VOLTAGE MEASUREMENTS—See page 295

A NEWNES PUBLICATION

Edited by F. J. CAMM

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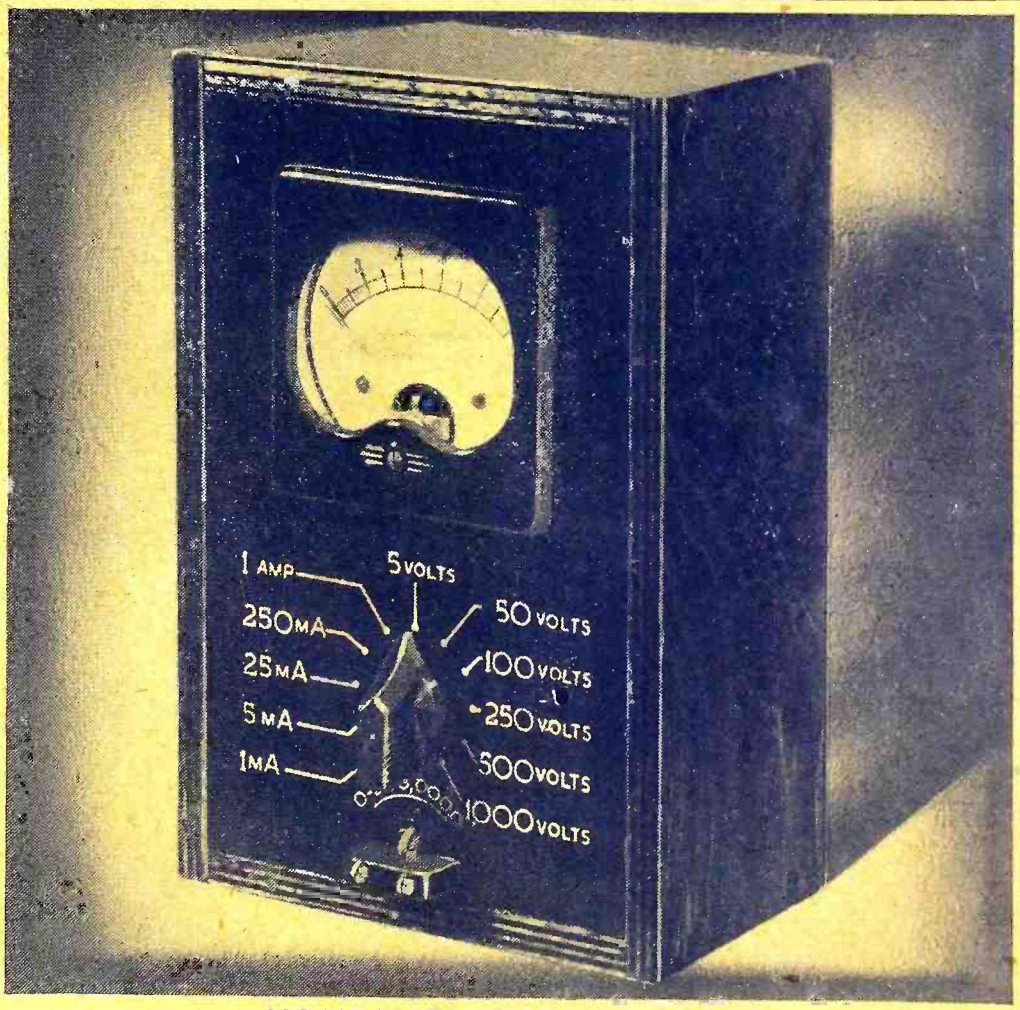
Practical Wireless and PRACTICAL TELEVISION

4D. EVERY WEDNESDAY

June 22nd, 1940.

Contents



HOME-MADE TEST EQUIPMENT

Practical Wireless BLUEPRINT SERVICE

PRACTICAL WIRELESS

	Date of Issue.	No. of Blueprint.
CRYSTAL SETS		
Blueprints, 6d. each.		
1937 Crystal Receiver	—	PW71
The "Junior" Crystal Set	27.8.38	PW94
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprints, 1s. each.		
All-Wave Unipen (Pentode)	—	PW31A
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Sixty Shilling Three (D, 2 LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow)	—	PW35
Summit Three (HF Pen, D, Pen)	—	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	PW39
Hall-Mark Three (SG, D, Pow)	—	PW41
Hall-Mark Cadet (D, LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-Wave Three)	13.4.35	PW49
Cameo Midget Three (D, 2 LF (Trans))	—	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	—	PW53
Battery All-Wave Three (D, 2 LF (RC))	—	PW55
The Monitor (HF Pen, D, Pen)	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P)	14.8.37	PW64
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.36	PW69
The "Colt" All-Wave Three (D, 2 LF (RC & Trans))	18.2.39	PW72
The "Rapide" Straight 3 (D, 2 LF (RC & Trans))	4.12.37	PW82
F. J. Camm's Oracle All-Wave Three (HF, Det., Pen)	28.8.37	PW78
1938 "Triband" All-Wave Three (HF Pen, D, Pen)	22.1.38	PW84
F. J. Camm's "Sprite" Three (HF Pen, D, Tet)	26.3.38	PW87
The "Hurricane" All-Wave Three (SG, D (Pen), Pen)	30.4.38	PW89
F. J. Camm's "Push-Button" Three (HF Pen, D (Pen), Tet)	3.9.38	PW92
Four-valve : Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P)	1.5.37	PW4
Fury Four (2 SG, D, Pen)	8.5.37	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B)	—	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull)	—	PW46
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P)	26.9.36	PW67
"Acme" All-Wave 4 (HF Pen, D (Pen), LF, Cl. B)	12.2.38	PW83
The "Admiral" Four (HF Pen, HF Pen, D, Pen (RC))	3.9.38	PW90
Mains Operated		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen)	—	PW18
A.C.-D.C. Two (SG, Pow)	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow)	7.1.39	PW35C
D.C. Premier (HF Pen, D, Pen)	—	PW35B
Unique (HF Pen, D (Pen), Pen)	—	PW36A
Armada Mains Three (HF Pen, D, Pen)	—	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	—	PW50
"All-Wave" A.C. Three (D, 2 LF (RC))	—	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	—	PW70
Four-valve : Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	—	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull)	—	PW47
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£5 Superhet (Three-valve)	5.6.37	PW40
F. J. Camm's 2-valve Superhet	—	PW52
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valve)	—	PW43
D.C. £5 Superhet (Three-valve)	—	PW42
Universal £5 Superhet (Three-valve)	—	PW44
F. J. Camm's A.C. Superhet 4	—	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualitone" Universal Four	16.1.37	PW73
Four-valve : Double-sided Blueprint, 1s. 6d.		
Push Button 4, Battery Model / Push Button 4, A.C. Mains Model	22.10.38	PW95
SHORT-WAVE SETS. Battery Operated.		
One-valve : Blueprint, 1s.		
Simple S.W. One-valver	23.12.39	PW88
Two-valve : Blueprints, 1s. each.		
Midget Short-wave Two (D, Pen)	—	PW38A
The "Fleet" Short-wave Two (D (HF Pen), Pen)	27.8.38	PW91
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2 LF (RC and Trans))	—	PW63
The Band-Spread S.W. Three (HF Pen, D (Pen), Pen)	1.10.38	PW68
PORTABLES.		
Three-valve : Blueprints, 1s. each.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen)	—	PW65
Parvo Flyweight Midget Portable (SG, D, Pen)	3.6.39	PW77
Four-valve : Blueprint, 1s.		
"Imp" Portable 4 (D, LF, LF (Pen))	—	PW86
MISCELLANEOUS.		
Blueprint, 1s.		
S.W. Converter-Adapter (1 valve)	—	PW48A

AMATEUR WIRELESS AND WIRELESS MAGAZINE

	Date of Issue.	No. of Blueprint.
CRYSTAL SETS.		
Blueprints, 6d. each.		
Four-station Crystal Set	23.7.38	AW427
1934 Crystal Set	—	AW444
150-mile Crystal Set	—	AW450
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprint, 1s.		
B.B.C. Special One-valver	—	AW387
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans)	—	AW388
Full-volume Two (SG det, Pen)	—	AW392
Lucerne Minor (D, Pen)	—	AW426
A Modern Two-valver	—	WM409
Three-valve : Blueprints, 1s. each.		
£5 5s. S.G.3 (SG, D, Trans)	—	AW412
Lucerne Ranger (SG, D, Trans)	—	AW422
£5 5s. Three : De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
Transportable Three (SG, D, Pen)	—	WM271
Simple-Tune Three (SG, D, Pen)	June '33	WM327
Economy-Pentode Three (SG, D, Pen)	Oct. '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	Mar. '34	WM354
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen)	—	WM389
Certainty Three (SG, D, Pen)	—	WM393
Minitube Three (SG, D, Trans)	Oct. '35	WM396
All-Wave Winning Three (SG, D, Pen)	—	WM400
Four-valve : Blueprints, 1s. 6d. each.		
65s. Four (SG, D, RC, Trans)	—	AW370
2HF Four (2 SG, D, Pen)	—	AW421
Self-contained Four (SG, D, LF, Class B)	Aug. '33	WM331
Lucerne Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2 LF)	Feb. '35	WM381
The H.K. Four (SG, SG, D, Pen)	—	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	Apr. '36	WM404
Five-valve : Blueprints, 1s. 6d. each.		
Super-quality Five (2 HF, D, RC, Trans)	—	WM320
Class B Quadradyne (2 SG, D, LF, Class B)	—	WM344
New Class B Five (2 SG, D, LF, Class B)	—	WM340

These Blueprints are drawn full size.
Copies of appropriate issues containing descriptions of these sets can in some cases be supplied at the following prices *which are additional to the cost of the Blueprint.* A dash before the Blueprint Number indicates that the issue is out of print.

Practical Wireless (issues dated prior to June 1st, 1940)	4d. Post Paid
,, ,, (Issues dated June 1st, 1940, and after)	5d. Post Paid
Amateur Wireless	4d. ,, ,,
Wireless Magazine	1/4 ,, ,,

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, and the issue (stamps over 6d. unacceptable) to PRACTICAL WIRELESS Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

	Date of Issue.	No. of Blueprint.
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.	—	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicorn A.C.-D.C. Two (D, Pen)	—	WM394
Three-valve : Blueprints, 1s. each.		
Home Lover's New All-Electric Three (SG, D, Trans) A.C.	—	AW383
Mantovani A.C. Three (HF Pen, D, Pen)	—	WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	Jan. '36	WM401
Four-valve : Blueprints, 1s. 6d. each.		
All Metal Four (2 SG, D, Pen)	July '33	WM329
Harris' Jubilee Radiogram (HF Pen, D, LF, P)	May '35	WM386
SUPERHETS.		
Battery Sets : Blueprints, 1s. 6d. each.		
Modern Super Senior	—	WM375
'Varsity Four	Oct. '35	WM395
The Request All-Waver	June '36	WM407
1935 Super-Five Battery (Superhet)	—	WM379
Mains Sets : Blueprints, 1s. 6d. each.		
Heptode Super Three A.C.	May '34	WM359
"W.M." Radiogram Super A.C.	—	WM366
PORTABLES.		
Four-valve : Blueprints, 1s. 6d. each.		
Holiday Portable (SG, D, LF, Class B)	—	AW393
Family Portable (HF, D, RC, Trans)	—	AW447
Two HF Portable (2 SG, D, QP21)	—	WM363
Tyers Portable (SG, D, 2 Trans)	—	WM367
SHORT-WAVE SETS. Battery Operated.		
One-valve : Blueprints, 1s. each.		
S.W. One-valver for America	15.10.38	AW429
Rome Short-Waver	—	AW452
Two-valve : Blueprints, 1s. each.		
Ultra-Short Battery Two (SG, det, Pen)	Feb. '36	WM402
Home-made Coil Two (D, Pen)	—	AW440
Three-valve : Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
The Carrier Short-waver (SG, D, P)	July '35	WM390
Four-valve : Blueprints, 1s. 6d. each.		
A.W. Short-wave World-beater (HF Pen, D, RC, Trans)	—	AW436
Empire Short-waver (SG, D, RC, Trans)	—	WM313
Standard Four-valve Short-waver (SG, D, LF, P)	22.7.39	WM383
Superhet : Blueprint, 1s. 6d.		
Simplified Short-wave Super	Nov. '35	WM397
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Two-valve Mains Short-waver (D, Pen) A.C.	13.1.40	AW453
"W.M." Long-wave Converter	—	WM380
Three-valve : Blueprint, 1s.		
Emigrator (SG, D, Pen) A.C.	—	WM352
Four-valve : Blueprint, 1s. 6d.		
Standard Four-valve A.C. Short-waver (SG, D, RC, Trans)	—	WM391
MISCELLANEOUS.		
S.W. One-valve Converter (Price 6d.)	—	AW329
Enthusiast's Power Amplifier (1/6)	—	WM387
Listener's 5-watt A.C. Amplifier (1/6)	—	WM392
Radio Unit (2v.) for WM392 (1/-)	Nov. '35	WM398
Harris Electrogram battery amplifier (1/-)	—	WM399
De Luxe Concert A.C. Electrogram (1/-)	Mar. '36	WM403
New style Short-wave Adapter (1/-)	—	WM388
Trickle Charger (6d.)	—	AW462
Short-wave Adapter (1/-)	—	AW456
Superhet Converter (1/-)	—	AW457
B.L.D.L.C. Short-wave Converter (1/-)	May '36	WM405
Wilson Tone Master (1/-)	June '36	WM406
The W.M. A.C. Short-wave Converter (1/-)	—	WM408

Practical and Wireless
★ PRACTICAL TELEVISION ★
EVERY WEDNESDAY
Vol. XVI. No. 405. June 22nd, 1940.
EDITED BY
F. J. CAMM
Staff:
W. J. DELANEY, FRANK PRESTON,
H. J. BARTON CHAPPLE, B.Sc.

ROUND THE WORLD OF WIRELESS

Servicing

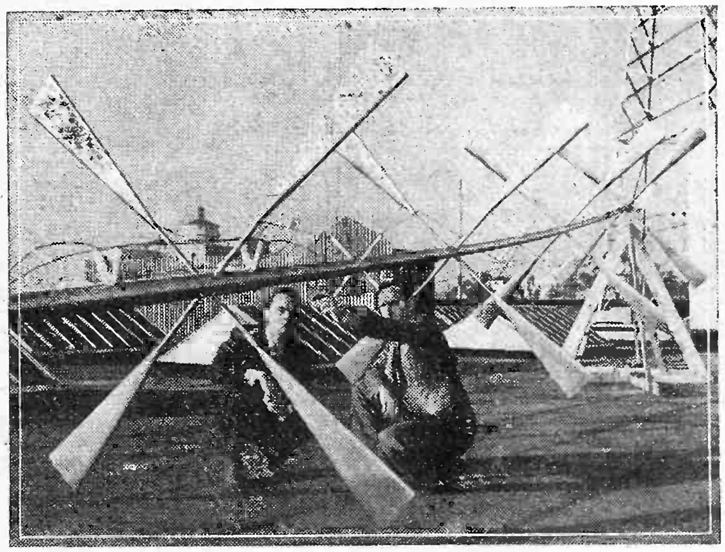
THE demands made upon the civilian population by the Military Service Act have resulted in a shortage of service engineers, and it is important to bear in mind that it is quite possible that many listeners will, for reasons of national economy, make their receivers last longer. This means also that service problems will undoubtedly be more acute and thus there will be a great demand for service men and others capable of dealing with the problems which will arise. We have in the past given great prominence to questions of servicing and therefore continue in this issue with some further details on the subject. There are many young readers who have been taking a very keen interest in radio construction and who would like to enter the service field, but who are not fully aware of some of the methods which may be adopted. It is not, of course, essential to have elaborate test equipment, although it is highly desirable if really comprehensive work is to be carried out. As an instance of what may be done with home-made apparatus we give in this issue details of a tester in which an ordinary beehive "night-light" type of electric lamp is employed. There are many other similar devices which may be made up and these will be dealt with from time to time.

