears that most constructors will have to make up their own, and in this design the construction is of the very simplest and does not call for workshop facilities.

Features

The organ has a two-octave keyboard which may be pitched by the constructor to correspond with any desired part of the piano keyboard. The central switch on the control panel gives three separate octave ranges (bass, tenor and soprano), and in conjunction with the keyboard this means that the overall compass of the instrument is four octaves. There are five separate tonal switches which may be used singly or in combination, thus producing dozens of different effects, and in conjunction with these is a separate switch which, by the addition of certain



View of the keyboard and main chassis which is a self-contained unit.



The player's view of the organ.

harmonics, changes the overall tone of the entire instrument. For want of a name I have called this a "strings/woodwind" switch, although strictly it does not make the reproduction resemble these types of instrument. In one position, however, the tone might be described as "hard" and in the other "soft," and this increases the usefulness of the tone

LIST OF C

RESISTORS (all ½ watt, except 1 as stated)

One at 150 Ω	Four at 100k Ω
Two at 1k Ω	One at 470k Ω
One at 1.5k Ω	One at .5M Ω
Three at 2.2k Ω	One at 1M Ω
Four at 10k Ω	One at 5k Ω (1 watt)
One at 15k Ω	R11, and Ra to Rx (see text)
Five at 22k Ω	
Three at 47k Ω	

(Dubilier, Erie, etc.)

CONDENSERS

One at 500 pF	Five at .1 μF
One at .005 μF	One at .15 μF
One at .01 μF	One at .25 μF (or two .1 μF in parallel)
Two at .02 μF	

Three 8 μF electrolytics 500 w. working.
One 32 μF electrolytic 500 w. working.
One 16 μF electrolytic 500 w. working.
Two 50 μF, 12v. or 25v. working (T.C.C., Dubilier, etc.).

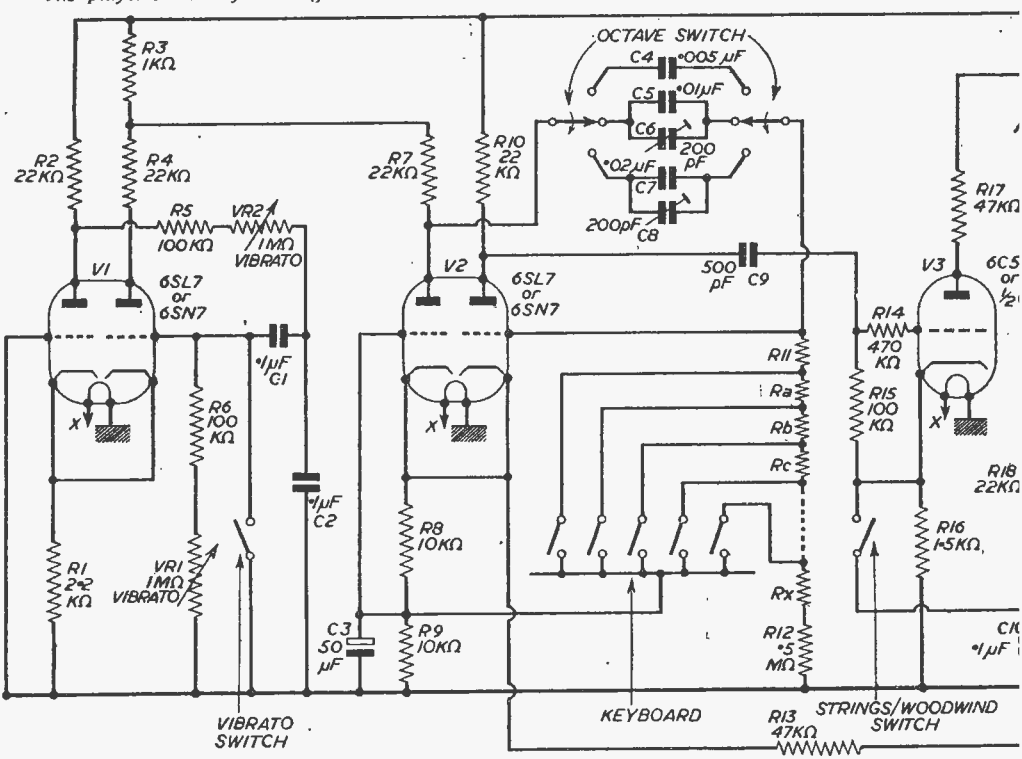
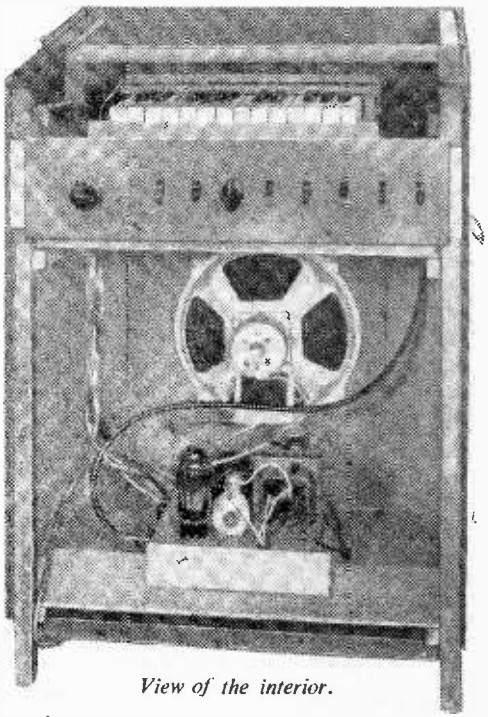


Fig. 1.—Theoretical circuit of the orga

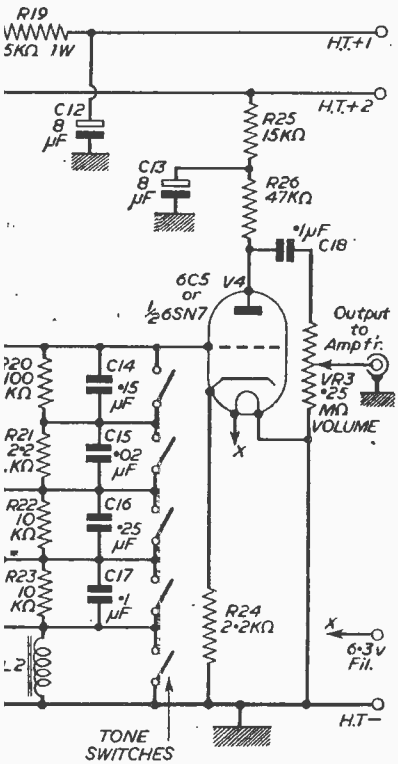
switches. Finally, vibrato may be added as desired by the remaining control; and although this is pre-set there is no reason why it should not be brought out to a panel control, either as a variable or as a two- or three-position switch so that different speeds of vibrato may be added as desired. The volume or "swell" control is of the ordinary knob

[PONENTS

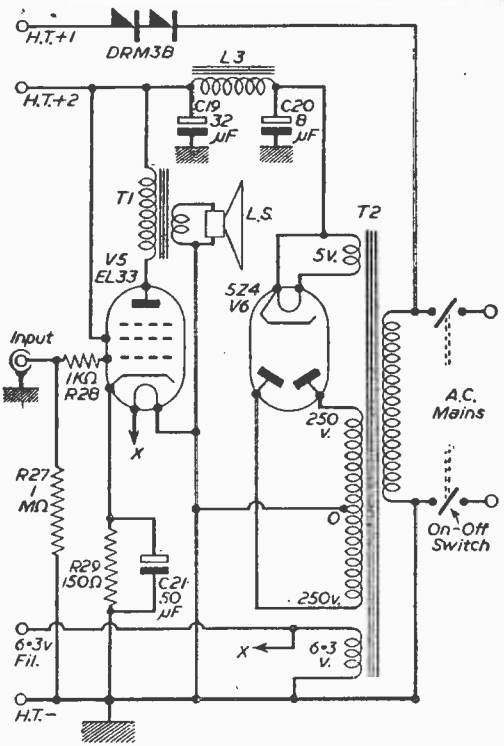
Two 200 pF trimmers (see text)
Seven key type on/off switches (see text) } Smith's Radio
Small push-pull output transformer, L1.
H.F. choke, Type HF9s (L2)
One 5-way tag, strip, Type T24
Two 2-way tag, strips, Type T17 } Bulgin
One octal plug, Type P.112
Seven octal valveholders (Clix).
Mains transformer (250-0-250 at 80 mA; 6.3v. at 3A. and 5v. at 2A.) (Wearite).
Smoothing choke, 10 to 20 henries at 80 mA.
One DRM3B selenium rectifier (or two RM/3 in series) (Standard Telephones & Cables).
2-pole 3-way Wafer type switch.
Extension control Type N.630 (Eddystone).
Coaxial plugs and sockets, two each, Types L604/S and L734/P (Belling & Lee).
One Stentorian Duplex 10in. loudspeaker (W.B.).
Two 6SL7s or 6SN7s; two 6CSs or L63s; one EL33 and one 5Z4.
Chassis, connecting wire, screws, etc.



