

16 PAGE "EASY STEPS IN RADIO" SUPPLEMENT

75

Wireless Magazine

140 PAGES
1/-

No 70. NOVEMBER, 1930.

ANOTHER
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W. JAMES ON ONE-KNOB TUNING

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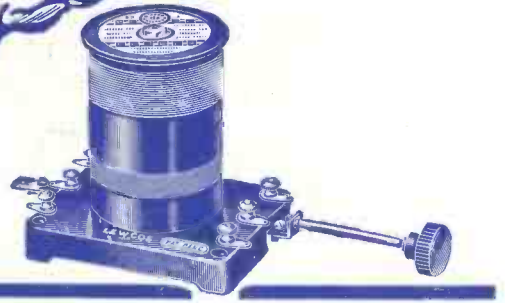
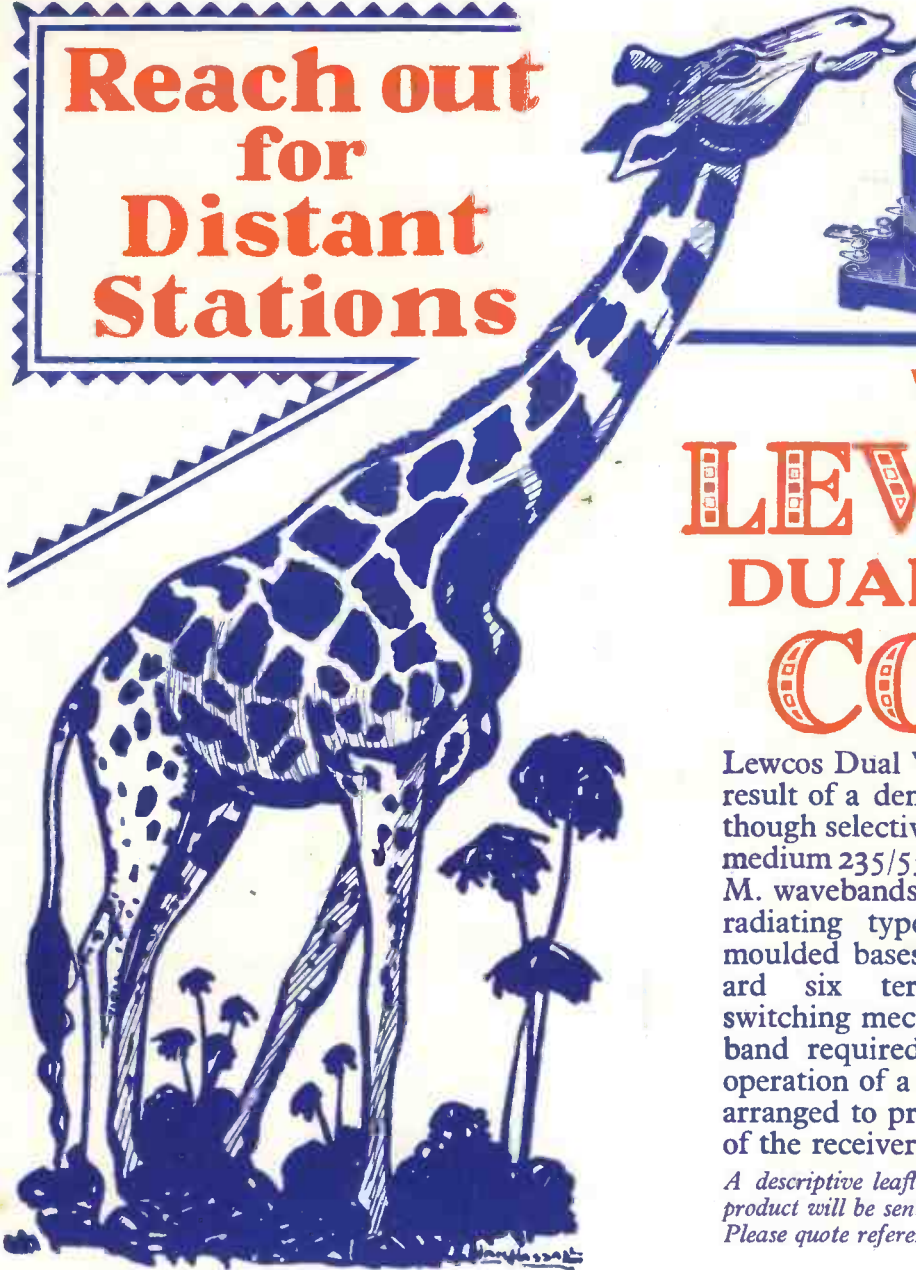
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Church Road
Leyton, London
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B.Sc. (Hons.), A.M.I.E.E.

Wireless Magazine

The Best Shillingworth in Radio

Vol. XII :: NOVEMBER, 1930 :: No. 70

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D. SISSON RELPH

The Editor's Comments

IN the very forefront of my contents this month I must put the "Easy Steps in Radio" Supplement, printed on tinted paper, which has occasioned my staff a great deal of thought and hard work, and is addressed particularly to the beginner although it appeals, I think, to everybody.

It tells the practical story of the aerial, tuner, and detector, the high-frequency and low-frequency amplifier, the valves and power supply, and the loud-speaker, and anyone who takes the trouble to read its simple sentences and look at its illustrations will get a good working idea of practical radio reception, and will be prepared for my big feature next month, when I shall publish a special loud-speaker number.

One-knob Tuning

W. James gives further notes in this issue on his *Regional Band-pass Four*, and next month will show you how to convert this set for operation from A.C. mains. Will you read, by the way, what he has to say on "One-knob Tuning for Modern Sets" in this issue, an article in which he draws the conclusion that careful design and manufacture can produce a true one-knob set, but that for amateur sets an adjustment is necessary.

One of these days I will hold a competition to find out which was the most popular set ever published in this magazine, although I expect that the vote would go to the Brookman's Three. The New Brookman's Three for £7, the subject of a special article this month, is based on a circuit almost identical, but with a single

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wave-change switch instead of two.

There is another "Five-point" set in this issue—a "four"; all these "Five-pointers" use standard two-pin plug-in coils, in spite of which their single self-indicating switch covers both wavebands.

J. H. Reyner is continuing his practical talk on "Making Your Own Records," and is now discussing a number of points that need special attention; I feel sure he is opening up to a number of our readers a most interesting branch of work.

Programme Matters

Following my editorial article of last month, Alan Hunter has something to say in our pages on "Putting Over Sponsored Programmes." Our Special Commissioner, writing under the title of "A Change of Heart at the B.B.C.?" discusses recent activities at Savoy Hill, and in another article "The Truth About the Programmes," W. Oliver attempts to carry a never-ending debate one step farther.

Once again, as last month, your shilling buys 140 pages. WIRELESS MAGAZINE has long been the best radio magazine in the world. I think it is now the biggest.

THE EDITOR.


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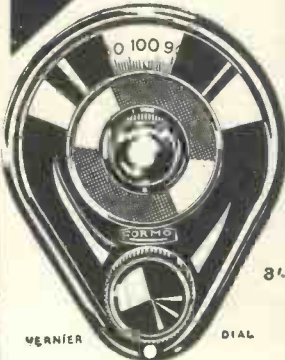
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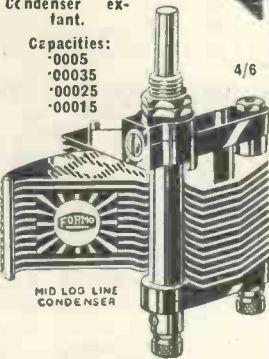
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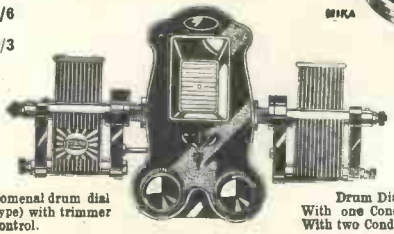


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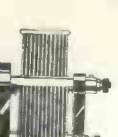


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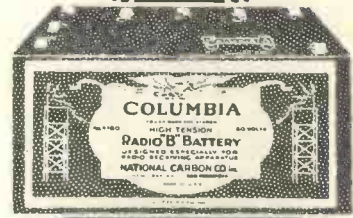
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Remember the date!
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NOVEMBER 20

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VALVES TO USE IN YOUR SET

Make	Type	Impedance	Amplification Factor	Filament Current	Mutual Conductance	Maximum Anode Voltage	Grid Bias at 100 volts	Grid Bias at 150 volts
Two-volt Three-electrode Valves								
Dario ..	Resist.	60,000	30	.1	.5	160	1.5	3.0
Mazda ..	H210	59,000	47	.1	.8	150	.5	1.0
Lissen ..	H210	58,000	35	.1	.6	150	—	1.5
Six-Sixty	210RC	55,500	39	.1	.7	150	1.0	1.5
Mullard	PM1A	51,000	36	.1	.7	150	1.5	1.5
Cossor ..	210RC	50,000	36	.1	.72	150	1.5	1.5
Marconi	H210	50,000	35	.1	.7	150	1.5	1.5
Osram ..	H210	50,000	35	.1	.7	150	1.5	3.0
Six-Sixty	210HF	25,000	19	.1	.75	150	—	—
Marconi	HL210	23,000	20	.1	.87	150	2.0	4.0
Osram ..	HL210	23,000	20	.1	.87	150	1.5	4.0
Mullard	PM1HF	22,500	18	.1	.8	150	3.0	4.5
Dario ..	Super HF	21,000	25	.15	1.5	200	1.5	3.0
Lissen ..	HL210	21,000	18	.1	.85	150	1.5	4.5
Mazda ..	HL210	21,000	26	.1	1.25	150	1.5	3.0
Cossor ..	210HF	20,000	20	.1	1.0	150	1.5	3.0
Six-Sixty	210LF	12,500	10.6	.1	.85	150	4.5	7.5
Cossor ..	210LF	12,000	10	.1	.83	150	3.0	4.5
Marconi	L210	12,000	11	.1	.9	150	3.0	7.5
Mullard	PM1LF	12,000	11	.1	.9	150	4.5	7.5
Osram ..	L210	12,000	11	.1	.92	150	3.0	7.5
Six-Sixty	217D	10,700	13.5	.17	1.25	150	—	4.0
Mullard	PM2DX	10,700	13.5	.2	1.25	150	3.0	6.0
Dario ..	Univ.	10,000	9	.1	.9	200	—	1.5
Lissen ..	L210	10,000	10	.1	1.0	150	3.0	7.5
Mazda ..	L210	10,000	15.5	.1	1.55	150	2.5	4.5
Dario ..	Super Det.	7,500	15	.15	2.0	200	1.5	3.0
Marconi	P215	5,000	7	.15	1.4	150	7.5	12.0
Osram ..	P215	5,000	7	.15	1.4	150	7.5	12.0
Six-Sixty	220P	4,800	7.2	.2	1.5	150	10.0	16.0
Lissen ..	P220	4,700	7	.2	1.5	150	9.0	15.0
Dario ..	SP	4,500	9	.15	2.0	200	7.5	12.5
Mullard	PM2	4,400	7.5	.2	1.7	150	7.5	12.0
Cossor ..	220P	4,000	8	.2	2.0	150	4.5	9.0
Mazda ..	P220	3,700	12.5	.2	3.4	150	3.0	6.0
Six-Sixty	230SP	2,750	5.5	.3	2.0	150	12.0	23.0
Dario ..	Hyper	2,700	5	.3	1.8	200	10.5	15.0
Mullard	PM252	2,600	5.4	.3	2.1	150	9.0	15.0
Marconi	P240	2,500	4	.4	1.6	150	15.0	24.0
Osram ..	P240	2,500	4	.4	1.6	150	16.0	24.0
Marconi	P2	2,300	6.5	.2	2.8	150	7.5	12.0
Osram ..	P2	2,300	6.5	.2	2.8	150	7.5	10.5
Cossor ..	230XP	2,000	4	.3	2.0	150	12.5	22.5
Lissen ..	PX240	2,000	4	.4	2.0	150	12.5	22.5
Mazda ..	P240	1,900	7	.4	3.7	150	6.0	13.5
Two-volt Screened-grid Valves								
Mazda ..	215SG	400,000	450	.15	1.1	150	1.5	1.5
Cossor ..	215SG	300,000	330	.15	—	150	—	—
Dario ..	SG	250,000	250	.15	1.0	200	—	1.5
Mullard	PM12	230,000	200	.15	.87	150	—	—
Six-Sixty	215SG	220,000	190	.15	.87	150	—	—
Cossor ..	220SG	200,000	200	.2	1.0	150	—	1.5
Lissen ..	SG215	200,000	180	.15	.9	160	—	1.5
Marconi	S215	200,000	170	.15	.85	150	1.5	1.5
Osram ..	S215	200,000	170	.15	.85	150	—	—
Two-volt Pentode Valves								
Lissen ..	PT225	64,000	90	.25	1.4	150	3.0	6.0
Six-Sixty	230PP	64,000	80	.3	1.25	150	6.0	10.5
Mullard	PM22	62,500	82	.3	1.3	150	6.0	12.0
Dario ..	Pent.	55,000	100	.3	1.8	160	6.0	15.0
Marconi	PT240	55,000	90	.4	1.65	150	6.0	9.0
Osram ..	PT240	55,000	90	.4	1.65	150	6.0	9.0
Lissen ..	PT240	22,500	45	.4	2.0	150	7.5	10.5
Cossor ..	230PT	20,000	40	.3	2.0	180	6.0	7.5
Mazda ..	230P-n	—	—	.3	1.8	150	9.0	9.0
Four-volt Three-electrode Valves								
Cossor ..	410RC	60,000	40	.1	.66	150	—	1.5
Dario ..	Resist.	60,000	30	.075	.5	160	—	1.5
Marconi	H410	60,000	40	.1	.67	150	1.5	1.5
Osram ..	H410	60,000	40	.1	.67	150	—	1.5
Lissen ..	H410	60,000	40	.1	.66	150	—	1.5
Six-Sixty	4075RC	58,000	37	.075	.64	150	1.0	1.5
Mullard	PM3A	55,000	38	.075	.66	150	1.5	1.5
Marconi	HL410	30,000	25	.15	.83	150	2.0	3.0
Lissen ..	HLD410	21,000	25	.1	1.2	150	1.5	3.0
Dario ..	Super HF	21,000	25	.1	1.2	200	1.5	3.0
Cossor ..	410HF	20,000	20	.1	1.0	150	1.5	4.5
Mullard	PM3	13,000	14	.075	1.05	150	3.0	6.0
Six-Sixty	4075HF	12,500	13.5	.075	1.1	150	3.0	5.0
Dario ..	Univ.	10,000	10	.075	1.0	200	—	1.5
Cossor ..	410LF	8,500	15	.1	1.76	150	3.0	6.0
Lissen ..	L410	8,500	15	.1	1.8	150	1.5	4.5
Marconi	L410	8,500	15	.1	1.76	150	2.0	4.5
Osram ..	L410	8,500	15	.1	1.77	150	3.0	4.5
Mullard	PM4DX	7,500	15	.1	2.0	150	3.0	6.0
Dario ..	Super Det.	7,500	15	.075	—	200	3.0	4.5
Six-Sixty	410D	7,250	14.5	.1	2.0	150	—	3.5
Marconi	P410	5,000	7.5	.1	1.5	150	6.0	10.5
Osram ..	P410	5,000	7.5	.1	1.5	150	6.0	10.5
Dario ..	SP	4,500	9	.1	2.0	200	6.0	15.0
Lissen ..	P410	4,500	9	.1	2.0	150	6.0	12.0
Mullard	PM4	4,450	8	.1	1.8	150	7.5	12.0
Six-Sixty	410P	4,200	7.7	.1	1.85	150	6.0	9.0

Make	Type	Impedance	Amplification Factor	Filament Current	Mutual Conductance	Maximum Anode Voltage	Grid Bias at 100 volts	Grid Bias at 150 volts
Four-volt Three-electrode Valves—continued.								
Cossor ..	410P	4,000	8	.1	2.0	150	4.5	9.0
Dario ..	Hyper P	2,700	5	.15	1.8	200	12.0	17.5
Marconi	P425	2,300	4.5	.25	1.95	150	9.0	16.5
Osram ..	P425	2,300	4.5	.25	1.95	150	9.0	16.5
Lissen ..	P425	2,250	4.5	.25	2.8	150	12.5	19.5
Cossor ..	415XP	2,000	4	.15	2.0	150	12.0	22.5
Mullard	PM254	2,000	4.2	.18	2.1	150	13.5	22.5
Six-Sixty	420SP	2,000	4	.2	2.0	150	12.0	22.0
Mazda ..	P425	1,950	3.5	.25	1.8	140	1.40	26.0
Four-volt Screened-grid Valves								
Dario ..	SG	250,000	250	.075	1.0	200	—	1.5
Mullard	PM14	230,000	200	.075	.87	150	—	—
Six-Sixty	4075SG	220,000	190	.075	.87	150	—	—
Cossor ..	410SG	200,000	200	.1	1.0	100	—	1.5
Marconi	S410	200,000	180	.1	.9	150	1.5	1.5
Osram ..	S410	200,000	180	.1	.9	150	—	—
Lissen ..	SG410	200,000	180	.1	.9	150	—	1.5
Four-volt Pentode Valves								
Dario ..	Pent.	55,000	100	.15	1.8	160	6.0	15.0
Six-Sixty	SS4 Pent.	53,000	83	.275	1.55	300	10.0	14.0
Marconi	PT425	50,000	100	.25	2.0	150	4.7	7.5
Osram ..	PT425	50,000	100	.25	2.0	150	4.0	7.5
Mullard	PM24	28,000	62	.15	2.3	150	6.0	12.0
Six-Sixty	415PP	27,000	60	.15	2.2	150	6.0	10.5
Mullard	PM24A	25,000	50	.275	2.0	300	6.0	21.0
Lissen ..	PT425	22,500	180	.25	2.0	150	7.5	10.5
Cossor ..	415PT	20,000	40	.15	2.0	150	6.0	9.0
Mazda ..	425P-n	—	—	.25	2.0	150	14.0	14.0
Six-volt Three-electrode Valves								
Mazda ..	H607	90,000	40	.07	.45	150	.8	1.5
Cossor ..	610RC	60,000	50	.1	.8	150	—	1.5
Lissen ..	H610	60,000	40	.1	.66	150	—	1.5
Marconi	H610	60,000	40	.1	.67	150	1.5	1.5
Osram ..	H610	60,000	40	.1	.67	150	—	3.0
Six-Sixty	6075RC	58,000	42	.075	.7	150	1.0	1.5
Mullard	PM5B	53,000	40	.075	.75	150	1.5	1.5
Marconi	HL610	30,000	30	.1	1.0	150	1.5	1.5
Osram ..	HL610	30,000	30	.1	1.0	150	1.5	3.0
Lissen ..	HLD610	21,000	25	.1	1.2	150	1.5	3.0
Cossor ..	610HF	20,000	20	.1	1.0	150	1.5	3.0
Mazda ..	HL607	20,000	20	.07	1.0	150	1.5	3.0
Six-Sixty	6075HF	15,200	17	.075	1.1	150	2.0	4.0
Mullard	PM5X	14,700	17.5	.075	1.2	150	3.0	4.5
Six-Sixty	D610	9,250	18.5	.1	2.0	150	—	4.0
Lissen ..	L610	9,000	18	.1	2.0	150	3.0	4.5
Mullard	PM6D	9,000	18	.1	2.0	150	3.0	4.5
Cossor ..	610LF	7,500						

FOUR ALL-ELECTRIC RECEIVERS by Columbia

No less than four all-electric models are offered by Columbia, varying in price from twelve to thirty-one guineas. The three new receivers are destined to enjoy the same immediate success as the famous 304; they come from the hands of the same master designers; the same quality and reliability is inbuilt. Their specifications will repay the closest study.



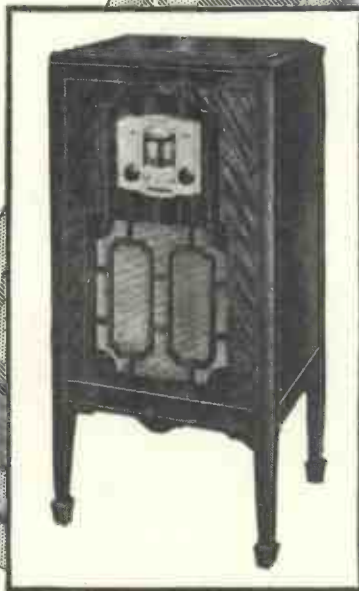
Model 307.
Powerful 3 valve circuit — Screen-grid, Detector, Pentode. Illuminated controls, tuning calibrated in wave-lengths, variable aerial coupling. Gramophone pick-up. All-Electric. A.C. or D.C.
Oak **20 gns.**
Mahogany **21 gns.**



Model 309.
Alternative programme without tuning! Just a switch! No dials or controls. All-Electric. A.C. or D.C. Built-In Speaker.
12 gns.



Model 304.
"The choice of the Experts"
5 valves, including 3 Screen-grid. Tuning dial calibrated in wave-lengths. Immense power and range. All-Electric A.C. or D.C.
26 gns. . . . Oak
27 gns. . . . Mahogany
28 gns. . . . Walnut



Model 331.
A new pedestal cabinet radio! With 3-valve All-Electric set and new balanced armature speaker. Gramophone pick-up. Wonderful tone and volume.
Mahogany **30 gns.**
Walnut **31 gns.**



Columbia RADIO

MADE BY — THE COLUMBIA GRAPHOPHONE CO., LTD.,
92, CLERKENWELL ROAD, LONDON, E.C.1.

Advertisers take more interest when you mention "Wireless Magazine"

DARIO valves, marketed in this country by Impex Electrical, Ltd., come from one of the largest valve factories on the Continent. The samples which have been sent us for test show how comprehensive is the range in the 2- and 4-volt series.

Firstly, there is the Resiston Bivolt, having a measured impedance of 69,000 ohms, and an amplification factor of 28, suitable for resistance-coupled amplifiers. The filament consumption is .1 ampere at 2 volts and the price 5s. 6d.

Detector Valve

Next in the range is the Super Detector Bivolt, having an impedance of 7,800 ohms and an amplification factor of 16.4. The filament consumption is .22 ampere at 2 volts. This is an excellent valve, and in addition to performing well in the detector stage, will make a good first-stage low-frequency amplifier. The price is 6s. 6d.

The Super-power Bivolt has an impedance of approximately 5,000 ohms, and an amplification factor of 9. The filament consumption is .21 ampere at 2 volts. The characteristics are similar to those of the usual power valve. The price is 7s. 6d.