H. V. Morton on Palestine

ON June 21st H. V. Morton is to tell the schools about the people of Palestine. "The life of the village people," he says, "has not changed very much since the time of Christ. Shepherds still watch their flocks on the hillsides . . . and the Arabs with their flocks and herds are still living like Abraham."

"Moonlight and Splash"

JAMES DYRENFORTH was recently responsible for the script of a crazy show called "Nuts in May." This was so successful that Tom Ronald, its producer, immediately asked Dyrenforth to get to work on another piece of madness. The result will be heard on June 20th, when "Moonlight and Splash" (not "Nuts in June") will be broadcast with Joyce Grenfell, Billy Milton, Dick Francis, Helen Clare and Dorothy Summers in the cast. Joyce Grenfell, renowned for her impressions in the Farjeon revues at the Little Theatre, London, will play the part of a rather eccentric housekeeper, but there will be opportunities for her to be heard in some of her own sketches, too. Billy Milton, lately playing in "Meet the Arrow" in "Crime Magazine," will broadcast some of his own songs, as well as having an important rôle in the main action of the show.



An unusual type of television aerial which was experimented with in America. It was claimed that better definition could be obtained by means of the paddle-like elements.

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

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

Ayrshire Brass Band

DARVEL BURGH BAND will broadcast on June 22nd under its conductor, Frederick Rogan. The band will play the ceremonial march, "Royal Progress"; a selection from "A Country Girl"; the dainty Heykens Serenade and a fantasia, "Ten Minutes wi' Burns," which means much to the players, because they all come from the Burns country in Ayrshire.

"Values"

ONE of the loveliest little plays ever broadcast from Wales was "Values," by D. T. Davies. This play, which was originally written in Welsh, was translated into English by the author and was broadcast in the Home Service programme last January. Judging by correspondence and people's comments the play helped them greatly in these troublous times. It will be broadcast again on June 23rd.

Children's Miscellany

THE Children's Hour from Scotland on June 22nd has something for children of all ages and tastes. Christine will read "The Handkerchief Hero," a story by Mary Manners Simpson for very young listeners. A talk for stamp collectors will be given by A. K. Macdonald, an old favourite of children, and Summer Saturday Variety will include songs by Kathleen and Elliot Dobie.

"Film Festival" (3): "Shall We Dance?"

THE third production in Douglas Moodie's "Film Festival" will be a revival of the radio version of "Shall we Dance?" which was first broadcast in December, 1938, and is to be heard again on June 24th. This is surely one of the best of the Fred Astaire-Ginger Rogers series, and contains one of George Gershwin's loveliest scores. Some of the best and most typical Gershwin numbers come from this show. "Let's Call the Whole Thing Off," for instance, is an excellent example of his light comedy work; while "You Can't Take That Away From Me" has the wistful, nostalgic quality for which he is celebrated. It is expected that Diana Ward will take the Ginger Rogers part in this broadcast.

All-dry Receivers

Details of the New Valves and Receivers which May be Built Round Them By W. J. DELANEY

IT was announced some time ago that special valves were to be produced which dispensed with the accumulator, and thus simplified receiver construction and brought into real use the portable type of receiver. These valves are now available for the home-constructor, and as a result a new field of experiment is opened to him. The ordinary type of "battery" valve is designed for a filament supply of 2 volts, and the current taken is generally of the order of .1 amps. This means that when three or more valves are used a fairly

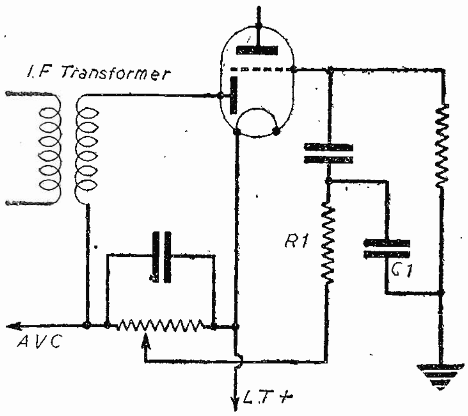


Fig. 1.—Skeleton diagram of second-detector stage with minimum of components.

substantial accumulator has to be employed or only a very short period of listening may be indulged in before the accumulator has to be recharged. When real long-distance reception is desired it is necessary to adopt a superhet type of circuit, and this means that at least four valves have to be employed. This adds to the filament current, and when the normal H.T. battery also is included (remembering that battery valves are designed for H.T. voltages from 100 to 150 volts), the overall weight as well as size becomes rather unwieldy for real portable use.

Valve Characteristics

The new "all-dry" valves, as they are called, are designed with a filament rated at 1.4 volts, and there are five types, four having filament current ratings of .05 amps. and one a .1 amp rating. The standard dry cell is rated at 1.5 volts compared with the 2-volts of a wet cell or accumulator as it is more properly termed. It will thus be seen that the new filaments are all right for a single cell, and it is thus possible to use four such valves with a total current consumption of only .2 amps. Although this is rather on the high side for simple small cells, it is quite within the bounds of a properly-designed single cell, and these are obtainable now incorporated in an H.T. battery. In some cases a number of the ordinary cells are connected in parallel, and these are, of course, then deducted from the total H.T. voltage, leaving in many cases only 90 volts or so for H.T. This combination of 1.5 volts and 90 volts is now more or less in general use, and the battery is thus no larger than the ordinary type of 100-volt H.T. which is normally employed, although various ideas are incorporated to permit the overall dimensions to be reduced. For instance, instead of flexible leads or terminal connections, spring strips are sometimes fitted so that when the battery is pushed home into the receiver the L.T. circuit is automatically completed. In other cases, two of the very small 45 volt H.T. units are connected in series. These units have been produced for deaf aids, and similar small receivers, and accordingly are not only very light in weight but also compact.

Valve Types

The new valves have been produced in six types—a pentagrid frequency changer and an H.F. pentode, both of which are available as "straight" or variable-mu valves; a single diode triode and two types of pentode output valve. It will thus be seen that the valves have been designed primarily for use in a superhet circuit, this offering the widest range of possibilities in receiver design and also in efficiency for small receivers of the portable type. The type numbers of these valves are 1A7G (or 1A7VG for the variable-mu) frequency changer; 1N5G H.F. pentode (or 1N5VG for the variable-mu); 1H5G for the diode-triode; 1C5G for the output valve and 1A5G for the other output pentode. The latter has a .05 amp filament and is rated to deliver 100 milliwatts, whilst the former has a .1 amp filament and is capable of an output of 240 milliwatts. By using 5 of these valves in combination it is possible to have a superhet with a total anode current of less than 12 mA and this, combined with a total L.T. current drain of only .2 amps, means a considerable saving in all directions, whilst still giving a remarkable output and range of reception.

Receiver Designs

The general design of receivers using these new valves is practically identical with that using ordinary valves, the only point of difficulty likely to be experienced by the average amateur being in the design of the 2nd detector and A.V.C. stage. This is on account of the fact that the valve used in that stage is a *single* diode-triode and not a double diode-triode which is more usually employed. A typical circuit is, however, given in Fig. 1 which shows that the arrangement is quite simple, the usual load resistance being eliminated and the L.F. volume control being used for this purpose. It thus acts in a dual capacity, a procedure which is quite satisfactory and which at the same time eliminates at least one component. In practice the circuit is actually simplified in other directions.

Another interesting point in regard to these valves is that they are of the octal type, which means that they are not only standardised for valve base design, but that they are also extremely small—again adding to their usefulness in the sphere of portable designs. It is almost unnecessary to indicate that grid-bias batteries are usually dispensed with in receivers employing these valves, the usual automatic biasing scheme being included. There is, however, just one point in this connection which should be borne in mind. The high efficiency output valve requires a bias of 9 volts and, obviously, if automatic bias is used, this 9 volts is subtracted from the total available H.T. As the valves are already only utilising a total of 90 volts, this loss of 9 volts might be found ill-considered in some receivers, and thus where extreme portability is not needed (as in a transportable or a standard home-receiver), the high-efficiency output pentode would be used, together with a separate biasing battery. In that case, too, one of the larger 1.5-volt cells (a small bell cell, for instance) would be employed.

Characteristics

Below will be found the general characteristics of the valves already mentioned, although it must be appreciated that there may be slight differences in the products of different firms, whilst the type numbers are also slightly modified by some makers.

We shall shortly be describing a receiver using these valves, but in the meantime for those who wish to build up their own receiver, we include a complete circuit of a 5-valve combination superhet with H.F. stage and using the 1C5 output pentode. The layout is not critical, but should follow the general lines of superhet circuits, paying particular attention to the screening of the H.F. stage and of the various I.F. leads.

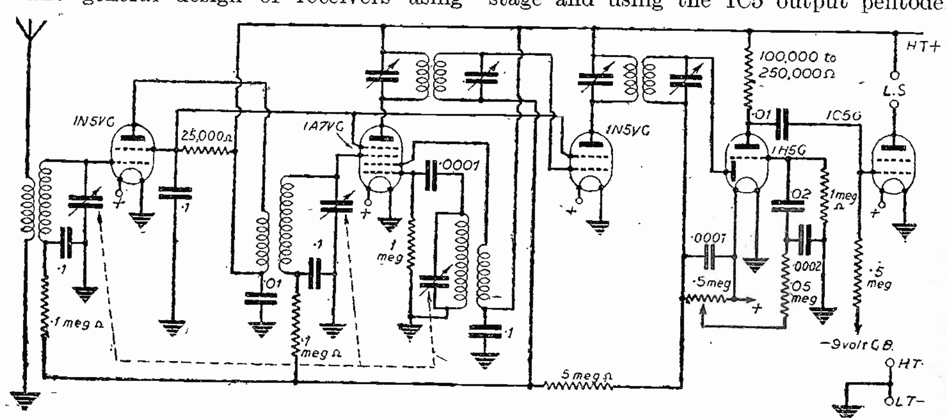


Fig. 2.—Diagram of superhet for the new 1.4 volt valves.

Type	Filament		Anode Volts	Screen Volts	Osc. Volts	Grid Bias Volts	Anode Current mA	Slope	Impedance	Amplification Factor
	Volts	Amps								
1A7G	1.4	.05	90	45	90	0	2.3	.25	—	—
1A7VG	1.4	.05	90	45	90	0 to −3	2.3 to 1.2	.2	—	—
1N5	1.4	.05	90	90	—	0	1.2	.75	1,500,000	—
1N5VG	1.4	.05	90	90	—	0 to −4	1.2 to 1.6	.65	1,000,000	—
1H5G	1.4	.05	90	—	—	0	.14	.275	240,000	—
1A5G	1.4	.05	90	90	—	4.5	4.0	.85	—	—
1C5G	1.4	.1	90	90	—	7.5-9	7.5	1.55	—	—

A Neon-lamp Tester

Details of a Novel Resistance Test Instrument

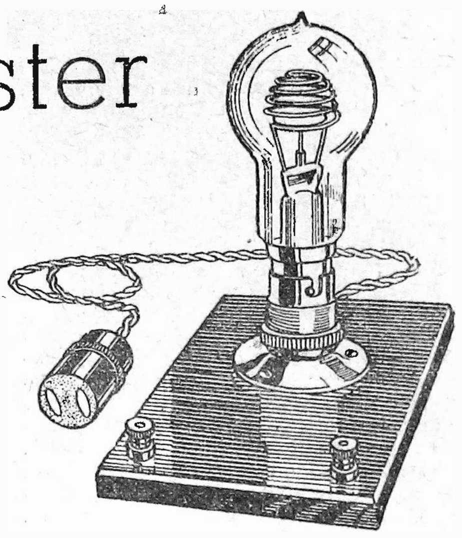


Fig. 1.—The neon-lamp tester ready for use.

THE ordinary neon lamp as sold for domestic lighting has applications other than that of an "electric night light." Perhaps its greatest sphere of usefulness is as a testing device for the radio constructor. Continuity and insulation tests, condenser tests, and the determination of the values of resistances are all possible with the aid of one of these useful gadgets.

Before carrying out any work with the lamp it is just as well to mount it in a holder on a small wooden base. A small "charging" board as used for accumulator charging from D.C. mains will answer the purpose very well. Such a board is illustrated in Fig. 1 and the wiring underneath is given in Fig. 2.

A "Flashing Sign"

The usual application of the lamp by the radio constructor is as a circuit tester and indeed, in this direction it is very useful. However, the purpose of this article is to give not only these tests but to describe a further use of the lamp, namely, a means of finding out the values of grid leaks and high resistances. By a suitably arranged circuit the lamp will give a series of intermittent flashes, the speed of the flashes determining the value of the resistances under test. Besides being a very interesting experiment in itself—it provides quite a novel "flashing sign" without any mechanical "works"—it is an easy method of checking just those resistances which are usually most difficult to measure, namely, very high ones. With ordinary meters accurate results are very difficult to secure owing to the small readings obtainable.

The neon lamp does not, of course, replace meters, but may be looked upon as supplementary to the ordinary moving-iron instruments. It must be admitted that the method to be described is one of substitution, but by drawing a simple graph many different values can be determined from two or three "known" resistances.

Useful Tests

Before going into details of the "flashing sign" tests here are some of the more common applications of the lamp.

By fitting two insulated test prods to the ends of a length of twin flex taken from the terminals on the lamp board the lamp may be quickly connected to any part of the circuit or component under test without fear of the conductivity of the constructor's hands upsetting the results. The prods can be bought or are easily made from pieces of vulcanite rod with the flex passing through the centre and connecting with metal contacts sticking from the end of the prod. A couple of old fountain pens will make excellent prods. A hole should be drilled in the top of each pen for the flex to pass through while the original nib or a cheap brass one will do as the contact. The wire is soldered to the nib before it is inserted in the feed, as in Fig. 4.

To make the lamp glow it will have to be either connected to an H.T. battery or plugged into D.C. mains. When buying the lamp the voltage required should be stated. On touching the two prods together the circuit will be completed and the lamp will glow.

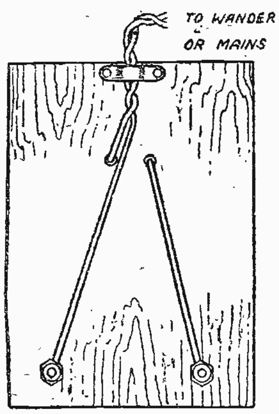


Fig. 2.—The wiring connections underneath the test board.

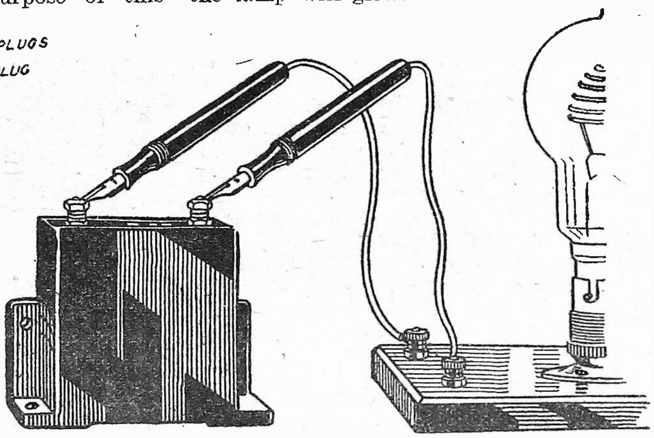


Fig. 3.—Testing the insulation of a fixed condenser with the neon lamp.

Testing Condensers

Owing to the comparatively high voltages used the lamp will provide a very stringent test of insulation and is, therefore, particularly useful in testing condensers.