View of the interior.



...estic type amplifier and power pack.



controlled type, but again, if desired, this may be foot-operated and its place on the panel taken by a jack into which a plug from the foot-control may be inserted. There is ample scope in the design for improvements, and work is at present being carried out on the design with a view to producing a "de-luxe" type of instrument, details of which will be published if it is found to be in demand.

The Circuit

In the circuit V2 is the "note generator" stage, a simple multivibrator with variable grid and anode components to cover the desired ranges, and this with V1, which is the vibrator generator, are based on the arrangement described some years ago in these pages by Mr. F. C. Blake. The arrangement is fool-proof and very easy to set up, although it calls for a little patience to get the pitch of every note correct. To avoid frequency shift when adjusting volume or tone switches these two stages, which as will be seen, both utilise double triodes, are fed from a half-wave rectifier and do not carry the current of any other part of the circuit. Two alternative arrangements are possible here, the arrangement shown in Fig. 1 having the drawback that the main chassis is "live" to one side of the mains, but by utilising a separate control panel as shown in the illustrations, together with a special extension for the octave switch, the panel is "dead" and there are no live controls. If, however, it is thought desirable, a separate 1-to-1 mains transformer may be used to feed these stages, and the modification is shown in Fig. 2. The stability is of a high order, and it will be found that a key may be pressed, the instrument switched on with the volume control at its maximum position, and as the valves warm up the note will be heard at correct pitch from the moment it becomes audible, right up to maximum volume, and any desired combination of tone or volume or vibrato may be used without the slightest variation in pitch.

There are a number of separate resistors in the grid circuit of the second half of V2 and the junction of each of these is connected to a separate key on the keyboard, with a common "earth return." V2 is biased to cut-off by R9, and when any key is pressed, R11, plus any resistors between it and the key in question, are joined across the grid circuit and control the frequency of oscillation. If all musical notes were mathematically related it would be possible to specify so many 1,000 or 2,000 ohms resistors—for instance, for inclusion between each adjacent key—

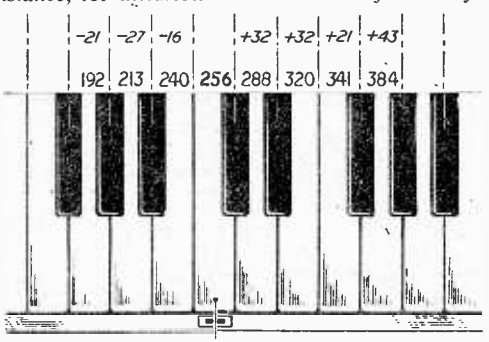


Fig. 3—Relative frequencies of one octave.

but, as may be seen from Fig. 3, the difference between the notes on the piano is not constant, and this means that all kinds of odd values have to be used for Ra, Rb, etc. The method of arriving at these will be described later. R11 is set to produce the highest note which is required, and the keyboard may be set up to coincide with the centre of the piano or with the octave above as desired.

There are two outputs from V2, the anode being taken in the usual way to a simple triode, and the

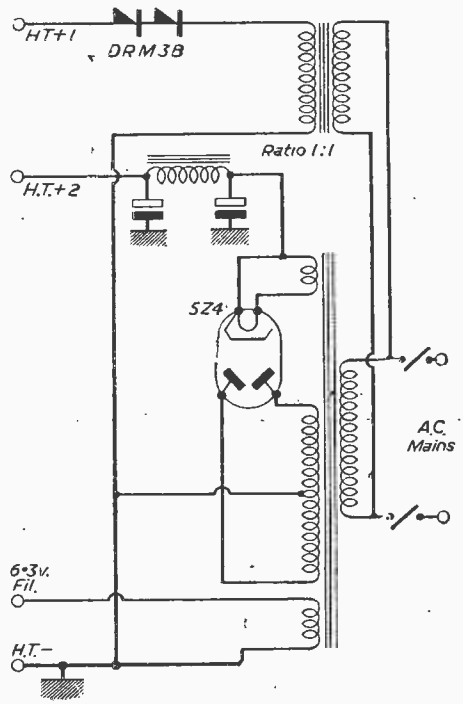


Fig. 2.—Alternative arrangement for feeding selenium rectifier.

main output being taken from the common cathodes. This is fed, with suitable stoppers, to the grid of the single L.F. stage which is used to produce the various tones, but the output from V3, also on the cathode-follower principle, is also taken, through a switch, to the grid of the L.F. stage, and the difference in phase and harmonic relationship produces the desired change in tone. In the tone-control stage, which is an adaptation of the popular Hammond Solovox arrangement, the normal grid-leak is replaced by four separate resistors in series with an iron-cored H.F. choke (L2), and across each of the resistors is a fixed condenser and short-circuiting switch. In addition, across two of the resistors is a centre-tapped L.F. choke (L1), actually a push-pull output transformer with the secondary ignored. As the two halves of this component are identical and the two associated resistors are also identical, it is possible to make both circuits harmonically related, and although C16 is specified as .25 μF, this is only because this is a standard value, and two .1 μF condensers in parallel, may be used.

(To be continued)

A Direct-reading Bridge

ANOTHER INTERESTING DESIGN WITH SOME NOVEL FEATURES

By Robert D. Paterson

OF the making of bridges as of books there would seem to be no end. Nevertheless, many practical interpretations of the bridge principle prove unsatisfactory in use because they lack comprehensiveness and readability. So the author offers no apology for putting forward yet another design which, though orthodox in theory, possesses both these characteristics in full.

There is no doubt of its comprehensiveness. Values of resistance, capacity and inductance from 10 ohms to 10 megohms, 10 pF to 1,000 μF and 10 μH to 100 H. can be measured with one movement of the range dial and another of the multiplier dial, while the single index mark which is common to both dials makes the instrument eminently readable. The reading is made from left to right just like a printed page. In the sketch of the panel (Fig. 2) the condenser being measured is 25×0.1 μF.

The Theoretical Diagram

The theoretical diagram (Fig. 1) may at first sight appear to be complicated. In reality it is not so. The following individual circuits can be readily picked out: the energising unit, the indicator unit and the bridge proper. The last in its turn can be broken down into three types of bridge for the measurement of R, C, and L respectively. Setting the range dial to the required range not only selects the correct ratio arms, but sets up the appropriate bridge network. These are set out in simplified form in Table 1, with the ranges obtained appended. The bridge in all its forms is energised from an audio source, either 50 c/s stepped down from the mains or a neon or valve oscillator. A null point indicator consisting of a magic eye preceded by an amplifying stage is incorporated.

The Bridge

A wire-wound variable resistor of 10 KΩ resistance, another of 20 KΩ, a 4 pole, 11-way range-selector switch and a set of six precision resistors and condensers compose the bridge proper. The 10 KΩ resistor which forms the variable arm must be of good quality, capable of being closely adjusted and free from back lash. It should preferably be of large diameter, say 3in. The 20 KΩ resistor is used to estimate the power factor of condensers and inductances. The bridge can be built with a variable ratio arm other than 10 KΩ but with less convenience. Either the ranges will be different and the multiplying factors fractional and liable to miscalculation, or else odd values of precision components will be needed, and these are difficult to obtain. A 10 KΩ resistor in conjunction with standards whose values are multiples or submultiples of 10 produces ranges which are convenient and easy to read. However

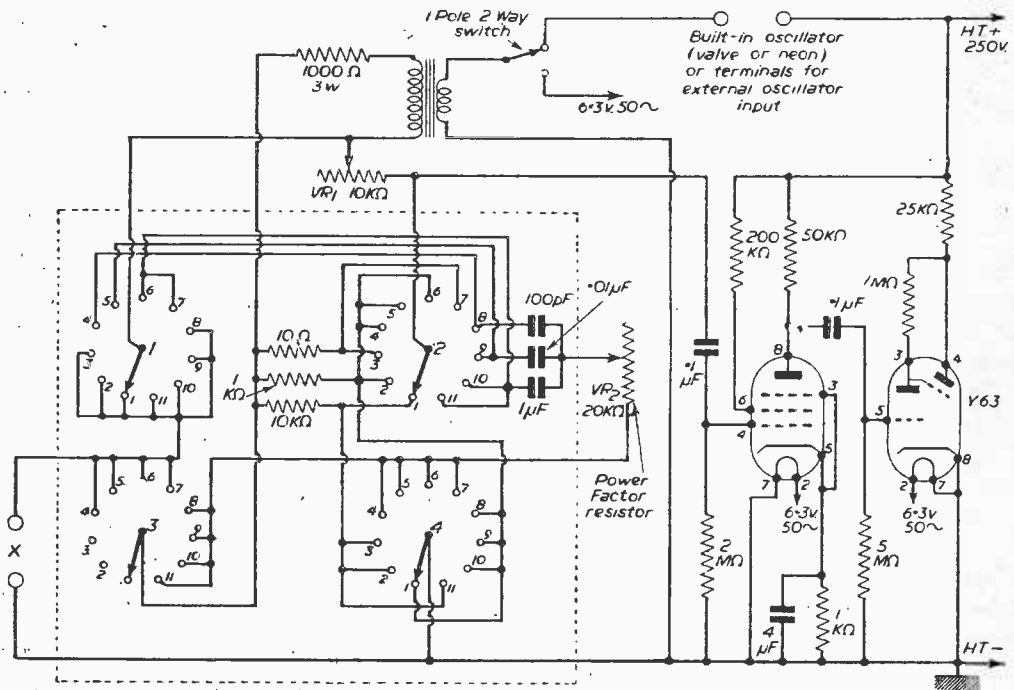


Fig. 1.—Theoretical circuit of the bridge described in this article.