Also in the 2-volt series is a Bivolt Hyper-power valve, having an impedance of approximately 3,270 ohms, and an amplification factor of 5.9. The filament consumption is .38 ampere, and the price is 9s. 6d. From the curves taken we found that grid swings up to 10 or 12 volts can be successfully

DARIO VALVES

handled with 120 volts on the anode. The somewhat curved lower portion of the characteristic may introduce second-harmonic distortion, but this may be minimised by making the speaker impedance large. To complete the 2-volt series is a screened-grid valve known as the Screenodion Bivolt, having an impedance of 350,000 ohms, and an amplification factor of 216. The filament consumption is .15 ampere at 2 volts, the price being 15s. 6d.

The characteristics of the valves in the 4-volt range are similar, the difference being mainly in the filament-current consumption, which is generally half that of the corresponding 2-volt valves, thus equalising the filament wattage in either type. The prices of the 4-volt valves correspond with those in the 2-volt range.

The Resiston Forvolt valve has an impedance of 70,000 ohms and an amplification factor of 21.5, the filament consumption being .075 ampere at 4 volts.

The next in the range is the Super H.F. Forvolt, with an impedance of 24,000 ohms, and an amplification factor of 23, while the Super Detector Forvolt has an impedance of 9,500 ohms, and an amplification factor of 12.7. The filament current in both cases is .075 ampere.

The low-frequency valve in this series is known as the Universal Forvolt, and has an impedance of 6,900

ohms, and an amplification factor of 9.7. Then we have the Hyper-power Forvolt, with an impedance of 3,400 ohms, and an amplification factor of 6.8.

Finally there is the screened-grid valve known as the Screenodion Forvolt, having an impedance of 300,000 ohms and an amplification factor of 180.

All these figures were obtained in our laboratories, with 120 volts on the anode. This voltage can be safely increased to 200, resulting in a considerably increased output from the power valves.

Indirectly-heated Valves

In addition to the normal valves, we also tested a few indirectly-heated samples. One of these, known as the Super-detector, was found to have an impedance of 10,000 ohms, and an amplification factor of 11. The heater consumption was 1.3 ampere at 4 volts. The construction of these valves follows the standard practice, the cathode surrounding the heater element.

The indirectly-heated screened-grid valve, known as the Super-Screenodion, merits attention; it has an impedance of 1,200,000 ohms, and an amplification factor of 360. The heater consumes 1.2 ampere. These figures are a little different from the makers' rating, since they claim a mutual conductance of 1 milliampere per volt, which in this case would lead to an amplification factor of 1,200. Nevertheless, the characteristics of this valve should ensure a good performance.

MAKE YOUR OWN RECORDS

SIMPLE — INEXPENSIVE — PERMANENT



HERE, at last, is an opportunity to make permanent gramophone records. Records of your children's voices, their musical talents, greetings and messages to your relatives and

friends in your own voices are novelties that will be appreciated and retained by all. The records are made by a simple device connected up to your radio set and gramophone.

See the October issue of WIRELESS MAGAZINE for full description of this Home recorder by Mr. J. H. Reyner. The complete apparatus, complete with six double-sided records, is retailed at £4 12 0. Further supplies of records can be obtained for the remarkably low price of 4d. each.

Write for full details and descriptive leaflet, explaining the secret of this wonderful home recording device, to

CAIRNS & MORRISON, LTD.
33 PERCY STREET, LONDON, W.1
Telephone - Museum 6564

Next Month's "W.M." Will Be a Special Loud-speaker Issue

Look Out for It on Nov. 20

QUITE NEW!

Your volt-meter converted into a **COMPLETE TESTING SET FOR 2/6**



By plugging a Sifam Circuit Testing Adapter on to the spike of your volt-meter you can use it for detecting Short Circuits, Open Circuits, Condenser Trouble, Bad Connections, and testing Valve Filaments.

The adapter costs only 2/6, but functions as efficiently as an expensive instrument.

SIFAM

Circuit Testing ADAPTER

PRICE 2/6 FROM ALL RADIO DEALERS

SIFAM POCKET VOLTMETER PRICE 7/6

If any difficulty write to:

SIFAM ELECTRICAL INSTRUMENT CO., LTD.
BUGH HOUSE, ALDWYCH, LONDON, W.O.2.



K.B. 232
Speaker,
£3 0 0.



K.B. 2-valve
Electric (A.C.)
Receiver. In
Oak £11 15 0.
Incl. Valves and
Royalties.



K.B. 3-valve S.C.
Electric (A.C. or
D.C.) Receiver in
Oak £19 10 0.
Including Valves
and Royalties.

*“What Station
would you like?”*

“What does it get?”
“Anything in reason,
Paris, Berlin, Rome,
Stockholm, Vienna...”
“What’s this now?”
“Budapest-tzigane
orchestra.” “Sounds
good enough for
London.”

For the enthusiast who searches Europe, or the listener content with London, a K.B. Receiver is equally suitable. It finds the foreigners quickly and easily, while thanks to the tone and clarity of K.B. Speakers, reception is as perfect as radio can be.

Illustrated Brochure of the full range of K.B. instruments will be sent on request. Demonstrations and Hire Purchase Terms gladly arranged.

KOLSTER-BRANDES LTD.
CRAY WORKS, SIDCUP, KENT



Kolster Brandes

**PROVED
PERFORMANCE**

W.M. 1-11/30.

Mention of the “Wireless Magazine.” will ensure prompt attention

Hear your records at their best

You are not getting the best out of your records unless you are reproducing them with the aid of a B.T.H. Pick-up. Only by this means can you hear all their beauty. It's like changing your old records for new ones when you fit a B.T.H. Pick-up. Gramophone music has a new meaning—it has all the sparkle and life of the real thing.

Get a B.T.H. Pick-up for your gramophone today. It fits your machine—it is supplied with four adaptors so that it fits *any* gramophone.



THE

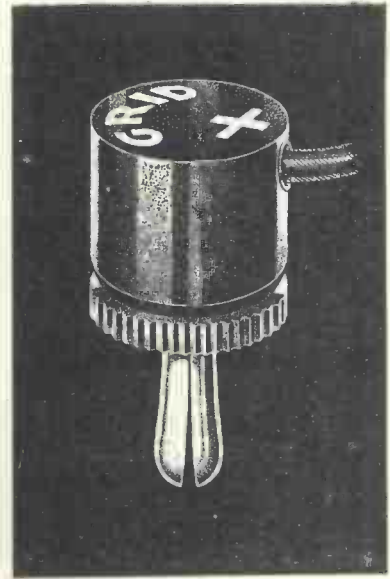


PICK-UP
and **ADAPTORS**
PRICE 27/6 COMPLETE



THE EDISON SWAN ELECTRIC CO., LTD.
Radio Division
1a Newman Street, Oxford Street, W.1
Showrooms in all the Principal Towns

EDISWAN W.105



Patent

FITS EVERY BATTERY SOCKET — and it stays put

HERE is the perfect Wander Plug—push it in and it STAYS “put” till you move it yourself. It grips ANY battery socket, too, because each Plug is tested in sockets larger and smaller than those of any battery made. Special ‘D’ section hard-drawn wire prongs. Side entry for flex, which is gripped, fray and all. Head engraved—12 letterings to choose from.

Price - 3d.

BELLING-LEE TERMINALS

Type “B”	6d.
Type “M”	4½d.
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TWIN PLUG & SOCKET 1/6

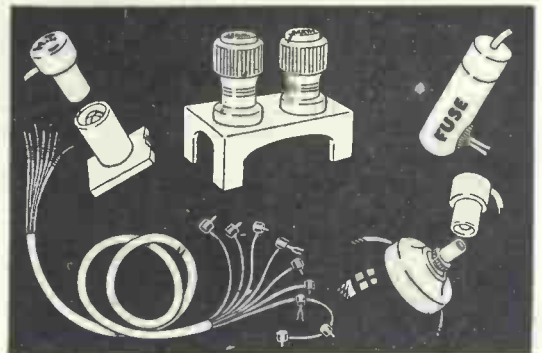
INDICATING SPADE
TERMINAL 4½d.

S.G. ANODE CON-
NECTOR 6d.

BATTERY CORDS,
9-way 5/9
also made in 5-, 6-, 7-, 8- and 10-way

The Belling-Lee Bakelite
Terminal Mount .. 8d.

The New Wanderfuse 1/6
Spare Fuses (150 m/a) 9d.
each.



Patent

BELLING-LEE
FOR EVERY RADIO CONNECTION

Advt. of Belling & Lee, Ltd., Queensway Wks., Ponders End, Mdx.

When you send your order don't forget to say you “saw it in the ‘W.M.’”

I'm Sorry!


But we shan't get that special programme to-night

—fact is, my H.T. battery's tired out and I've forgotten to buy another so we'll have to miss that special performance after all.

Yes, I quite understand you're fed up with my H.T. batteries running down always when something worth listening to is on—

Well, I won't buy another battery, I'll get an R.I. H.T. Unit, constant power and absolutely safe, my dear.



The secret of the new  H.T. Unit is the use of Nikalloy the amazing metallurgical discovery, utilised with such amazing success in the "Hypermu" and "Hypermite" transformers and "Hypercore" Choke.

Ask for the leaflet which tells all about the New H.T. Unit which is absolutely revolutionary in Safety, Efficiency and Economy.

Suitable for Portables and most receivers up to 5 valves.

Both models fitted 3 positive tapplings, one being variable. Outputs are similar:—

S.G. + 60/80 volts for S.G. Valves.

Det. + 0/150 volts. Variable.

Power + 140 volts. 20 milliamps.

TYPE A20/3 FOR A.C. £4 : 15 : 0

For 200/250 v. 40/100 cycle supply.
For 25 cycles 15 : 5 : 0, suitable also for 50 cycles.

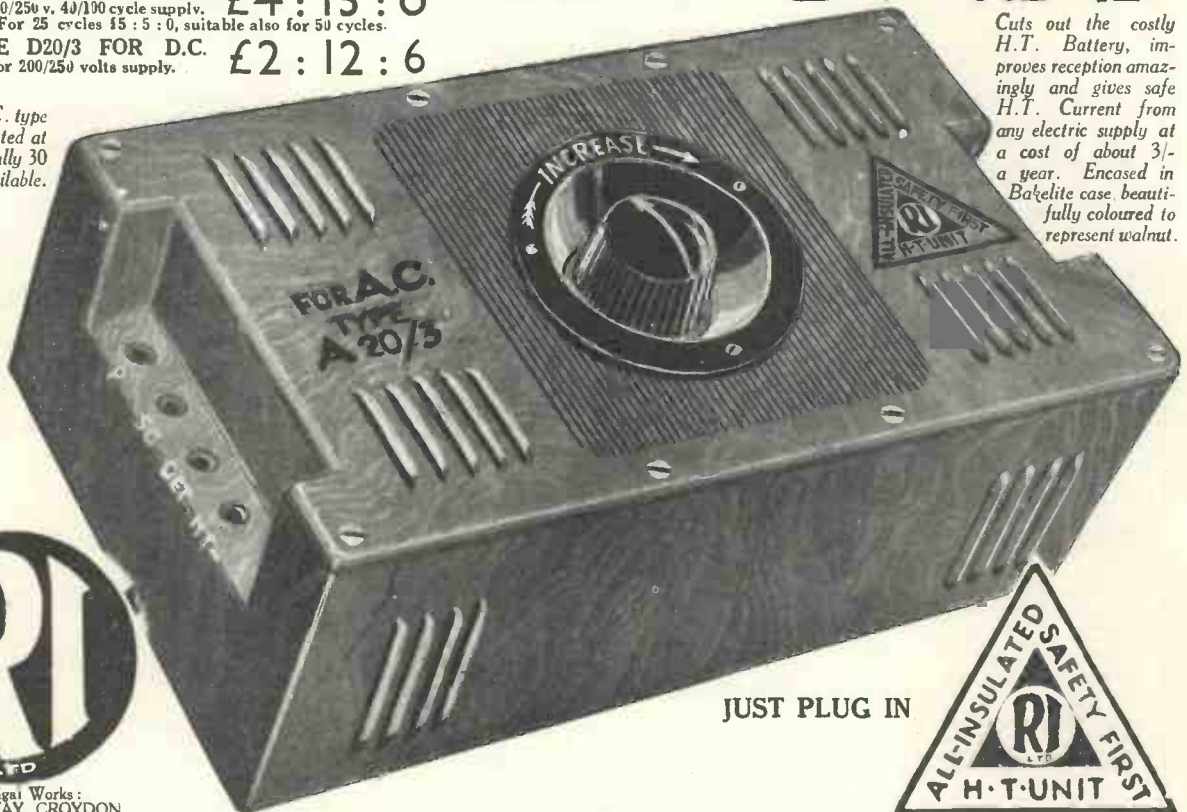
TYPE D20/3 FOR D.C. £2 : 12 : 6

For 200/250 volts supply.

Although D.C. type is normally rated at 20 m.a., actually 30 m.a. are available.

ALL-INSULATED H.T. UNIT

Cuts out the costly H.T. Battery, improves reception amazingly and gives safe H.T. Current from any electric supply at a cost of about 3/- a year. Encased in Bakelite case beautifully coloured to represent walnut.



Madrigal Works:
PURLEY WAY, CROYDON

JUST PLUG IN



When replying to advertisements, please mention "Wireless Magazine"

Broadcast Identification Sheets

For the benefit of readers we are publishing each month a series of panels specially compiled for the WIRELESS MAGAZINE by Jay Coote.

In these, readers will find a ready means of identifying foreign stations. To prevent any confusion in a.m. and p.m., the times are given on the Continental twenty-four-hour system. Example: 8 a.m.=8.00; 8 p.m.=20.00.

In the event of alterations in wavelength, power or call; a special panel bearing the alteration will be published at the earliest opportunity.

These identification sheets should be cut out and filed either alphabetically or in order of wavelength as they appear.



1,550 miles from London

1,200m.
(250 kc.)

Power: 5 kw.

STAMBOUL

(Turkey)

Standard Time: Eastern European (G.M.T. plus 2 hours).

Announcer: Man.

Call: *Allo! Allo! Istanbul Telsiz Telefonu*, followed by French translation: *Ici poste Radio Stamboul*.

Interval Signal: Gong (about 75 strokes per minute).

Main Daily Programme: G.M.T. 15.30, Oriental music; 18.30 orchestral and vocal concert, news.

The studio closes down with the playing of the National Anthem and "Good-night" in the Turkish language, followed by the usual French formula.



465 miles from London

403m.
(743 kc.)

Power: 1.1 kw.

BERNE
(Switzerland)

Standard Time: Central European (G.M.T. plus one hour).

Announcer: Woman.

Call: *Hallo! Radio Bern* (pron.: *Bairn*).

Opening Signal: Short melody played on a musical box.

Interval Signal: Metronome.

All announcements are made in the German and French languages.

Good-night Greetings (in French and German), followed by a few words in the Bernese dialect and repeat of opening melody.

Main Daily Programmes: G.M.T. 15.00, concert; 19.00, evening entertainment; 21.00, news; dance music (Sundays).



289 miles from London

413m.
(725 kc.)

Power: 1.5 kw.

DUBLIN
(Irish Free State)

Standard Time: Greenwich Mean Time.

Announcer: Man.

Call: *Se seo radio ath Cliath agus radio Corcaighe* (Dublin and Cork calling).

All announcements are made both in English and Erse.

No interval signal, but station opens with a tuning note.

Main Daily Programme: G.M.T. 19.00 or 20.00.

Time signal, news and weather forecast are given regularly at the end of the evening transmission.

On Sunday afternoons a relay is frequently made of football matches or other sports.

Relay: Cork, 224.4 m. (1.337 kc.), 1.5 kw.



580 miles from London

418m.
(716 kc.)

Power: 1.7 kw.

BERLIN WITZLEBEN
(Germany)

Standard Time: Central European (G.M.T. plus one hour).

Announcers: Male.

Call: *Achtung! Achtung! Hier Berlin und die Gleichwellensender* (common wave stations) *Stettin, Magdeburg und Berlin (Ost)*. When the "Deutschlandsender" (Königswusterhausen) and the Zeesen short-wave transmitter relay the programme they are included in the call as well as any provincial station taking the same broadcast.

Interval Signal: Metronome (4 beats per second).

Good-night: *Gute Nacht, meine Damen und Herren*.

Transmits throughout day from 05.30 G.M.T.; main evening programme 19.00 or 19.30; dance music to 23.30 daily (except Tuesday and Friday).

Almost nightly the station closes down to the playing of the *Deutschlandslied* (Haydn's Hymn: *Austria*).

Associated Transmitters: Berlin (E), Stettin, Magdeburg on 283 m. (1.058 kc.); Königswusterhausen, 1.635 m. (183.5 kc.); Zeesen, 31.38 m. (9.560 kc.).



600 miles from London

501m.
(599 kc.)

Power: 8.5 kw.

MILAN
(Italy)

Standard Time: Central European (G.M.T. plus 1 hour).

Announcer: Woman.

Call: *Ente Italiano Audizioni Radiofoniche* (abbreviated to EIAR, pronounced: *Eh-yah*). *Radio Milano, Torino e Genova*.

Opening Signal: Carillon.

Interval Signal: Morse letter T (—) or, when relaying Turin, song of nightingale.

Main Daily Programme: G.M.T. 19.00 or 19.30. Usually closes down between 22.50 and 23.00.

Programmes are exchanged with both Turin and Genoa. Station closes down with Italian National Anthem and Fascist hymn, followed by the full opening call.

Good-night: *Buena notte a tutti*.
Associated Transmitters: Turin 278.2 m. (1.098 kc.), 8.5 kw.; Genoa 381 m. (788 kc.), 1.5 kw.

A New NOVOTONE The TYPE J

Possessing exactly the same characteristics as the type S, but having less overall amplification.

With the introduction of this new Novotone practically every user of an electrical pick-up is catered for, no matter what type of amplifier he is using.

The Type J can be used with almost any average circuit without making alterations of any sort. A standard volume control can be used across the output terminals without affecting the reproduction.

The result, when reproducing records with the Novotone, is "amazing realism."

Write for free descriptive Folder N.M.

- Type J - - £3.3.0
- Type S Standard Model £5
- Type H for High Resistance pick-ups £5

GAM-BRELL ALL-ELECTRIC RECEIVERS



THREE & FOUR V. MODELS

These sets incorporate every possible refinement. Modern circuit gives long range, good volume and perfect reproduction. Change of programmes in any room without the use of an aerial. Many British and Foreign programmes are available when an aerial is used. Special device gives hair-line to broad tuning at will. Calibrated wavelength chart makes tuning exceedingly simple. Terminals for pick-up. Volume control on radio and gramophone.

Prices for 3v. Model

D.C., £24.0.0 A.C., £26.15.0

Prices for 4v. Model

D.C., £27.0.0 A.C., £33.0.0
Oak or Mahogany Cabinets.

Write for fully descriptive leaflet R.M

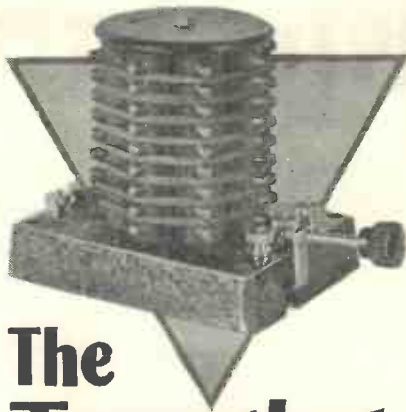
GAMBRELL RADIO LTD.
6 Buckingham Street, Strand, W.C.2

MICROPHONES

If you are not a Micro experimenter you are losing a lot of pleasure. Your present valve set will enable you to work in an entirely new field of "talkies" and we stock mikes within the reach of all. Prices range from 1/- to £20, and we can supply a fine sensitive pendant mike in solid metal case, not a thin stamping, with brass front for only 4/6. Pulpit Pedestal, 12/6. Transmitters Hand Mike, 15/-. Announcers P.A., 65/- Micro Transformers, 3/8, 5/-, 7/6 and 10/-. If you prefer a separate Amplifier we have these in portable type £2 15 0. or mains mode £3 10 0.

Send stamped addressed envelope for our new Sale Bargain List.

ELECTRADIX RADIOS
218, Upper Thames St., London,
Telephone: CITY 0191 E.C.4



The Tuner that Selects! 17¹/₆

THIS is the Watmel Dual Range Tuner. More than that, it is also a wave-trap. It transforms a "woolly" circuit into a selective one—gives snap and tuning clarity quite exceptional. You can incorporate it easily in any existing circuit employing reaction—and you should build it into any new circuit. Loose aperiodic coupling and efficient winding are the secrets. And the Watmel Tuner is a beautifully finished job.

All moulded parts of attractive Walnut-mottled Bakelite. Robust positive push-pull switch concealed in base.

Price complete 17/6

The

WATMEL BINOCULAR H.F. CHOKE
gives maximum efficiency, very low self-capacity and an extremely restricted field

Type DX3
Inductance - 200,000 mh
Self Capacity - 1.6 m.mfd
D.C. Resistance, 1,400 ohms.
Price 6/-

Type DX2
Inductance - 40,000 mh.
Self Capacity - 1.2 m.mfd.
D.C. Resistance, 450 ohms
Price 4/-



If you cannot get these Watmel products at your dealers, send remittance and order direct to us, and the article will be dispatched by return.

WatMel

WATMEL WIRELESS CO. LTD.
Imperial Works, High St., Edgware.

Telephone: EDGWARE 0323

M.C.13

The Easy Way TO PERFECT RADIO

offers you Every Known Radio Receiver or Component on

EASY TERMS with SERVICE AFTER SALES

The following list is merely representative, and we ask you to fill in the coupon below or send us a list of your requirements.

GOSSOR EMPIRE MELODY MAKER KIT
SEND 10/- 1931 Model, S.G., Detector Balance in 12/9
ONLY and power. Cash £6 17 6 payments of

1931 OSRAM MUSIC MAGNET KIT
SEND 23/6 2 S.G., Detector and Balance in 18/6
ONLY Power. Cash £11 15 0 12 monthly payments of

MULLARD 1931 ORGOLA 3-VALVE KIT
SEND 14/8 S.G., Detector and Power Balance in 14/8
ONLY Cash £8 0 0 11 monthly payments of

DYNAPLUS SCREENED THREE KIT
SEND 10/6 S.G., Detector and Balance in 10/6
ONLY Power. Cash £5 14 6 11 monthly payments of

SHORT-WAVE KIT FOR THE INVITATION FOUR

SEND 26/10 Cash price including every re- Balance in 26/10
ONLY quired component, cabinet and 11 monthly payments of
valves, £14 12 5

Detailed list and description on request.