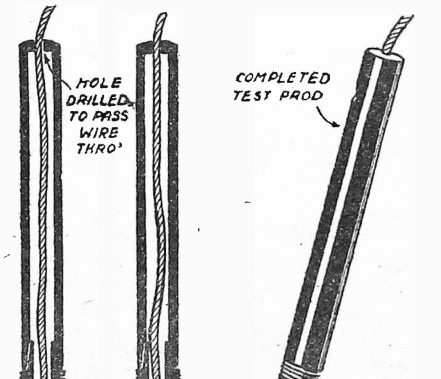


Fig. 4.—How a testing prod can easily be made from an old fountain pen.

The test prods are held in contact with the terminals of the condenser for a minute or two, as in Fig. 3. If the condenser is leaky a series of flashes will occur in the lamp, that is to say, that after a short time it will glow momentarily, and then go out again immediately, and then after a similar period of time it will suddenly flash again. If this only occurs at long and regular intervals, say once every minute, the condenser may be considered as O.K., although, of course, a perfect condenser would give no flashes at all. However, in a test of this sort allowance has to be made for any slight leakage in the lamp holder, wiring, and test prods, which would give the same effect as leakage in the condenser, so that an occasional flash does not mean the condenser is a "dud." In fact, this test is so searching that a flash every minute or half minute represents a leakage resistance of not less than several million ohms. It is when the flashes occur several times per minute or when they gradually increase in frequency that the insulation may be taken as very poor or broken down. This test may be applied equally well to fixed or variable condensers, but cannot, of course, be used for the electrolytic type.

A multitude of other insulation tests may be carried out by placing the prods across the suspected part. For instance, the insulation between the sockets of a valve-holder can be tried by placing the prods in the sockets themselves, or again, the insulation between the windings of a transformer may be checked by connecting one prod to one of the primary terminals and the other to one of the secondary terminals.

Continuity Tests

To test for breaks in the wiring of coils, transformers, etc., the prods should be connected across the terminals of the component in the same way as with a condenser. A continuous glow indicates that there is no break in the wire, but erratic glowing or no light at all means that there is respectively only a partial connection or else a complete break.

Another use for the neon tester is in determining whether a variable resistance or potentiometer is working properly. If the two terminals of the variable resistance, or, in the case of a potentiometer, the terminal joined to the slider and one of the other two, are connected to the lamp and the slider is moved slowly round, then any place where there is a faulty contact will be

(Continued on next page)

A NEON-LAMP TESTER

(Continued from previous page.)

ind'cated by the lamp going out at that point. If the instrument has a fairly high resistance, such as 5,000 ohms or more, then the glow of the lamp should steadily increase or decrease as the knob is turned first one way and then the other. If it flickers it means the slider is not making proper contact at the point where the flickering occurs.

In testing a variable resistance or potentiometer in this way we get a very good idea of how the lamp will behave when resistances of various values are connected in series with it, for in moving the slider we vary the resistance from zero to the full value of the instrument. Now if we look at the lamp we shall see that the glow does not gradually get paler as the resistance is increased, but rather does it diminish in area. First of all the whole of the beehive shaped electrode or the disc glows (according to the direction of the current), and then the glow becomes smaller until only a small point is illuminated. Instead of the variable resistance several fixed resistances may be tried. It will be noticed that each one will give a different amount of glow according to its value. This in itself will provide a rough means of finding out the value of an unknown resistance. As an

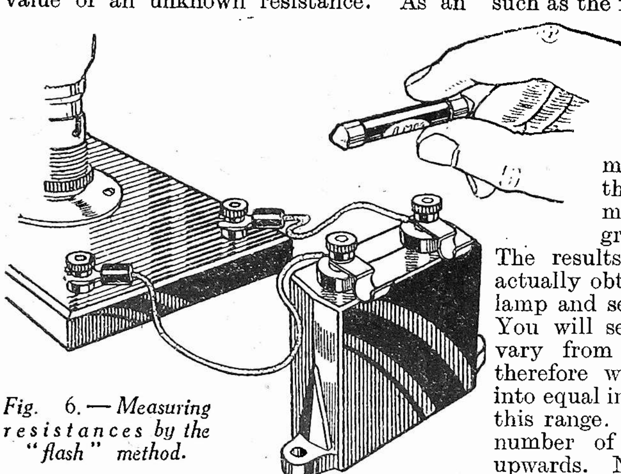


Fig. 6.—Measuring resistances by the "flash" method.

example we may find that a grid leak of two megohms makes the lamp just glow, whereas a ½ megohm leak makes about a quarter of the total area of the electrodes light up. If a leak of unknown value is then submitted to the test and found to give a glow area smaller than that of the ½ megohm leak but more than that of a 2 megohm one, then we may fairly safely assume its value to be in the region of 1 megohm.

Obviously this method gives only approximate results, and has the drawback that a large number of known resistances is needed in order to be able to determine the value of any unknown one. A far more accurate and reliable method is that mentioned earlier, namely, the "flash" method.

Measuring Resistances

The circuit necessary is shown in Fig. 5. It consists simply of a large fixed condenser in series with the lamp, and an H.T. battery or other direct current source, while the resistance under test is placed across the condenser. A good idea is to discard the prods and connect the condenser with two wires to the lamp as in Fig. 6. Grid-leak clips or stiff wires can be fitted to the condenser terminals to facilitate the quick attachment and removal of the resistances. A good quality condenser of about 2 mfd. capacity should be used, and when the current is switched on there

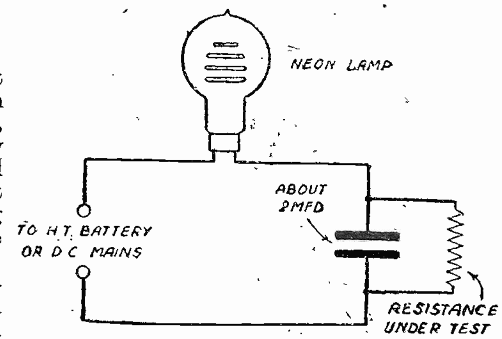


Fig. 5.—The circuit used when testing resistances by the method described in the text.

should be no glow or flashes from the lamp until the resistance is connected up. On placing a resistance in position the lamp will start flashing at regular intervals. There may be five, ten, twenty, or more flashes per minute until the lower values are reached, then the flashes become too fast to count, or else merge into one continuous glow.

Now in order to test a range of different resistances it is best to make a simple graph as in Fig. 7. By placing three or four different resistances of known value across the fixed condenser in turn a table such as the following may be compiled.

Resistance.	Flashes per minute.
3 megohms	14
2 "	20
1 "	26
½ "	33

From this it is a very simple matter to make the graph. For the benefit of those readers who may not be familiar with plotting graphs, this is how one is made. The results tabulated above were those actually obtained with an "Osglim" neon lamp and several good quality resistances. You will see that the resistances chosen vary from ¼ megohm to 3 megohms, therefore we divide the graph vertically into equal increments of resistance to cover this range. Along the base we mark the number of flashes per minute from 0 upwards. Now taking the first figures in the table we see that a resistance of 3 megohms gave 14 flashes. We run a pencil along the horizontal line marked 3 megs. and one along the vertical line marked 14. Where they intersect at A we put a small cross. We carry out the same procedure for the other points, thus 2 megs. meets 20 at point B, and so on. The points A, B, C and D are then joined up with a line as shown.

Once the graph is complete we can read off the value of any unknown resistance within the limits of the graph. Suppose, for instance, that we placed an unmarked resistance across the terminals of the condenser and the lamp flashed 30 times per minute. Following up from the 30 line on the graph we see that it meets the curve at the same point as the horizontal line marked ½ meg. The value of the resistance is therefore ½ meg. In the same way a resistance giving 17 flashes would be approximately 2½ megohms.

The accuracy of these results depends to a large extent on getting the lamp to flash at regular and easily countable intervals. To ensure this, a little care in the adjustment of the voltage and the capacity may be required. If the flashes occur too quickly to count then a larger condenser, say 4 mfd., should be used. This will slow up the flashes considerably. Keeping the voltage of the supply as low as possible will also help, although naturally it must not be reduced so much that the lamp will not glow at all.

There is one peculiarity in connection with neon lamps which must be mentioned here, as it is possible for it to cause slightly

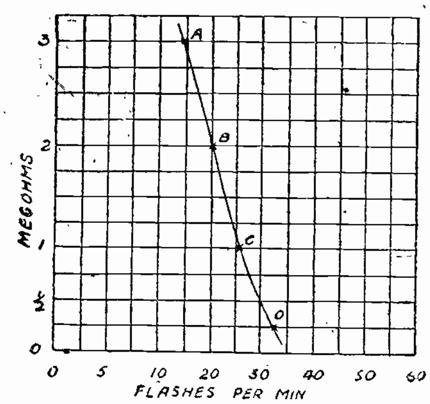


Fig. 7.—The curve used for finding the value of resistances.

erratic results, and that is there is sometimes a time lag between the flash and the voltage producing it. This means that although the upper critical voltage necessary for producing a discharge is reached, yet the discharge does not immediately take place. This is due to insufficient ionization within the lamp itself. However, it may be overcome by having a bright light, or another neon lamp glowing in the near vicinity of the test lamp, when the work is in progress.

BRITAIN'S VICTORY DRIVE

CONTINUING the new B.B.C. feature programmes describing Britain's drive on land, on sea, and in the air, and in the workshops of the country, a second series will tell the story of the part that Britain is playing in the Allied war against Nazism. These programmes, entitled "Marching On," the first of which will be broadcast on June 21st, are to be put on the air at fortnightly intervals, alternating with the "Go To It" series. They will be under the general editorship of Laurance Gilliam, of the B.B.C. headquarters staff. Among well-known B.B.C. script writers and producers who will contribute to this series are Robert Kemp, Francis Dillon, Stephen Potter, A. L. Lloyd, Denis Johnston, and D. G. Bridson.

The idea behind this second series is that of a radio magazine showing the progress of the war for each preceding fortnight, throwing into relief by dramatised presentation or narrative the outstanding events which have happened. Major military, naval, and air force events, home front and Empire news will be featured in this way and the underlying moral of these programmes will be that, although the road to victory has its ups and downs, the reverses will only serve to spur Britons on to still greater efforts which will end in the defeat of their enemies.

ON YOUR WAVELENGTH

By Thermion

Aliens and Wireless Sets

I LEARNED from the Ministry of Home Security that all Germans living in this country, irrespective of age or grade, must immediately dispose of their radio receiving sets. It does not matter whether the German concerned has been in this country for half a century or more. It is illegal for him to own a wireless set. If any of my readers know of any German who owns a wireless set he should take immediate steps to inform him that it should be disposed of at once or, alternatively, the police should be informed. In this war we cannot afford to take risks, and I have no doubt that this new order will impose hardships on many Germans living in this country who are anxious to see Hitler defeated. But fifth column activities in other countries have taught us a lesson. When the German troops have arrived, people who would never have been suspected of subversive action have guided the invaders, fed them and housed them. That must not happen here. There may be something in the suggestion that once a German always a German at heart. Do not be misled by their spoken hatred of Hitler. That may be part of the camouflage and the cunning, and is intended to disarm suspicion. It is the duty of every reader, in fact, of every citizen, to inform the police of anyone guilty of expressing pro-Hitler views.

A wireless receiving set can be used as a transmitting set, and we must make very sure that Germans enjoying the protection and hospitality of this country shall not abuse those privileges.

Car Radio Conversion

SINCE the recent order prohibiting the use of car radio, whether installed in the car or carried as a portable, I have had a number of letters from readers asking how such receivers can be operated from the mains. I have told them all that such a conversion is not worth while, for it is far too expensive. Much better, especially if the car is laid up, to remove the set with its battery indoors and operate it in the usual way. While I am dealing with the question of car radio, you will remember that I raised the point concerning the dealer who is transporting a portable to the home of the purchaser. The P.M.G. now informs me that the regulation provides that apart from certain authorised exception, no person shall use or have in his possession or under his control any wireless receiving apparatus in any road vehicle. This prohibition applies not only to wireless sets fixed in a road vehicle, but also to any wireless receiving apparatus carried in a vehicle in circumstances in which it can be used or readily adapted for use. The police have instructions to see that the regulation is obeyed. The Postmaster-General is unable to give a general exemption to persons or firms engaged in the supply or conveyance of radio sets to customers, or the collection of sets from customers for repair. In this connection no difficulty would appear to arise in regard to mains-operated receivers which could not be used in a vehicle. In the case of battery-operated sets, whether portable or not, it should be arranged, if possible, that the battery should not be carried in the road vehicle at the same time as the rest of the set. If however, this separation is impracticable, it is considered that the police will be unlikely to raise any difficulty in the case of bona-fide radio wholesalers or retailers, if the set is kept separate from the battery, and is securely wrapped up and sealed.

The military and the police cars are, I presume, exempt. Vans equipped with P.A. outfits are receiving consideration. An amplifier is not wireless receiving apparatus. Moreover, it seems that portable receivers may be carried for short distances by hand without the police interfering.

With regard to Philco car radio they state that they are evolving a scheme which will shortly be circulated to dealers. Sets which use a vibrator unit can be operated by removing it and feeding alternating current of appropriate voltage to the primary winding of the vibrator transformer. I understand that Philco will shortly introduce a transformer for the purpose. It must be noted that where an energised loudspeaker field is employed, further modifications are necessary.

Our Roll of Merit

Our Readers on Active Service—First List.

Alfred Thomson
(Radio Officer, Merchant Service),
31, Fore Street, Fowey, Cornwall.

J. Herron
(Fusilier),
19, Church Street, Keswick, Cumberland.

J. Widden
(Radio Mechanic, R.A.F.),
4, Spring Gardens, Dorking, Surrey.

K. Firth
(Radio Mechanic, R.A.F.),
253, Huntingdon Road, York.

J. E. Whittle
(Private, R.A.M.C.),
2, Church Terrace, Darwen, Lancs.

T. H. Plater
(Aircraftman, 2nd Class, R.A.F.),
341, Milligan Road, Leicester.

J. Bell
(Petty Officer, R.N.),
c/o G.P.O., London.

F. W. Chambers
(Wireless Operator, R.N.V.W.R.),
51, Whitehead Road, Aston, Birmingham, 6.

G. Hazelwood
(Gunner, R.A.),
17, Staffordshire Street, Peckham, S.E.15.

T. E. Greenhalgh
(R.A.F.),
37a, Greenleach Lane, Worsley, Manchester.

Valve Standardisation

THE British Institute of Radio Engineers have formulated a policy which they have submitted to the Service Departments, the Ministry of Supply, and the Ministry of Labour. Their proposals are intended to help in the national emergency and are not made for controversial reasons. They think that if the proposals are adopted they would release from the radio industry skilled artisans, such as toolmakers, jig and tool designers, etc., as well as save valuable material including copper, iron, nickel, molybdenum, and glass. Also they would increase export trade, and simplify radio servicing.

Briefly, they propose a first step of a general adoption of the 6.3 volt 0.3A valves. This range of valves which, of course, includes a higher voltage range, is comprised by twenty types, as against the enormous number of other types. In some quarters this is thought to total nearly 1,000. They say that if receivers were designed on the use of these three types they would equal in performance any receiver at present available. They even suggest that there would be a greater all-round advantage, and at a lower cost to manufacturer and consumer. For example, such features as automatic inter-station noise suppression, automatic volume control, post demodulator automatic volume level maintainer, could with the incorporation of the screened triode-heptode, the output tetrode, and a two system rectifier, be included without difficulty, thereby proving a sales advantage in the home and export field. Obviously, all receivers would have to be of the A.C./D.C. type, thus entirely eliminating the needs for mains transformers, and in the case of smaller sets eliminating the smoothing choke, thereby saving a considerable amount of high quality Swedish iron and copper.