if a variable resistor on hand is of a suitable type but measures a little more than 10 KΩ, it may be used, and the unnecessarily great overlap between ranges accepted as a necessary evil, or a fixed resistor of suitable value may be wired between the moving arm and the end (not the free end if it is a potentiometer) of the variable. The value of the required resistor can be calculated from Ohm's Law where :

$$\frac{1}{\text{required R}} = \frac{1}{10\ \text{K}\Omega} - \frac{1}{\text{present R}}$$

or by trial and error, using an ordinary D.C. resistance meter to adjust the combined value to 10 KΩ or just over. Since the ranges are calculated upon using the variable resistor from its maximum value 10 KΩ down to one-hundredth part of the maximum, namely 100 Ω, a nominal 10 KΩ resistor which is short of that value by less than 100 Ω can be pressed into service by inserting in series with it a fixed resistor to raise its value again to 10 KΩ or slightly over.

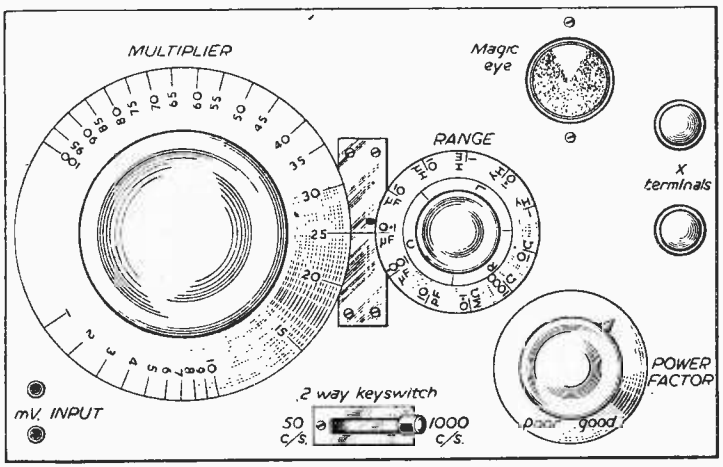


Fig. 2.—Suggested panel layout ; the words in capital letters are inscribed on the panel, the others are just for guidance.

Energising the Bridge

The energising voltage is drawn from the secondary of a step-up transformer of ratio 1 to 5 or so, an ordinary audio-type being suitable. This transformer may be fed from a variety of sources. In the original model two sources were available chosen by the throw of a switch. One was 50 c/s drawn from the heaters of the valves and this, thanks to the sensitiveness of the magic eye and its amplifier, sufficed for nine out of ten of the measurements made with the bridge. For high values of resistance, and low values of inductance and capacity, where the null point on 50 c/s is indistinct, provision was made to use a signal at about 1,000 c/s generated by a multivibrator circuit (described by the writer in PRACTICAL WIRELESS for May last) and injected at the terminals shown on the panel. Alternative forms of 1,000 c/s generators which could be incorporated in the bridge are suggested in Fig. 3—the component values given should be regarded as experimental as the writer has not found it necessary to try either in place of the existing sources. A 1,000 Ω 3-watt resistor is shown in series with the secondary of the transformer. Without it the bridge could pass during the measurement of a low impedance a current large enough to damage the component or the transformer. The resistor limits the current to a safe value, but when a high impedance is being measured it has relatively little effect, and nearly the whole voltage across the secondary is available to produce a sharp null point.

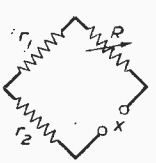
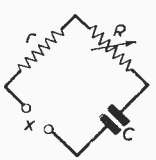
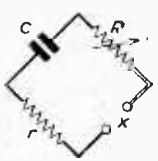
Construction

It will be seen from the theoretical diagram that one of the "x" terminals is at earth potential. This is a useful feature since it means that components earthed to a chassis can be tested without isolating them completely from it. But it also implies that the whole of the variable arm of the bridge VR1 is at a different potential and therefore certain precautions must be taken to avoid hand-capacity effects. First, the chassis and the panel upon which the bridge is built should be of metal and connected to the earth line of the power unit, that is usually to the centre tap of the mains transformer. Secondly, VR1 should not be fixed to the panel but to a bracket at the rear of the chassis and connected to the dial by a flexible coupling and a rod of insulating material. Thirdly, since the final adjustment of the bridge will be made with the left hand upon VR1 (if the layout suggested in Fig. 2 is adopted), the "x" terminals should be placed at the opposite end of the chassis. Otherwise the layout of the instrument can be varied within wide limits to suit the constructor's own requirements and material. The single index common to the range dial and the multiplier dial should, of course, be retained. The range and multiplier knobs should be of the flat type so that a circular piece of white cardboard can be fixed to the skirt of each to carry the graduations. They should also be capable of being adjusted on the spindles so that the flat portions are the same distance from the panel. This is shown in Fig. 4 as is the plan of the index. The latter can

(*Continued on page* 421)

TABLE 1

Range Switch Positions

1, 2 & 3	4, 5, 6 & 7	8, 9, 10 & 11
Wheatstone Bridge	Capacity Bridge	Hayes Bridge
		
Range 1 10–1000Ω	10–1000pF	10–1000μH
2. 1K–100KΩ	·001–0·1μF	1–100mH
3. 100KΩ–	0·1–10μF	0·1–10H
4 10MΩ	10–1000μF	1–100H

(*Continued from page* 418)

be made from Perspex, rectangular in shape and provided with four countersunk screw holes for fixing to the panel. The index mark is a straight scratch in the upper surface of the Perspex filled in with a trace of black enamel. When the index is correctly set on the panel the index mark should lie on the straight line joining the spindles of the variable resistances, and these in turn should lie on the horizontal centre line of the panel or on a line parallel to it. Make the chassis of the usual inverted U pattern. Mark out and drill the panel for the controls, the terminals and the magic eye. Then attach it to the chassis. Next mount VR1 with its coupling and knob as suggested above. Fit a blank cardboard scale to the knob. Wire up the multiple switch unit, that is the wiring shown inside the dotted line in Fig. 1 and mount it on the panel with its knob and accompanying scale. Lastly, put the index in position. Then before wiring VR1 or the switch unit to each other or to any other components calibrate both as follows :—

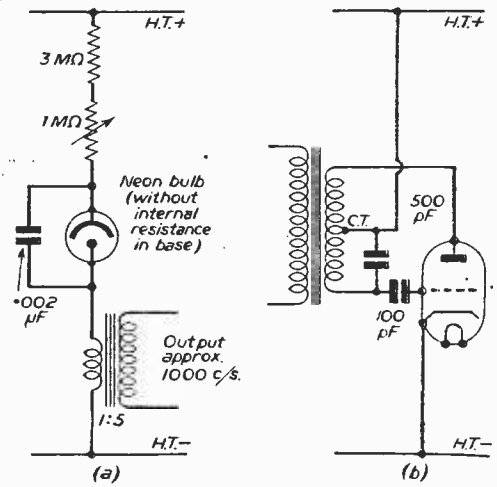


Fig. 3.—Alternative audio sources. (a) Neon oscillator and (b) valve oscillator with a centre-tapped transformer.

Calibration is easy if a second bridge or resistance meter is available. Since the readings of the bridge are all proportional to the resistance of the 10 KΩ variable, calibrate the latter at intervals of 100 ohms and mark these intervals 0, 1, 2, etc., up to 100. There is no objection, of course, to closer calibration, 1.1, 1.2, etc. The calibration should be done, as stated before, while the variable resistance is still unconnected to any other components. Mark on the dial of the range switch opposite the index mark in each of its eleven positions the lowest value of the corresponding range as shown in Table 1. The lowest value is chosen because it is intended to be multiplied by the simple factors shown opposite on the multiplier dial.

Completing the Bridge

Wire in the other components so that the connections between the parts of the bridge proper are very short, particularly those of the 100 pF. standard condenser, the 10 KΩ standard resistor and the leads to the grids of the amplifier and magic eye respectively. Keep the precision components as far as possible from the heat of the valves. Thorough ventilation is essential and this should be kept in mind when choosing a case to house the completed instrument. A sufficient number of ventilation holes should be provided in its sides.