EXIDE

SEND 8/6 120 volt W.H. Type H.T. Accu- Balance in 8/6
ONLY mulator, in crates 11 monthly payments of
Cash price £4 13 0

EKCO 3F.20 H.T. ELIMINATOR, 20 m/a

SEND Tappings for S.G., 60 volts Balance in 7/4
ONLY and 120/150 volts. For A.C. 11 monthly payments of
Mains. Cash price £3 19 6

FARRAND INDUCTOR SPEAKER FOR PERFECT REPRODUCTION

SEND 6/5 Unit and Chassis complete Balance in 6/5
ONLY ready mounted 11 monthly payments of
Cash price £3 10 0

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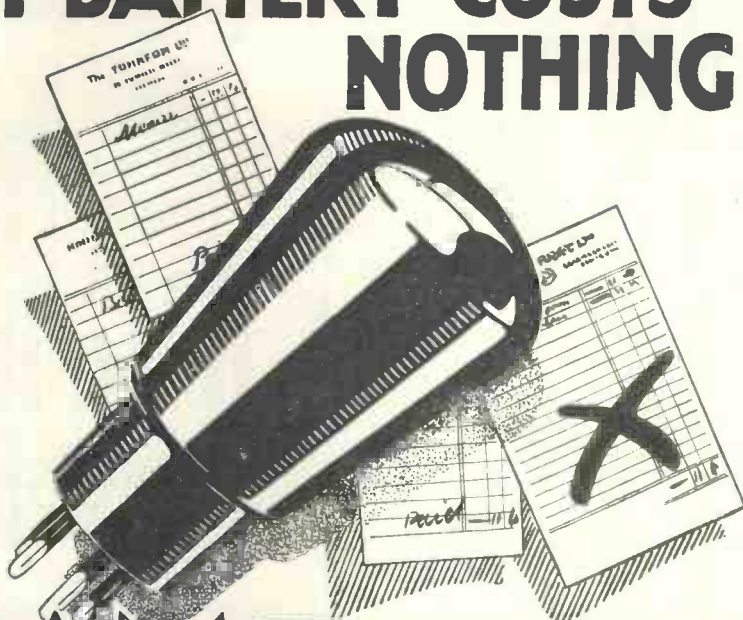
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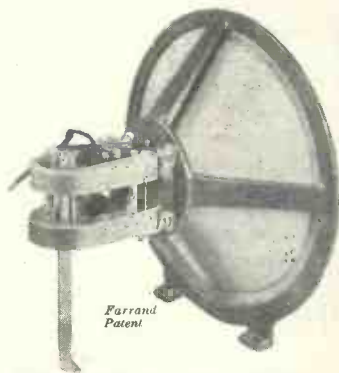
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The ORIGINAL N & K INDUCTOR LOUD-SPEAKER

This remarkable loud-speaker not only equals the moving coil but improves on its sensitiveness, clarity and beauty of tone. Cheaper to buy. Simple to operate. No batteries. Large quantities supplied without delay.

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If you had carefully collected all the catalogues at the recent Radio Exhibition at Olympia and had them bound into one huge volume you would not then have as good a guide to all that is latest and best in the wireless industry as the new stupendous 1931 catalogue issued by:—

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PRICE:
30,000 ohms 1/6
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When building the "Five-Point-Four" receiver described in this issue, make certain that the Magnum Spaghetti wire-wound resistances are used. These have been specified as they are the most convenient form of resistance, are considerably cheaper than the cartridge type, economical in space and simple to use.

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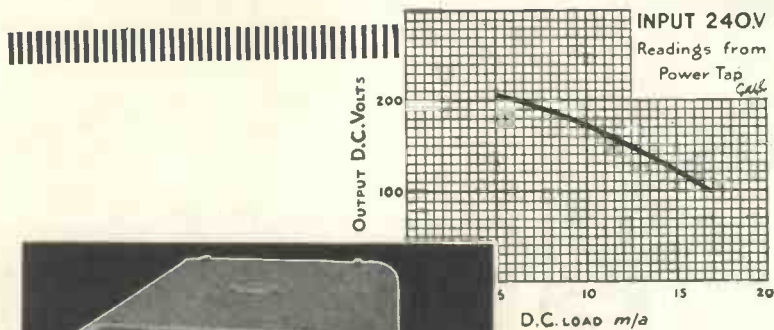
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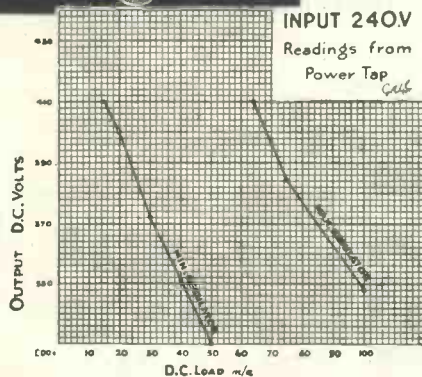
£3 : 7 : 6



MODEL W 3
Output 350 volts
at 100 m/a.

Price :

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Westinghouse recommend Regentone Components in every circuit in their "All-Metal Way 1931."

Regentone "Portable" Combined Mains Units (H.T. with L.T. Charger) have proved so efficient and so reliable that leading British Set Manufacturers are recommending them for use in their own Sets.

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120 VOLTS at 15^m/a
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Why worry any longer with H.T. Batteries when you can get a Mains Unit made by Regentone—a firm who have specialised in Mains Radio since 1924—to suit any and every requirement. In order to ensure absolutely silent operation of any mains-driven receiver, it is essential that the mains apparatus be totally screened. This can only be effected by metal casing as standardized on all Regentone Mains Units. This method is the first recommendation of the Institution of Electrical Engineers regarding electrical apparatus, as when the metal screening case is earthed a sure precaution against short-circuit and shock is provided.

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REGENT RADIO SUPPLY CO., Regentone House, 21 Bartlett's Buildings, Holborn Circus, London, E.C.4. Phone : Central 8745 (5 lines).



Write for leaflets giving curves and all particulars.

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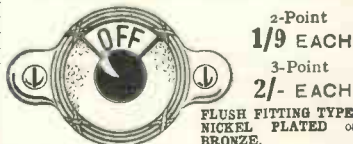
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Receivers can be modernised, repaired or overhauled without delay. "Wireless Magazine" and other sets constructed to specification.

Write for list giving price for building the following sets described in this issue:—
"New Brookman's Three," "Five-point Four," "The Falcon Three," "The Falcon A.C. Unit."

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Try the new Limit EXCELSIS, the blue riband of soundboxes, against any other make. You will be astounded at the marvellous improvement in reproduction. In fact it is better than many soundboxes sold at double the price. Fit one to your own gramophone—you can get one to fit it. Any good dealer can supply.

15/6

The original Limit soundbox, priced at 10/6, still maintains its high reputation in the gramophone world. If any difficulty in obtaining write for name of nearest stockist.



LIMIT Engineering Co., Ltd. Albion Street, King's Cross, N.1.

High-Grade SET AND SPEAKER CABINET Constructed of finely figured Oak on carved ball and claw legs, hand french polished. The ACME OF CRAFTSMANSHIP £8.8.0, carriage paid. RADIO-GRAMOPHONE CABINET £10.0.0, carriage paid. Models from £2.2.0 to £20. Thirty-page illustrated catalogue, post free. GILBERT, Cabinet Maker, Established 1866. Swindon



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Volume controls are used by all high-class set manufacturers of to-day. Experimenters specify Rotor-Ohms for all circuits. Smoothness, Silence and Accuracy are the outstanding features all receivers should have—therefore insist on Rotor-Ohm and ensure perfect control.

In all Resistances 6/- ROTOR ELECTRIC, 2-3 Upper Rathbone Place, W.1

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Actual
Size



6d.
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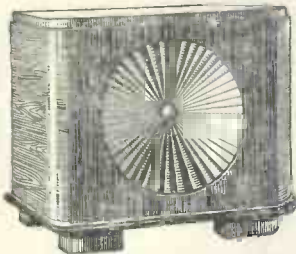
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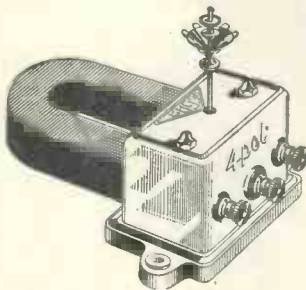
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HEGRA THE SELECTED SPEAKER

It is significant that Hegra speakers are being recommended to an ever-increasing extent, by designers of new general-purpose circuits. Hegra speakers, thanks to their electrical design, give full value to tone without sacrificing volume or responsiveness at any point over the whole range. All reputable Radio dealers stock Hegra products.



The Hegra Cabinet Speaker—Type "T" with triple impedance tapping for use with any type of output valve (incorporating E type unit). Complete in beautifully finished Walnut Cabinet £2.12.0



The Hegra Unit—Type "E." 4-pole balanced-armature unit, giving moving coil results. Triple impedance tapping. Price complete with clips 15/9



W.C.17

IN TUNE WITH THE TRADE

"Fetter Lane" Reviews a Selection of Catalogues and Pamphlets from Which the Beginner Can Learn Something. To Get Them Free Use the Coupon Below

BATTERY INFORMATION

DO you know how long your high-tension battery should last and can you easily work out from the high-tension consumption of your set the standard performance that should be expected?

If you cannot then you should certainly get hold of a new Ever Ready catalogue which gives precise details of practically every battery in the Ever Ready range. Even the overall dimensions are given, so that if you are selecting a new battery to fit into a special compartment of a portable or transportable then you can measure up the length and breadth thereof, as the saying is, and make sure of not going wrong. **145**

"MAKING WAY"

THE Peto-Scott idea, which commends itself to me, is that you should be "making way while you pay." In other words, you should take advantage of their easy-payment system, which you will find detailed in the new "Easy Way" catalogue just produced.

This gives full descriptions of most of the leading 1931 sets and parts, and shows how they can be obtained for small initial deposits and equally small monthly payments.

Peto-Scott's were pioneers in this system, so far as radio is concerned, and you can buy wireless gear on the "easy-way" with complete confidence. **146**

CHOOSING YOUR COILS

LEWCOS have coils to suit every circuit. I do not think that is too optimistic a claim to make on their behalf. I am moved to do so after reading through the 1930 Lewcos catalogue, which is full of interesting information about coils, high-frequency chokes, low-frequency transformers, potentiometer units and so on.

There are some useful circuits given so that you can use Lewcos coils in practically every connection and there is some interesting information on the performance of the individual parts, such as the low-frequency transformers and chokes. You should certainly get this booklet. **147**

THE ALL-METAL WAY

FROM the Westinghouse people I have just received "The All-metal Way for 1931." It seems to be going a slightly different way from that of 1930, for even more useful information on mains operation is given. The first half of this booklet has nothing whatever to do with the cataloguing of Westinghouse metal rectifiers, but is entirely filled with interesting and instructional information on the way these units

work. By the time you have read it through you will be able to argue with the highbrows as to the relative advantages of "voltage doublers" and "bridges."

And, apart from this, you will then be able to delve into the catalogue section and select for yourself the most suitable Westinghouse units to fit your set and you will know how to connect them in circuit. I intend reading through "The All-metal Way" to rub up my knowledge of mains working. **148**

SUITING COILS TO CIRCUITS

IT is not easy, given any dual-range coil, to find quite the best circuit to suit it. Of course, if you make up any receiver in which a Tunewell coil is specified then you will know just how to make the connections, but if you have the coil first and not the circuit then you may be in doubt.

To overcome this difficulty Turner and Co. have produced a booklet giving, among other things, some very useful circuits in which Tunewell coils can be used. It is interesting to note that among these circuits two well-known *Amateur Wireless* layouts appear, the Clarion Screen-grid Three and the 1930 Clarion Three. **149**

CURING BATTERY BOTHERS

EVEN listeners in the heart of London often experience difficulty in getting their batteries charged locally. There are so many "botchers" still about.

Several friends of mine have got over this trouble, which is quite a serious (Continued on page 341)

SEND TO US FOR THESE CATALOGUES!

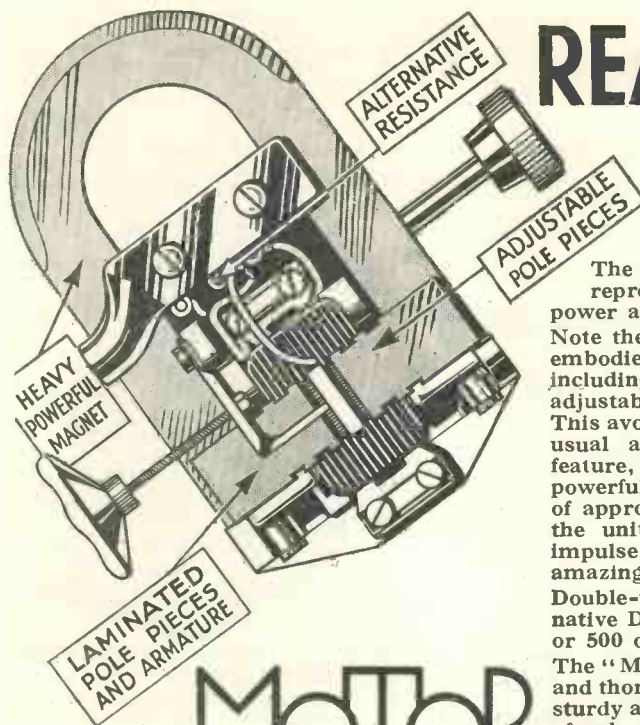
As a keen wireless enthusiast you naturally want to keep abreast of all the latest developments and this special feature will enable you to do so with the minimum of trouble and the cost of only ½d. for postage.

Here we review the newest booklets and folders issued by eight well-known firms. If you want copies of any or all of them just cut out this coupon and send it to us. We will see that you get all the literature you desire.

Just indicate the numbers (seen at the end of each paragraph) of the catalogues you want below.

My name and address are:—

Send this coupon in an unsealed envelope, bearing ½d. stamp, to "Catalogue Service," WIRELESS MAGAZINE, 58/61 Fetter Lane, E.C.4. Valid till Nov. 30



REAL MOVING COIL POWER AND PURITY 27¹/₆

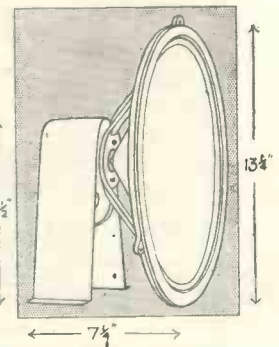
The very latest advance in cone reproduction—REAL moving-coil power and purity at last achieved.

Note the many entirely new features embodied in the "MOTOR" unit, including laminated pole shoes made adjustable by patented cam movement. This avoids the damping effect of the usual armature adjustments. This feature, together with the enormously powerful field magnet, having a pull of approximately 10 pounds, makes the unit sensitive to the smallest impulse, yet capable of handling an amazing top load power of 10 watts. Double-tapped winding gives alternative D.C. resistances of 250 ohms or 500 ohms.

The "MOTOR" unit is big, powerful and thoroughly well made, every part sturdy and strong—nothing to get out of order—no part to chatter or rattle. Ask your dealer to demonstrate this wonderful unit for you.

LOUD SPEAKER CHASSIS

Complete with 15-inch cone, "MOTOR" power unit and stand ... 47¹/₆



MOTOR

The New Isophon
LOUD SPEAKER
POWER UNIT

TEKADE RADIO AND ELECTRIC LTD.
29 Farringdon Street London, E.C.4
Telephone: Central 2482

NEW



HIGH TENSION METAL RECTIFIERS

ON

STAND 66 (TONMAN HALL)

MANCHESTER RADIO SHOW



Call at the stand for a copy of the
"All Metal Way, 1931"

40 pages of technical and practical information, circuits, etc., for amateur constructors and mains users, or send 3d. stamp for a copy to:—

H.T.7. 200 volts, 28 m.a.

21/-

Also H.T.6. 175 volts 25 m.a. - 17/6
and H.T.5. 120 volts 20 m.a. - 15/-

The Westinghouse Brake & Saxby Signal Co., Ltd. 82 York Road King's Cross

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Designed and built in the inimitable "BURTON" way—the EMPIRE TWO Battery model receiver here illustrated represents the most wonderful value ever offered :: :: ::

57'6

Owing to the divergency of opinions regarding various makes of valves, all Bur Ton receivers are supplied without valves. Send for latest lists illustrating the newest Bur Ton receivers and components, and name of nearest agent where you can see and hear them :: :: ::

VISITORS to the recent Radio Exhibition were unanimous and unsparing in their praise for the exceptional value offered in the BURTON EMPIRE TWO battery model receiver.

This set is designed to give good reception of local station programmes. Tuning is effected by a drum drive condenser, combined with a volume control. Two push-pull switches provide for changing wave range and for switching "on and off." The set is compact in design and contained in a very attractive moulded Bakelite Cabinet.

Ask your dealer to show you—THE

BURTON

EMPIRE TWO

Say you saw it in the Wireless Magazine.

(Battery Model)



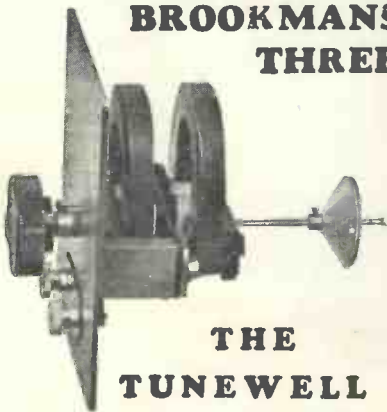
THE BURTON AUTO TRANSFORMER

A neat and compact instrument of the highest efficiency, being carefully wound to give correct ratios. Enclosed in neat moulded case.

TYPE B/3, ratio 3-1 : 10/6 each
TYPE B/5, ratio 5-1 : 10/6 each

C. F. & H. BURTON
Progress Works
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GET THE BEST FROM YOUR NEW BROOKMANS THREE



THE TUNEWELL SPEAKER UNIT

This Tunewell Double Magnet Speaker Unit will give you the "last ounce" of undistorted reception from your Brookmans Three. Pure volume. Amazing tone. Placed in "highest class for quality of reproduction" in recent Wireless World test. Price 2-1/6

From your dealer or address below

Complete Speakers from 28/6 to 63/-

Write for List

TURNER & CO.

54 STATION RD., NEW SOUTHGATE, N.11



10 amps.

On test the new Benjamin Rotary Switch breaks 10 amps at 20 volts and does it 50 times in rapid succession. On 250 volts A.C. also, the switch behaves well proving its complete adequacy for use with trickle chargers, eliminators, etc. One hole fixing to either metal or insulated panels is obtained by drilling 1/2" clearance. Read all about these switches and the circuits in which they can be used fully described with diagrams in our catalogue No. 1142.

Without terminals 3/-

Th: Benjamin Electric Ltd.
Tariff Road, Tottenham, N. 7
Tottenham 1500

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BENJAMIN

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British Institute of Engineering Technology,
283 Shakespeare House, 29/31, Oxford Street, W.1

You will get prompt replies by mentioning "Wireless Magazine"

IN TUNE WITH THE TRADE—Cont.

one, by taking advantage of the hire and charging service offered by Radio Service (London) Ltd., of 105 Torriano Avenue, N.W.5. In this way they can hire high- or low-tension accumulators at a very small figure and according to a folder which has just been sent me by the Radio Service people the charges made seem barely to cover the cost of charging.

Alternatively, if you have accumulators of your own this concern undertake to recharge and clean them up regularly. If you are having any trouble with your local charging station then you should give Radio Service a chance to show how batteries can be cared for. I am told that the tariffs for every part of the service have just been reduced. **150**

WHEN BUYING VALVES

IT is very extraordinary how the efficiency of modern sets has made many set users lamentably ignorant about their valves. What I mean is that sets to-day are so efficient that even with some incorrectly chosen valves a good performance is still obtained. But, naturally, it is to your advantage to make sure of getting the right valve for every holder.

In this connection I can recommend to you a new booklet produced by the Marconiphone Co., Ltd., which not only catalogues all Marconi valves in an easy-to-select manner, but gives most instructive tables and keys for finding out the characteristics of any given valve.

When it comes to the point many set users are a little shaky in regard to their valve technicalities and this booklet should do much to reassure them. **151**

MAINS KNOWLEDGE

PROBABLY few firms have been quite so much in touch with mains matters as have Ferranti, Ltd., who have been well-known in the electrical industry since 1884. Whenever they utter dictums about mains working I metaphorically doff my hat and you can picture me doing so to a new booklet they have introduced dealing with some new mains components of interest to home constructors of eliminators.

If you read this through you cannot fail to learn much of the technicalities of these all-important parts. I say all-important because in mains working it is much more dangerous to go wrong in values and safety factors than it is with ordinary battery working. If you do go wrong you will believe me, but I advise you to get the Ferranti literature and not go wrong in this connection. **152**

Other catalogues received during the month are reviewed on page 436; application for those must be made direct to the manufacturers concerned

Follow The Pilot!



Pilot Radio Kits Guarantee Success. Everything for your new set, down to the last screw, in an attractive carton, including **The Famous Pilot Test Meter** without which no set is complete. No delay—Immediate dispatch service.

PILOT KITS INCLUDE:

1. Every specified Component.
2. "Red Triangle" guaranteed ebonite panel, highly polished and drilled to specification.
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6. A written guarantee of service.
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Components included in Pilot Radio Kits may be obtained separately. Send us a detailed list of your requirements. Quotations by return.

SEND NOW FOR THE PILOT CHART

Contains detailed Price Lists of all the latest and best Kits, and over 30 valuable Hints and Tips for the Amateur Constructor.

Sets described in this issue:

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KIT "A" Cash £5-8-0 Or 12 monthly payments of 9/11
 KIT "B" " £7-7-0 " " " 13/6
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KIT "A" Cash £ 6-6-4 Or 12 monthly payments of 11/7
 KIT "B" " £9-3-10 " " " 16/10
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FALCON A.C. UNIT

KIT "A" Cash £5-10-3 Or 12 monthly payments of 10/2
 KIT "B" " £7-10-3 " " " 12/0
 KIT "C" " £9-17-9 " " " 12/7

W.M. STANDARD D.C. UNIT

KIT "A" Cash £2-18-0 Or 6 monthly payments of 10/3

IMPORTANT NOTE.—Kit "A," is less valves and cabinet, Kit "B," is with valves, less cabinet, Kit "C," is complete with valves and cabinet.