The technical objection that certain specialised apparatus will still require specialised types of valve is undeniable, but does not materially effect the scheme, since, of the ten millions to twelve millions radio receiver valves absorbed by the radio receiver industry, well over 80 per cent. are used in sets in which the five specified types of valves could be satisfactorily used. The other 20 per cent. is made up of replacement valve business which, if the proposed scheme is put into effect, could easily be satisfied for the next 18 months to 2 years from the existing available stocks of diverse types. The specialised types of valve manufactured have always been less than 10 per cent. of the normal receiver valve business, and the adoption of the scheme put forward will undoubtedly expedite production of the specialised types which may still be required for the Defence Departments, the B.B.C., and the G.P.O.

Comment, Chat and Criticism

Outline of Musical History–5

Music During the Eighteenth Century

By Our Music Critic, MAURICE REEVE

THE history of music during the eighteenth century is really the story of "matters musical," rather than of music itself. Even more important than the invention of new harmonies and sounds was the discovery of new forms in which to write music; new instruments on which to play it; and new combinations of instruments for which to write it. The enormous progress in these departments of the art is what makes the century particularly illustrious; revolutions in harmony and kindred subjects were to follow in the next.

And their importance cannot be exaggerated. The great Bach's son, C. P. E. Bach, developed the first stages of "first movement," or modern sonata—binary—form, which Haydn was shortly to perfect, and Beethoven, a little later still, to transform. Gluck rescued opera from an impending ignoble death, and gave it the character and unity which Wagner crowned a hundred and fifty years later. Whilst Gluck infused it with lasting qualities by insisting on the equal importance of all its component parts, and choosing tragic and dramatic plots for his own examples, Mozart, a far greater genius, took it into the world of comedy, and with a series of incomparable masterpieces ensured immortality for himself and his works.

Haydn

Haydn's development of sonata form opened up the vast world of the sonata, symphony, quartet, etc., without which music to-day would seem non-existent. Haydn's own examples were to be greatly excelled by those of the divine Mozart, as his were, in turn, to be by those of the giant Beethoven. But it is to Papa Haydn, Beethoven's first teacher of importance, that we owe the modern symphony. Without his experiments and discoveries it is doubtful what would have happened.

Not only did the expansion of sonata form from the suites and overtures of Bach, and others, ensure the eventual arrival of the symphony, but side by side went the great expansion of the orchestra —including the introduction of violins—to ensure that when it did arrive it would be the biggest and most comprehensive form that music was to evolve for itself; and the most satisfying. Beethoven's master works set the seal on it for all time.

The Pianoforte

The invention of the "piano e forte" was a tremendous event which inspired the first of that gigantic series of compositions for the instrument, to which almost every composer of note has contributed ever since. Wagner and Elgar are lone exceptions. Only to-day does the fount of inspiration which the first hammer-actioned instrument set running, seem to be drying up. The modern virtuoso pianist is largely to blame. Unlike his predecessors he never finds time to devote to serious composition.

Not the least of the piano's claims to the gratitude of musicians is the origin of the concerto, for a solo instrument with orchestral accompaniment. Music would be infinitely poorer without the concertos of Mozart, Beethoven, Brahms and others.

Introduction of Rhythm

Coming last, but certainly not least, in the development of music at this time is the virtual introduction into big-scale works of rhythm as an integral element. The development of "ternary" form gave the word an entirely new meaning from that given it by Couperin, Bach, or Handel, working as they did in the simpler and unsophisticated "binary" mode. But rhythm, like most of the components of a piece of music, is an exhausting subject on its own, and only its historical antecedents and rise can be touched on here.

Neither can an analysis of sonata form be attempted. It is only possible to record the enormous scope it gave to the great masters in the writing of large-scale works which could embrace within their movements the whole gamut of human feeling and emotion. Works of the depth and import of the Jupiter or the Eroica symphonies had not previously been heard, because no framework had so far been devised that was capable of holding such a wealth of treasure. Once the design had been perfected, however, a series of monumental works were built up on it, and its subsequent improvement and enlargements, have proved it conclusively to be the *ne plus ultra* of musical forms.

This article can well close with a review of the two great masters who adorned the latter half of the eighteenth century, and whose work made possible the glories that were to come.

Joseph Haydn, 1732-1809, was the son of a wheelwright, and as a young man and a student was so poor that he cleaned shoes in exchange for some lessons. He taught himself theory and composition, and by the thriftiest living managed to buy a few necessary books one at a time. His particular study was C. P. E. Bach's sonatas and Fux's "Gradus and Parnassum." Then, through the influence of a wealthy friend that he met at this time, he became appointed Chapel Master to Prince Esterhazy, and never looked back.

Born twenty-four years before Mozart and outliving him by eighteen years, Haydn had the unique privilege of being both Mozart's teacher and, in the last years of his life, his pupil and disciple. It is significant that most of his best work was produced after Mozart's death.

Haydn is called the father of the modern symphony, as well as of modern chamber music, and sonata form. Although owing much to his predecessors there is no doubt that he had a great influence on the course music was to take. Although a lot of his enormous output was lost in a fire, 125 symphonies, 77 string quartets, 4 oratorios, and masses of sonatas, trios and smaller pieces remain, as well as the Creation and The Seasons.

Haydn's orchestra consisted of strings, two flutes, two obi, two fagotti, two horns, two trumpets, and tympani. This still remains the foundation of our modern orchestra. He said good-bye to the "band" oboes and bassoons of Handel's day.

Mozart

Wolfgang Amadens Mozart, 1756-1791, was certainly the greatest child prodigy genius ever known. The son of a good musician, he had many compositions to his credit at six years of age, as well as a tour of principal European cities. A tour of Italy in 1769 developed his wonderful gift of melody, and his numerous works for all sorts of instruments won admiration. Going into the service of the new Archbishop of Salzberg in 1772, this prince was to be the bane of Mozart's life with his extreme conservatism, and opposition to all reform in musical composition.

"Idomenev," his first "reform" opera, was produced in 1781. Though in advance of Gluck, it was a long way behind what he himself wrote later. But it incurred the Archbishop's extreme hostility, and Mozart was literally kicked out of the service. Thereafter his life was one long struggle against poverty which was increased by his marriage to a charming woman who, however, was a very bad manager.

"Marriage of Figaro"

The great "Marriage of Figaro" appeared in '86, Don Giovanni in '87, after which the Emperor gave him a small salary to prevent him going to England. In '88 he wrote his three greatest symphonies within the space of six weeks. In '90 came "Cossi fan Tutte," "La Clemenza di Tito" in '91, and the greatest of all, "The Magic Flute" in '92. Beethoven considered this the greatest of all operas, because it contained every known species of music from the lied to the chorale and fugue. Also the artistic and dramatic flow of the action.

The Requiem

Mozart was commissioned to write the Requiem a few weeks before his death. It was left unfinished. In addition to these masterpieces he wrote hundreds of the most beautiful works—concertos for piano and violin; sonatas, trios, quartets, etc. To the everlasting disgrace of Vienna he was buried in a pauper's grave when he died at the tragically early age of 35.

There is little doubt that Mozart, had he been granted a normal span of life, would have been by far the greatest of all musicians, presuming that what he did actually accomplish was a specimen of what he would have done. Even as it is, his greatest works have never been surpassed, and "music's miracle man" might be a fitting title for this truly great genius.

For the Beginner

Voltage Measurements

An Explanation Regarding the Choice of a Voltmeter for Eliminator Output Measurements

IT has been stated many times in these pages that it is essential to use the right type of meter when measuring such points as detector anode voltage, S.G. voltage, or the output of a mains unit or eliminator. It still appears, however, that the reason why a special type of meter must be used is not clear, and that to many beginners the difference between a low-resistance voltmeter and one of high resistance is a point of little consequence.

It should be clearly understood that a voltmeter is a milliammeter having a resistance in series with one of its leads, this resistance being usually enclosed in the meter casing. The function of the resistance is to cut down the current to the value permissible through the ammeter. When a voltage is applied across the output terminals of the ammeter-resistance combination (i.e. the voltmeter terminals), a current will flow through the meter, causing a deflection of the needle. To avoid loss of time in calculation, the ammeter scale is marked in volts, so that while the current is still the actuating force in the meter, the deflection is now registered in volts.

The value of the series resistance is governed by the current range of the meter, and the maximum voltage it is desired to measure. For reasons that will be explained later, this resistance must have a high value if accurate voltage measurements are to be obtained.

A milliammeter having a full-scale deflection of 2 mA. or less, may be converted into a reliable voltmeter; or in other words, a voltmeter having a resistance of 500 ohms per volt, or more, will give sufficiently accurate voltage measurements for all ordinary wireless purposes.

Reason for Inaccuracy

A low-resistance meter is unsuitable for measuring eliminator voltages, because eliminators have a high internal resistance, due to the incorporation of smoothing chokes and dropping resistances. A low-resistance meter will naturally drain more current than a high-resistance instrument—Ohm's Law states that current is equal to voltage divided by resistance. This high current drain reacts on the source of voltage to be measured, thus causing an inaccurate indication on the meter.

Effect on D.C. Mains Unit

Let us take, for example, a simple 250 volts D.C. mains unit as shown in Fig. 1, having an output of 125 volts at 25 mA., or, in other words, having a voltage of 125 across points A and B when the current registered on milliammeter C is 25 mA.

As will be seen from the sketch, the total internal resistance of the eliminator is 5,000 ohms (500 ohms choke, plus 4,500 ohms dropping resistance). In order to obtain the specified output of 125 volts, the current consumption must be 1/40 amp. (25 mA.), and therefore the total circuit resistance must be 250 volts divided by 1/40 amp., which amounts to 10,000 ohms. We already have 5,000 ohms in the eliminator, therefore the external load (receiver to which eliminator is connected) must be 5,000 ohms. If a voltmeter having a resistance of 5,000 ohms is now connected across A and B, with the receiver switched on, the total load will be reduced to 2,500 ohms, because the meter resistance of 5,000 ohms will be in parallel with receiver resistance of 5,000 ohms. Therefore, the total resistance across the 250-volt mains will be 4,500 ohms (dropping resistance) plus 500 ohms (choke), plus 2,500 ohms (meter and receiver). This amounts to 7,500 ohms, and consequently the total current consumption will be increased to 1/30 amp. (250 volts divided by 7,500 ohms). The voltage drop inside the eliminator will then be its internal resistance of 5,000 ohms multiplied by 1/30 amp., which amounts to 166⅔ volts. Therefore, when the meter is connected across A and B, the actual voltage across these points will only be 83⅓ volts (250 minus 166⅔), but as soon as the meter is removed, the voltage will rise to 125 volts.

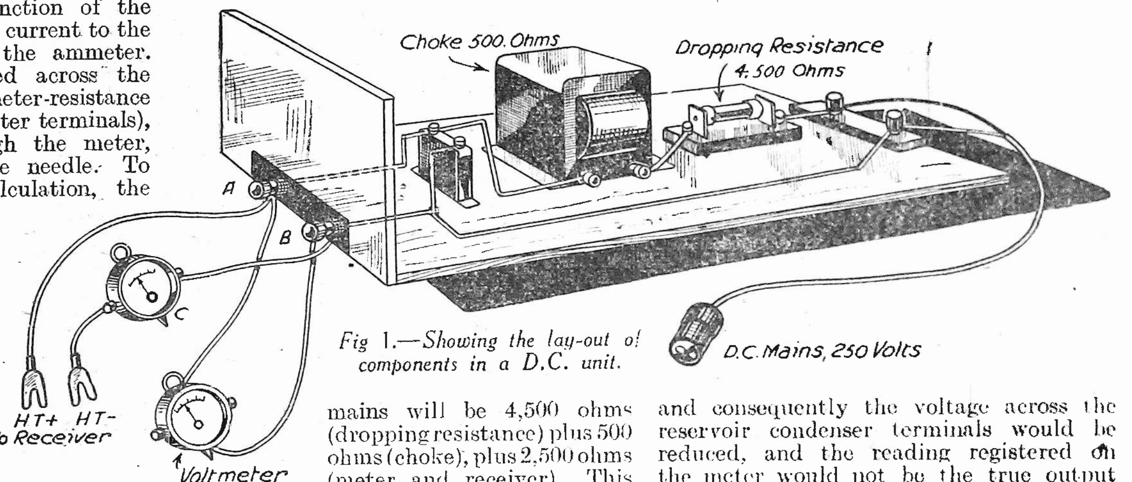


Fig 1.—Showing the lay-out of components in a D.C. unit.

If, however, the meter resistance were 100,000 ohms instead of 5,000 ohms, it will be evident from the above calculation that its effect on the voltage output would be negligible, and, therefore, the reading obtained would be sufficiently accurate.

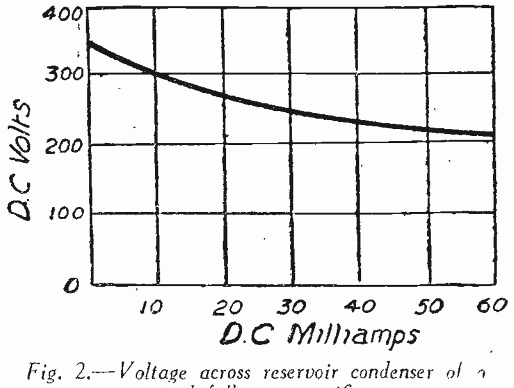


Fig. 2.—Voltage across reservoir condenser of a typical full-wave rectifier.

Effect on A.C. Mains Unit

The foregoing limitation applies when dealing with A.C. units also, but we have a further limiting factor to contend with—namely, the effect of the reservoir condenser. This condenser is connected across the rectifier output circuit, and the voltage across its terminals varies with the output-circuit current drain. Fig. 2 shows the drop in D.C. voltage across the reservoir condenser as the current drain imposed by the receiver is increased. It is, therefore, obvious that if a low-resistance meter were connected across the output terminals, the current drain would be greatly increased, and consequently the voltage across the reservoir condenser terminals would be reduced, and the reading registered on the meter would not be the true output voltage.

The foregoing calculations should also make it quite clear that the specified output voltages of an eliminator are only obtained when the eliminator is on load—that is, when the receiver is switched on.

Battery Receivers

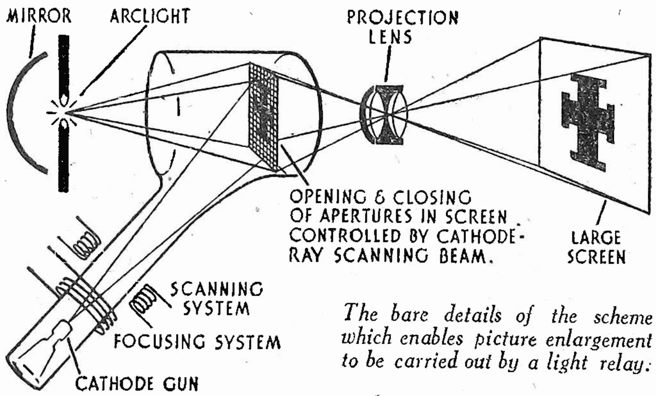
In the case of the battery-operated receiver, a low-resistance meter will give sufficiently accurate measurement of the voltage of the H.T., L.T., and G.B. batteries, because the internal resistance of these is very low. If, however, it is desired to measure the H.T. voltage applied to the plate of a valve having a resistance in its anode circuit, for example, a detector valve preceding a parallel-fed transformer or R.C.C. unit, the low-resistance instrument again becomes unsuitable for the same reason as that given above in the case of the D.C. mains unit.

ELECTRONIC BREVITIES

Notes on Cathode-ray Tube Developments, and Photo-electric Cells

Removing a Danger

CATHODE-RAY tubes for certain purposes have to be operated at extremely high voltages, a figure of 50,000 volts for the final anode not being uncommon. If by accident a short-circuit should occur in the main E.H.T. supply, or should there be a flash-over, then the capacity which exists between the electron beam, and deflecting coils and the anode, is capable of causing the coils to assume for a short period of time a potential of 50,000 volts which is negative to earth. This is, therefore, a source of danger to any engineers who may be working with the tube, and in addition, damage may be caused to equipment or components associated with this part of the apparatus. Various schemes have been devised to overcome or reduce this risk, and in one of the most up-to-date, inductive windings are connected in series between the main H.T. terminals, and those sections of the equipment associated with it. A flash-over or short-circuit will then be instrumental in producing a very large voltage drop across these windings, and this will have the effect of reducing very materially the momentary potential which is assumed by the deflecting equipment.