The N.P.I. and the Power Pack

The amplifying portion of the null point indicator may be placed on the chassis but the magic eye itself must be mounted at right angles to the panel. In the original model an escutcheon for the magic eye

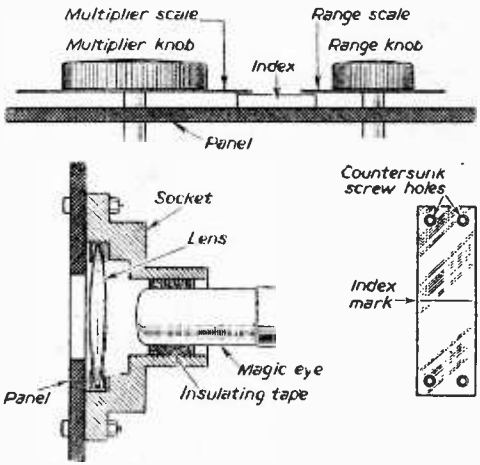


Fig. 4.—Section of escutcheon for magic eye, and indicator mounting details.

was made from a surplus multi-pin socket. The pins were stripped out, leaving a circular tube with a flange carrying conveniently tapped holes to take fixing screws. A lens was fixed in the tubular part by means of washers cut from rubber and cardboard, and the screen end of the magic eye itself was wrapped round with sufficient insulating tape to make a firm push fit in the back of the escutcheon (see Fig. 4). The escutcheon once screwed to the panel provided support, magnification and a neat finish to the indicator. As an alternative to making a U chassis the valves and the audio transformer, from which the energising voltage is drawn, may be mounted on a small sub-chassis set parallel to the panel and spaced from it by distance pieces so that the magic eye lies in its correct position. By this method the wiring can be made very short indeed. An integral power pack may be used but in view of the effect of the heat generated on the precision components a separate unit is desirable, and it is assumed that such is available. The demands of the instrument are very light. The type of leads to which the unknown will be attached depends upon the "x" terminals used, but those ending in crocodile clips are most generally useful. No attempt is made to calibrate the power factor resistance apart from marking "good" at the minimum end and "poor" at the other.

Using the Bridge

To use the bridge set the frequency switch to one of its two positions 50 c/s or 1,000 c/s, and turn

the range switch to the appropriate section R, C or L. Connect the unknown across the "x" terminals, rotate the multiplier dial through its full sweep. If the magic eye opens and closes again adjust the multiplier dial for maximum shadow. The value of the component can now be read off from the dials. If a null point cannot be obtained the neighbouring ranges must be tried in similar fashion. A little experience with the bridge will soon teach the user whether a higher or lower range is required. When the value of the "unknown" is known approximately the correct range can, of course, be chosen at once. If the null point is not sharp adjust the power factor resistance until a more definite indication is obtained. Then read off the resistance, capacity or inductance from the dials.

LIST OF COMPONENTS

Valves :
1 R.F. Pentode. 6AC7
1 Magic Eye. Y63

Switches :
1 1p. 2w. key type.
1 4p. 11w. rotary.

Variable Resistors :
1 10k Ω W/W.
1 20k Ω W/W.
1 1 M Ω preset.

Precision Resistors and Condensers:
One each 10 Ω, 1,000 Ω, 10k Ω, 100pF, 0.01 μF, 1.0 μF.

Fixed Resistors and Condensers:
1 5M Ω.
2 2M Ω.
1 1M Ω.
1 200k Ω.
1 50k Ω.
1 25k Ω.
1 1k Ω.
1 0.002 μF.
2 0.1 μF.
1 4 μF or an electrolytic condenser of greater capacity.

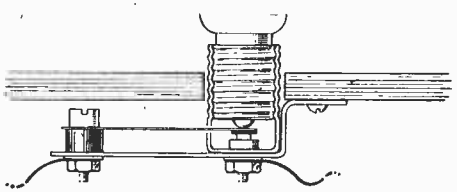
Sundries :
1 large skirted knob.
1 small skirted knob.
1 pointer knob.
2 valveholders.
1 neon lamp (without voltage dropping resistor in base).
4 insulated terminals.
2 flying leads terminating in crocodile clips.
Cardboard for panel and dials.
Mains unit supplying 6.3 heater volts and about 250 volts D.C.
Sheet of Perspex.

An Aerial Current and Tuning Indicator

A TRANSMITTING ACCESSORY BY G2VU

THIS device consists of an ordinary screw bulb-holder adapted so that it can be used in the aerial feeder circuit for tuning, and to indicate the actual aerial current in the case of low-power sets.

An insulated silver-tipped spring passes, as shown in the drawing, through a slot in the bottom of the holder, which is attached to a piece of strip brass, and is operated by screwing the bulb in or out,



Details of the simple indicator described here.

causing the spring to make contact with a silver pin in the head of the holding screw, thus acting as a switch.

When the bulb is fully screwed in, it is short circuited and a direct metallic circuit is provided for the aerial current. On giving the bulb a quarter turn outwardly the insulated spring follows the bulb and brings it into circuit.

Advantages

Tuning and indicating by bulb has several advantages, apart from saving of cost and space. This holder is arranged for one hole fixing and occupies a space of only 1¼in. by 5/16in. Two advantages are that the cutting in or out of the bulb does not interrupt the circuit, and if the bulb is burnt out, by screwing it in the circuit is instantly restored.

Bulb Rating

Screw bulbs can be obtained in various ratings, and it is easy to choose one suited to the output of the set and thus obtain an indication of the wattage being dealt with. The centre contacts of the bulbs should be filed down as they are usually oversize.

Stockholm Conference on VHF.

A CONFERENCE to consider the assignment of very high frequencies (ultra short wavelengths) for sound and television broadcasting in Europe, which began in Stockholm on May 28th, has just completed its work (on June 30th). The use of television and very high frequency sound broadcasting on any appreciable scale by European countries is a comparatively recent development, and the Conference, which was convened at the suggestion of the Swedish Administration, was the first of its kind. It was attended by representatives of 31 countries.

The Stockholm Conference has produced an agreement with which are associated three plans for the assignment of frequencies to European broadcasting stations, one for each of these three bands.

In band one (41-68 Mc/s) the Conference accepted the assignments which the United Kingdom has made for the five high-power television stations of the BBC, and for the five low-power stations which are to open in due course. The way in which sound and television broadcasting services will develop in the United Kingdom in bands two (87.5-100 Mc/s) and three (174-216 Mc/s) has yet to be decided.

The Stockholm plans will come into force on July 1st, 1953, and are due to be reviewed not later than July 1st, 1957.

A Cheap Wattmeter

MAKING A SIMPLE CURRENT RECORDER FROM SURPLUS EQUIPMENT

By J. McGrail

OBTAIN an A.C. electric light meter (they can be bought for 10s. upwards) and, having removed it from its iron case, dismantle it completely except for the coil "K."

Separate very carefully the aluminium disc and its spindle. Drill the disc to take the 4 B.A. rod "A" (which I made ⅜in. long). The needles "B" should be a tight fit in the 4 B.A. rod. Clamp the disc between the nuts "C," leaving about ⅛in. clear at one end of the rod "A." Next drill nut "D" to take wire "G." (I used 18 gauge, shaped as illustrated.) Obtain the mainspring from a small wrist-watch—one can be bought for 1s. if necessary—and solder its inner end to the rod "A" where the ⅛in. was left. Thread nut "D" (with "G" fitted in hole x) on to "A" close to "C," and follow with "E."

Do not tighten "E" yet. The original coils "L" were too thick and insensitive, and I replaced them by two coils of 20 turns each of 22 gauge. I used 14 gauge copper wire to mount the pivots "F" and to anchor the outer end of the spring. One length was held under screw "S" and the free end was made into a loop and "F¹" was soldered to it. The second was held under screw "W" and "F²" was soldered in the same way.

Assembly

The aluminium disc was dropped between the iron cores of the coils "K" and "L" and the wire holding the pivots (which had already been approximately shaped) was carefully closed to hold the disc free from obstruction. The third piece of 14 gauge wire was held under screw "T" and its free end brought up to the outer end of the spring and soldered. Having got this far, the disc should swing for some time before finally coming to rest. If it doesn't the use of the 14 gauge wire will become apparent as this can be moved in any direction with the aid of a pair of pliers. The nut "D" must now be turned so that "G" almost touches the support of "F¹" and the lock-nut "E" tightened.