PETO - SCOTT CO. LIMITED

POST THIS COUPON NOW

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Rubber Bands (24)	4	4
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Sample doz. (18 volts), complete with bands and electrolyte. No. 1, 4/1; No. 2, 5/- post 8d., terminals extra. No. 3, with terminals, 7/6 (10,000 millamps). Sample unit, 8d. Orders 10/- cart. paid. New illustrated catalogue post free.

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HALF A GUINEA FOR A SUGGESTION

When you have read all through this issue just sit back a minute and try to think of some subject of special interest to listeners that is not dealt with.

Then jot your idea down on a postcard and send it to "Suggestions No. 4," WIRELESS MAGAZINE, 58-61 Fetter Lane, E.C.4.

A prize not exceeding half a guinea each month will be given for

the best suggestion for the title or subject of an article with the most popular appeal.

The closing date for this month's competition is November 20.

Do not write a letter; a postcard only is required.

The winner of the September competition is Mr. D. Arrand, of Nun-Appleton, Bolton Percy, York.

"BAIRD VERSUS BELL"

BELOW we publish a letter received from Baird Television, Ltd., in reply to the remarks of Mr. Paul Findley quoted under the above title on page 257 of the October WIRELESS MAGAZINE:—

To the Editor, WIRELESS MAGAZINE,
SIR,—Under the heading "Baird versus Bell," you publish a letter from Mr. Paul B. Findley. Mr. Findley states that the latest model of the Bell apparatus employs 5,000 image channels, whereas the Baird Televisor employs only 2,100. He entirely omits to mention that the Baird Televisor is a commercial apparatus operating through the B.B.C. and limited, therefore, to a definite waveband of 9 kilocycles, which thus sets a definite limit to the number of picture elements which can be transmitted.

On the other hand, the Bell apparatus of which Mr. Findley writes was shown in a purely experimental way over a specially balanced landline. There can be no legitimate comparison whatever between the two achievements.

On the one hand we have a commercial apparatus working regularly under commercial conditions in the hands of the public, and working through a channel which definitely limits the frequency to a 9-kilocycle waveband. On the other hand we have a purely experimental result achieved over a telephone line with no limitation as to frequency employed. Nothing is easier than to construct a disc having 90, 100 or even more apertures and fix this up under laboratory conditions to give exceptional results. Picture images with as many as 90 lines and 8,000 elements have been transmitted experimentally in the Baird laboratories, but such experiments are of little interest unless they offer a commercial application.

H. J. BARTON CHAPPLE,
Information Department,
Baird Television, Ltd.

Our Tests of New Apparatus

SUPERIAL WIRE

ELECTRON aerial wire will need no introduction to readers, since it has been used in large quantities for many years. Briefly, it consists of one copper strand surrounded by a number of steel-wire strands to provide strength and suppleness. These are finally enclosed in a thick weatherproof insulation.

The wire is particularly adapted for use as an aerial, since it is immune from the effects of long exposure and, in fact, owing to the quality of the insulation, may be slung round a tree or chimney for temporary use.

Due to the large number of steel strands, the wire is exceptionally strong, and is better suited to take the strain caused by the movement of a tree to which it is attached than the majority of aerial wires.

NEW TYPE OF WIRE

The makers have recently issued a new type of aerial wire called Superial, in which the copper strand has been increased in diameter, thereby decreasing the high-frequency resistance.

Some readers may have a feeling that the efficiency of this form of wire is seriously below that of the usual stranded phosphor-bronze. This is not the case, and in order to demonstrate this one of the laboratory aerials which has been in use for some years was dismantled, and a Superial wire of exactly the same length substituted.

The voltage developed by the Brookman's Park carrier across a given tuning coil, energised by these two aerials, was compared, and proved to be identical. This aerial wire can be obtained in 100 ft. lengths. The makers are the New London Electron Works, Ltd., of East Ham, E.6.

ROTOROHM RESISTANCES

IN the early days of broadcasting, variable high resistances took the form of some sliding or rotating arm bearing on a high-resistance compound. Although this arrangement was satisfactory for a time, it was impossible to prevent scraping off the resistance material, which ultimately led to a variation in the resistance values, and caused consequent jerky noises in the loud-speaker

One of the most ingenious methods of overcoming this difficulty is utilised in the Rotorohm variable high resistance, sold by the Rotor Electric Co., Ltd. The resistance element is placed in circular formation in the bottom of a slot; bearing on this with continual pressure is a stationary coil of wire whose turns are insulated from each other.

A rotating plunger is arranged to make contact with the other side of this coil, and is, therefore, making indirect contact with various parts of the resistance, according to the position of the plunger. With this method of construction the



Rotorohm variable resistance

element is indestructible provided that no heavy current is passed through it.

The sample tested was arranged as a potentiometer, with a connection to either end of the resistance and one to the rotating arm. The element is so arranged that at one end the change in resistance is more gradual than throughout the remainder of the movement, and in consequence volume control is more uniform.

The maximum resistance of the sample tested was approximately 1.5 megohms, with a useful minimum of approximately 10,000 ohms. Placed across the secondary of an intervalve transformer, this provided admirable control of volume, from a whisper to full strength.

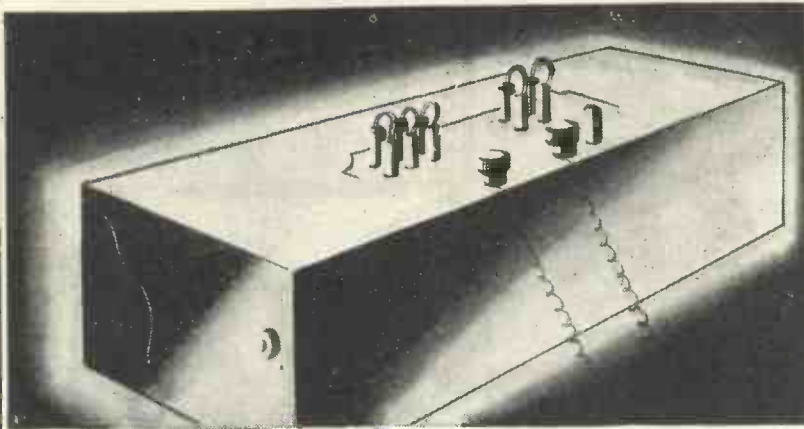
This may be also used as a variable grid leak, particularly in circuits employing a power detector, in which the value of the leak may, with advantage, be decreased to as little as 100,000 ohms for quality reproduction.

Around and About

OWNERS of Burndept portable sets will be interested to know that the Chief Engineer of the Zurich broadcasting station has just ordered one of these instruments for his personal use. We hear that this receiver met with a great reception at the Zurich Radio Exhibition.

We are asked by the Brownie Wireless Co. (Gt. Britain), Ltd., to advise readers that they no longer make valve holders. This decision has been made since the New Brookman's Three (see page 353) was built, but no doubt a number of dealers still have stocks.

Prospective constructors of the Five-point Three described last month should note that the two Gripso switches needed are 1s. 9d. each and not 2s. 3d. as indicated in the original list of components.



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POWER UNIT ALONE
(H.T., L.T., and G.B.) £6 6 0
ALL MAINS CONVERSION
EQUIPMENT from £8 5 0

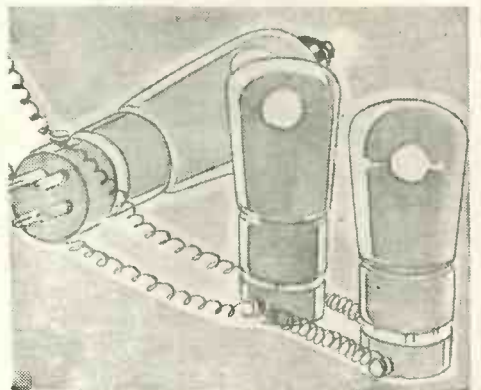
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Details of how to build these units are explained in the current issue. SEE that you use the SENSITITE Standard Unit boxes as specified. Price, D.C., 4/6; A.C., 7/6.

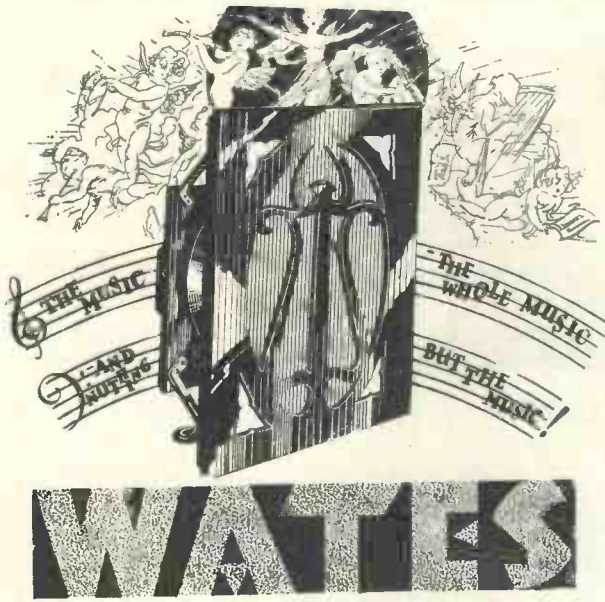
Have you heard about our new Sensitite All-electric Screened-grid 3 Kit? Wonderful range and power, easy to build, inexpensive to buy. In fact the finest value in all-mains receivers—Everything supplied—Nothing else needed, £9 10s.

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There is news in the "Wireless Magazine" advertisements

"Soul-stirring REALITY"



Patent No. 309214

"DOUBLE-CONE" CHASSIS

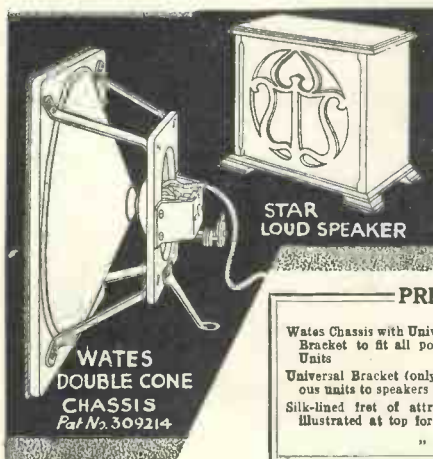
THE wonderful superiority of reproduction is due to the use of large and small cones which, being free to move within the chassis, accurately respond to the high and low frequencies, through the small and large cones respectively. The whole range of audible frequencies, from the high-pitched notes of string instruments to the deep full-throated majesty of bass notes, is reproduced with a fidelity and realism that adds enormously to the results of any unit. The most astonishingly life-like music and speech, however, is obtained when the chassis is fitted with the famous Wates Star Unit, now reduced to 25/-. Whatever unit you use, fit it to the Universal Chassis to-night and you will then realise how good your set really can be.

It must be heard to be believed. There is nothing else at any price to equal it. Ask your dealer to demonstrate, or if any difficulty write direct to the address below.

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Fully Illustrated Catalogue from:
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Silk-lined fret of attractive design, as illustrated at top for 12 in. chassis	4 0
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H & B

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The complete kit ready for immediate assembly. The finest kit it's possible to buy. Metal panel drilled to specification and sprayed in chocolate colour with gold finish, or in any colour you wish. **Cash Price, £5 15 0**
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Included in this kit are Full-size Blueprint, Wire, Screws, and Baseboard. Write for detailed list.

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The complete kit for the A.C. Unit, including U5 Rectifying Valve, Wires, Screws, Baseboard, Metal Cabinet and Blueprint. **Cash Price, £6 14 3**

NEW BROOKMAN'S THREE

A real distance getter, very selective and easy to assemble. H. & B. kit contains only the finest components it is possible to buy. Every part exactly as used by the designer. Panel drilled ready, Baseboard and Full-size Blueprint included in each kit. **Cash Price, £4 19 6** Valves, £1 19s. extra. Write for detailed list.

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Music Monitor Coils, 9/6. James Screened-grid Portable Coils, 9/6. Panel for Falcon A.C. Three, drilled, 3/-. Screen for same, 1/6.

Carriage Paid on all cash orders. C.O.D. charges paid on orders over £1.

H & B RADIO CO.

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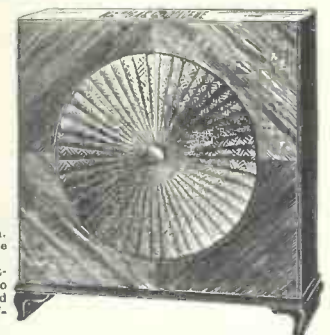
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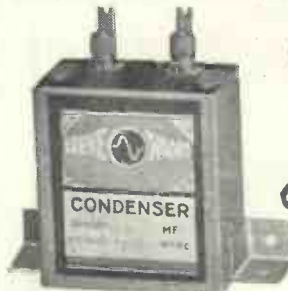


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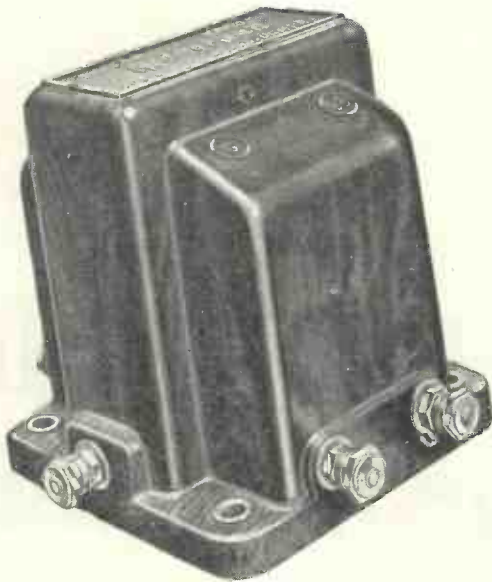
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Telsens "Radiogrand" Transformer, new model, shrouded in genuine Bakelite, with new windings and core, fitted with earth terminal. The outcome of careful research this transformer is scientifically designed right down to the smallest detail. Made in ratio 3-1 and 5-1 it will meet the needs of modern broadcasting conditions for several years to come.

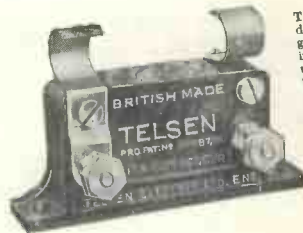
Price 12/6 each; Ratio 7-1, 17/6 each.
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Telsens Valve Holders. Pro. Pat. No. 20,266/30. An entirely new design in Valve Holders, embodying patent metal spring contacts which are designed to provide the most efficient contact with the valve legs, whilst allowing the valve to be inserted or withdrawn with an easy movement instead of being subjected to undue strain, which often causes damage and loss of efficiency to the valves. Low capacity, self-locking, supplied with patent soldering tags and hexagon terminal nuts.

Price 1/- each.
 Price 1/8 each.
 Also 6-pin.



Telsens Fixed (Mica) Condensers, shrouded in genuine bakelite, made in capacities up to 0.002 u.F. Pro. pat. No. 20,287/30. 0.003 supplied complete with Patent Grid Leak Clips to facilitate series or parallel connection. Can be mounted upright or flat. Tested on 500 volts. Price 1/- each.

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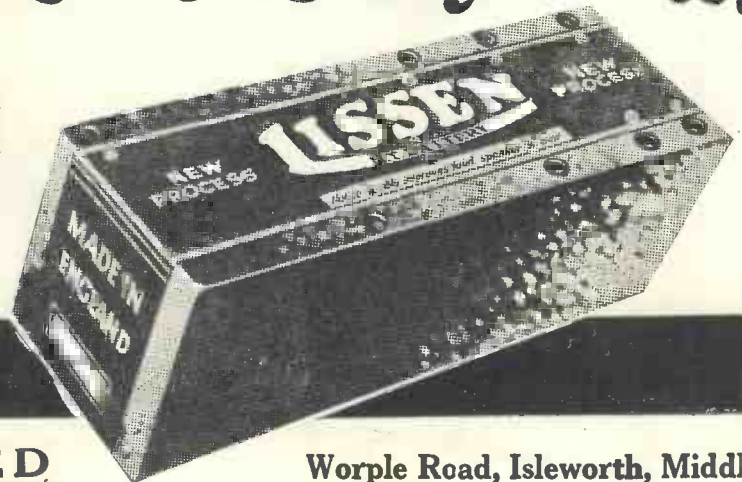
“Current per Cell”—that is the modern test of the H.T. battery for radio. Because with modern valves the drain upon your H.T. battery is very heavy and every cell to-day must do its share.

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Speedy replies result from mentioning “Wireless Magazine”

An Editorial Word

IS TELEVISION AT A STANDSTILL?

IN the arguments on television that have interested wireless people during the last four or five years, I have found difficulty in allying myself with either the pessimist or the optimist. I have always thought the pessimist to be unfair; I have always known the optimist to be so.

The trouble with television was that it was announced too early. Almost as soon as the public had had its imagination stirred by the broadcasting of sound, there came the revival of the old idea of television. Many, many years before practical men could possibly give the public thoroughly satisfactory television transmitters and receivers the public jumped to the idea that television was at hand, and foolishly expected to be able in the very near future to place something like a hooded focusing screen on the top of their wireless sets and see on it public events re-enacted before their eyes with all the natural colours and vivacity associated with the old-fashioned camera-obscura or the view-finder of a camera. I have found it difficult to convince some people that, as far as could now be seen, the present system of television did not contain the basic principle which would make any such miracle possible.

I have seen most things that Baird television has done during the last seven or eight years. Mr. J. L. Baird, for whom I have both respect and liking, has from time to time invited me to see the results of his labours. I saw them as far back as 1923, I think, in a back room in Soho when Mr. Baird was using possibly the crudest experimental apparatus I have ever seen in my life. Nowadays his apparatus is the best in the world.

I think it would have been good for television if Mr. Baird, in those early days, had interested some rich patron who would have been content for the inventor to work out his ideas patiently until television was ready for commercial introduction. But "might have been" are rather easy after the event. Mr. Baird's invention proceeded by the course which is customary nowadays, that of forming a development company and inviting the public to subscribe the capital to be used in experimentation. In due course, another company—definitely a commercialising company—was formed, and we have during the last few years had opportunities of judging what the company regards as a commercial result.

I remember, approximately two years ago, seeing what I thought was a most beautiful televised picture in Mr. Baird's Long Acre studio. I was delighted with the quality of the line-transmitted pictures and remember recording my impressions at the time. His pictures had all the quality of soft photographic enlargements and I realised that Mr. Baird, by looking to mechanical details and particularly by making a stride forward in the method of lighting, had very considerably improved his results. When, however, the picture was transmitted by wireless instead of by line, there was considerable falling off in quality.

For many months we have had in our editorial laboratory a Baird Televisor and occasionally I "look-in" to the pictures televised from Long Acre via the B.B.C. Must I confess to a feeling of disappointment?

Let me explain that I am one of those who have wanted television to "make good"; I am one of those who have resented unfair attacks on the inventor and his system. But I must admit that I have not seen improvement in televised pictures for a long time, and that seems to me to be frankly disappointing. If the system is the right system, if it contains within itself the kernel of a wonderful fruition, it should have shown definite improvement during the past two years. Perhaps it has—unknown to me.

Contrast what you hear to-day from a first-rate set operating an equally good loud-speaker and what you heard in 1922! Both transmission and reception of broadcast sound have made enormous strides, very largely in the perfection of details, not in the discovery of new principles. There was in the broadcasting and reception of 1922 the prototype of everything in broadcasting to-day.

Have we now in television in this country or elsewhere something that can be developed in the next few years to give us anything comparable to the present state of broadcasting?

I have to confess that if I compare the first broadcast I saw in Mr. Baird's Long Acre studio with the full-size televised picture presented on the stage at the Coliseum Theatre this summer, I might be tempted to suppose that television has gone backwards!

Fortunately, I know that it has not, but I feel that a public demonstration of the kind witnessed at the Coliseum was a mistake. The public looked at a crude representation which I from my seat in the stalls could scarcely recognise, although some of the ladies and gentlemen whose features were being transmitted were familiar to me.

The public wondered what it was all about. It was just another instance of an idea being exploited at the laboratory stage rather than allowing it to develop into such a state of progress as would create immediate enthusiasm when the public saw it. The demonstration gave an opportunity for some critics to think and say damning things about the system, and rather than assisting television told very heavily against it. Thousands of people left the Coliseum under the belief that television could do nothing better than produce a caricature from which that subtle thing "likeness" was absent. I know differently, but the public could only form their ideas from the public demonstration.

What really are the prospects of television in this country in the immediate future? Can Mr. Baird provide the public with a service of televised pictures which in quality will give pleasure and in their nature provoke interest? Is the development of television at this moment at a standstill? Has the system already produced all it has to give?

These questions are vitally interesting and if Mr. Baird himself sees fit to provide the answers in our pages, I am sure that every reader will be delighted to read what he has to say.

Bernard Jones



What Wireless Means to A Great Hospital

IN a hospital it is not uncommon for a nurse to have to remove the earphones from a sleeping patient's head . . .

It is perhaps incorrect to say that wireless is the greatest gift to an invalid. It probably comes as a greater blessing to the blind—who can say what it has meant to them to have a miraculous new world opened up for their enjoyment?

Psychology of Blindness

If ever a history were written of the psychology of blindness, surely radio would be heralded as something of the utmost importance.

If the blind come first in the rank of those who have drawn the maximum of enjoyment from wireless, I think it would be only just to give invalids the second place. To them it is a godsend which lessens their sufferings and hastens their recovery.

In the Middlesex Hospital, it is installed almost throughout and I have yet to meet the patient who does not fully appreciate the enjoyment which it offers. I believe that there was once a man who told me he did not like it, but I could not even be sure of this!

The worst feature of illness is often not the illness itself but the enforced idleness. A man is suddenly switched from a life of happy activity into a

By *DOROTHY M. SMITH*
(Lady Superintendent of the Middlesex Hospital, who is a great believer in the healing powers of radio).

state in which, before wireless came, he was compelled more or less to lie still and think . . . And too much thinking when one is ill and depressed can be a bad thing.

One's thoughts are not likely to be pleasant ones or such as are conducive to a speedy recovery. There is always a danger of introspection, that is, of thinking over and over again how unfortunate one is, and of the things one ought to be doing if one were well. The greatest good which wireless does to the invalid is to take his mind off himself.

Under the conditions of an ordinary illness of sufficient severity to merit entry into a hospital, it is nearly impossible to direct an invalid's mind into the right channels in any other way than by wireless.