The bare details of the scheme which enables picture enlargement to be carried out by a light relay.

A Triple Use

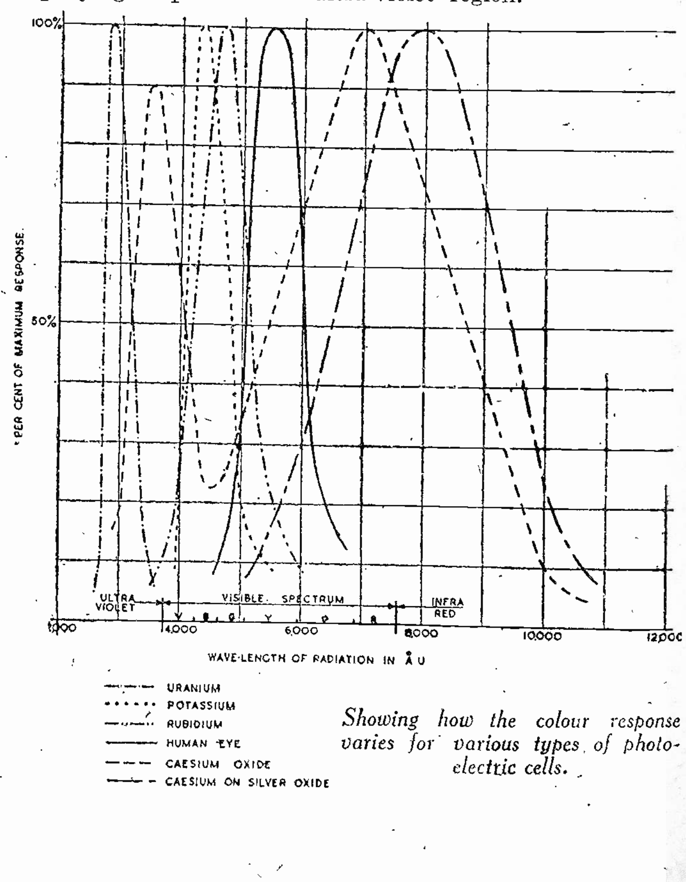
THE electronic multiplier continues to be developed for a variety of specific purposes, but in America details have been made available of this device which in the form proposed is said to be generally suitable as a generator of oscillations, amplifier, or detector. The most important feature seems to be dependent upon the shaping and disposition of the secondary emitting electrodes, and for this multiplier they are constructed in the form of two or more conical rings. The walls of these rings are made to diverge in the direction of the final collecting electrode which is generally the high-potentialled anode, and to converge towards the cathode with which is associated a grid, also conical shaped. This grid has an open mesh, and is raised to a high positive potential with reference to the cathode. When the operating potentials have been applied and regulated to their correct values, the primary electrons released from the cathode surface are drawn outwards in a radial direction, and so strike against the inner wall of the initial conical ring secondary-emitting electrode. The primary electrons with the secondaries released by the impact are now attracted by the high voltage of the open mesh grid, and pass through the interstices at great speed to impact on the opposite inner wall of the second ring electrode. A further electron multiplication takes place, and this process continues until finally the amplified electron stream is drawn through an aperture at the top of the conical assembly to be collected by the final anode. Although the process of working is described, no details appear to be available to show exactly how the device can function in any one of the three purposes mentioned at the beginning of the paragraph.

Enlarging by Projection

A CONCENTRATED effort seems to be taking place abroad in order to perfect schemes, which can be regarded as quite satisfactory, for enlarging television pictures to a size comparable with that normally seen in an average up-to-date cinema. There is little doubt that this work will have many repercussions on any subsequent developments which take place in this country in the eagerly awaited post-war period. A large percentage of the present schemes incline towards the principle of replacing the fluorescent screen of the cathode-ray tube with a special form of surface which reacts to the modulated electron beam in such a way that each elemental area changes its degree of transparency or opacity in direct proportionality. The idea will be made clear by a reference to the accompanying simple diagram where the light from an arc lamp is concentrated by means of a back reflector on to this special surface, while a projection lens directs the emerging beam towards a remote screen so that the final picture is enlarged by many diameters. In one of the most up-to-date of these methods the surface which acts as a light controlled relay—shown in the diagram for simplicity as a series of apertures to correspond to the elemental areas—is built up by depositing a very large number of tiny light particles over a rippled sheet of glass. This sheet is positioned close to the screen of the electronic relay so that as a direct result of the electrostatic of the electron beam impact the tiny particles orientate edgewise to the arc lamp beam instead of remaining broadside. The actual degree of rotation will depend on the strength of the electrostatic influence which in turn has a direct relationship to the television picture modulation. Another advantage of this relay scheme is that there is a storage effect, for each element of picture remains bright or dark as the case may be for the whole period of a picture scan, and in consequence the overall brightness of the final enlarged picture is much greater than one where at any one instant only a single elemental area is operative.

Colour Response

ALTHOUGH photo-electric cells for different purposes have found their way into every form of modern industry, there is one particular feature that still needs careful observation, namely, the colour response. The perfect photo-electric cell for general purposes would be one which had a colour response exactly simulating the human eye, but so far the efforts of the inventors have failed to produce a cathode material which falls within this category. Some cells are colour sensitive at the red and infra-red end of the spectrum, while others work best in ultra-violet light. As an indication of the extent of these variations reference can be made to the accompanying graphs where the percentage of maximum response of one or two representative photo-electric materials used for cells has been plotted against the wavelength of radiation in Angström units (A.U.). At 50 per cent. it will be seen that the eye covers the approximate range of 5,000 to 6,000. The same diagram shows how cæsium oxide and cæsium on silver oxide have really good sensitivity outside the visible spectrum at the infra-red end, while potassium has its best performance in the ultra-violet region.



Showing how the colour response varies for various types of photo-electric cells.

CHOOSING A CHOKE—2

In This Article L.F. Chokes are Dealt With

THERE are at least five uses to which low-frequency chokes may be put in radio receiving apparatus. The most familiar, and that for which there is no substitute whatsoever, is in the smoothing circuit of a high-tension supply unit—" battery eliminator " or " power pack," as it is variously termed. In a power unit operating on alternating current mains, the rectifier, whether of the valve or metal type, gives an output which is certainly a direct current, so far as being uni-directional is concerned, but which is, in its present form, totally unfit for use as the high-tension supply because it is fluctuating in value, carrying a ripple corresponding to twice the frequency of the A.C. supply, and also ripples of higher frequency.

Similarly, a supply drawn from direct current mains is far from steady as regards voltage, for it suffers from ripple also, and in many districts where direct-current mains are available, it is more difficult to eliminate the ripple than to smooth the output of the average A.C. rectifier.

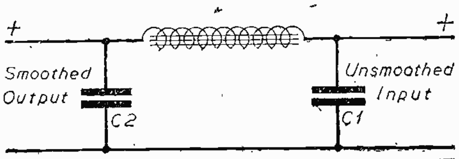


Fig. 1.—Smoothing circuit as used in mains units and receivers.

Smoothing Circuits

The method of removing ripple is the same in either case—the use of a smoothing circuit as indicated in Fig. 1. Here the two terminals marked " input " are those connected either to the output of the rectifier, or the direct current mains (when the condenser C1 is really unnecessary), so that a " ripply " voltage exists across these two points, and any current flowing in a circuit attached thereto will be subject to similar fluctuations. But a low-frequency choke is connected in series with the circuit, and by virtue of the impedance it offers to current fluctuations shunts a very large proportion of the ripple current into the alternative path provided by the large capacity condenser C_1. A further condenser C_2 is also shunted across the supply at the other end of the choke and has the effect of still further smoothing.

A single smoothing choke of suitable design, with two reservoir condensers—usually of 4 mfd. capacity—is in most cases sufficient for smoothing the output from a full-wave rectifier valve operated on normal commercial A.C. systems, and also for smoothing a supply taken from some D.C. mains. In many instances, however, it is found necessary to add another choke and condenser to obtain satisfactory smoothing on D.C. mains.

The Output Stage

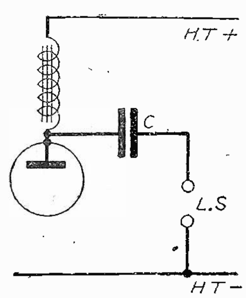
The next application of low-frequency chokes is in the output stage of a receiver. The anode current of the output valve consists of a steady direct-current component and also an alternating current component corresponding to the audio-frequency power which will ultimately operate the loudspeaker. It is, of course, possible to pass the whole anode current through the speaker winding, and in many cases the loudspeaker will operate quite satisfactorily, provided its impedance is correctly matched to that of the output valve. But then the direct current portion of the anode current will pass through the winding as well as the alternating current component, and will have the effect of heating it up. This may not be of importance in the case of a small output valve, but the mean anode current of many large output valves is fairly heavy—a matter of 30 milliamperes or more, and may be greater than the speech coil can carry continuously without overheating or even the risk of burning out.

One way of avoiding this is to employ a choke-capacity output filter, as shown in Fig. 2. A choke having a suitable inductance value is inserted in the anode circuit of the output valve between the anode and H.T. positive terminal. The choke has a comparatively low resistance to the direct current portion of the anode current, but the audio frequency portion is choked back and takes the easier path through the condenser C to the loudspeaker, and thence to the H.T. – terminal. An additional advantage of this system is that, as the speaker winding is entirely isolated by the condenser C from the high-tension voltage, there is no risk of shock or disastrous shorts if the loudspeaker or extension leads are accidentally earthed.

Choke-capacity L.F. Coupling

A similar application for a low-frequency choke is as a coupling between two audio-frequency valves. The connections are shown in Fig. 3, and are identical with the

Fig. 2.—Smoothing or L.F. choke in an output filter circuit.



somewhat better known resistance-capacity coupling. It has an advantage over R.C.C., however, in that as the choke is of comparatively low resistance, the drop in anode voltage in the coupling device is comparatively small.

It is, perhaps, not so well known as it should be that a low-frequency choke can be employed in place of a decoupling resistance in situations where it is desired to keep the voltage drop in the decoupling arrangements as low as possible. The action of a decoupling choke is exactly the same as that of the smoothing choke in a high-tension supply unit and it can, in effect, be considered as an extension of the smoothing system. Another use for a choke is in place of a grid-leak in resistance capacity couplings where, for any reason, it is desired to keep the resistance of the grid circuit low.

H.L. and L.F. Choke Differences

The design of low-frequency chokes differs from that of radio-frequency chokes in several particulars. In the first place, in order to achieve the necessary high impedance at the comparatively low (audio) frequencies, a much higher inductance is necessary. Inductances of 15 to 30 henries are usually specified for output chokes, and somewhat larger values, up to 50 henries, for smoothing. In order to achieve the necessary high inductance, low-frequency chokes are wound on iron cores built up from a number of laminated sheets, similar to those forming the cores of low-frequency transformers.

Such a construction is not applicable to high-frequency chokes because at the enormous radio frequencies the loss due to eddy currents induced in iron cores and other magnetic losses would be very serious.

Another point of difference is that low-frequency chokes usually have to carry much heavier currents than radio-frequency chokes, and are therefore wound with wire of much heavier gauge. To help readers, practical values are reproduced on page 300.

Selection

We must now consider what points affect the selection of a low-frequency choke. Obviously, the first consideration must be to see that the choke has the correct inductance—the figure specified by the designer of the set. Next, it is important to ascertain that the rated inductance is obtained when the choke is carrying the full load current of the circuit. This is, of course, a matter of design. The inductance of the choke depends upon the number of turns, the size of the coil, the size of the core, and the current carried. If the core is not of sufficient section, the iron may become magnetically saturated at, or even before, full load. If the steady, direct current component is sufficient to saturate the core, the alternating current component will not be able to produce the alterations in magnetic strength required, and the effective inductance will drop. The correct specification for a low-frequency choke, therefore, is that it shall be of a given inductance at a given current. All good makes of choke are rated in this way by the manufacturers.

The resistance of the choke is the next point to receive attention, especially in the case of smoothing chokes. If such a choke has a somewhat high resistance, a fairly big voltage drop will develop across it, and

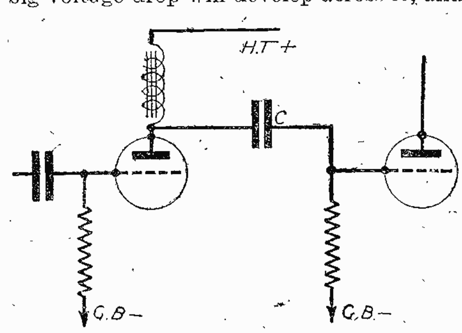


Fig. 3.—L.F. choke used for L.F. coupling purposes.

this voltage drop will be high when the current passing is high, and less when the current passing is reduced.

(Continued on next page).

CHOOSING A CHOKE

(Continued from previous page)

Three effects will follow: first, the drop in voltage due to the choke's resistance will reduce the anode voltage available for the various valves; second, the voltage regulation of the supply unit will be poor; and third, the receiver will be more prone to low-frequency oscillation, hum, and motor-boating because the resistance of the smoothing choke will be common to the anode circuits of all the valves.

Matching

If the choke is intended for use in a choke-capacity output filter, it may be necessary to obtain a tapped choke for impedance matching. Every listener knows that the impedance of the load in the anode circuit of an output valve must bear a certain relation to the valve impedance, and the best value of load impedance is usually quoted by valve manufacturers for each type of output valve. If the impedance of your loudspeaker is not the correct value to form the optimum load for your output valve, you must adjust matters by employing either an output transformer of appropriate ratio, or a tapped choke. A tapped choke may be considered as a kind of transformer (auto-transformer is the technical name), in which the whole or a part of the choke winding acts as the transformer primary, while a part of the whole of the winding functions as the secondary. Tapped chokes giving a variety of different ratios can be obtained, as well as centre-tapped chokes for push-pull, quiescent push-pull, and "Class B" circuits.

Purpose	*Inductances*	*D.C. Res.*	*Current*
L.F. Coupling ..	15/20 henries	500/800	15/30 mA.
Power-grid Coupling..	100/300 ,,	1,000/2,000	5/10 mA.
General Purpose ..	20/30 ,,	300/500	30/60 mA.
Output Filter ..	20/60 ,,	200/500	20/60 mA.
Pentode Output ..	30/60 ,,	500/1,000	20/60 mA.
Mains Smoothing ..	30/60 ,,	200/500	20/80 mA.

Concerning the mechanical design of low-frequency chokes there is really not much to be said. The purchaser will naturally see that the general finish is good, and will attend to such matters as convenient and accessible fixing lugs or feet, and solid terminals or soldering tags. Insulation is an important matter, particularly in smoothing and output chokes, and must be designed to withstand the full voltage to which the component is likely to be subjected.

It is sometimes necessary, especially in the case of chokes which are to be incorporated in the receiver proper, to shield the component magnetically, in order to prevent stray magnetic fields from the choke inducing hum in other parts of the circuit. Shrouded chokes are encased in a metal case, and this case should be connected to earth by the terminal provided. Shrouding is not so important in smoothing chokes embodied in supply units installed some little distance from the receiver proper.

Loose laminations often produce a very annoying form of hum—or even buzzing—due to magnetic stresses, and we have known cases when this hum was so bad as to be audible as a most unpleasant background to even fairly big volume production, and was often mistaken for actual circuit hum.