The Case

I made a wooden box 6in. x 6in. x 8in. and drilled a ⅜in. hole in the centre of one end. Then I placed the meter in the box so that the 6 B.A. rod "H" (previously fixed to "G" at x) protruded by about ⅜in. Next I cut and marked a white cardboard disc and fixed it to the end of the box by three drawing-

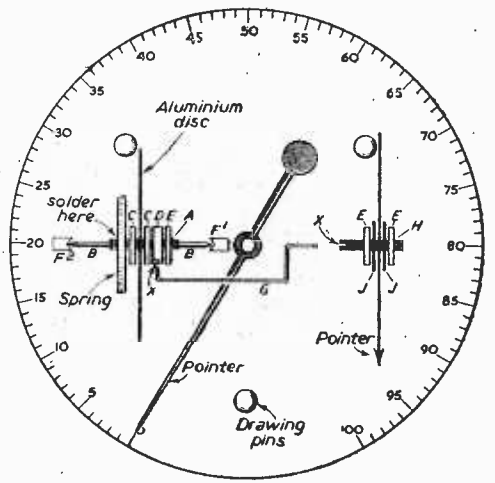


Fig. 1.—Details of the dial and pointer mounting.

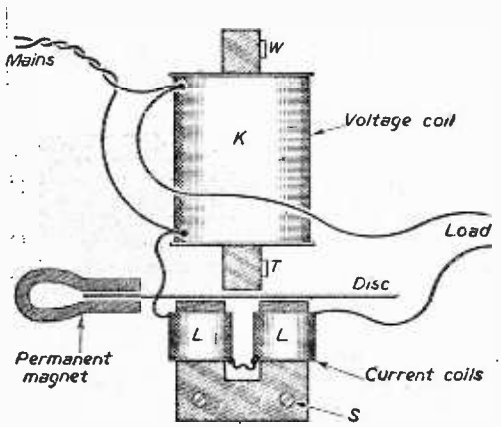


Fig. 2.—General assembly and circuit details.

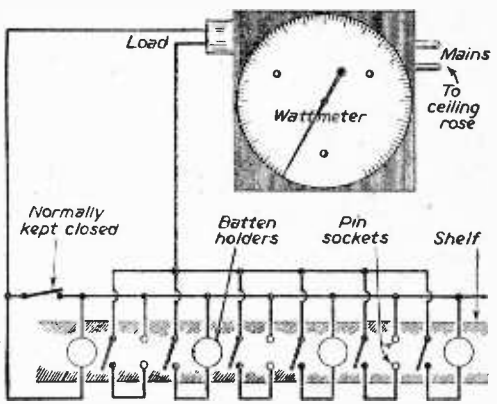


Fig 3.—Typical workshop or experimental bench arrangement.

pins, also a pointer as shown. This latter was placed on "H" and clamped between "E" and "J," pointing to 0 on the dial. The coils "L" should be wired as shown and if the pointer tries to move the wrong way the connections for "L" must be reversed. It is necessary, when re-assembling, to replace the permanent magnet.

Packing may be necessary to raise the meter so that "H" comes opposite the $\frac{3}{8}$in. hole in the box. The dial diameter is 6in. It may be helpful to solder "G" at x and also where the needles enter "A." I marked my meter dial "0 to 100" in black and calibrated (in red) by means of lamps of various wattages.

In order to take full advantages of the meter I have screwed a 5-amp. pin socket on the load side of the box and a pin plug on the input side. Under the shelf on which the meter stands I have screwed seven lamp and pin sockets with their respective switches. Six of these are in shunt and one in series with the rest. They are connected as shown. The series socket is used when I am doubtful of the apparatus I am testing, and is normally shorted out. A 100 w. lamp is normally kept in this holder. Shunts across the "load" would enable the meter to be used for anything higher than 5 amps.

MATERIALS REQUIRED

- **A.** 4 B.A. screwed rod drilled $\frac{1}{8}$in. at each end to take gram. needles "B."
- **B.** Gramophone needles.
- **C.** Thin 4 B.A. nuts.
- **D.** Thicker 4 B.A. nut drilled at x to take "G."
- **E.** 4 and 6 B.A. locking nuts.
- **F.** Pivots (from balance of old clock or M/a. meter.
- **G.** Copper wire shaped to bring "H" in line with "B" and of a gauge to fit x.
- **H.** 6 B.A. screwed rod drilled to take "G."
- **J.** 6 B.A. washers.

The screwed rods can be any length but the aim is lightness.

Dunsfold Airfield

THE Hawker Aircraft Co., Ltd., who recently took over Dunsfold Airfield, near Guildford, have now completed a new control tower which has been equipped with some of the latest radio and navigational aid equipment, including two V.H.F. D/F installations designed and manufactured by Marconi's Wireless Telegraph Co., Ltd.

The facilities provided for the controller are three V.H.F. channels for communication with aircraft, with automatic D/F on two of them, one V.H.F. channel for contact with the fire appliance, and telephonic communication with selected people on the airfield, together with other necessary authorities in addition to the normal airfield exchange. Provision has been made for a further V.H.F. channel to be fitted at a later date.

The "heart" of the installation is an air traffic control desk, which has been especially designed by International Aeradio, Ltd., to fulfil the requirements of the controller. From the panel in front of him he can determine the local meteorological conditions as a barometer, wind speed and wind direction indicators, together with a clock, are fitted in the control escutcheon. The heads for driving the wind speed and wind direction indicators are mounted on the roof of the tower. The two escutcheons, on either side of the meteorological one, house loudspeakers to which the receivers on the radio channels are connected, and to identify the channels, close to his left-hand, the controller has four luminous indicators, on the caps of which are engraved the frequencies. On reception a lamp inside the indicator is illuminated showing which channel is calling, whilst to transmit the controller merely depresses the indicator and speaks into the microphone. A fifth indicator gives broadcast facilities which can be used in the event of an emergency. No volume controls are available on the desk, as a special amplifier is fitted between the receiver and loudspeaker which gives a constant output irrespective of the input. The output is set to the required level during installation and thereafter it is not touched. The controller has, therefore, the minimum number of controls for the radio side of his work.

News from the Clubs

ECCLES & DISTRICT RADIO SOCIETY (G3GXI)
Hon. Sec.: G. Gray, 2, Egerton Road, Monton Green, Eccles, nr. Manchester.

THE club continues to meet weekly on Mondays at 7.30 p.m. at Eccles House Club, Abbey Grove, Eccles, and a cordial invitation is extended to any interested radio-enthusiast to come along to the meetings.

Full workshop facilities are now available, also access to test gear at nearby premises on a Wednesday night.

Arrangements are being made for members to visit Holme Moss television station in the near future.

LEICESTER RADIO SOCIETY
Hon. Sec.: A. L. Milnthorpe (G2FMO), 3, Winster Drive, Thurmaston, nr. Leicester.

AT the meeting held in the clubroom on July 7th, two short lectures were given, one on D/F equipment with practical demonstrations by P. Simpson (G3GGK), and the other on 150-watt transmitters by G8RY. The next important event of the society will be a D/F day on August 30th, and full details of this will be given at the meeting on August 18th.

On September 1st the "Ediswan Cathode-ray Tube" lecture will be given by C. L. Wright, B.Sc.(Eng.), and on October 6th H. Turner (G8VN) will give his lecture and demonstration of "Modern Cinema Sound Recording Equipment."

The society meet every first and third Monday every month, and meetings are held in the clubroom of the Holly Bush Hotel, Belgrave Gate, Leicester, at 7.30 p.m.

Further details of membership can be obtained from the Hon. Secretary.

THE WEST MIDDLESEX RADIO CLUB
Hon. Sec.: P. W. Smith, 121, Richmond Avenue, Hillingdon, Middx.

THE West Middlesex Radio Club meets on the second and fourth Wednesdays of each month at the Labour Hall, Southall Broadway, visitors being welcome.

August meetings are: Wed., 13th: Recorded talks. "The Ether" and "The Ionosphere," followed by a discussion; Wed., 27th: Lecture: "The Principles of Radar."

THE MIDLAND AMATEUR RADIO SOCIETY
Hon. Sec.: G. W. C. Smith (G3HDK), 84, Woodlands Road, Birmingham, 11.

THE field week-end organised by the above Society held on June 28th–29th was a great success, the weather being perfect, and an enjoyable time was had by all. A total of 20 countries were worked.

Following usual practice, a general meeting of the Society will not be held during the month of August.

THE ROCHDALE RADIO AND TELEVISION SOCIETY
Hon. Sec.: J. Riley, 1, Darley Bank, Britannia, Bacup.

THE society have obtained premises for use as a clubroom and all activities this month are concerned with decoration.

Meetings are on Friday evenings at 7.45 p.m. at the clubroom, 1, Law Street, Sudden, Rochdale.

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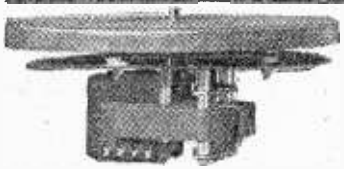

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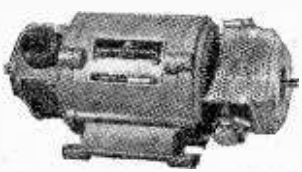

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CARBON POWER MICROPHONE

In original carton With transformer and leads (made by Tannoy). Requires only a loudspeaker and 12-volt acc. to make a portable P.A. equipment. Power consumption approx. 2 amps., output 4-5 watts.