It is so much healthier for a man to be listening in to a Promenade Concert than to be wondering how his business is going in his absence. It is so much better for a woman to be laughing at a vaudeville item than to be worrying about how her children are managing without her.

Worry does not help Nature in her

task of curing. Wireless, besides doing so much to lessen the amount of worry indulged in by hospital patients, is also helping to give them the mental attitude likely to speed their way to normal health.

And here is another virtue of wireless; it is suitable for every type of patient at every stage of recovery. I do not consider loud-speakers are suitable in the hospital except in the children's ward. In every other instance earphones are installed, and thus each patient can form a little isolated world of his own in which he can listen or not listen according to his mood or personal preferences.

Easiest Form of Entertainment

Radio is the easiest form of entertainment, the one which makes the least demand on the listener, and this makes it particularly suitable for the invalid who may be short of patience or feel the need of a form of entertainment which, although enjoyable, does not make too great a demand on his strength.

In our own case, the earphones sometimes provide a welcome refuge from the noise of hammers—only it must be added, a temporary noise, due to our rebuilding scheme, for which we still need much money!

I am sometimes asked what items out of the broadcasting programmes

re best appreciated by the patients. It is difficult to mention any one section and say: "That is what they like best," but there is no doubt that the Sunday evening service is very highly appreciated. It is an extraordinary sight to see quite a number of a ward full of patients actually joining in the singing of hymns by an unseen and absent congregation, but this often happens.

News Bulletins

Men seem to have a very keen interest in the news bulletins. I think it must be that, lying helpless in hospital, they feel a little out of touch with the great world outside and seek to re-establish contact by listening to the latest developments in the community of which they hope shortly to be healthy members.

Next in popularity come the variety hours. This, of course, is a very good sign, for the healing power of laughter has long been widely appreciated. "Laugh and grow fit!" is not a bad policy for the hospital patient, and wireless is certainly helping him to do it. Outside broadcasts of sporting events and so forth are always, quite naturally, sure of a hearty welcome. To be able to be present in spirit, if not in body, at these events is a great boon.

Strange and New

It may seem strange to readers of this article, but we actually get patients from the depths of the

New Names for Old

*The Sailor's Arms 'twas called of yore—
They called it that for years and years;
They say that in the Civil War
The place was noted for its beers.*

*The Sailor's Arms 'twas called of yore—
That inn upon the broad highway,
And that's the quaint old name it bore
Until a very recent day.*

Exhibited for all to seek,
The name was there in letters brown.
Until one afternoon last week
They took the ancient title down.

For when they got "The Brookman's Four"
The villagers came flocking in,
And painted up upon the door:
"This here we've called *The Listening Inn!*"
C.P.P.

country to whom wireless is something strange and new. They have never heard a wireless set before! As may be imagined, their enjoyment of the programmes is even greater than that of the patients who have sets of their own at home.

It is for reasons such as the foregoing that I am convinced of the good work which wireless is doing in hospitals, and opposed to those who decry it. Anything which can help

an invalid to forget his own troubles and put him in a cheerful frame of mind cannot but help to hasten his journey towards good health.

A Good Influence

This, wireless is doing. Therefore its influence is all to the good, and I am sure that any ex-patient who has enjoyed wireless during his enforced helplessness will support me in this statement.

FOR THE SHORT-WAVE EXPERIMENTER

Metres	Kilo-cycles	Call	Station	Metres	Kilo-cycles	Call	Station
15.94	18,820	PLE	Bandoeng (Java).	37	8,108	HS4PJ	Bangkok (Siam), 200 watts.
16.8	17,850	PLF	Bandoeng (Java).	39.98	7,500	EK4ZZZ	Danzig (Germany).
16.9	17,750	HSP	Bangkok (Siam), 20 kw.	40.90	7,390		Paris Experimental (France), 1.2 kw.
18.8	15,957	PLG	Bandoeng (Java).	41.3	7,264	PBFS	Eindhoven (Holland).
19.56	15,337	W2XAD	Schenectady (New York). Relays WGY.	43.60	6,881	SMC	Casablanca (North Africa).
19.72	15,210	W8 XK	East Pittsburg (Pa.). Relays KDKA.	43.86	6,840	VRY	Georgetown (British Guiana).
19.83	15,130	W3XAL	Boundbrook (New Jersey).	44	6,818	XDA	Mexico City.
19.84	15,121		Rome (Vatican station testing).	45	6,866	CT1AA	Lisbon (Portugal).
21.5	13,950		Bucarest (Romania), 150 watts.	47	6,383	CT3AG	Funchal (Madeira Islands), 0.3 kw.
21.91	13,690	W2XO	Schenectady (New York). Relays WGY.	48.86	6,140	W8XK	East Pittsburg (Pa.). Relays KDKA.
22.07	13,630	W2XO	Schenectady (New York). Relays WGY.	49.02	6,120	W2XE	Richmond Hill (New York). Relays WABC.
25	12,000		Oporto (Portugal)				
25.36	11,830		Calcutta (India) testing.	49.18	6,105	W3XAL	Boundbrook (New Jersey), 12 kw.
25.4	11,810	3RO	Rome (Italy), 9 kw.	49.5	6,060	W3XAU	Philadelphia (Pa.).
25.42	11,800	W2XAL	Coytesville (New Jersey). Relays WRNY.	49.5	6,060	W8XAL	Mason (Ohio). Relays WLW.
25.53	11,751	G5SW	Cnelmsford (England), 15 kw.	49.67	6,040	W2XAL	Coytesville (New Jersey). Relays WRNY.
25.6	11,718	CJRX	Winnipeg (Canada), 2 kw.	49.83	6,020	W9XF	Downer's Grove (Ill.). 5 kw. Relays WENR, Chicago.
26.6	11,278	1BDK	Brussels (Belgium).				
28	10,710	CT1BO	Lisbon (Portugal).	50.25	5,980		Rome (Vatican station testing).
28.8	10,410	VK2ME	Sydney (Australia), 20 kw.	52.8	5,682	OCTU	Tunis Kasbah (North Africa).
29	10,300		Paris Experimental (France), 1 kw.	58	5,172	OVJMPT	Prague (Czechoslovakia).
29.5	10,167	HS2PJ	Bangkok (Siam), 0.5 kw.	60	5,000		Bratislava (Czechoslovakia).
30.5	9,836		Poznan (Poland), 300 watts.	62.5	4,800	W8XK	East Pittsburg (Pa.), 40 kw. Relays KDKA
31.1	9,677	7LO	Nairobi (Kenya Colony).				
31.28	9,590	PCJ	Eindhoven (Holland), 25 kw.	62.56	4,795	W9XAM	Elgin National Watch Co. (Ill.). Time Signals.
31.38	9,560		Zeesen (Germany), 8 kw. Relays Berlin.	80	3,750	3RO	Rome (Italy), 9 kw.
31.48	9,530	W2XAF	Schenectady (New York), 40 kw. Relays WGY.	135	2,222	W2XB	Oslo (Norway).
31.6	9,494	OXY	Lyngby (Denmark).	139	2,158		New York.
33	9,090		Radio Vitus (Paris).	192.3	1,560		Scheveningen-Haven (Holland).
34.68	8,660	W6XN	Oakland (Cal.). 5 kw. Relays KGO.				

Further Notes on

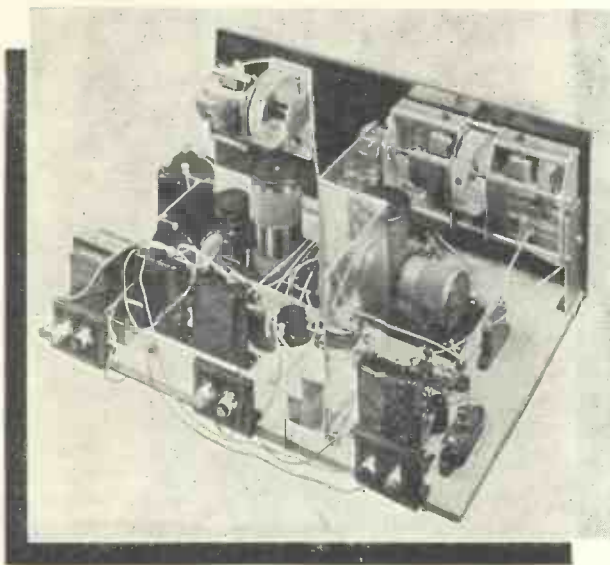
The REGIONAL BAND-PASS FOUR

The New Four-valve
Screened-grid Set
Designed by
W. JAMES
Full Constructional
Details Were Given
Last Month

BAND-PASS tuning has so many advantages that quite an amount could be written of the systems used. The idea is, of course, to put between the aerial and the first valve a really selective device, and yet one which does not distort the signals.

In practice it is easy enough to provide such a device for one wavelength only. The width of the band of frequencies passed on can be regulated to suit broadcast conditions, and, in fact, an almost ideal filter can be provided.

It is not so easy to deal with a wide range of wavelengths, such as from 200 to 550 metres. To cover this range we must tune by altering the capacity or inductance incorporated in the



ACCESSIBLE ASSEMBLY OF GANG CONDENSER

This view of the Regional Band-pass Four shows how accessible are all the parts, in particular the gang condenser and Binowave coils

circuits.

The high-frequency resistance of the circuits therefore alters, and it is rather difficult to provide a coupling between two circuits which will give the complete filter the desired characteristics over the whole range.

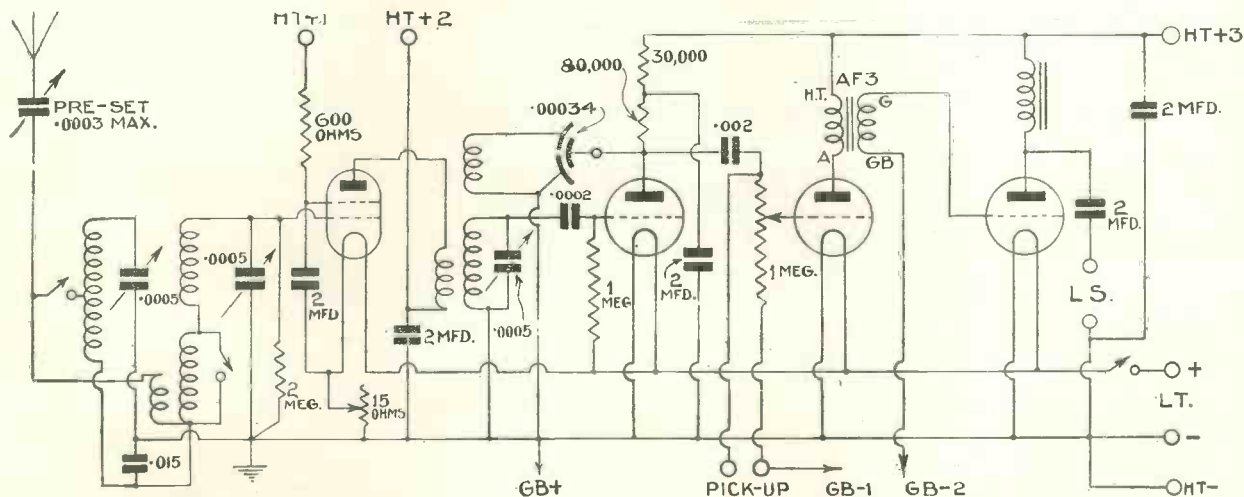
We are helped in this matter, however, by the tuning characteristics of the rest of the circuit. In the Regional Band-pass Four, for example, we have the aerial-circuit filter and a tuned transformer between the screened-grid and detector

valves. Plain tuned circuits tune more sharply at the longer wavelengths, the ratio of capacity to inductance being greater at the longer than the shorter wavelengths.

Filters may have the opposite characteristics, or give nearly uniform tuning over the range. What really matters, however, is that the combined tuning shall be satisfactory, and this has been achieved in the new set.

Naturally, the effect of reaction is to modify the tuning curves. Reaction tends to weaken the high notes when applied to the detector circuit of the set, but it must be remembered that feed-back through the screened-grid valve will tend to move the peaks of the filter farther apart, the effect being one of high-note accentuation.

In this set a capacity-coupled filter is used. It is not purely a capacitive coupling, as a little coupling is allowed to remain between the pair of medium-wave coils for the



CIRCUIT OF THE REGIONAL BAND-PASS FOUR

This set comprises screened-grid valve, leaky-detector and two low-frequency stages—resistance- and transformer-coupled respectively

purpose of improving the effect over the whole range.

When first tuning the aerial could be connected through the pre-set condenser direct to the grid of the first valve. With this connection the aerial coil is cut out, but the pre-set condenser must be reduced to a low value.

A station can be tuned in and then the aerial can be put back to its old position and the filter adjusted. The adjustment of the filter is really an easy matter, but is best carried out carefully.

Trimming Adjustments

All that has to be done really is to set the trimming condenser across the aerial-circuit condenser, leaving the pre-set condenser at a low value and the trimming condenser connected to the second (grid tuning) condenser at zero. But in practice the signal strength may be poor, owing to the low value of the pre-set condenser.

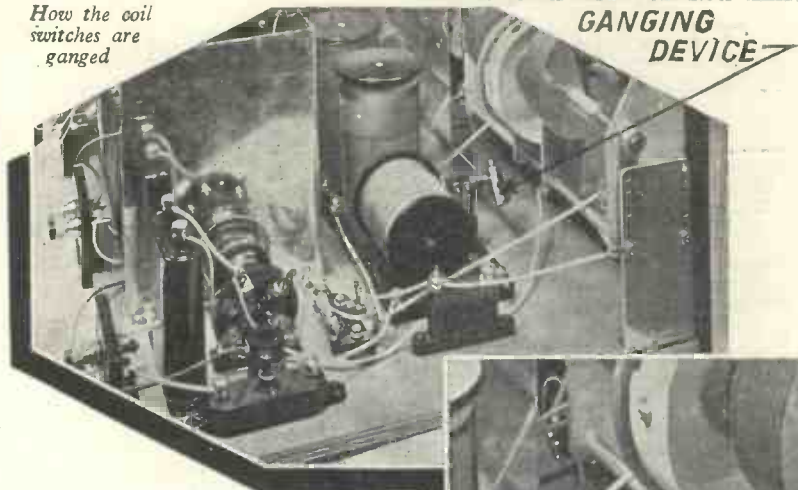
It is therefore necessary to increase this a little, and at the same time either to increase the capacity across the grid circuit or to reduce the trimming condenser in the aerial circuit. The amount of the signal developed across the ends of the tuned circuit can be adjusted in this way, while the filter-circuit balance is easily effected.

No Appreciable Loss

Some curves taken are given and show that at the wavelength of London Regional the filter action is good. There is no appreciable loss. At the wavelength of 5GB the tuning of the filter is even more broad, but the tuned transformer between the valves is more sharp, so that the net result is a tuning curve showing sharpness with little distortion.

On the lower wavelengths the interval circuit tunes more broadly, but the filter circuit itself is fairly sharp, with the result that the com-

How the coil switches are ganged



Last month W. James described his "star" set for the new season. It has been specially designed for WIRELESS MAGAZINE readers and will create particular interest in all radio circles. It will receive thirty stations almost anywhere in the British Isles.

Many novel features have been introduced, but only where they are of real practical value. Here are the ten chief points of interest in the design:—

1. **Band-pass Tuning** to give the necessary degree of selectivity under modern broadcasting conditions.

2. **Uniform Selectivity** on all wavelengths is a feature of great practical value.

3. **Uniform Magnification** ensures consistently good results.

4. **Simplified Tuning** means that the set can be operated satisfactorily even by the inexperienced.

5. **Two Volume Controls** are provided to avoid overloading, one for the high-frequency side, and another for the low-frequency side.

6. **Both Medium and Long Wavelengths** are covered by the special Binowave coils, controlled by a single wave-change switch.

7. **A Gramophone Pick-up** can be used without any alteration to the set at all.

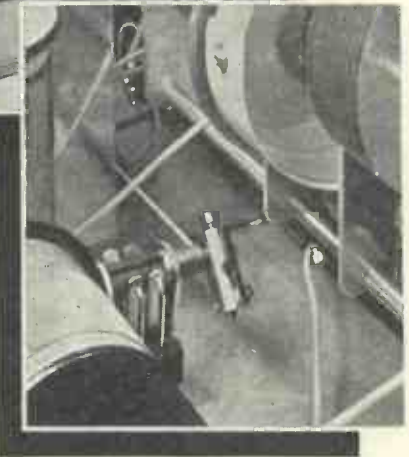
8. **Great Magnification** is provided by the Binowave coils and the special arrangement of the circuit.

9. **Perfect Stability** is a feature of this as well as every set designed by W. James.

10. **The Best Quality** is assured provided the correct valves and anode voltages are used.

Last, but not least, we believe that the thousands of constructors who will want to build this set will be able to get all the parts without delay. So start building this wonderful set to-day!

combined tuning is satisfactory; much more so than without the filter.



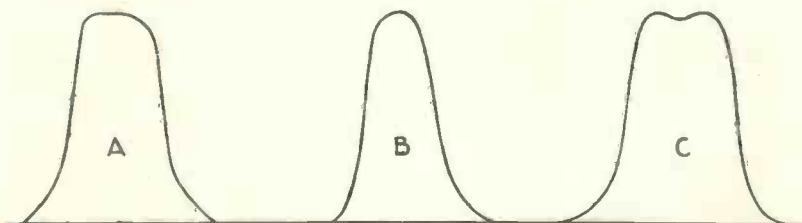
For this reason the receiver handles rather differently from ordinary sets. When tuning the filter circuit, for example, a station is brought in over a degree or two, as compared with the much sharper tuning and variation in strength experienced with the ordinary circuit. With a band-pass circuit a station is heard at practically uniform strength over a degree or two and then falls off quickly.

Stability and Capacity

It is well known that for the maximum high-frequency magnification with stability not only must the circuit be suitable, but the valve itself must have the minimum anode-grid capacity combined with good characteristics.

A new valve which seems to work very well is the Cossor screened-grid, and is one worth trying in the set. There are other makes of screened-grid valves which are satisfactory in the set, but it is as well to choose the best.

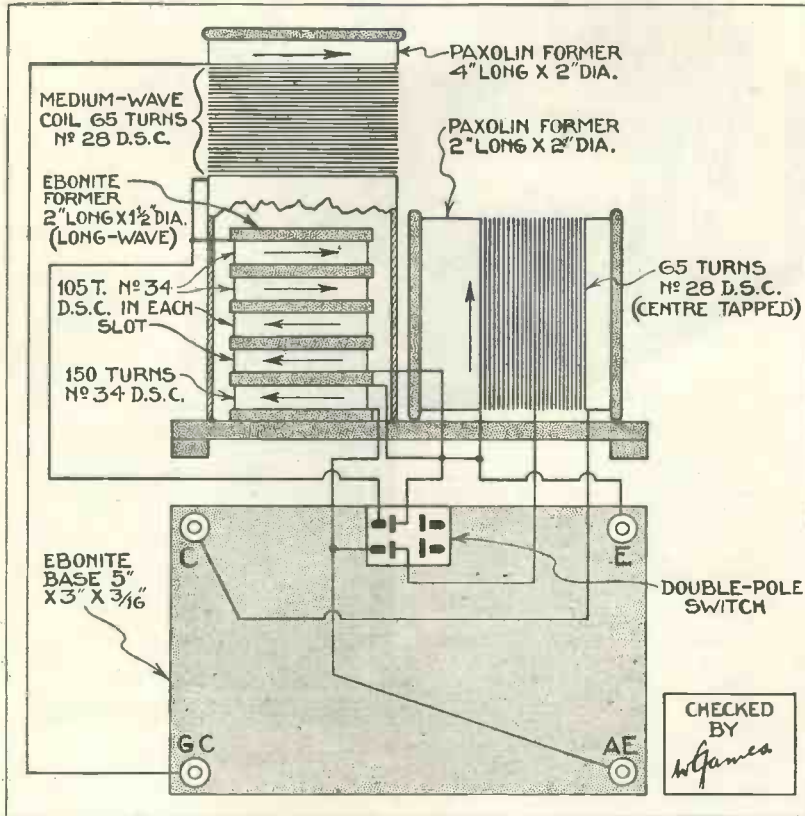
For detection a valve having a moderate impedance is needed, and since the first article was written new Marconi and Osram valves have appeared. The particular valves have an amplification factor of 35 with an impedance of 35,000 ohms,



TUNING CHARACTERISTICS OF THE REGIONAL BAND-PASS FOUR

A.—Tuning at London Regional. B.—At London National. C.—Midland Regional

The Regional Band-pass Four—Continued



BINOWAVE COIL TYPE E

Constructional details of type E (band-pass) Binowave coil as used in the Regional Band-pass Four

and owing to careful construction there is an absence of microphonic feed-back.

A valve of this type is not needed in the first low-frequency position, as the total magnification would be too great. It is better to use a valve of the 20,000-ohm type, typical examples being the Mazda HL, Cossor HF, and Marconi HL.

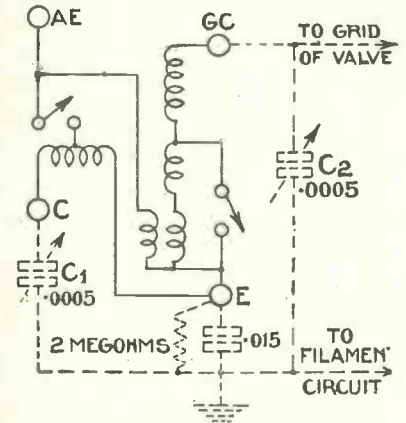
Choice of Power Valve

In the power stage we should always use the biggest valve that can be supplied from the high tension available. I would recommend a valve such as the Mazda P240, which has an impedance of 1,900 ohms and an amplification factor of 7, but those who use dry batteries might not be prepared to use the largest types and to supply adequate current.

With a smaller power valve, of which there are several good types to choose from, such as the Marconi and Osram P2 valves and the Cossor 220P, enough volume for most purposes will be obtained,

particularly when plenty of high tension is used.

A supply of 100 volts is not of much real use; 120 volts is a little better, and is, in fact, what many people use; but for the finest results



Circuit of the type E Binowave coil, specially designed by W. James

the highest voltage that the valves will take ought to be provided. Always use enough grid bias for the last valve; in fact, too great a bias is to be preferred to too little.

COMPONENTS FOR THE REGIONAL BAND-PASS FOUR

CHOKES, LOW-FREQUENCY

- 1—R.I. Hypercoar, 17s. 6d. (or Climax, Varley).

COILS

- 2—Wearite 1930 Binowave, types C and E with ganging device, £1 15s.