B.L.D.L.C. The British Long-Distance Listeners' Club

THE weather conditions recently have apparently increased the interest in long-distance reception, and we have received some very comprehensive logs from various parts of the country. It is interesting to note the variations in signal strength, and countries received in different parts of the country when similar types of apparatus are used, and when several reports are received from one locality: there is also a very good opportunity of seeing the difference in receiver efficiency. For instance, it has been found that in one locality three listeners may receive a certain American station during a certain period at R9, whereas one listener in the same locality will only get the station at R3, and yet with a similar type of receiver. From this it is fairly obvious to assume that this single listener is either using a very inefficient circuit, or that his aerial is not well arranged. Obviously, however, there is also the risk that his results may be due to peculiar local conditions, and from the remainder of his log it is possible to see whether or not this is so. It is often not worth while publishing logs because of the risk of misleading listeners in other parts of the country who may consider that conditions are suitable for the reception of certain countries, simply because those places are being well received in another part of the country.

However, for those who require some guide we would mention that Member 6364 has written us again stating that he has had to move from his normal residence, and is now in Buckinghamshire. He was able to take his 0-v-2 with him, and from May 1st to the 26th his log includes the following:

Fone: K4ESE, K6QHU, KA1BH, PY2AV, W1(8), W2(11), W3(8), W4(3), W5EUL, W6WD, W8XCB, W9KQG.

CW.: CE3AJ, CR6AF, CX1LG, HH1KC, HJ1K, J2CZ, K4FCV, K6KQG, PAH, KQB, KA1(7), LU6DJK, OQ5(4), PK1PM, PY1(4), PY2(3), PY4(2), PY4BX, PY6AC, PY7(2), PY8AN, TA1AA, U9MI, VQ2AM, W1(56), W2(28), W3(14), W4(5), W5GRU, W6(7), W7(2), W8(23), W9(15), XE3AG, XU5WT, XU8MY.

Spring Cleaning

WE recently published an article on overhauling a receiver, and it may have appeared to some members that such an overhaul was not needed in radio apparatus. Some idea that this impression is erroneous may be gained from the fact that one member wrote and said that he had cleaned up his receiver on the lines given, and that the better results obtained were well worth the extra trouble. Incidentally, we recently heard of a case where a reader had used petrol for cleaning certain parts, knowing that petrol was a dirt solvent, but unfortunately he had not allowed sufficient time to elapse for the petrol fumes to evaporate, and he switched on with disastrous results, due to a faulty on-off switch. This arced, and the resultant slight explosion and fire, although very localised, and quite small, damaged several components, and led to unnecessary expense for replacements. There are, of course, specially-prepared chemical cleaners for switches, etc., and these should be used if the parts are sufficiently dirty to warrant their use. Normally, of course, an ordinary rag and a little elbow grease should be sufficient.

Contacts Wanted

PLYMOUTH: Member 5897, 90, Albert Road, Devonport.

Newcastle-on-Tyne: Member 6609, 43, Hyde Terrace, Gosforth, Newcastle-on-Tyne 3, Northumberland. (Incidentally, we recommend our "Wireless Transmission for Amateurs" for the purpose mentioned by you.)

Wakefield: Member 6573, 131, Manygates Larne, Sandal, Wakefield. This member is anxious to contact anybody who listens to 10-metre "hams," and also anybody who has heard OK3ZN on 20 metres, during April.

Harrow Weald: Member 6295, "Leswyn," 643, Kenton Lane, Harrow Weald, Middlesex.

Dunfermline: Member 6583, 12, Park Place, Dunfermline.

Walthamstow: Member 6736, 15, Borwick Avenue, Walthamstow, E.17.

Change of Wavelength

MEMBERS who are interested in American reception should note that WPIT, Pittsburgh, Pennsylvania, has changed the wavelength on which it carries the English Hours, from 19.72 metres (15,210 kc/s) to 25.27 metres (11,870 kc/s). We are indebted to Member 6402 for this information.

NEW RECORDS

AN interesting album issued by Brunswick this month contains a set of records for tap dancers. These new accompaniment records—the music is in the Russ Morgan manner—have been made so that they can be used for every possible tap routine—*Brunswick* 02914/7. Russ Morgan and his Orchestra play two hits of the moment on *Brunswick* 02959—"Woodpecker" and "In an Old Dutch Garden," whilst Ella Fitzgerald and her Orchestra have made "Baby, What else can I do" and "Lindy Hopper's Delight" on *Brunswick* 02951.

Tunes from his latest film "The Road to Singapore" figure prominently in Bing Crosby's latest recordings. On *Brunswick* 02973 he sings "I'm too Romantic" and "The Moon and the Willow" and on *Brunswick* 02974 "Sweet Potato Piper," all of which are from the film. The last tune is coupled with "Between 18th and 19th on Chestnut Street," which he sings with Connie Boswell.

A "Switch-in" H.F. Unit

Details of a Simple Fixed-tuned H.F. Amplifier which can be Brought Into Action Quickly when Required

By FRANK PRESTON

NOW that the majority of listeners use only the B.B.C. "Home" or "Forces" programme, the simplest type of receiver is generally sufficient to provide good reception. A receiver of the 0-v-2 type, for example, will give very satisfactory results in most parts of the country. This is a particularly important point when a battery set is in use, for battery current can be saved.

As everyone has found out, however, there are times when reception suddenly falls off, the programme becoming very weak or even inaudible until the volume control is turned up. And when that is done background noises are sometimes troublesome or reproduction is too weak for comfortable listening. A high-frequency amplifier provides the best and simplest means of overcoming this difficulty, but since the amplifier is required only on certain occasions—and then it is usually for only a very short time—it is an advantage to be able to switch it out of circuit.

It would be possible to obviate this disadvantage by including another switch in the anode circuit, or by employing a two-point on-off switch, of which one pair of contacts was in the L.T. and the other in the H.T. circuit. But that may not be convenient, and the capacity between the two circuits would not be desirable. It should be pointed out that, in practice, the disadvantage of having the two circuits virtually in parallel is often unimportant. The idea can, therefore, be tried and then employed if found satisfactory. Instead of moving the aerial lead, a change-over switch can be fitted, joining the centre contact to the aerial lead (or to a fixed condenser in series with it), and then taking leads from the two other terminals to the aerial terminal on the set and to the anode terminal of the valve respectively. Care should be taken to avoid possible short-circuits, and the switch should be placed fairly near to both the aerial terminal and the valve-anode terminal.

the receiver is used almost exclusively for the reception of the two B.B.C. programmes it is possible to use a fixed-tuned amplifier, in which the tuning circuit consists only of a medium-wave coil and a preset condenser.

Fig. 1 shows the type of circuit which may be used conveniently. As may be seen, there is a coil with a preset condenser in parallel, and this is connected in the grid circuit of an H.F. pentode. A change-over switch is fitted, by means of which the aerial lead may be connected either to the top end of the pre-tuned circuit or to the aerial terminal of the Det.-L.F. set. In addition to this there is a two-pole on-off switch; this is used to break the filament circuit of the H.F. pen. and also to disconnect the anode coupling condenser from the aerial terminal of the receiver when the unit is not required. To bring the unit into action it is necessary to operate the aerial switch so that the aerial is connected to the top of the pre-tuned circuit and also to close the two-pole switch. This completes the filament circuit and also connects the anode circuit to the input tuning circuit of the Det.-L.F. receiver.

By following this arrangement it will be

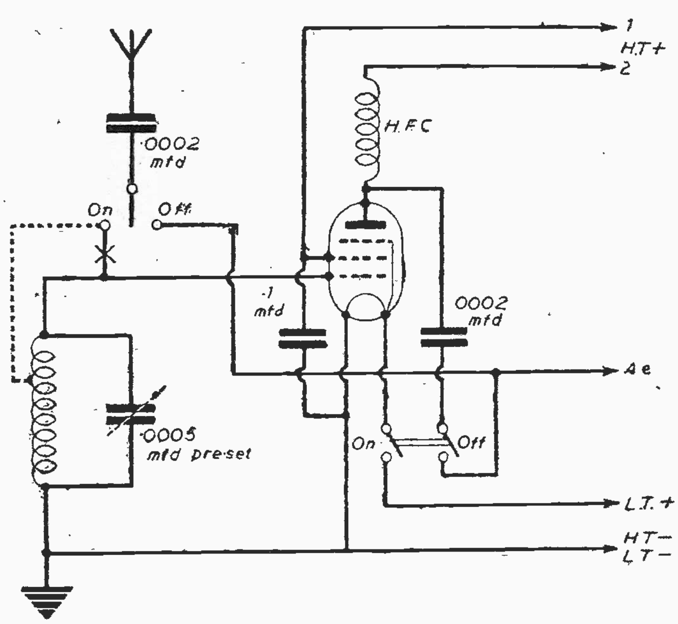


Fig. 1. (Left)—Circuit of a simple pre-tuned H.F. amplifier for use with a Det.-L.F. type of receiver.

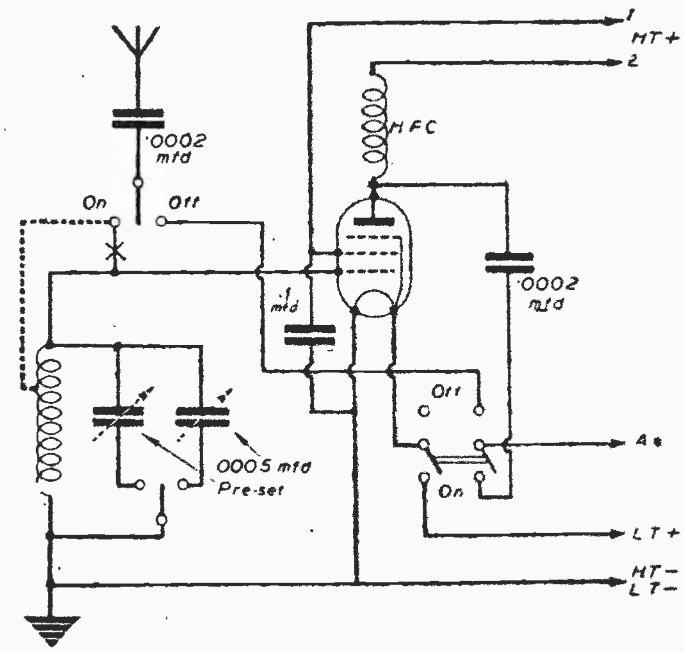


Fig. 2. (Right).—A modified circuit similar in essential principles to that shown in Fig. 1.

Alternative System

There are various methods of arranging the switching in an H.F. receiver, but some of them are not conducive to efficiency. In fact, it is an axiom that switches should be avoided wherever possible in H.F. circuits. One method is to transfer the aerial lead-in from its usual terminal to the anode terminal of the H.F. valve; if battery current is to be saved, however, it is also necessary to break the filament circuit of the H.F. valve. This can be done most easily by fitting a separate on-off switch in one of the filament leads.

This method of cutting out the first valve is not always ideal, for the simple reason that the H.F. choke in the anode circuit of the H.F. valve (in the case of the most widely used tuned-grid circuit) is virtually in parallel with the tuning circuit for the grid of the detector valve. This is because the choke is connected between the anode and the H.T. battery, which is at earth potential in the H.F. sense.

The above remarks apply particularly to a "straight" set already having an H.F. stage. When a detector-L.F. type of receiver is used it will probably be considered worth while to add an H.F. amplifier which can easily be switched into circuit when signal strength is temporarily reduced—this is done by the B.B.C. in the interests of national security, as has been announced on various occasions.

Simple H.F.-Amplifier Unit

Details have often been given in these pages of H.F. amplifier units, but for the purpose under consideration a simpler form of unit is often to be preferred. As

seen that the H.F. choke is isolated from the detector tuning circuit when the amplifier is not in use. Although two separate switches are shown it would be a simple matter to gang them or to use a three-pole change-over switch. This should, for preference, be of the anti-capacity type, since some Q.M.B. switches are not altogether satisfactory for use in tuning and H.F. circuits.

Both Programmes

Only a single preset condenser is shown in Fig. 1, and this would be adjusted to bring the circuit into tune for either of the two B.B.C. transmissions—probably the

"Home" service. An alternative switching system is shown in Fig. 2, and here again two separate switches or a three-point change-over switch could be used for bringing the amplifier into use. In addition there is a single-pole change-over switch to bring either of two preset condensers into circuit. These can be adjusted for the two alternative programmes, but the switch must, of course, be separate from the three-pole unit.

The principle of the main switching does not differ from that shown in Fig. 1, but is to be preferred when a fairly long lead must be used between the aerial lead and a two-pole switch; it may also be found better to screen the aerial lead running between two separate switches.

Practical Details

No matter which of the switching methods is adopted, the H.F. unit can be made in very simple form, using a small baseboard to carry the valveholder, coil and H.F. choke, and a small panel to carry the switches and, if desired, the preset condensers. The whole could well be fitted into a compact box to stand alongside the receiver. Terminals, on a terminal mount, should be used for the aerial and earth leads, but all other connections may conveniently be made with direct flexible leads running to the H.T. battery and the set.

The aerial and earth leads could be transferred from the receiver to the amplifier unit, and the Ae lead would be connected to the aerial terminal on the set. H.T.+1 and 2 should be fitted with wander plugs and connected to 72 and 120-volt points on the H.T. battery, or to other sockets which provide the most suitable voltages. It is most convenient to connect the combined H.T.—L.T. — lead and the L.T.+ lead to the corresponding points on a valveholder in the receiver, but they may be taken directly to the batteries if the amplifier is switched off each time the receiver switch is turned to the off position.

The Coil

No mention has yet been made of the coil, but it may be of any standard type. If, however, a dual-range coil is used, see that the wavechange switch connections are short-circuited. A suitable coil can be made quite conveniently by winding 55 turns of about 26-gauge enamelled wire on a 2½in. diameter former. If a tapping is taken after the 20th turn so much the better, for then the aerial connection may be as shown by broken lines in Figs. 1 and 2; these will replace the leads marked by crosses. The use of a tapping will increase selectivity, although very sharp tuning is not always needed for what is virtually local-station reception. If a ready-made coil is used which has a tapping or a separate aerial winding, this may be used in the same way.

REGENERATION IN TUNED CIRCUITS

A Novel Reaction Scheme for Plug-in or Other Replacement Coils

IT is sometimes desirable to sharpen the tuning of an oscillatory circuit, one end of which is earthed, without in any way altering the connections of this circuit or making any extra points of connection to its inductance. There are a number of known ways for doing this, but most of them involve a drawback of one sort or another. For example, an extra coil having a few turns may be wound in coupling relation to the coil of the oscillatory circuit, and utilised as a feed-back coil in different ways. Where it is desired to use plug-in coils, however, there may not be any extra pins provided on the coil support for connection to this extra coil. Also, this extra coil should not have a fixed value, because a fixed coil is not suitable as a feed-back coil for a wide variety of different plug-in coils which may be plugged into the oscillatory circuit. Similarly, a variable inductance in the plate circuit of a valve is known to produce regeneration in a tuned circuit connected between its grid and cathode. However, for each different plug-in coil, it would be necessary to provide a different value of variable inductance to obtain the desired amount of regeneration.

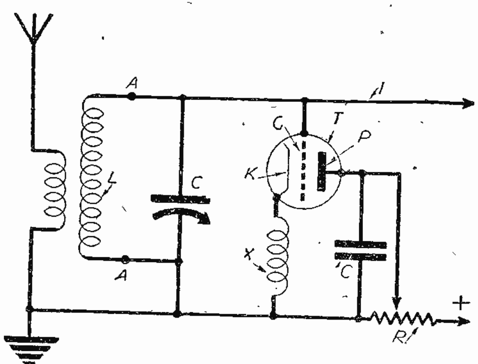
The object of the arrangement about to be described is to provide a simple means for producing regeneration in a resonant circuit, and especially to provide a means which functions satisfactorily without alteration for a wide variety of different coils that may be plugged into the resonant circuit.