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Containing a VCR97 Cathode Ray Tube, with mu-metal screen, 4/VR91's (EF50), 3/VR54's (EB34), various w.w. pots, switches, H.V. cond., resistors, etc., built in metal chassis to fit into metal box 18 in. x 8¼ in. x 7¼ in. All controls are brought to front panel beside viewing screen.

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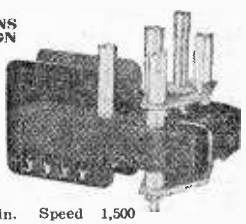

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CATHODE RAY TUBES. VCR97 Brand New. Guaranteed Full Picture ..... 40/- carriage 5/-
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METAL RECTIFIERS. S.T.C. 300 volt 75 m/a., 6/-; S.T.C. R.M.2, 150 volt 120 m/a., 4/6; G.E.C. 6 volt 1 amp., 4/-; Westinghouse 12 volt 2½ amp., 12/6; S.T.C. 12 volt 3½ amp., 17/6; 12 volt 8 amps., 32/6; E.H.T. Pencil Type, 600 volt 1 m/a., 4/7; E.H.T. Pencil Type, 1,000 volt 1 m/a., 6/-; 2,550 volt 1 m/a, 14/8; 5,150 volt, 1 m/a. 26/-; 1 m/a. Meter Rect., 11/6.

E.H.T. TRANSFORMER for VCR97. Input 230v. Output 2,500v., 4v., 2-0-2. 45/-.

E.H.T. TRANSFORMER for 5CP1. Input 230v. Output 3,250v. 6.3v. at 0.6 amp., 2-0-2v., 45/-.

5 K.V. STEWART E.H.T. TRANSFORMER. Input 210/230/250 volts. Output 5kV. and 4v. 1 amp. Insulation volts 6.500v. D.C., 79/6.

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STROBE UNITS. Brand New, in sealed maker's cartons, these contain SIX EF50's, one 5Z4, five EA50's, one SP61, a host of condensers, resistors, transformers, chokes, relays, switches, seven pots and five smoothing condensers. On two easily separated chassis they measure 6in. x 8¼in. x 7¼in. ONLY 67/6, plus 5/- car.

EX-GOVT. VALVES. The following are Brand New:—

EF50 Red Sylvanian, Original Boxes (U.S.A.)	10 0
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EF50, EF54, CV66, EF8, EF36, EF39, EK32, EL32, EBC33, 42SPT, 6K7GT, 6J7GT, 6L7GT, 6SK7GT, 6SJ7GT, 6B8GT, 6N7GT, 6J5GT, 6C5GT, 6AC7, 6SA7GT, 6SH7GT, 6D6, 6C6, 6N7, 12SA7GT, 12SK7GT, 12SJ7GT, 12SQ7GT, 12C8, 12SR7GT, 12SH7GT, 12A6GT, 14A7GT, 12Q7GT, 7A7GT, 7C7GT, 7H7GT, 7S7GT, 7B6GT, 41MP, 955, 9001, 9002, 9003, VR150/30, 28D7, 9D2, 15D2, VP41, MS/PENB, 6SS7, KTW62, VS70, 7545, 5Z4G, 5Y3G, 6X5GT, 1G6GT.

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ALL DRY BATTERY VALVES. 1S5, 1R5, 1T4, 1S4, 3S4, 3V4, 1LN5GT, 1H5, 1N5GT, 3Q5GT, at 10/- or 36/- set of four. At 8/6: SP2, VP2, TDD2A, TP22, VP23, HL23/DD, PEN25, TP25. At 6/-: 215SG, KT2, PEN220A. At 4/-: P2 (Super Power). At 2/6: HL2. At 7/6: HIVAC, XH and XL. At 12/6: 1A7GT. At 15/-: 6AK5.

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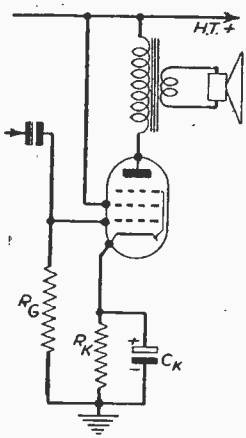
Designing the Output Stage

HOW TO WORK OUT BIAS VALUES, TRANSFORMER RATIOS AND OTHER IMPORTANT DATA

By J. S. Kendall

THERE are many beginners who manage to obtain some odd valves but, although they are able to find the characteristic of them in a valve data book, are unable to use them. They are either used in incorrectly designed circuits with disappointing results, or they are kept until a suitable circuit turns up. Again, it may be required to replace an obsolete valve with a more modern one (this latter is often the concern of the service engineer).

Fig. 1 is the output stage of a mains receiver or amplifier. The problem in designing is where to start. There are four calculations to be made; they are: the value of the grid resistor, the ratio of the output transformer, and the value of the resistance and condenser in the cathode circuit.



Circuit of a 'mains' output stage

Taking the calculations in the order given, the grid resistor will be dealt with first. If this is too high in value a charge will accumulate on the control grid, and for some peculiar reason it will attain a positive potential and cause a rise in anode current with the result that the valve is quickly ruined by overheating and excessive cathode current. Dr. Frederick E. Terman, of Stamford University in America, who is a great authority on valves, gives the formula for the calculation of the maximum value as $\frac{10}{G^2}$ MΩ. For those that do not follow maths readily this means that if the mutual conductance figure, which is given in milliamperes per volt, is multiplied by itself and the result divided into 10, the maximum value of grid resistor will be found. An example or two will be found helpful here.

The EL32 has a slope (that is another name for mutual conductance) of 2.8. If this figure is multiplied by itself we get 7.86, or to the nearest number above—8. Divide this into 10 and we get 1.25. This is the maximum resistance that should, in MΩ, be used as a grid resistance for this valve.

For another example take the EL33. This has a slope of 9.0 mA/V, and as $9\times9=81$, this gives a maximum resistance value of 10/81 MΩ. This works out to 125 KΩ, say 100 KΩ to be a safe working value.

Ohms Law

The value of the cathode resistor can be found by a simple application of Ohms Law, which, as most readers know, states that the current flowing in the circuit is directly proportional to the applied voltage and inversely proportional to the resistance. In short, the current is found by dividing the voltage in volts by the resistance in ohms. In radio engineering we use the milliampere far more than the ampere so, if we divide the voltage in volts by the resistance in thousands of ohms, the result will be in milliamperes. For example, the current through a resistor of 5,000Ω with five volts applied will be .001 ampere, i.e., 1 mA, but if we use 5 KΩ in place of 5,000 ohms (it is the same thing but in a different mathematical form) the result of 1 mA will be obtained first time.

The first step in the calculation of the cathode resistor is to find the total cathode current, and this is the sum of both the anode and screen current of the valve. For the EL32 this is 32 for the anode current and 5 for the screen, which makes a total of 37. The bias required is —18 volts, and by Ohms Law R is the voltage divided by the current, which gives R as $\frac{18\times1,000}{37}$ (the introduction of the 1,000 is to bring the answer to ohms instead of KΩ). As the tolerance of the average resistance is only 10 per cent., for simplicity of calculation the 37 can be taken as 36, and this then makes the answer a round 500Ω. For a second example take the EL33; this has a screen current of 4 mA and an anode current of 36 mA. As the bias required is 6 volts, then the resistor required will be $\frac{6\times1,000}{40}\Omega$, which, on working out, gives a value of 150Ω. Quite simple, isn't it?

For finding the value of the cathode condenser take the value of the cathode resistor and calculate the value of condenser which will give an impedance of one-fifth this value at the lowest frequency required to be handled by the stage. (It is frequently easiest to settle for a 50 μF as this is usually O.K.) If the lowest frequency required is low, say, 100 cycles, then using the formula $Z=\frac{10^6}{2\pi fc}$ where f is the frequency, π is Pi and is equal to 3.14 and C is in μF, transposing the formula we get $C=\frac{10^6}{2\pi fZ}$ by filling in the figures for the signs and letters $C=\frac{10^6}{6.28\times100\times15}=\frac{10^4}{6.28\times15}=\frac{10^4}{94}$ approx., therefore C equals 150 μF for the EL33, but for the EL32 it works out to 45 μF. In the latter case a 50 μF would be in order.

The above calculation will depend on just what is wanted in the way of frequency response.

Output Transformer

The choice of the output transformer is in itself quite an art. Here the type of service required must be taken into account, together with the anode current of the valve, frequency response of the circuit, the load resistance of the valve, and the impedance of the speaker used.

There are two ways of labelling output transformers. One is to state the maximum current that can be passed before saturation occurs in the core (this causes the distortion in the output transformer itself), whilst the other is to state the maximum standing anode current. The former way of marking transformers is used by some of the firms that hope to sell inferior goods, but other firms state both the maximum current and the power. This latter way of marking is very useful where the component is to be used in a push-pull circuit, where the maximum current is perhaps five or six times the standing value. This is the case in Class AB2. For a single-ended stage the maximum current is normally twice that of the standing current. Some firms make a transformer to suit particular valves, such as a single 6V6G matching to a 2Ω, 4Ω, 7Ω or 15Ω speaker, but there are many firms that turn out a multi-ratio type.