CONDENSERS, FIXED

- 1—T.C.C. .0002-microfarad, upright type, 1s. 6d. (or Dubilier, Trix).
- 1—T.C.C. .002-microfarad, upright type, 1s. 10d. (or Dubilier, Trix).
- 1—T.C.C. .015-microfarad, upright type, 3s. 3d. (or Dubilier, Hydra).
- 5—Ferranti 2-microfarad, 12s. 6d. (or Mullard, T.C.C.).

CONDENSERS, VARIABLE

- 1—Jackson two-gang Chassimount, .0005-microfarad, type C2, with drum dial, £1 6s. 6d.
- 1—Jackson .0005-microfarad universal log, with junior drum dial, 19s.
- 1—Lotus .00084-microfarad differential, 8s. 6d. (or Ready Radio).
- 1—Polar preset .0003-microfarad maximum, 2s. (or Formo, Lewcos).

EBONITE

- 1—Becol 18 in. by 7 in. panel, 7s. 7d. (or Lissen, Peto-Scott).
- 3—Junit terminal blocks, 2s. 3d. (or Lissen).

HOLDERS, VALVE

- 3—W.B. rigid type, 3s.
- 1—W.B. universal type, 1s. 3d. (or Junit).

PLUGS

- 7—Belling-Lee, marked: G.B.+ , G.B.—1, G.B.—2, H.T.—, H.T.+1, H.T.+2, H.T.+3, 1s. 9d. (or Ealex, Clix).
- 2—Belling-Lee spades, marked: L.T.+ , L.T.—9d. (or Ealex, Clix).

RESISTANCES, FIXED

- 1—Simmonds 600-ohm, 1s. 6d. (or Magnum, Wearite).
- 1—Magnum 30,000-ohm, flexible spaghetti type, 1s. 6d.
- 1—Magnum 80,000-ohm, flexible spaghetti type, 1s. 6d.

COMPONENTS FOR THE REGIONAL BAND-PASS FOUR

- 1—Lissen 1-megohm, with holder, 1s. 6d. (or Dubilier).
- 1—Lissen 2-megohm, with holder, 1s. 6d. (or Dubilier).

RESISTANCES, VARIABLE

- 1—Rotorohm 1-megohm potentiometer, type M, 6s. 6d.
- 1—Wearite 15-ohm rheostat, 1s. 6d.

SCREEN

- 1—Parex to specification (or Ready Radio, H. & B.).

SUNDRIES

- Tinned copper wire for connecting.
- Length of Sistofolex sleeving.
- 1—pair Bulgin grid-bias battery clips, 6d.
- 1—Bulgin Midget on-off switch, 10½d.

TERMINALS

- 6—Belling-Lee, marked: Aerial, Earth, L.S.—, L.S.—, Pick-up (2), 1s. 6d. (or Ealex, Igranic).

TRANSFORMER, LOW-FREQUENCY

- 1—Ferranti, type AF3, £1 5s. (or Varley, Phillips).

ACCESSORIES

BATTERIES

- 1—Ever Ready power, 120 volts, £2 2s. 6d. (or Siemens, Pertrix).
- 1—Ever Ready 16-volt grid-bias, standard type, 3s. 6d. (or Siemens, Pertrix).
- 1—Fuller 2-volt, type LDG, 9s. 6d. (or Lissen Marcomiphone).

CABINET

- 1—Pickett table model, £1 1s. (or Camco, Digby).

LOUD-SPEAKER

- 1—Ediswan cone, £3 (or Amplion Lion, Celestion).

VALVES

- 1—Mazda 216SG, £1 (or Cossor 215SG).
- 1—Marconi H2, 8s. 6d. (or Osram H2, Mazda HL210).
- 1—Mazda HL210, 8s. 6d. (or Cossor 210HF, Marconi HL210).
- 1—Mazda P220, 10s. 6d. (or Marconi P2, Cossor 220P).

The prices mentioned are those for the parts used in the original set; the prices of alternatives as indicated in the brackets may be either higher or lower

Easy Steps in Radio



Everything the beginner wants to know about his (or her) radio installation is simply explained in this special supplement. No previous technical knowledge on the part of the reader has been assumed. Everybody will be able to understand this simple "step by step" guide, which has been compiled by D. SISON RELPH & ALAN HUNTER

The Nature of Wireless

WIRELESS transmission consists of waves vibrating in a medium we call the ether. It is intangible and invisible, yet it is all-pervading, otherwise wireless would be impossible.

The transmitting station creates waves in the ether by setting up an electrical movement in its aerial. When a wireless wave at the transmitting point creates a disturbance in the ether, that disturbance is felt *one second later* at all points 300,000,000 metres (or 186,000 miles) away.

Tremendous Speed

Wireless waves are therefore almost instantaneous in speed. They have the same speed as light, namely, 300,000,000 metres (or 186,000 miles) per second. All wireless waves, no matter what their source or nature, travel at this speed.

The simplest possible sequence of wireless transmission and reception is this: (a) sound waves are converted by a microphone into electric-current variations, (b) electric-current variations are converted by the transmitter into ether vibrations, (c) ether vibrations are converted by the receiver into electric-current variations, and (d) electric-current variations are converted into sound waves by the loud-speaker.

The fundamental similarity of wireless waves is their speed, constant at 300,000,000 metres per second. But although all wireless waves travel through the ether at the same speed, the frequency with which they cause the ether to vibrate differs for every wave.

This frequency of a wireless

wave is determined by its length. As the speed is constant, the longer the wave, the less frequent will be the waves passing a given point in a second.

A long wave is said to have a low frequency and a short wave a high frequency. The connection between frequency, wavelength, and speed of wireless waves is expressed by the simple equation: frequency equals speed divided by wavelength.

We speak of a wireless wave having a certain frequency. But when it is a music or speech signal there are other frequencies associated with the fundamental. These frequencies correspond to the speech and music impressed

upon the wireless wave at the transmitter.

Three distinct ranges of wavelengths are in general use for broadcasting:—

1.—The ultra-short waves between, say, 10 and 100 metres; these waves are of very high frequency. They are used by short-wave broadcasting stations where world-wide range is desired. But these waves are not very consistent or reliable.

2.—Medium waves between, say, 250 and 650 metres; these are used by the majority of European broadcasting stations.

3.—Long waves between, say, 1,000 and 2,000 metres; these are used by high-power broadcasting

stations where a wide range of reliable reception is required.

For a given power, long waves are the most reliable, but the ultra-short waves have the greatest range. The medium waves provide a good compromise between reliability and range, hence their popularity for broadcasting stations.

In All Directions

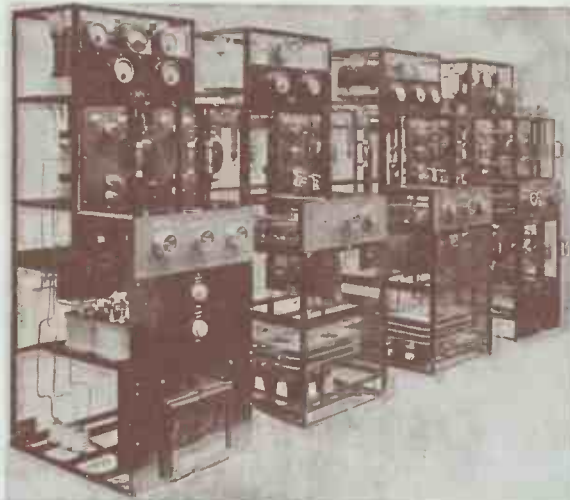
When a broadcasting station sends out a wireless wave or, in other words, creates a vibration in the ether, that all-pervading medium is universally affected. This means that from the point of transmission signals go out in all directions.

The broadcasting power is expended in all directions, but the proportion of power utilised by each receiver is infinitesimally small.

It is not the power of the wireless wave that creates the movement of air caused by the movement of the diaphragm of the loud-speaker. The wireless wave simply controls latent, but already present, power in the valves at the receiving end.

Wireless waves can be deflected from their course; a mountain containing metallic ore will shield the valley beyond from wireless waves. Similarly, a large steel building will prevent wireless waves from penetrating properly to a portable set inside.

Besides being deflected, wireless waves are reflected by the upper atmosphere. Unfortunately the reflection is not constant, so wireless reception dependant upon reflected waves is apt to be unreliable.



A Marconi 6-kilowatt transmitting installation. This is the type of equipment used at a normal broadcasting station. The old transmitter at 2LO was of this type

Aerial and Earth Essentials

THE aerial connected to a receiving set is a device for converting etheric wireless waves into electric-current variations. It consists of a length of low-resistance wire suspended as high as possible, free at one end and connected to the aerial terminal of the set at the other.

Thus suspended, an aerial wire readily responds to vibrations in the ether. So when a wireless wave is sent from a broadcasting station, minute high-frequency oscillating currents are developed along the aerial wire.

Aerial Efficiency

The lower the resistance of the aerial system, the greater will be the energy developed. With small sets an efficient aerial is essential.

Aerials can be divided into two distinct types. Firstly, there is the open aerial, consisting of a suspended wire working in con-



A frame aerial consists of a length of wire wound round a rectangular or other regular-shaped former. It takes the place of an aerial coil in a set and is tuned to the desired wavelength by a variable condenser

junction with an earth connection. Secondly, there is the frame aerial consisting of a length of wire wound into a loop or square, from one to three feet in diameter; frame aerials do not generally have earth connections.

The open aerial is the more efficient. With average height and length it receives equally well from all directions. The frame aerial is not very efficient, although due to its special action it is in great use. The frame aerial develops far more energy when it is pointing in the direction of the incoming signal than when it is otherwise placed.

This directional property is

Because modern sets are so efficient that they will give some sort of result even under the worst conditions, the aerial and earth system of a receiving installation often gets too little attention. A good aerial and earth may be equivalent to an extra valve in the set, so take trouble to erect the best you possibly can.

In an aerial-earth system the earth connection is as important as the aerial, a point that many listeners do not grasp.

valuable in eliminating interference between two signals that cannot be easily separated by the process of tuning. But it is only of use in this way when the signals are coming from directions approximately at right angles with respect to the receiver. For confined spaces the frame aerial is widely adopted, as in portable and transportable sets.

In general, the type of aerial recommended is a suspended wire, either outside or inside the house, preferably outside. The total length of the aerial wire is fixed by law at 100 feet. This is measured from the free end to the aerial terminal of the receiver. Under present-day conditions the full permissible length of aerial wire is seldom wanted; 70 feet is a good average length.

Two cardinal rules apply to aerial erection: isolation and insulation. The wire must not be allowed to come into direct contact with any object between the point of suspension and the aerial terminal of the set. In other words, it must be well insulated.

Isolation is not so easy to achieve; we mean isolation from earthed objects. The aerial wire should not run parallel for any length with any earthed object, such as the side of the house or the roof; nor must the wire inside the house be more than a few feet in length, otherwise some of the energy received by the aerial will be dissipated before it reaches the receiver.

Value of Short Wires

The guiding rule is to keep the energy received away from the earth until it has passed through the set and then to lead it to earth as efficiently as possible by means of a short, low-resistance wire.

The aerial should, if possible, be erected outside the house; and height is more important than length. In fact, the ideal aerial would be a 100-foot vertical wire; but as that is almost impracticable,

as much as possible of the wire should be utilised in the downward stretch—which should be kept several feet away from the wall.

Indoor aerials are more efficient than frame aerials; as far as possible, the rules of outdoor-aerial erection should be observed with the indoor aerial. A total length of 50 feet is recommended.

The best wire to use for aerials is the stranded type, and it should be low-resistance copper of high conductivity. That known as "7/22" aerial wire is recommended. It need not be enamel covered, although in towns this is an advantage. Indoor aerial wire can conveniently be a single strand of cotton-covered wire of stout gauge.

Earths are a problem in many homes. The ideal is a large metal plate buried below the aerial wire, but a good substitute is a 3-foot metal spike or earth tube. The

pipe, which usually makes extensive contact with earth. The metal on the pipe should be scraped bright and a stout clip fixed round it.

Gas pipes should be avoided; the danger from this contact is negligible, but the inefficiency due to the white-lead joints is considerable.

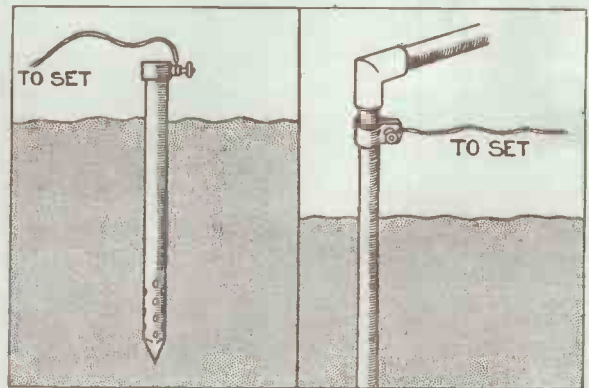
Under modern conditions the aerial is not so important as it used to be, owing to the great increase in the power of transmitting stations and in the amplifying properties of wireless receiving apparatus. But with a small set there is still a need for an efficient aerial if maximum efficiency is to be obtained. A good aerial is still a great economy.

What is a Good Aerial?

By a good aerial, we do not necessarily imply a long aerial; it is true that the higher and longer is the aerial, the greater is the power of the signals received; but all forms of interference, such as atmospheric and powerful nearby stations, are also greatly increased.

So we can say that a high, long aerial brings in plenty of signals—but also plenty of interference. The real significant point to note is that as the aerial is reduced in its pick-up abilities, the interference is more reduced in strength than the required signals.

In other words, the ratio of interference to signal is lowered; a valuable point. This question of interference-to-signal ratio is more fully dealt with under "Amplifying at High Frequencies" on page eight of this supplement.



On the left is shown a common form of earth connection—a metal tube, preferably copper, stuck in the ground. On the right is an earth clip fixed round a water pipe; gas pipes are not recommended

soil in which an outdoor earth is buried should be kept damp and the lead from the earth to the set should be short.

When such an earth is impossible the best alternative is to make contact with a main water-

In these days of efficient amplifying valves, one has to be careful to choose a suitable length of aerial, otherwise serious interference results. For most sets a short aerial is the most suitable for this reason.

Points About Commercial Sets

Battery Sets

BATTERY-OPERATED sets with two or three valves are very suitable for listeners without an electric-light supply. The batteries can be contained inside the cabinet, or connected externally. A two-valve battery-operated set can be economically run from the standard-capacity H.T. battery, but a three- or four-valver needs to have double-capacity or even treble-capacity batteries. Every set with a pentode output valve should have a double-capacity H.T. battery. Where the batteries are externally connected, the leads should be clearly marked to indicate the correct voltages to be applied to the anodes of the valves.

The average price of a good-class three-valve

battery set is £12. This includes the valves but not the batteries or loud-speaker. Two-valvers can be had for £6 to £7, but, before buying, one should make sure they are selective enough to separate two regional stations.

The greatest source of trouble with battery sets is—the H.T. battery. This is the high-voltage one; it runs down within two or three months and must be replaced with a new one, otherwise the quality of reproduction suffers.

Seen on the right is a typical battery-operated receiver with three operating controls on the panel. One dial is turned for different wave-lengths and the other controls volume



Mains Sets

SETS worked from A.C. or D.C. mains supplies dispense entirely with batteries. All-electric sets, as they are called, are therefore more expensive than battery sets, since equipment is included for energising the valves. A.C. mains are more useful than D.C. mains for running complete sets, although quite efficient all-electric D.C. models are available. The average price of a two-valve all-electric set, for either A.C. or D.C. sup-

The set on the left takes all its power from alternating current electric-light mains. This model includes a loud-speaker mounted underneath the receiver itself.

plies, is £12; for a three-valve all-electric set the average price is £21. The more elaborate four- and five-valvers run up to £30 or £40, and one designed to include the loud-speaker, so that the only "extra" is a short aerial and a good earth connection, would cost more.

Better quality of reproduction can be obtained from a mains-operated set than from a battery set, because more power is available through the larger power valve.

The entire elimination of the battery upkeep problem—and with that, the major ills of wireless reception—is a strong argument in favour of the mains-driven set, which is always preferable to a battery set.

Portables and Transportables

THE outstanding difference between a portable set and any other type of set is this: a portable (or transportable) has its aerial contained in the cabinet or container, whereas a table cabinet set has an externally connected aerial. Portables are self-contained; they include the loud-speaker and the power supply. Portables can be worked from batteries or from the mains supply.

The shape of the cabinets of portables can take two forms; the most popular is the attaché case, with the set and batteries in the main compartment, leaving the lid to house the loud-speaker and frame aerial. The other shape is an upright cabinet with the loud-

speaker and batteries below the set. Prices of battery-operated portables vary between 16 guineas and 24 guineas. Twenty guineas is a fair price for a good model. For mains-operated portables one must pay more. £30 is an average price.

The A.C.-mains transportable is probably radio in its most convenient form. There is no aerial to be erected and no battery problem. This type of set is becoming very popular.

A typical transportable receiver is illustrated on the right. This is a three-valver, with a screened-grid high-frequency amplifying valve—a very popular type



Radio Gramophones

RADIO gramophones are combination instruments, comprising a multi-valve set and all the equipment for reproducing gramophone records by electrical means. Nearly always these instruments are driven from the mains, owing to the need for considerable power to give purity of reproduction with good volume. Most radio gramophones have an electrically-driven gramophone turntable. A few include a frame aerial for radio reception,

A particularly elaborate radio gramophone is shown on the left. This model has two gramophone turntables so that there need be no delay between the playing of records

but most of them need a small external aerial.

The radio side of these instruments is usually sufficiently powerful to provide a large number of stations at full strength. In view of the many constituents of a radio gramophone, it is natural that prices vary considerably, but reputable models cost upwards of £50, and really elaborate models are listed at prices between £100 and £250.

In addition to their obvious use in the home, radio gramophones are very popular in cafés and other public places. The variety of amusement to be had from such an instrument is endless. The radio gramophone is the musical reproducer de-luxe.

What the Tuner Does

ALTHOUGH at any given time there are hundreds of wireless waves surging up and down the aerial of the receiving set, the tuner enables the detector to respond to one signal to the exclusion of all others.

Rather, we should say that a perfect tuner working in a well-regulated broadcasting plan would do that; but through various imperfections the tuner often responds to more than one signal at a time.

So when one station is tuned in others are sometimes heard as a background. The ability of a tuner to select one station to the exclusion of all others determines the selectivity of the set.

A set is selective when its tuner is so well designed that each station is separately received without interference from stations on adjacent wavelengths. Con-



So geared that many revolutions of the control knob are needed to put the vanes of a variable condenser in and out of mesh, a slow-motion dial is found on every modern set

versely, a given adjustment of a tuner that brings in two stations at once is a sure sign of an unselective set.

We shall see later that, after the signal has been detected, the speech and music frequencies are left to operate the loud-speaker, and the high frequencies of the wireless wave are by-passed to earth. Why, then, should we worry to pick out the signal before detection by the process of tuning?

Equal Response

The answer is that the aerial is almost equally responsive to all the signals received upon it, so the required signal is differentiated from all the others by making its strength very great compared with the rest.

The energy received from even a powerful near-by broadcasting station is extremely minute; of the order of millionths of a watt, which is the unit of electrical energy. Compare that amount

Every radio set has a tuning circuit that enables a transmission on any particular wavelength to be picked out at will from other transmissions being sent out at the same time. It is impossible to use a set without having to tune it, so it is always a great advantage to know just what the operation really means.

There are various special forms of tuners for special purposes, but fundamentally they are all used for separating one broadcast programme from another.

with the 60 watts required to light an ordinary electric bulb!

The aerial offers practically the same resistance to all wireless-wave currents; but by tuning one signal—that is, adjusting the constants of the receiver's tuning to the transmitting tuning—the resistance of the whole aerial system is greatly reduced and that particular signal's current rises accordingly. Tuning is therefore a resistance-lowering process.

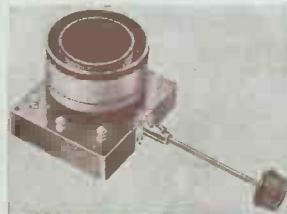
What is a Watt?

We have mentioned "watts energy" and "tuning constants," two phrases that need some further explanation. The first should not be difficult to grasp; the watt is the unit of electrical energy. The domestic electric-light bulb just mentioned requires anything from 30 to 100 watts. How does this compare with the power of a transmitting station, which is also measured in watts? Well, the old London transmitter was rated at 1,500 watts, while the new Brookman's Park stations have a rating of about 60,000 watts.

The watt is the product of the unit of electrical pressure, the volt, and the unit of electrical rate of flow, the ampere. Thus, one watt is equivalent to one volt multiplied by one ampere.

Without going deeply into electrical science, we can see that a great pressure behind a small flow can represent just as much energy as a low pressure behind a large flow.

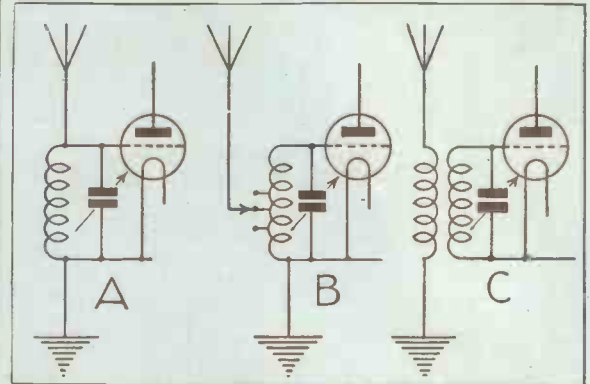
When the receiving aerial re-



A typical dual-range tuning coil, with a switch that can be adjusted from the panel for medium or long waves

sponds to the transmitted wave, the aim is to develop the greatest possible electrical pressure or voltage, because the first valve in the set is a voltage-operated device. The best tuner is one that causes the greatest voltage to be developed by the incoming signal.

"Tuning constants" is a phrase covering the two essentials of a tuned circuit, namely, the inductance and the capacity. The two together form an oscillatory cir-



At A is shown a plain aerial tuner. The diagram B shows a tapped coil for increasing the selectivity. At C a double circuit is shown, with a primary coil and a secondary coil. The secondary is usually tuned, but the primary is often untuned

cuit, which has a very low resistance when adjusted to the same value as that of the transmitter tuning.

The property of inductance is exhibited by an inductance coil and the property of capacity by a condenser. Every tuned circuit has a coil and a condenser.

The oscillation constant of a tuning circuit is the product of its capacity and inductance; we call this the LC value. This product can be obtained by a small amount of inductance and a large amount of capacity or vice versa.