Referring to the accompanying diagram, a parallel tuned circuit composed of a plug-in coil L and condenser C is connected at one end by a lead 1 to the grid of a frequency-changer valve (not shown), and the other end is earthed. The reference-letters AA designate the terminals of the plug-in coil holder.

An extra valve T arranged to operate as an amplifier is provided, and its grid G is connected to the earthed end of the resonant circuit LC, while its cathode K is connected to earth through a choke coil X whose impedance at the operating frequency is capacitive. The plate P of the valve is earthed for radio-frequency variations through a sufficiently large condenser C, while its direct current potential is adjustable by means of potentiometer R connected between earth and a point of positive potential.

Operation

The operation of the arrangement depends upon the existence of inherent capacity between grid G and cathode K of valve T which, together with the effective capacity of choke X, forms a capacity potentiometer across the tuned circuit so



Circuit-diagram of a parallel tuned circuit as described in the text.

that the grid and plate of the valve T are connected to the ends AA of the tuned circuit, while the potential of the cathode is intermediate the potential of these two ends. The valve T is thus connected to the resonant circuit in the same way as it would be connected in the case of a Colpitts three-point oscillator circuit, except that one terminal of the resonant circuit is earthed, instead of the cathode being earthed as in the Colpitts circuit. By sliding the connection of potentiometer R from earth toward the positive potential end, the transconductance of the valve T is varied, and the effect of the valve is first to regenerate the circuit LC, and ultimately to produce oscillations. This arrangement has been found in practice to produce readily controllable regeneration over a wide range of frequencies. It is, of course, possible to supplement the grid-cathode capacity of the valve T or the distributed capacity of the choke X, or both, by auxiliary condensers; but this has not been found necessary in practice, and it is preferable not to increase the total capacity shunted across the variable condenser C any more than necessary, since this alters the tuning range of the variable condenser.

Although the circuit diagram shows the grid G of valve T connected to the upper end, or unearthed side, of the resonant circuit LC, while the plate P is connected for radio-frequency energy to the lower, or earthed, end of the resonant circuit, if desired, the grid and plate electrodes may be reversed in position.

While the proposal has been described with reference to the first tuned circuit in a wireless receiver, it will be understood that it may be applied to any tuned circuit whether it be used in a receiver or in a transmitter in connection with an amplifier, frequency changer or detector, or merely as a wave-meter. The arrangement described has been developed by the laboratories of the Radio Corporation of America.

Automatic Reduction of Static Interference

A Brief Description of a New Use for "Westectors"

By W. A. FLINT

MOST readers will be familiar with the use of "Westectors" for detection, A.V.C. and battery economy, but they may not know that they may be used as automatic "silencers" in communication receivers and the like, where static and automobile interference must be reduced to a minimum.

If such rectifiers are worked below the bottom bend of their characteristic curves (see Fig. 1) by keeping the normal audio voltage impressed on the rectifiers low enough to prevent the operating point of the rectifiers rising up the curve to the straight portion, and are connected back to back to give a non-linear characteristic in both directions, all audio voltages above this level will move the operating point up the characteristic curve to the straight

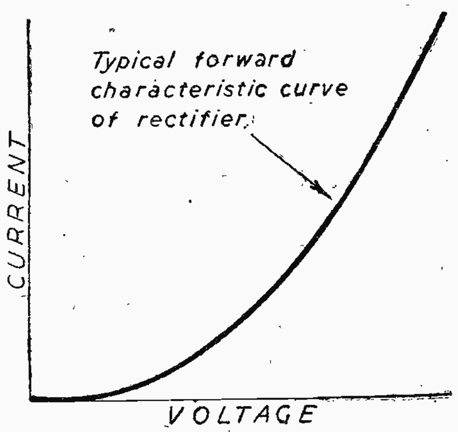


Fig. 1.—Curve of a normal Westector.

portion, and the rectifier will short circuit the output for the duration of the noise peak.

Such a circuit will considerably reduce the level of the noise peak and bring it to the level of the normal signal, even though the peak may be many times stronger than the normal signal.

Where the normal audio frequency is of the order of 1.5 volts, such as in an early low frequency stage of a receiver, two W.X.6 Westectors may be connected across the grid leak as shown in Fig. 2, and peaks caused by static will be limited to this voltage.

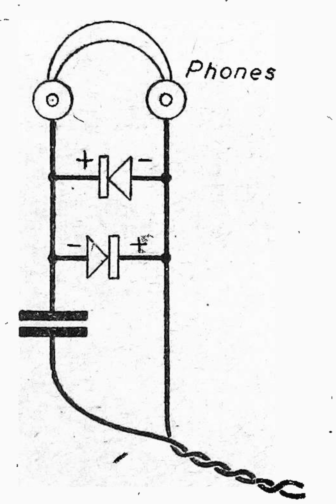
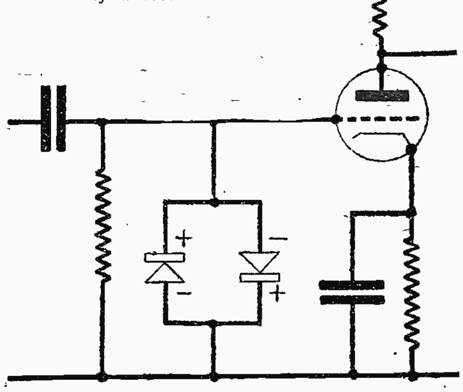


Fig. 4.—A noise silencer for the output stage.

In Early Stages of Receiver

Another arrangement for use in the early stages of the receiver is shown in Fig. 3, where two W.6 Westectors are used, connected back to back across the secondary of a transformer. The primary winding of the transformer is connected between the grid of the L.F. valve and the earth line in a combined resistance and choke capacity coupling circuit, and the rectifiers are biased so that voltages above a value determined by the bias voltage are short circuited. The bias may be obtained from a grid bias battery and control obtained by using the various taps in the battery, or, in the case of a mains receiver, may be obtained from the bottom end of a screen

Fig. 2.—How to fit a static reducer to the early part of a receiver.



voltage potentiometer and adjusted by means of a variable potentiometer connected at the bottom of the original potentiometer.

By adjusting the potentiometer or grid bias battery, the operation of the circuit may be controlled to suit the prevailing reception conditions so that all sounds above a certain amplitude, which is controllable, are cut off.

In the latter stages of the receiver, where the audio voltage is normally greater than 1.5 volts, it is necessary to use the "H" type of metal rectifier.

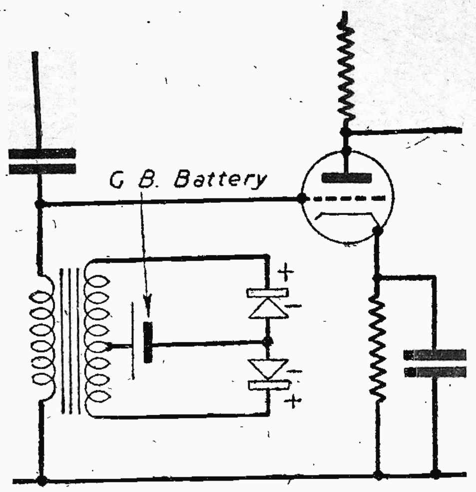


Fig. 3.—An alternative to the Fig. 2 arrangement.

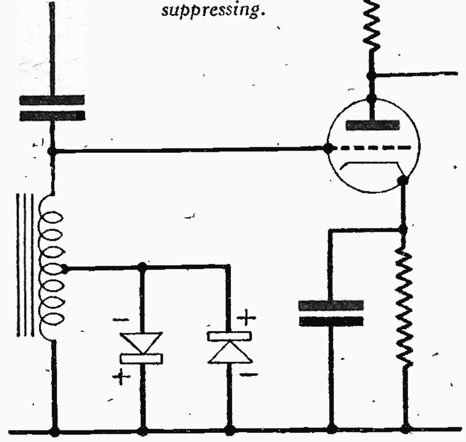
With Headphones

When headphones are to be used, two styles H.6 rectifiers may be employed, connected across the headphones, as shown in Fig. 4, to limit the signal output to a maximum of about 15 milliwatts, which corresponds to comfortable headphone strength. These rectifiers will absorb any excess voltage such as that caused by static, which might otherwise cause loud "clicks" in the 'phones. When using this circuit, however, it is essential to isolate the 'phones from the H.T. supply by transformer or choke-capacity coupling. Otherwise, there will be a voltage drop across the headphone coils, which will serve to bias the rectifiers, and cause them to operate on the wrong part of their characteristic curve.

Another simple noise silencer circuit is shown in Fig. 5, where two "H" type rectifiers are connected across the centre-tap of a choke and the "earth" line of the receiver. The choke is connected in the normal combined resistance and choke capacity coupling circuit, and the size of the "H" type rectifiers used depends upon the maximum audio-frequency signal voltage which is developed across the centre tap of the choke, and the "earth" line. For a maximum audio voltage of 2, type H.10 rectifiers should be used, for 4 volts the H.20, 6 volts the H.30, 8 volts the H.40, and 10 volts the H.50.

Such circuits as those outlined above may require minor adjustment to suit prevailing local conditions, but where static interference is experienced, their use will definitely prove of benefit in reducing such interference to a minimum.

Fig. 5.—Using two "H" type rectifiers for noise suppressing.



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).

Peculiar Fault

SIR,—I wonder if you or any of your readers could explain a fault which I recently experienced, but which cured itself and left me completely in the dark regarding the cause. The receiver was a commercial 7-valve superhet, with magic-eye tuning. I was listening to a local programme, when suddenly there was severe distortion, and I noted that the eye had closed considerably. Just as I was going to see if a tuning re-adjustment was required the eye opened, but another station came in, quite clearly and with no trace whatever of the original local. The signal was constant (due to A.V.C.) but the eye varied slightly just as with a normal fading signal. I stood for a moment wondering what had happened, when the procedure repeated itself and the original station came back. The same thing has not happened since, and I understand that no one near me was listening to the second station I heard, so that it was not due to re-radiation. The makers of the set have not had any similar complaint and cannot explain the phenomenon.—J. DARBY (S.E.17).

Anti-fading

SIR,—I was interested in the Diversity method of reception which you recently dealt with, and would like to inform other readers that the idea is well worth trying out, especially in districts where fading is experienced more or less severely. I have travelled about a great deal and have noted that in some districts fading is very pronounced and some such steps are essential in order to prevent uncomfortable listening. I tried a scheme once where I used two separate aerials, pointing in different directions and found that this also gave some freedom from fading, but introduced a difficulty due to an unbalancing of the input with the result that an effect very similar to fading was actually introduced. This was proved by using another set at the same time and whereas this gave fading at times, which was counteracted on the other set with the two aerials, there were times when a constant signal was received on the "comparator" receiver, but the signal from the two aerials actually faded. I should like to hear of the results experienced by other experimenters who have experimented with anti-fading devices.—G. TRIMBLE (Winchester).

Push-pull *versus* R.C.C.

SIR,—I have been a regular reader of PRACTICAL WIRELESS for about two years now, and feel that I must let you know how much I enjoy reading it. I started in radio about five years ago, when I built my first crystal set. At present I am busy building a set of S.W. coils, which I am going to use in a short-wave-3 circuit, and I hope to let you know the results. And now, may I make a suggestion? From time to time you have described receivers with a push-pull output stage, but all these seem to employ push-pull transformers; but I seem to have read in your paper that R.C.C. is best for quality, and is also much cheaper. Could you possibly publish an article on this subject? The very best of luck to PRACTICAL WIRELESS which, in my opinion, is doing a national service.—P. W. BARNETT (St. Albans).

A 5-valve S.W. Set!

SIR,—With reference to Mr. A. G. Martin's letter in your issue of the 23rd of March last, I suggest a three v. set, i.e., a S.G. valve untuned, triode det. and a tetrode output (e.g., a Cossor 42OT.), the set to employ 6-pin coils, and some kind of power unit with a valve or metal rectifier. I should make the parts as optional as possible; for instance, I have a mains unit which supplies approx. 250 v. at 80 mA, and 4 v. at 4 amps. which I should use. I think parallel trans. coupled for the L.F. stage should be employed.—R. GUILLAUME (Weybridge).

Correspondent Wanted

A. H. JOHNSON, 28 Windsor Road, Willesden Green, London, N.W.2, is desirous of getting in touch with an amateur in his locality who is interested in general radio, and who would be willing to co-operate.

Prize Problems

PROBLEM No. 405

ABBOTT had an A.C. mains receiver which had worked well for some time, but suddenly developed a fault of the following nature: When adjusted for normal volume the results were almost as good as when the set was first installed, but as soon as the volume was reduced bad distortion occurred. What was the cause of the trouble? Three books will be awarded for the first three correct solutions opened. Entries must be addressed to The Editor, PRACTICAL WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 405 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, June 24th, 1940.

Solution to Problem No. 404

When Kent introduced his output circuit coupling he overlooked the fact that the L.F. choke would have a much lower resistance than 50,000 ohms, and; accordingly, the use of the latter component, in view of the high anode current of an output valve, resulted in the loss of substantial H.T. voltage and the valve accordingly failed to deliver the original output.

The following three readers successfully solved Problem No. 403, and books have accordingly been forwarded to them:

D. Hay, Argyle House, 12, Elgin Avenue, W.9.
C. V. Davies, Isle of Whithorn, Scotland.
D. Abelson, G. Ward, County San., Harefield, Middx.

HUM REDUCTION

MAINS hum in the output of a wireless receiver or low frequency amplifier is usually attributed to imperfect smoothing of the rectified alternating current supply, but it may be present if alternating current is applied directly to the cathode heaters of indirectly-heated valves. The hum currents in such a case may be due to the capacity between the lead-in conductors of the control-grid and heater. Again, the heater itself may act as a grid to vary the current flowing from the anode to the cathode and thus produce hum.

The alternative expedients about to be described have been found effective in reducing hum produced by the causes mentioned.

Referring to Fig. 1, an octal valve base is shown, and the electrodes to which the pins are connected are indicated. The shell or metal envelope of the discharge device, which is connected to the terminal 4, is commonly connected through external connections to the heater terminal 3, and to earth because of the greater convenience of wiring adjacent terminals together. The opposite heater terminal 7, it will be observed, is adjacent to the control grid terminal 6. The capacity between these two terminals, or more particularly between the lead-in conductors extending from these terminals up through the glass seal, which capacity is indicated by dotted lines 9 in the figure, is sufficient to induce into the grid circuit of the discharge device an objectionable amount of voltage from the heater circuit. In fact, this voltage after amplification in two or three amplification stages may amount to as much as 10 volts, and is thus decidedly objectionable. This voltage may be very substantially reduced by earthing the heater terminal 7 through the external connections, this terminal being the one nearer to the control grid. The metallising terminal 4 is then connected to the terminal 7, and terminal 3 is, of course, not earthed. This change in circuit connection has been found to reduce the hum voltage produced by the capacity 9 to as low as one quarter of its initial value.

Fig. 2 shows a valve circuit in more complete detail. The valve 10 has a cathode which is connected through bias resistor 11 to earth and to the terminal 7 of the heater. The cathode is also connected through terminal 4 to the envelope of the electron discharge device. The source of heating current which is represented by the cathode transformer 12 is connected directly across the heater, i.e., between terminals 3 and 7.

The input circuit of the valve comprises an input coupling condenser 13 and a resistance 14 connected between the control

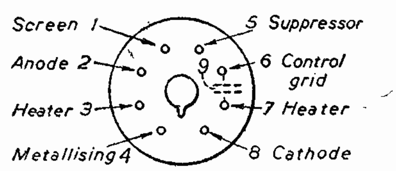


Fig. 1.—Octal valve base showing electrode connections.

grid and cathode of the valve through the bias resistor 11. The output circuit comprises the coupling condenser 15, anode coupling resistor 16, and source of anode potential 17. Screen-grid potential is supplied by the source 18. The sources 17, 18, and similarly the cathode bias resistor 11, are by-passed for currents to be amplified, by condensers 19, 20 and 21 respectively.