Take, for example, the Radiospares "Standard" output transformer. This is a multi-ratio type rated at maximum standing current of 40 mA, and gives a choice of 18 different ratios. Given this component how are we to make the best use of it? The turns ratio of a transformer gives a ratio of voltage. The output from a valve is in terms of power. Now power is E^2R, so we take E_A as the output voltage at the anode of the valve, Es as the voltage developed across the speaker and Rs as the impedance of the speaker. If the power is the same on both sides of the transformer then E_A^2/Ra equals Es^2/Rs. Transposing this equation $\frac{R_a}{R_s} = \frac{E_a^2}{E_a^2}$ but $\frac{E_a}{E_a}$ is the turns ratio of the transformer, then $\frac{E_a^2}{E_A^2} = \frac{R_A}{R_s} \therefore \frac{E_s}{E_a} = \sqrt{\frac{R_A}{R_s}}$

Therefore the ratio for an EL32 matched to a 4Ω speaker will be the square root of the load impedance. For this valve it is $\sqrt{8,000}$ equals 90 divided by the square root of the speaker impedance ($\sqrt{4}$ equals 2), which gives 45.

Take for a second example the EL33. This has a load impedance of 7,000, so that the ratio with a 3Ω speaker will be $\sqrt{\frac{7,000}{3}} = 48$. In this case it would be permissible to use a ratio of 50 : 1, as 10 per cent. either way makes very little difference.

The student of radio should obtain a manual of valve data and then try designing an output stage by theory, and then after the calculations have been mastered, try building one of his own design.

The Mini-four

SOME HINTS FROM TWO OF OUR READERS

THIS extremely compact receiver, with its switched tuning, has been found to work very well when fitted to a bicycle. The only alterations to the set itself were the insertion of a five-pin socket and a double-pole isolating switch for the internal batteries. There is adequate room for these on the left-hand side of the receiver, viewing it from the front. As the life of the internal battery is so short, it was thought worth while to run the set off the larger batteries placed in the saddle-bag, thus saving the internal battery for portable use. This suggestion comes from Mr. Corbett, who adds the following details.

Four of the five pins on the socket should be connected to the L.T. and H.T. connections of the set and the batteries should be connected to the associated pins of a five-pin plug. The fifth pin on the socket should be taken to the "hot" side of the output transformer secondary. The connection to the external speaker from the plug should be taken to this fifth pin and the earth pin (usually L.T. negative).

This speaker should be mounted in the back of a suitable sized metal box and a head-lamp face off an old battery lamp cut out with metal shears and bolted on the front. The lamp may then be used with a dynamo, and the speaker will not be so obvious.

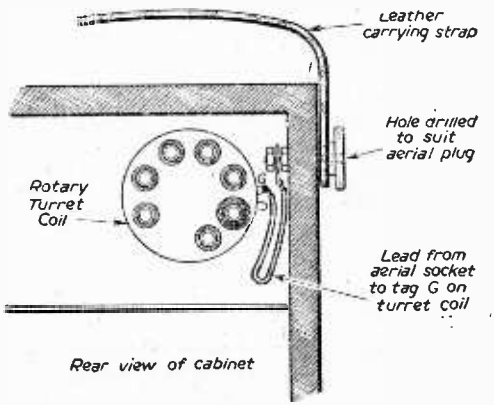
The aerial may be of the rod type mounted on the cycle (but insulated from it), or the aerial lead may be taken to a handlebar grip, so that the rider's body acts as the aerial. In this case, a few yards of wire would have to be thrown out if the rider wanted to use the set while dismounted from his machine.

An H.T. of 45 volts is ample and may be made up from nine-volt G.B. batteries, or a 45-volt H.T. battery may be used. The L.T. may be any 1.5 volt cell, but the larger the better. The internal batteries must be cut out with the isolating switch when the plug is in position or one set of batteries will run down the other.

The Home and Light programmes were received with ample volume except under bridges and near large buildings when the cycle was being ridden. The set may still be used as a portable by disconnecting the plug and switching on the internal batteries.

Aerial Socket

Mr. Coote, of Southend-on-Sea, has made a neat arrangement for plugging in the aerial when an outside aerial is needed with this receiver. The idea is self-explanatory from the illustration below, where, instead of the 4 B.A. C.S. screws supplied by the cabinet makers, he substitutes a 2 or 4 B.A. screw with large or flanged head (diameter between ⅜in. and ½in.) with a hole drilled in one as shown.



Mr. Coote's idea for an aerial socket.

Programme Pointers

By MAURICE REEVE

Speeches

THAT this programme is boring, always was boring and ought to be abolished, might well be the terms of a motion to ban—among other boring programmes—the broadcasting of the proceedings of the Pilgrims Society. Anything more paralysingly dull, more fulsomely harmful or more sleep-compelling than the speeches made at their dinner to Mr. Eden recently could scarcely be imagined. The same old recollections of the Pilgrim Fathers, the same references to Bunker Hill and 1812—rather sinister now by virtue of their frequent repetition—the same absence of any of the realities of Anglo-American relations—conveying to the intelligent listener the almost certain knowledge that much was being withheld from him because it would not be "good" for him to know it—the general atmosphere of hypocrisy and of "you scratch my back while I scratch yours" pervading the whole proceedings, made for a sickening and repellant forty-five minutes (incidentally, it ran well over its time and ruined an excellent programme Louis Kentner was scheduled to give).

Mr. Eden, for all his charm and popular photogenic personality, imparts a peculiar sentimental rise and fall to his radio voice which, during the course of a speech of any length, often becomes extremely monotonous. Coupled with entirely irrelevant references to the greater speed of motor cars to-day compared to fifty years ago—when the Pilgrims were founded—and to the frequency with which the Atlantic is crossed by air now as to then, made up an oratorical performance that was anything but stimulating. Next time I listen to a Pilgrims Banquet I shall play a game of darts. They will not put me off my stroke.

Plays

"Murder on the Map" was a report by Wynford Vaughan Thomas on threats to our famous beautiful landscape by the encroachments of modern science, industry, housing and what you will. A very good programme and Mr. Thomas a fervid and eloquent defender of beauty and "hands off." Not always convincing, I'm afraid, for the very reason that, until our population is drastically reduced, the amenities which fifty millions and more require and, by any reckoning, are entitled to, will eat away our matchless inheritance. It needn't be uncontrolled spoliation, of course, but some of it, alas, must go, unless the country is to become the playground for millions of occasional visitors from the cities and the slums.

What better radio fare can be demanded than a Somerset Maugham comedy well acted and produced? This we had in "Penelope," in which a young, inexperienced wife is counselled by a mature man of the world on how to bring her erring young husband back to his proper place, to wit, at her feet. All was accomplished with the utmost gaiety and charm by everyone concerned. D. A. Clark-Smith, Nan Munro and Max Adrian were the chief protagonists, and Peggy Wells was the capable adaptor for broadcasting.

Another play of not a dissimilar character though rather solider, but of great worth and merit, was "Love and Geography." As the author's name is probably as difficult for an Englishman to write as to pronounce, I will kill two birds by giving myself some practice in the former by writing it here, and the reader the opportunity of reading it—in the same place—Björnstjerne Björnson. Norwegian, needless to say.

In this piece maps and travel threaten to play the part of co-respondent. But the situation is saved with great charm and philosophic wisdom. Cecil Trouncer, Avice Landone and Catherine Lacey were the contestants this time, with Cynthia Pughe the adaptor for broadcasting. What a pity this sort of stuff can never reach the boards! It is our fault and not —— ——'s.

A third play which is by way of being a masterpiece, was Rosetand's "l'Aiglon," the story of the loyalty Napoleon's son rallied round himself and of his unavailing efforts to restore the Buonapartist dynasty to the French throne. The story is highly romantic and much beautiful writing goes to the telling of it. Marius Goring headed a large cast, which must receive my compliments *in toto* as space forbids their separate mention. The distinguished playwright, Clemence Dane, was both translator and adaptor for broadcasting. There must be quite a staff of these latter at Broadcasting House.

Pianist

And lastly, Claudio Arrau completed his noble and Herculean task of playing all the Beethoven Sonatas and the 33 Variations. The best was as good as we are likely to get from any pianist these days.

Stories

Four other programmes of more than ordinary merit are left for mention. "The Voice of the Actor" was of exceptional interest in comparing past and present masters of the histrionic art. My word, how methods and styles have changed! Couldn't singers and pianists, etc., be similarly brought together? "The Banning of the Mikado" attractively narrated an incredible story which out-Gilberted Gilbert in sardonic humour. We shall probably do the same again when the next Japanese Crown Prince honours us similarly. "SHAPE," another Vaughan Thomas documentary, purported to tell a frightfully important story. But, as with the Pilgrims Dinner, one couldn't help feeling that all that was vital and really important was being left unsaid.