To vary the oscillation constants you can vary either the inductance or the capacity, or both. But in practice it is found most convenient to vary the capacity and to keep the inductance constant.

This is because the mechanical means of varying capacity is so much more precise than for varying inductance.

In early sets the coils were sometimes varied in inductance; some crystal sets still adopt this method.

Although tuning systems appear to differ considerably, they all involve a coil and a condenser. The coil may take many forms, but the condenser always consists of one set of movable metal plates interleaving by a varying amount a set of fixed plates.

Unit of Capacity

When the plates, or vanes as they are sometimes called, are the least overlapping, the capacity of the condenser is at its minimum. When the vanes are overlapping as much as possible the condenser's capacity is at its maximum. We measure a condenser's capacity by the unit called a farad; but as this is an unduly large unit for radio work we usually speak of the microfarad, which is a thousandth part of a farad.

Actually, a variable condenser

used for tuning has a maximum capacity of but a fraction of one microfarad. When we mention a .0005-microfarad condenser we mean that at its maximum this is the capacity; no condenser has an absolutely zero minimum.

There is always some residual capacity even when the moving vanes are all out of mesh with the fixed vanes, but the best designed condensers have a very low minimum, so that with any given coil the tuning range is as great as possible.

Coils take two distinct forms: the solenoid and the plug-in types. The simple solenoid consists of a tube of insulating material upon which is wound in a single layer thin-gauge wire covered with either silk or cotton,

to insulate one turn from the two adjacent turns.

The solenoid coil is the most efficient; a very fine example of solenoid-coil construction can be found in the Binowave tuners designed by W. James.

As a rule, one coil is not suffi-



On the left, a two-pin plug-in tuning coil in a holder. A variable condenser with a slow-motion dial is shown on the right

cient with the normal variable condenser to cover the two wavelength ranges in use. So two separate solenoids are arranged with a switch between them; one covers the 250- to 550-metre range and the other the 1,000- to 2,000-metre range.

Plug-in Coils

Another way out of this drawback is to use two separate coils of the plug-in type. These coils are wound on a special honeycomb pattern, so that a large amount of inductance can be confined in a small space. This type of coil is very popular owing to the ease with which wavelength ranges can be varied.

Over the available range of a variable tuning circuit the variable condenser is conveniently calibrated by its dial. The dial is divided into 100 or 180 degrees, but the division is absolutely arbitrary. That is to say, there is no relation between the wavelength of the station received and

the dial reading at which it is received.

So a station having a wavelength of 300 metres might be logged at 40 degrees on the dial of one set and at 50 degrees on the dial of another set.

Calibration

The divisions of the dial are a convenient calibration of the condenser associated with a tuned circuit; increases of wavelength are noted by increases in the reading of the dial. Thus 250 metres might be located at 10 degrees and 350 metres at 40 degrees. But the wavelength does not, as a rule, increase in direct proportion to dial divisions.

The simplest possible condenser dial, having a knob that rotates the shaft of the moving vanes direct, is not generally used in modern sets. It is much preferable to have a slow-motion dial, which works the moving vanes through a reduction gear. In this way a large movement of the dial causes only a small movement of



Five different makes of two-pin plug-in coil. That on the extreme left is of the X- or double-tapped types, used for obtaining increased selectivity

the condenser vanes, resulting in a much greater precision of operation.

In many sets there are two tuning circuits, or even more,

with two or more tuning condensers. Here the dial readings for a given station may not be the same on each condenser. The aerial-condenser dial often has a lower reading than the secondary tuner, because the aerial itself

adds some capacity to its circuit.

To end these notes on what the tuner does, let us reiterate the main function of tuning; it is to separate one required signal from the dozens of unrequired signals received simultaneously by the aerial. Selectivity in a set is the measure of its ability to tune in one signal to the exclusion of all others.

Value of Theory

All these theoretical aspects of tuning should be thoroughly grasped before the manual side of tuning is attempted; for it is very valuable to understand what the tuner does. Then one can learn something of how to make the tuner of a set do its job.

Careful control of a set cannot overcome inherent tuning faults; but it can do much to ensure that the best possible results are being obtained.

In simple sets the large tuning knob varies the wavelength of the

tuning circuit of the detector valve. Very little experience is needed to get good results with a one-knob tuning set; but great care must be taken to see that the smaller knob marked reaction, is used in conjunction with the tuning knob.

To make quite sure that an adjustment of reaction has not upset the tuning, it is a good plan always to re-set the tuning knob after any alteration of the setting of the reaction knob.

More Elaborate Sets

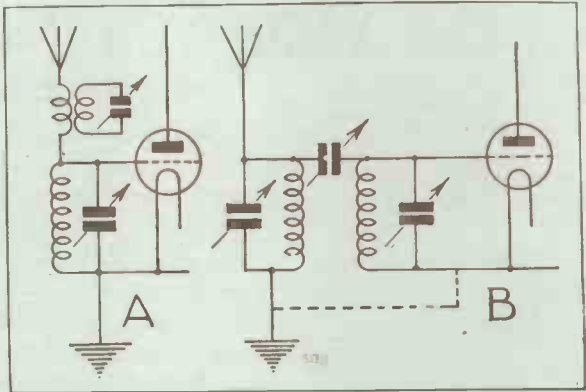
In more elaborate sets, where there are two separate tuning knobs, the process of adjusting the wavelength of the set to that of the required station is a little more complicated; but a good plan is to adjust the high-frequency coupling tuning condenser first and then to make final adjustments on



When both sets of metal plates are in mesh the variable condenser is at its maximum capacity. The two sets of plates are insulated from one another

the aerial-tuning condenser, which is not nearly so critical in its setting.

Both knobs may not be at the same setting for a required station, but the set is poorly designed if there is a very great discrepancy.



Special additional tuning circuits are sometimes used to make a set more selective. At A is shown a common form of wavetrap coupled in the aerial circuit; this is tuned to the wavelength of an interfering signal. At B is shown an additional tuner connected in parallel with the main circuit to give sharper tuning.



A single-layer or solenoid type of tuning coil. The photograph shows clearly how the wire is anchored by threading it through holes in the former

MEMORISE THESE SYMBOLS

Crystal Detector	Aerial	Earth	Headphones	Fixed Condenser	Variable Condenser	Fixed Coil	Coil with Slider	Coupled Coils	Variometer	Wires Joined	Cross Wires not joined

Why You Need A Detector

BEFORE we can understand the need for a detector valve, the nature of wireless waves must be thoroughly understood. A wireless wave is a very high-frequency oscillation, changing in direction millions of times a second. In effect, the ether is made to vibrate at this high frequency and the vibration caused by the transmitter is almost instantaneously effective at the aerial of the receiver. There it causes high-frequency oscillations to flow through the tuning system.

Two Components

As received from a broadcasting station, the wireless signal consists of two distinct components, the high-frequency current of transmission and the low-frequency currents of speech and music. The wireless wave acts in a similar way to a telephone line, in that it is a carrier for the very much lower frequencies of speech and music.

The great difference between



Typical fixed condensers, which may vary in capacity from .0001 to .001 microfarad. That on the extreme left has clips to hold a grid leak

the frequency of transmission and the frequencies of sound can be illustrated by a simple example: a wavelength of 300 metres corresponds to a frequency of 1,000,000 cycles per second, but middle C in the piano scale corresponds to over 256 cycles per second.

At the transmitting end, the low frequencies are impressed upon the high frequency of transmission by



On this valve holder the letters F indicate the two filament sockets, G the grid socket, and P the plate or anode socket

means of a modulator. At the receiving end the wireless telephone signal must be de-modulated, or, in other words, the low frequencies must be separated from the high frequencies. That

No matter what kind of set you have, it must include a detector, which is the separator of the high and low frequencies of which a wireless signal is made up; until this separation has been made, a loud-speaker or headphones cannot respond.

Perhaps detection is the most difficult phenomenon in radio there is to explain, but we believe everybody will understand the non-technical aspect of it presented here.

is what the detector valve does.

A detector valve does not "detect" the waves; that is done by the aerial. But the final link in the sequences of wireless reception is the loud-speaker. And the loud-speaker is unaffected by the wireless wave as received by the aerial; it is only affected by low frequen-

There are two methods of arranging a valve so that it acts as a detector, or should we say as a separator of low frequencies from high frequencies. The simplest method of detection is known as the anode-bend method. But whatever the method, the valve itself is always a three-electrode type, as used for some high-frequency amplifying circuits and for many low-frequency amplifying circuits.

Broadly speaking, one can say that almost any three-electrode valve can be arranged to work as a detector. Its working characteristics can be largely regulated by altering the high-tension anode voltage and the bias voltage on the grid.

Anode-bend detection is widely used in sets where great selectivity is required. This method of detection is not so popular as leaky-grid-condenser detection, which is much more sensitive. To make a valve work on the anode-bend method the grid must be biased negatively; some special detector valves having characteristics particularly suited to this form of detection are available.

For detecting with a grid leak and condenser the valve is worked with a zero or slightly positive bias. The value of the grid con-

denser found to give the best detection has a value of .0003 microfarad; and the value of the grid leak usually chosen is 2 megohms.

As briefly as possible, we will now explain how a grid leak detector works. Remember, its job is to separate the low frequencies from the high frequencies, which it does in a rather roundabout way.

What happens is that the high-frequency oscillations bearing the modulations of the low frequencies vary the voltage of the grid of the detector, thus varying the electron stream from the filament to the anode.

By-passing H.F.

The low-frequency current appears in the anode circuit of the valve and can thus affect the sound reproducer. But during detection the high-frequency current is, as we have already mentioned, by-passed to earth.



A common type of fixed condenser often used in detector-valve grid circuits. It is fitted with two clips to hold a grid leak, that on the right being insulated from the condenser terminal

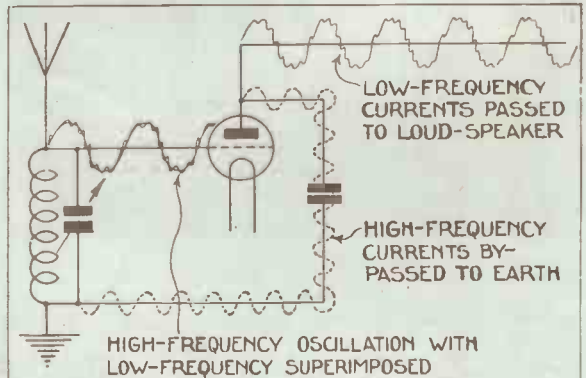
In choosing a valve for grid-leak detection one must remember that, in addition to its action as a separator of high frequencies from low frequencies, this detector is also an amplifier of the low frequencies. For this reason the impedance of the valve must be

cies corresponding to speech and music.

If the high frequencies are allowed to get past the detector valve, they cause distortion. For this reason, at the detector stage there is always what is known as a by-pass condenser. Matters are so arranged that after detection the high frequencies are offered an easy path to earth through a fixed condenser, and at the same time are debarred from passing through to the low-frequency amplifying part of the set by means of a high-frequency choke, whose function is indicated in its name.

Use of Reaction

Sometimes the high-frequency current is made use of after detection. In the ordinary detector circuit this high-frequency current is flowing in the anode circuit and can be reintroduced into the aerial circuit by means of a coupling coil and condenser. This produces what is known as regeneration, or, more popularly, reaction. There is a limit to the amount of high-frequency current that can be used again in this way. But up to that limit the process of reaction is very valuable and is widely used in small sets.



This diagram shows what effect a detector valve has on a wireless signal. The high-frequency current is the "carrier" of the speech and music currents, which are of much lower frequencies. After detection the high-frequency currents are filtered out and by-passed to earth

chosen with respect to the form of coupling that follows it. The question of matching the valve impedance with the impedance of the coupling following it will be referred to in later sections; here it is only necessary to mention that a detector valve preceding a resistance-capacity coupling can have a high impedance, such as 50,000 ohms, with a correspondingly high amplification factor.

Transformer Couplings

With transformer coupling the detector valve must have a lower impedance. Generally, a low-ratio transformer has a high primary impedance, so a high-impedance valve can be used. The



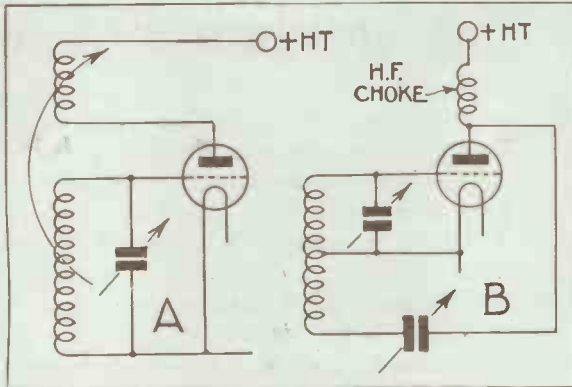
High-frequency chokes are used to prevent the passage of high-frequency currents where they are not wanted. The example shown is of the binocular type

impedance could be 20,000 ohms, but with some high-ratio transformers the primary winding has only a medium impedance, so a fairly low-impedance detector valve must be used. A valve with an impedance of, say, 10,000 to 12,000 ohms would be suitable.

One of the faults in valve detection can be traced to applying too great a signal voltage to it, thereby



Underneath view of a valve holder, showing how the socket and soldering tag are sometimes made from one piece of metal



Two common methods of obtaining reaction or regeneration from a valve. At A is shown a coil in the anode circuit coupled to the grid circuit, into which energy is fed back. At B the amount of feedback is controlled by the lower variable condenser

causing overloading, with consequent distortion. For this reason the choice of a detector valve depends on the amplification preceding it, as well as on the amplification following it.

A resistance-capacity coupling following a detector valve does not, therefore, necessarily imply that the correct detector valve should be one with a high impedance; for it might well happen that through considerable amplification before detection the signal applied to the high-impedance detector valve would overload it. This fault could be prevented by using a lower impedance valve, thereby sacrificing some amplification in the interests of quality of reproduction.

We have now seen that a detector valve is a very important link in the chain of wireless reception, for it can be arranged, with the aid of reaction, to amplify high frequencies and, in the grid-leak and condenser method, it is also a low-frequency amplifier.

We have also seen that for normal detection the valve does not have to be specially constructed, but must have its grid and anode voltages suitably adjusted.

Faults of Detection

Many of the faults of detection are due to the fact that one or other of these voltages has been incorrectly applied. Distortion can often be traced to the detector circuit, either through overloading or through improper matching of the detector-valve impedance with the impedance of the coupling following it.

Much of the instability of sets can be traced to the fact that the high-frequency component of the detected current is not properly

by-passed to earth. A .0001-microfarad fixed condenser between the anode of the detector valve and earth is essential for good detection on the leaky-grid condenser principle. No less important is the use of an efficient choke to act as a barrier for the high-frequency currents.

Although we have not so far mentioned it, the crystal detector is still widely used in very simple sets: replacing the valve, the crystal needs no batteries to enable it to work; consequently it has found favour among listeners desiring the simplest possible reception.

A crystal detector can be used in connection with valve amplifiers; but there is an obvious reason why this is not usually done; for as

silicon, will allow electric currents to flow more readily in one direction than in the other, consequently a wireless wave, which is changing its direction millions of times a second, undergoes a change on reaching a crystal arranged as a detector. The high impedance of the telephones inserted after the crystal prevents the high-frequency current from passing through, so it is by-passed by the fixed condenser across the telephones.

Critical Contacts

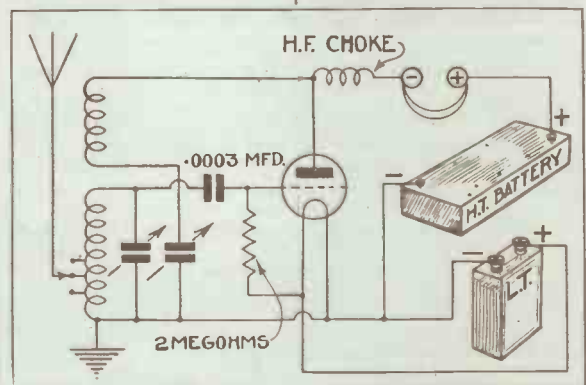
Crystals are not often used in the sets of to-day, because the crystal contact is very critical and, as we have said, amplification is



When the knob of this simple on-off switch is pulled out the metal cup on the right connects the two flat metal springs together and current can flow

needed to give good loud-speaker results.

Much of the good quality of a set is determined by the detector valve, which is greatly influenced in its action by the amplification before and after it. Anode-bend

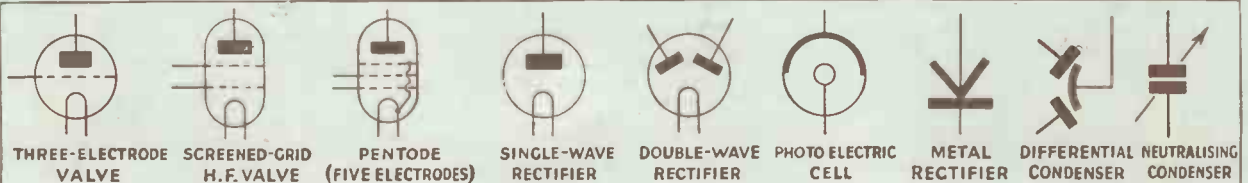


Here is shown a typical one-valve circuit, with complete battery connections. The thick black line in the valve represents the anode or plate, the dotted line the grid, and the semi-circular loop indicates the filament or cathode

soon as valve amplification is introduced, so also are batteries, which might just as well be utilised for running a valve detector.

Contacts between certain minerals, such as galena, zincite and

detection and power detection are the most suitable for high-quality results; but in small sets the method of using a grid leak and condenser of the usual values provides the greatest sensitivity.



Amplifying at High Frequencies

SO far, we have dealt with the first two stages of wireless reception, namely, tuning and detection. Before we discuss the final link in the chain, the loud-speaker, we must show why the processes of tuning and detection are often not enough to produce a sufficiently strong current in the anode of the last valve to operate the loud-speaker; additional amplification is nearly always needed, either before or after detection.

When the signal is amplified before detection, we call it high-frequency amplification. This is because, although the low frequencies of speech and music are present in the signal before detection, they do not affect amplifying arrangements designed to respond to high-frequency oscillations.

Thus high-frequency amplifica-

Since the introduction of the screened-grid valve a year or two ago, high-frequency amplification has become much more popular than it was formerly. This method of amplification is essential if a set is to give satisfactory reception of distant foreign stations—a thing that most listeners want.

It is convenient to regard high-frequency magnification as a method of adding range to a receiver; it is not normally incorporated to increase the volume of transmission.

tion to the resulting weak signal. The object of high-frequency amplification is to provide the detector valve with a signal sufficiently strong to enable it to operate efficiently.

and hence long-distance broadcast reception.

Every three-electrode valve can be used for high-frequency amplification, although one designed to have as great a magnification factor as possible, consistent with impedance requirements, is usually recommended. The simplest possible way of using a high-frequency amplifying valve is to couple it to the detector through a high-frequency choke coil.

This method depends for its efficiency upon the amplifying properties of the valve. In practice such an aperiodic (or untuned)

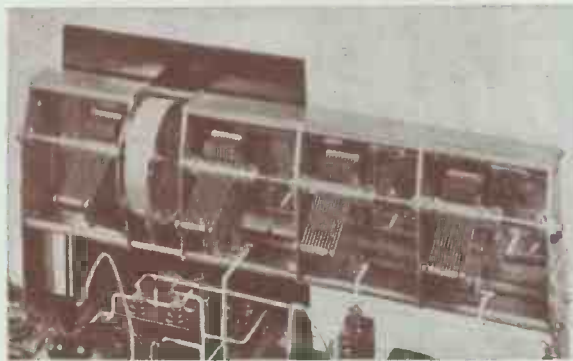
As soon as the high-frequency coupling is made resonant, the circuit becomes unstable, due to the construction of the valve. In discussing detection, we mentioned how regeneration could be obtained by means of a coil and condenser connected in the anode circuit of the detector valve.

Electrode Capacity

Unfortunately, in the ordinary three-electrode valve, this regenerative effect occurs without any additional coil and condenser, due to the fact that there is a small condenser formed by the electrodes of the valve. Through this capacity between the anode and grid energy is fed back and causes the valve to oscillate, thereby rendering its amplifying properties useless.

Because we need the additional energy obtainable from resonance in high-frequency amplification, some means of overcoming the effect of the grid-to-anode capacity had to be devised. The most satisfactory method is to neutralise the effect of the valve capacity by means of an external capacity having an equal but opposite effect upon the signal passed on by the amplifying valve.

There are still many good sets



With ganged variable condensers it is possible to tune a number of circuits with a single panel control. By this means a high-frequency amplifier with several tuned stages can be easily operated. The example shown is a four-gang model

tion is quite different from low-frequency amplification, where the low frequencies are alone amplified, the high frequencies having been by-passed to earth immediately after detection. High-frequency amplification is much more difficult to put into effect than low-frequency amplification, because we are dealing with an extremely minute amount of energy as received by the aerial.

Why Amplification is Needed

Some of the reasons why high-frequency amplification is needed can be briefly explained; probably the greatest reason is the weakness of signals as received from distant stations. Only the local station, by which is meant a broadcasting station within a radius of fifty miles, can usually be received at good strength without high-frequency amplification.

Beyond that distance, no matter how efficient the aerial and tuning arrangement may be, the detector valve will not respond efficiently

While there are many different systems of detection, and while both crystal and valves can be used for this purpose, high-frequency amplification can be done only with valves. In fact, it is true to say that the valve has made practicable high-frequency ampli-

The original form of screened-grid valve had connections made at both ends, but because it needed a special holder it has lost favour and been replaced by the type shown opposite

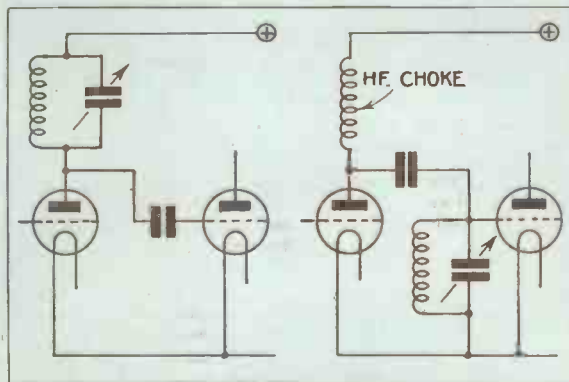
coupling does not provide sufficient amplification. For this reason a resonant (or tuned) circuit is introduced, similar in action to the tuning circuit connected to the aerial.

using three-electrode high-frequency amplifying valves working on the neutralising system. But within the last two years a very important advance has been made in the actual construction of high-frequency valves, so that now there is really no need for complicated neutralising circuits, because the capacity effect of the electrodes is neutralised within the valve itself.