(Continued on facing page.)

With the connections shown it will be observed that due to the cathode heating current supplied by transformer 12, the

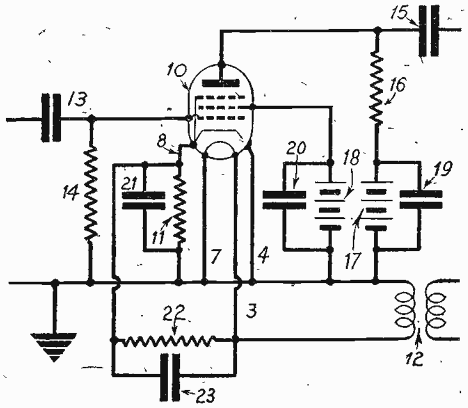


Fig. 2.—Detailed valve circuit for explanatory purposes.

potential of the heater varies cyclically with respect to the potential of the cathode. This heater has the effect of a grid within the discharge device in that when its potential varies in the positive direction, the current in the anode circuit increases, and when it varies in the negative direction, the anode current decreases.

In order to eliminate the hum resulting from these effects a voltage is supplied between the control grid and the cathode, which tends to oppose these variations in anode current. It has been found convenient to supply this voltage across the cathode bias resistor 11, and this is effected by the shunt combination of resistance 22 and condenser 23, the latter being connected between the cathode of the discharge device and the terminal 3 of the heater. It has been found that by properly proportioning this resistance and condenser relative to the resistance 11 and condenser 21, a voltage may be produced across resistance 11 tending to make the grid sufficiently negative with respect to the cathode during the half cycles of the heating current, when the anode current tends to increase just to overcome these variations. To effect this, it is merely necessary that the voltage supplied to the cathode through resistance 22 be in phase with the voltage supplied to the heater, and it may easily be shown that this condition obtains when the time constant of resistance 22 and condenser 23 is equal to the time constant of resistor 11 and condenser 21. By the use of this connection, including resistance 22 and condenser 23, the hum voltage may be reduced to substantially less than half that which is produced when these elements are omitted from the circuit.

Of course, the tendency of the anode current to increase, due to variation in the heating current, is opposed to a slight extent by the potential produced on resistance 11 by the passage of this anode current. That is, an increase in anode current produces a larger potential on resistance 11 which, in turn, drives the grid more negative and tends to maintain the anode current constant. This effect, however, is far too small to be of importance in the elimination of hum, and for effective elimination of hum it is necessary to supply a greater voltage across resistance 11 as is done by resistance 22 and condenser 23.

Fig. 3 shows a modification of the arrangement in which the heating current is supplied from a transformer 12 as in Fig. 2. The secondary winding of this transformer, however, has an intermediate point which is connected to the terminal 7 of the heater, the terminal at one end of the secondary winding being connected to the opposite terminal 3 of the heater, and the other terminal of the secondary winding being connected through grid coupling resistor 14 to the control grid of the discharge device. In this way it will be seen that when the heater is driven positive with respect to ground, thereby tending to cause the anode current to increase, the grid is simultaneously driven negative with respect to the cathode, thereby tending to oppose the increase in anode current, and thus prevent the production

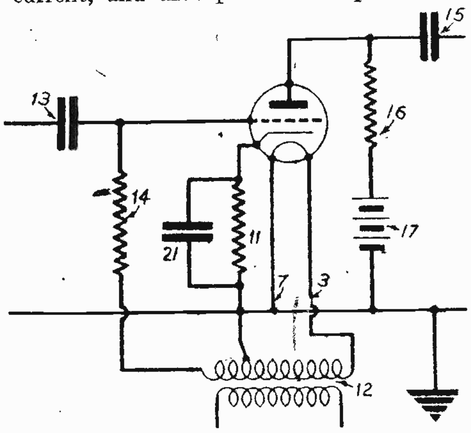
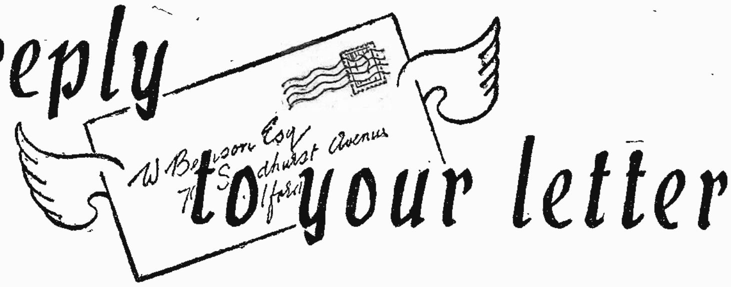


Fig. 3.—Modified circuit showing how hum may be prevented by the special heater and cathode arrangement.

of hum. This system was developed in the Laboratories of the G.E. Company of America.

In reply to your letter



Mains Components

"I have been given an indirectly-heated A.C./H.L. valve and as I have not had one of these before I am a bit puzzled about the centre and fifth pin. Could you tell me what are the connections to it, please? Another problem is, if an H.T. battery is used for H.T. and a mains transformer for L.T., is the negative end of the H.T. only connected to earth?"—L. N. H. (Feltham).

THE centre pin on an indirectly-heated A.C. valve is the cathode connection. The heater (or filament) is only a means of heating the cathode in order to obtain the emission and thus the main point of connection is the cathode. It may be regarded as the essential filament pin in an ordinary battery valve. Therefore, in a simple detector stage the cathode would be joined direct to the earth line and the grid leak would be joined direct to the cathode. In an L.F. stage the bias required is obtained automatically by inserting a resistance between cathode and earth, the value being chosen according to the normal anode current and the voltage required. A by-pass condenser is shunted across the resistance. When using the two sources of supply mentioned in your second query, the centre tap of the heater winding for L.T. must be joined direct to earth. If there is no centre tap you must connect a low resistance across the winding, and earth the centre tap of that. Special small adjustable components are available for this purpose and are known as "hum-dingers." The resistance is generally between 20 and 50 ohms.

Faulty Components

"I have built two or three sets recently and they have all failed to work properly. I attach a list of the parts I used and should be glad if you would send me a blueprint to enable me to build a good set with these parts, as I do not want to go on trying out any more."—J. L. (Hove).

WE assume that you have built circuits of standard design and have not tried to make up your own arrangement. As most circuits to-day have been standardised it is not worth while our recommending another circuit as it would be most likely that one or more of your parts is faulty, or you have not appreciated some fundamental point in construction and thus would be likely to adopt the same scheme in a new receiver. It is therefore recommended in this case that you either have all your present parts properly tested or alternatively purchase a blueprint of one of our receivers and then obtain new parts for its construction. Incidentally, we would remind you that we only guarantee our receivers when built from parts which we specify.

New Design for Chassis

"I have been experimenting for some time and have hit on a scheme which I think is novel and offers some advantages. Instead of adopting the usual chassis form of construction I have tried the chassis inverted. That is to say, the condenser and valves only are on top and everything else is inside the chassis. A 'lid' is then put on the bottom of the chassis, and the result is a perfectly stable arrangement which seems to give more gain than when the orthodox arrangement is used."—D. C. R. (Lambeg).

THERE is nothing novel in your idea and you could probably obtain the same results with a standard scheme properly carried out. Firstly, the valves and condenser are always on top of the chassis and therefore the only parts you have transferred are the coils and majority of the wiring. If you look back through many of our past issues you will see that we have often put the coils underneath (for instance, in the "Ideal" radiogram) and this is quite a normal procedure.

RULES

We wish to draw the reader's attention to the fact that the Queries Service is intended only for the solution of problems or difficulties arising from the construction of receivers described in our pages, from articles appearing in our pages, or on general wireless matters. We regret that we cannot, for obvious reasons—

(1) Supply circuit diagrams of complete multi-valve receivers.
(2) Suggest alterations or modifications of receivers described in our contemporaries.
(3) Suggest alterations or modifications to commercial receivers.
(4) Answer queries over the telephone.
(5) Grant interviews to querists.

A stamped addressed envelope must be enclosed for the reply. All sketches and drawings which are sent to us should bear the name and address of the sender.

Requests for Blueprints must not be enclosed with queries as they are dealt with by a separate department.

Send your queries to the Editor, PRACTICAL WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

Wiring, if properly carried out may be run on top of the chassis, and the coils may also be there, if properly screened. The only point about your idea which is not often used, but one which has been mentioned before in these pages, is the closing of the bottom of the chassis. This prevents direct signal pick-up on the inter-circuit wiring and is often worth while where selectivity problems are experienced due to the close proximity of a powerful station.

Special Tuner

"I have a well-known make of P.A. amplifier delivering 10 watts. This has been used for some time for dance work but there is not much doing now and I should like to use the amplifier for radio work. I believe it is possible to add a form of tuner to this and should like details as to the best way of doing this. Have you any designs you could offer?"—P. E. (Keighley).

YOU could build either a simple H.F.-detector unit for local-station reception, or a powerful superhet unit for general work. In any case you would have to include a detector stage and this would provide the output for feeding your amplifier in the same way as a microphone or pick-up. We have described one or two H.F. units in the past, and for general work we would recommend a superhet unit consisting of frequency changer, I.F. and 2nd detector, with A.V.C.

Pilot Lamps

"I am constructing a receiver from a 'commercial' diagram and there is one little point I should like clarified. You will note from the extract I send that there are four small circles marked 'pilots.' These, I assume, are dial lights, but I do not wish to use four and wonder if there would be any readjustment to the circuit needed as the lamps seem connected in a special way."—T. N. (Winchester).

THE dial lights, or pilot lamps, are obviously intended for a multi-waveband dial, each being switched for the waveband in use. There is thus only one lamp in circuit at a time and in the circuit in question an ordinary 6-volt bulb may be used. The lamp is joined in parallel with any of the single valveholders, and the only thing to do in the circuit in question is to ignore all the switch wiring to the lamps. Do not use a 4-volt filament as the supply is 4 volts A.C. and a 6-volt filament will therefore be more suitable and give longer life.

Low-loss Insulation

"I have noted that some modern parts are mounted on what looks like glass and I have been told that this gives higher efficiency. I have an old broken fire-proof glass dish on hand and wonder if I could cut this up and use it for insulation purposes? Would it be suitable, and if so, what is the best method of drilling?"—G. A. C. (Oswestry).

THE material in question is only needed on ultra-short-wave apparatus, the improvement from its use on broadcast bands being offset by losses in other parts of the circuit. For 5 metres and below the material offers undoubted advantages, but you would no doubt find that the material you have would be difficult to work and, furthermore, insufficient; flat sections would be difficult to get out. Good quality paxolin or the special ceramic insulation would be almost as good, unless you were anxious to make a really highly efficient set and then special precautions would have to be taken with all other parts of the set.

REPLIES IN BRIEF

The following replies to queries are given in abbreviated form either because of non-compliance with our rules, or because the point raised is not of general interest.

M. J. H. B. (Shaftesbury). Write to the Columbia Company and to F. L. Masters, Forest Way, Pound Hill, Crawley, Sussex.

M. F. (Southwark). Get into touch with the makers. There may be a faulty component, probably a short-circuited or partially short-circuited H.T. condenser.

W. F. (Blackburn). The critical component is the anode choke, and it is this which should match the valve.

L. T. R. (Oswestry). The original component is not now on the market, but it may be substituted by the Bulgin component, type L.F.10.

M. C. N. (Seaview). We are looking into the matter, and will publish details as soon as they have been received.

G. H. M. (Standtow, Belfast). You must use a driver stage in the circuit in question. Do not try to feed from the detector stage.

J. L. L. (S.E.11). We have no details of the set in question, but we think it would be inadvisable to try to modify it on the lines you suggest.

R. A. J. (Caernarvon). The details have now been reprinted, and appeared in last week's issue.

J. A. (Fishponds, Bristol). We do not know of any coils similar to those mentioned.

The coupon on page iii of cover must be attached to every query.

LATEST PATENT NEWS

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, either sheet by sheet as issued on payment of a subscription of 5s. per Group Volume or in bound volumes, price 2s. each.

NEW PATENTS

These particulars of New Patents of interest to readers have been selected from the Official Journal of Patents and are published by permission of the Controller of H.M. Stationery Office. The Official Journal of Patents can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. weekly (annual subscription, £2 10s.).

Latest Patent Applications.

9289.—Cossor, Ltd., A. C., Stevens, W. H., and Bedford, L. H.—Thermionic Valve Circuits. May 27th.

9426, 9427, 9428.—Fox, P. X.—Coil winding machines. May 29th.

9256.—Keyser, N.—Clock-on wireless set. May 27th.

9364.—Marconi's Wireless Telegraph Co., Ltd., Beanland, C.P., and Cockrell, C. S.—Inductance and capacity trimmer unit. May 28th.

9214.—Page, H.—Wireless aerial systems. May 25th.

9244.—Page, H.—Wireless antenna systems. May 25th.

9128.—Philco Radio and Television Corporation.—Loop antenna circuits. May 23rd.

9280.—Scophony, Ltd., and Dodington, S. H. M.—Supersonic wave apparatus. May 27th.

9160.—Slater, G.—Automatic gramophones. May 24th.

Specifications Published.

521439.—Kolster-Brandes, Ltd., and Smyth, C. N.—Focusing magnets for cathode-ray tubes.

521490.—Thornton, A. A. (Philco Radio and Television Corporation).—Noise-limiting circuits for carrier-wave communication systems.

521589.—Thornton, A. A. (Philco Radio and Television Corporation).—Noise-limiting devices for use in electric transmission systems.

521408.—Standard Telephones and Cables, Ltd., and Currey, J. C.—Public address horn-type loudspeakers.

521409.—Kolster-Brandes, Ltd., and Tedham, W. F.—Time-base circuits.

521522.—Kolster-Brandes, Ltd., and Smyth, C. N.—Television systems. (Addition to 520235).

Printed copies of the full Published Specifications only, may be obtained from the Patent Office, 26, Southampton Buildings, London, W.C.2, at the uniform price of 1s. each.

Notes from the Test Bench

Magic-eye Tuner

WE have heard recently one or two cases where listeners have broken a valve or the connections to it. In each case the valve in question was the magic-eye tuner fitted to some commercial receivers by means of a horizontal fitting which leaves the end of the valve projecting slightly through a round escutcheon on the panel. Normally this should be quite satisfactory, but apparently over-zealous cleaning has been responsible for pushing the valve in or something has fallen against the front of the set and the valve has received a severe blow. This type of trouble may be overcome in a simple manner, and in fact the following idea is also applicable to home-made receivers where this type of indicator is required. The valve is mounted in the ordinary way on the chassis, preferably towards the front. A small mirror is then mounted at an angle of 45 deg. above the valve and a hole is cut in the panel and provided with a slightly projecting screen so that the reflection of the valve to pin the mirror may easily be seen. An additional refinement is to mount a small magnifying lens between the valve and mirror so that a larger image may be obtained.

Marking Valveholders

AT one time it was customary for some set makers to label the valveholders on the receiver with the type of valve to be used. This is a good idea for the home constructor also, as it is possible with modern valves to insert a valve in a socket and the disposition of the pins may be such that a valve will be damaged although not receiving excessive L.T. supply. The marking should preferably be made by means of small paper labels attached to the chassis or by means of adhesive tape of the surgical type, marked with ordinary linen marking ink.

Phase Splitter

MANY listeners are using a push-pull output stage with R.C. coupling and for the input valve utilise a single indirectly-heated triode, taking the output from cathode and anode. Whilst this works very well, it will be found that an improvement in quality and very often in gain and stability may be obtained by using one of the double-triodes, either with a single cathode or double cathode. In either case the bias resistance may be of the single type included in the cathode lead, the two cathodes being linked in the double type of valve and earthed through the single bias circuit.

Classified Advertisements

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