OPEN TO DISCUSSION

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

Converting to Push-pull

SIR,—Regarding the article in your July issue, the following comments may be of interest.

The Schultz push-pull arrangement is not self-balancing, and thus, if the output transformer is electrically centre-tapped, the alternating currents in the two halves of its primary being unequal, one valve (the one with the signal on its control grid) delivers more power than the other. It is possible that the degree of unbalance resulting from the use of the circuit constants on page 322 would pass unnoticed, but in any case, it can be minimised by increasing the value of Rc.

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying surplus equipment. We cannot supply alternative details for constructional articles which appear in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. If a postal reply is required a stamped and addressed envelope must be enclosed.

In the article the suggestion is made that the potential drop across Rc may be regained by modifications to the H.T. smoothing arrangements. It seems probable, however, that a more elegant system would be to feed H.T. to the anodes and screen grids of the output valves directly from the cathode of the rectifier, i.e., use the voltage across the reservoir capacitor. The voltage at this point is likely to be high enough to offset the drop across Rc. If the voltage is higher than is necessary to compensate for the drop due to Rc, then Rc can be increased with consequent improvement in the balance of the alternating anode currents. The voltage across the reservoir capacitor will admittedly have a strong alternating component, but as the system is closely balanced for an input applied via the H.T. supply, very little—if any—hum will be introduced. Further, the hum on the smoothed H.T. rail will fall due to the reduction in the current flowing through the smoothing filter.

In the article it is implied that a 32 μF reservoir capacitor may be used. While in many instances this is likely, readers should ensure that such a value would not result in the peak charging current exceeding the limit laid down by the valve makers for the particular rectifier in use. If the maker's figure would be exceeded by such a value there seems little to be done. The normal solution in such cases of increasing the series impedance of the source feeding the rectifier would tend to offset the effect of an increase in capacity.

In conclusion, it may be mentioned that this push-pull circuit is also known as "long-tailed pair," the name being a reference to the apparent increase in the length of the grid-base of valves used in such a circuit.—S. C. MURISON (Surbiton).

Condenser Testing

SIR,—I note from the remarks of Mr. Hindle in your July issue that he is not in favour of the addition of a potentiometer resistance to adjust the voltage given by a power pack as mentioned in his article of February. I still contend that a potentiometer gives more flexible control to the neon test circuit for general radio condensers and condensers used in tuning circuits.

Many power packs give a voltage in excess of 400 volts if measured with an electrostatic voltmeter and with a discharge resistance of 5 MΩ the pulse of the neon lamp can be so rapid on small condensers that it cannot be easily timed.

It has been found that with a 0.1 μF condenser, for example, the pulse at about 270 volts applied pressure can be slowed down to measurable timing and comparison made with equal or equivalent condenser values.

The potentiometer can easily be marked so that the minimum voltage to suit the striking voltage of the lamp is not exceeded.

In timing circuits for traffic signals ("robots," they call them in South Africa) where a 5 μF condenser discharges through adjustable resistances, and the control relays are "triggered" by neon lamps, the D.C. source from the "transrector" is stabilised by a valve circuit, and by potentiometer control, regulated to a lower value. In tests on many condensers with a capacity bridge the value of the capacity of the condensers has been found to be rarely far off the rated value, but the insulation resistance between plates can, in humid tropical climates, fall from hundreds of MΩ to a few MΩ when kept in stock for a few weeks only.

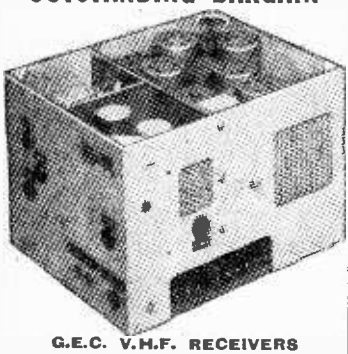
Condensers which fail through inadequate sealing against the ingress of moisture are useless for traffic control and X-ray timing devices.

Mr. Hindle mentions the straight part of the charging curve of a condenser, yet a reference to the equation for the time constant in terms of P.D. and time indicates that the charging curve cannot be straight at any portion.

The "Osglim" lamp was mentioned because it should be easily procurable and, incidentally, many types of neon lamps are fitted with internal high resistance although this fact is only ascertainable by opening up the cap.

(*Continued on page* 437)

OUTSTANDING BARGAIN



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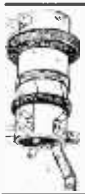

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(*Continued from page* 434)

It has been found with a reduced supply voltage that the cheap neon lamps, with a low striking voltage of about 90 volts, and obtainable in most stores, can be usefully employed for condenser testing.

Trusting this information may be of interest to your readers.—K. COOMBS (Cape Town, S.A.).

Receiver Design at V.H.F.

SIR,—I note in your July issue of PRACTICAL WIRELESS, on page 316, one of your contributors labels the first valve in the circuit as ECH33. I think this is probably a typographical error and should be ECH35.

I thought I had better mention this as we have already had an enquiry or two for ECH33, and we can trace it only to this particular diagram.—C. H. GARDNER (Mullard Ltd.).

Cycle Radio

SIR,—Out of interest and enthusiasm for radio, I have succeeded in making a four-valve receiver for my bicycle.

Using full-size valves, it runs on as low a voltage as 60 volts H.T., 2 volts L.T., size being 7in. × 4½in. × 3in., I have the battery, L.T., etc., in a box in the saddle-bag, with frame aerial round inside the box. Reception is perfect ; I can get stations all the way round the scale and on long or medium wave.

I've braced the valves with rubber inside the chassis against shock.

It will work a midget speaker, but I prefer to use those small button 'phones.

I don't lose any volume when riding, except on a sharp turn, but I don't lose audibility, just slight volume is lost.

I have the set mounted on the handlebars, and the rest of the gear—aerial and batteries, etc.—in the saddle-bag.

It is a four-valve straight built on an amplifier panel ; three knobs, selectivity, volume and tuning switch is incorporated with the volume switch.—R. ALEXANDER (Whitstable).

Balanced Twin Speakers

SIR,—I was interested by the letter from G. Hurrell, in the June issue.

I built my own amplifier and I am using a home-made cross-over network at 3,000 c/s, feeding a 12in. bass speaker and a 5in. "tweeter." Both speakers are "doctored" to give improved results and were originally quite cheap.

However, the result is excellent quality which—in my opinion—is more realistic than most. But it is very "squeaky."

I, too, have had to attend concerts to gain a fair estimate of the balance of a live orchestra.

I have come to these conclusions. The majority of commercial receivers "cut off" at about 4,000 or 5,000 c/s. This is the "standard" by which reproduced music is judged.

Standard records, even when they have the higher frequencies, are no better for it since your ears tend to become "deaf" to the "needle hiss," and so to the high frequencies. Anyway, most people have the sense to cut the top on standard records to get rid of the hiss.

I hope my experience has done something to reassure Mr. Hurrell and I hope he "sticks to his guns."—G. J. BADMAN (Street, Som.).

Sign of the Times

SIR,—I read with some amusement, the comments by A. J. S., in his futile attempts to purchase a volume control and switch in his native town. I have come to the conclusion, that most radio shops look with disdain upon the struggling amateur. There are, of course, exceptions, but they are few and far between. My advice to A. J. S. is why trouble the locals for anything, when we have, at our elbow, everything which is required in PRACTICAL WIRELESS, including catalogues advertised by a goodly percentage of radio dealers, and it only needs a stamped addressed envelope to either, and their shop window will be placed before you, at a price no amateur would refuse.—W./O. T. WHITE (R.A.F., West Kirby).

"Amateur Transmitters"

SIR,—May I reply to the letter by Mr. R. Lockwood, of Leicester, in the August issue.

Mr. Lockwood states that most amateurs to-day appear on the air as self-styled comedians and that little technical matter is discussed. He also goes on to say that the amateur does not care what type of signal he puts out so long as he gets on the air.

I, as an officer of the radio society embracing most of the amateur transmitters in his home town, cannot allow this statement to go unchallenged.

The quality of the transmissions put out by members of the Leicester Radio Society are without exception equal to "BBC performance," and I suggest that Mr. Lockwood listens to the local net any Sunday morning on 1900 kc/s, when he will find enough technical matter to last him the whole of the week.

He did not state which frequency band he generally uses or the type of receiver he operates, as poor quality is often the result of bad receiving conditions.

Finally, may I state that if Mr. Lockwood is so interested in technical tuition, he will be made welcome at any of the meetings of the local radio society, where he can "air his views" and actually take part in a local transmission. The society meet every first and third Monday in the month, at the Holly Bush Hotel, and announcements appear frequently in the technical press.—C. L. WRIGHT, B.Sc. (G3CCA) (Publicity Officer, Leicester Radio Society).

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(Continued from page 439)

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

Send (Preferably) a postal order to cover the cost of the Blueprint (stamps over 6d. unacceptable) to PRACTICAL WIRELESS Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

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PRACTICAL WIRELESS, Sept., 1952.

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