A Revolution

In fact, the screened-grid valve, as it is called, has revolutionised high-frequency amplification. It is now possible to arrange three or four stages of high-frequency amplification with these valves without introducing instability.

The tremendous amplification before detection has greatly increased the range of reception of modern sets, but it has meant modifying the detector valve so that it can handle the considerable signal voltage developed by the preceding stages. To-day we



A simple tuned-anode circuit with a plain coil is shown on the left. On the right is a choke-feed circuit, with the tuned coil in the grid circuit of the second valve. One or other of these arrangements is usually used when employing two-pin plug-in coils for a high-frequency coupling

have what are known as power detectors to cope with this greatly increased amplification at high frequency.

One of the problems of high-frequency amplification relates to the ratio of sensitivity to selectivity. It is quite easy to design a set capable of amplifying at high frequency to an enormous extent, but unless each stage of amplification has a well-designed tuning circuit associated with it, the selectivity is so poor that many stations that would have been inaudible on a simple set come in at great strength and cause interference with one another.

For reasons of selectivity, the simple tuned circuit that used to be employed for high-frequency amplification, called tuned-anode coupling, has now been almost entirely replaced by a more selective circuit employing a high-frequency transformer.

Connections

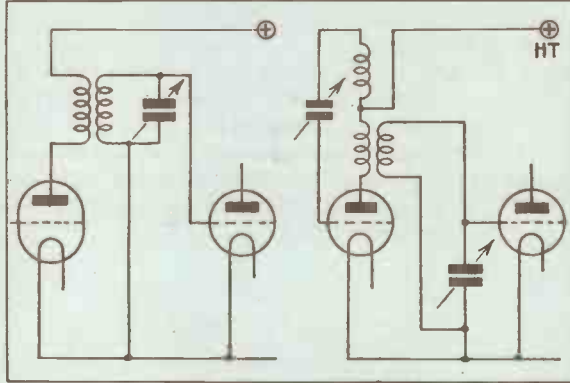
The primary winding of this transformer is connected in the anode circuit of one high-frequency valve and the secondary winding is connected to the grid circuit of the next high-frequency valve or to the detector. In effect, there are two separate tuning circuits between each high-frequency amplifying stage, so adequate selectivity is obtained, in spite of the considerable high-frequency amplification at the receiving end

earthed objects. This also applies to high-frequency amplification, where the signal is just as easily lost if stray capacities are allowed to be formed by the proximity of earthed objects.

The grid and anode connections are, therefore, kept as short as possible, so that between the valve

situated environments. But where a weak signal is already suffering from atmospheric interference, or is fading periodically, high-frequency amplification is not likely to be of much use.

The ratio of interference to signal strength is obviously determined by the distance and power



The diagram on the left shows the arrangement of a high-frequency transformer coupling such as is frequently used in the anode circuit of a screened-grid valve. On the right is a similar coupling with an extra winding and very small capacity condenser which is used to balance out neutralise the inter-electrode capacity of a three-electrode valve

and its coupling circuit the chances of loss are reduced to a minimum.

We have explained how the use of two or three high-frequency amplifying valves increases the range of a receiver, but one should never forget that high-frequency amplification at the receiving end

of the transmitter and by prevailing conditions in the ether. This ratio remains the same at any given time, irrespective of the amount of high-frequency amplification. Thus a weak signal suffering from interference will not, when amplified by high-frequency valves, be worth listening to because the interference will be amplified to the same extent as the signal.

High-frequency amplification is of very great value where the aerial is inefficient. Frame aerials, as used in portable sets, are very inefficient compared with a normal outdoor aerial. But portables have a considerable range of reception, due to the fact that they employ one or two stages of high-frequency amplification.

Much greater simplicity of operation is conferred upon a set having plenty of high-frequency amplification. In such sets there is no necessity to "boost up" the signal with reaction at the detector stage because the signal is already sufficiently amplified before detection. And the elimination of reaction is a great boon that is all the more appreciated by the non-expert listener.

One of the disadvantages previously associated with high-frequency amplification was the complication of tuning, due to the fact that a separate tuning knob had to be used with each stage of high-frequency amplification. That disadvantage has now been overcome



The modern type of screened-grid valve has an ordinary base, but there is a terminal at the top for the anode connection. Such valves are usually used in conjunction with external metal screens

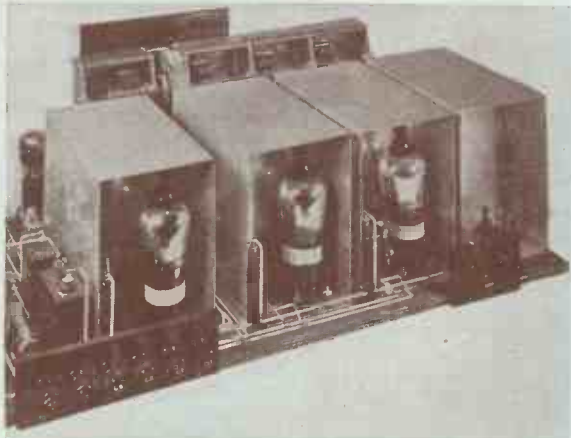
by what is known as gang-condenser tuning. The separate tuning condensers associated with each high-frequency amplifying stage are now controlled by a shaft rotated by a single knob.

In normal sets of average sensitivity to weak signals, only one stage of high-frequency amplification is used; with a fairly good aerial this is sufficient to bring in most of the powerful home and foreign stations.

Eliminating Reaction

But reaction has to be used in such a set; to eliminate reaction one must add two or three stages of high-frequency amplification. Sets with three high-frequency valves need no reaction and are often controlled by a single knob working a gang condenser.

When the aerial is poor, as in a portable set, or where reception conditions are unfavourable, high-frequency amplification is indispensable.



High-frequency amplifiers are built up in aluminium or copper boxes, which act as shields against stray capacities which would introduce losses. In this set the tuning coils are in special compartments behind the valves

In all high-frequency amplifying circuits great precautions have to be taken to avoid losing the energy being amplified by the valves. We mentioned under aerial essentials that wireless waves are very prone to leak away to earth unless their conductors are kept well away from

will not necessarily enable a distant signal to be heard with clarity and freedom from variation in strength and quality.

High-frequency amplification can overcome inefficiency in the receiving aerial and can make up to a large extent for poorly-

MEMORISE											
THESE →											
SYMBOLS	Phones	Variometer	Fixed Coil	Aerial	Fixed Condenser	Variable Condenser	Earth	Loose-coupled Coils	Tapping Switch	Tapped Coil	Crystal Detector

Amplifying at Low Frequencies

AFTER detection, a wireless signal is a low-frequency alternating current. The high-frequency component, representing the carrier wave, is carefully by-passed to earth before any low-frequency amplification is introduced.

First of all, we must see why, after a signal has been picked up on the aerial, differentiated from all others by tuning, amplified at high frequency by valves, and detected by a further valve, it is still not sufficiently powerful to affect phones or a loud-speaker.

Inefficient Mechanism

The main reason is that the loud-speaker mechanism is very inefficient; it is a current-operated device and requires a considerable variation of current through its winding before its diaphragm can move a column of air.



A low-frequency transformer has two windings, a primary and a secondary, the secondary having three, five, or even seven times as many turns of wire as the primary. This results in the voltage being increased by three, five, or seven times

Between the detector and the final valve the signal voltage, which is now at low frequency, must be further amplified, so that when applied to the power valve it can cause correspondingly big

Practically every set used in conjunction with a loud-speaker incorporates one or more stages of low-frequency amplification, because the current obtained from the detector is not great enough without additional amplification. To a very great extent, the quality of reproduction obtained from a radio set depends upon the proper design of the low-frequency amplifier.

In these notes the various forms of coupling are explained, so that listeners will be able to understand just how their own receivers are arranged.

current changes in its anode circuit.

The most important first principle of low-frequency amplification is this: Whatever the degree of amplification obtained by the low-frequency coupling device may be, all frequencies within the audible range must receive equal amplification.

If the top end of the scale is accentuated more than the low frequencies, distortion will be evident. The quality of reproduction will suffer just as badly if the low frequencies are amplified more than the high frequencies in the audible range.

Valve Impedance

Always, there is the problem in low-frequency amplification of ensuring equal treatment to the whole range of audible frequencies. Provided that the coupling device is well designed, the quality of reproduction is largely governed by the matching of the impedance of the valve preceding the coupling with the impedance of the coupling itself.

There are three distinct systems of low-frequency coupling in use. Undoubtedly, the most popular is transformer coupling. The primary winding is connected in the anode circuit of one valve and the

secondary winding in the grid circuit of the next.

It so happens that audible frequencies have the best chance of being equally amplified when the impedance in the anode circuit of the valve is not less than twice



Pick-ups are used for playing gramophone records through a radio set and loud-speaker. They convert small mechanical movements into electric currents, which are amplified like low-frequency wireless signals

the impedance of the valve itself. This means that the impedance of the primary winding of the transformer must be as great as possible; for if it is small the impedance of the valve has to be reduced

preceding a transformer with a step-up ratio of 1 to 3 should give a theoretical overall amplification of 45.

It is because of the additional amplification due to the step-up in ratio of the primary to secondary windings that transformer coupling is so widely used. But there are other forms of coupling without the advantage of this step-up effect capable of giving very good quality reproduction. Capable, in other words of amplifying all audible frequencies to the same extent.

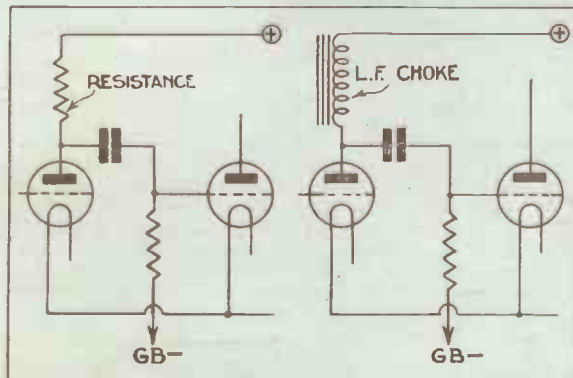
Resistance Coupling

The most popular runner-up to the transformer is resistance-capacity coupling. This is all the more widely used to-day owing to the greatly increased amplification factors of low-frequency valves; in this system the overall amplification can never be greater

than the amplification factor of the valve preceding it, and in practice it is always something less.

It is fairly easy to conform with the large impedance requirement when using resistance-capacity coupling, and that is why the system lays such claims to purity of reproduction.

A similar system is choke-capacity coupling; here a choke coil of high impedance replaces the resistance in the anode circuit.



On the left are shown two valves coupled by the resistance-capacity method. The value of resistance is two or three times the impedance of the first valve. On the right a low-frequency choke of high inductance replaces the resistance and more voltage is applied to the anode of the valve



Every resistance-capacity coupling unit includes an anode resistance, a fixed coupling condenser, and a grid leak. The anode resistance is chosen to match the preceding valve

and so, unfortunately, does the amplification factor, so the overall amplification is reduced.

In a transformer-coupled low-frequency amplifying stage the overall amplification is given by the amplification factor of the valve multiplied by the ratio of secondary to primary turns. Thus a valve with an amplification of 15



Another type of gramophone pick-up. The needle causes a small iron bar to move near a coil of wire, which results in a current being produced

There is some advantage in choke coupling compared with resistance coupling, owing to the fact that there is less high-tension voltage drop across the choke than across the resistance.



This pentode valve has five grids and gives enormous amplification. Only one extra connection is necessary. The terminal on the base is connected to the high-tension battery

Consequently, a greater high-tension voltage is applied to the anode of the amplifying valve, and the amplification is thereby increased. Chokes are much more expensive than resistances, and

centre. Instead of using one valve after the transformer, two valves of identical characteristics are used.

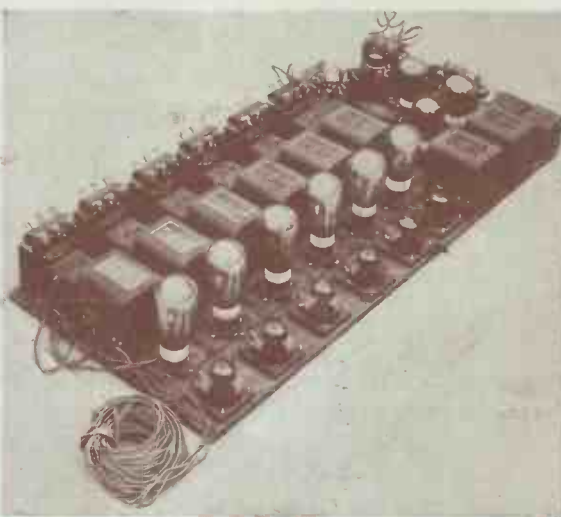
The two ends of the secondary go to the two grids of these valves and the centre tap goes to the grid bias. The two anodes of the push-pull valves go to the two ends of the primary winding of an output transformer, the centre tap of which goes to the high-tension supply.

Overloading Avoided

In effect, the voltage applied to the two push-pull valves is half what would be applied to one valve with an ordinary transformer. The advantage of this system is that overloading of the output valve, and thus a very common cause of distortion, is avoided.

To prevent overloading the last valve and to vary the amount of volume, the low-frequency coupling device usually includes some form of volume control. One of the most satisfactory methods of controlling volume with transformer coupling is by means of a potentiometer, connected between the secondary winding and the grid of the following valve. In this way the voltage handed on to the valve by the transformer can be varied over wide limits.

In all forms of volume controlling at low frequency the object must be to avoid interfering with the good amplifying properties of



A multi-stage low-frequency amplifier using nine valves. Such apparatus is only used for outdoor work and filling large halls holding an audience of several thousand people

Just as it is important to choose a valve of the correct impedance to precede the low-frequency coupling, so it is equally important to choose an output power valve with an impedance that matches the loud-speaker. Usually the lower the impedance of the output valve, the better is the quality of reproduction, provided that the loud-speaker winding has an equivalent impedance.

Within the last year the pentode power valve has achieved considerable prominence; this special type of power valve has been devised so that, while capable of handling sufficient power to operate the loud-speaker, it also provides considerable amplification.

Usually one does not rely on the power valve to provide much amplification; for its real function is to convert a given signal-voltage change into as great a current change as possible.

By introducing two extra grids into the usual three-electrode power valve, it has been found possible to gain a large amplification factor.

Value of Pentodes

Because of this, the pentode valve is used in small sets, where the amplification prior to the power output is insufficient to give good volume. One of the drawbacks of the pentode is its liability to be overloaded. So when a pentode is used, the amount of low-frequency amplification must be restricted, otherwise distortion will be produced.

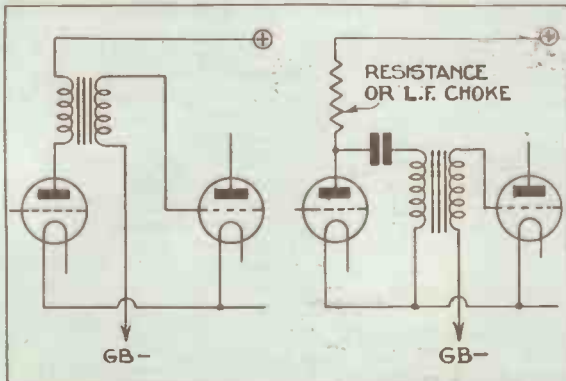
All power valves, whether pentode or three-electrode in construction, pass more anode current than other valves in the set; if the power valve passes more than about 7 milliamperes, it is a good plan to have an output filter arrangement between the valve and the loud-speaker winding, which might otherwise be damaged



In appearance a low-frequency choke is similar to a transformer, but there are only two terminals, because there is only one winding

owing to an excessive current flowing through it.

For the output, one can use a choke and condenser, or a transformer. Both devices have the effect of separating the direct current of the high-tension battery from the loud-speaker, at the same time allowing the low frequencies of the signal to be passed on to operate the loud-speaker.



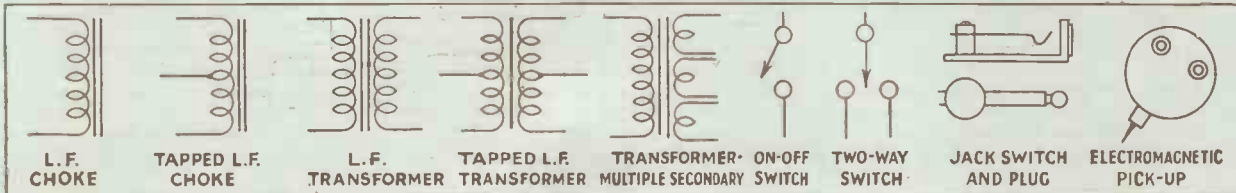
A circuit with a step-up low-frequency transformer is shown on the left. On the right the same circuit is shown arranged for resistance of choke feed, which keeps the direct anode current out of the transformer primary winding and helps to improve the quality of reproduction

usually one chooses between resistance-capacity coupling and transformer coupling.

A special form of transformer coupling, widely used in powerful equipment, is known as push-pull amplification. In this system the secondary winding of the intervalve transformer is tapped at the

the circuit, irrespective of the volume.

Where gramophone records are reproduced by electrical means the low-frequency amplification can be readily controlled by a potentiometer, fitted between the gramophone pick-up and the grid of the first amplifying valve.



Valves for Every Purpose

ALTHOUGH valves appear to be very simple pieces of apparatus their construction is quite complex because there are so many different types. All valves have certain characteristics in common and we will discuss these in their relative order of importance.

First of all we have a filament that emits electrons when a current is passed through it (or a special surface that emits electrons, but which is provided with a separate heating element). The electrons emitted from this part of the valve do not

variation in the anode voltage. For instance, in the case of a low-frequency amplifying valve a change of 1 volt on the grid may produce a change of 30 or 40 volts in the anode circuit of the valve, which means, of course, that the signal has been amplified thirty or forty times.

It will be clear that by varying the size, shape and positions of the three electrodes inside the bulb, the characteristics of the valve can be altered. For instance, if the anode is moved farther away from

capacity coupling the impedance may be between 30,000 and 100,000 ohms, while with a transformer coupling a value between 10,000 and 30,000 ohms would normally be used.

It will be clear that the last valves in a set have quite large voltages applied to their grids because of the magnification introduced by the preceding valves, and in order to avoid distortion it is most important that the last valve in the set, or power valve as it is usually called, should not be overloaded. For this reason valves that can stand large variations in grid voltage are used in the last position. Such valves have very low impedances, normally between 1,500 and 5,000 ohms.

For the sake of purity of reproduction it is desirable that the power valve should have the lowest possible impedance but, as we have already seen, a low impedance results in a large anode current flowing, and if this is too great the high-tension battery will soon become exhausted.

Practical Compromise

In practice, therefore, it is necessary to compromise and use a valve which, while having a low impedance, will not take more current than can economically be obtained from the source of high-tension supply available.

Up to now we have only discussed valves having three electrodes, but there are other special types in common use having four and five electrodes, called tetrodes and pentodes respectively.

Tetrodes have been developed to a high degree of efficiency for high-frequency amplification. They are often referred to as screened-grid or shielded valves. Their impedances are very much higher than those of ordinary three-electrode valves; common values are between 200,000 and 400,000 ohms. As these valves have an extra electrode there is

also an extra external connection to be made.

The other special type of multiple-electrode valve, the pentode, is used as a power valve, although the ordinary rules of low impedance do not apply here, representative values being 20,000 to 65,000 ohms. Although these valves have three grids, which are arranged in a special way, there is only one external connection as in the case of screened-grid valves.

Magnification

The value of a pentode lies in the fact that it has a very high amplification factor. Whereas the magnification of an ordinary type of power valve lies between about three and eight, the magnification factor of a pentode may be as high as 100.

Pentodes are very sensitive valves and need only a small voltage variation on the grid. For this reason they must be used immediately following the detector valve, no intermediate low-frequency amplifying stage being needed.

Details of a large number of valves are published every month in *WIRELESS MAGAZINE* and a glance at the list will soon show how many valves of different types are available.

It will be apparent from what has already been said that the incoming wireless signal makes the valve operate by releasing more or less of the energy that is already there waiting to be used. All the current flowing in the anode or plate circuit of the valve comes from the high-tension supply which, as will be seen later, can be obtained from a number of sources.

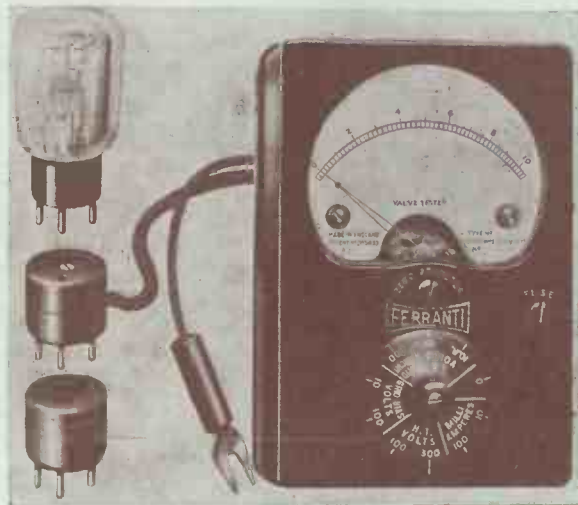
Besides a source of high tension every valve also needs a filament supply, while many need a "biasing" voltage on the grid for their proper operation.

Filament current is usually obtained from accumulators and different types of valve may need 2, 4, or 6 volts.

Special Mains Valves

Special types of valves are available for operation direct from A.C. mains; these usually take 1 ampere at 4 volts, which is obtained from a special secondary winding on a step-down transformer connected to the electric mains.

Two types of mains valves are in common use; the first are indirectly heated (that is, the cathode or electron-emitting surface is heated by radiation from the filament, which does not itself emit electrons), and the second are directly heated, as is the case with ordinary battery valves.



This valve tester enables the user to read anode voltages, anode currents, filament voltages and grid-bias voltages on a single meter

form a current until they are drawn together and made to flow in one direction.

This "drawing together" of the electrons is accomplished by inserting in the bulb a second electrode, called the anode or plate. This is supplied with a positive potential from a high-tension battery (or mains unit) and therefore attracts the negative electrons emitted from the filament. In this way a current is caused to flow through the valve itself.

Use of the Grid

But to be of any use this electron stream flowing between the filament and anode must be controlled by some means and for this purpose a third electrode, called the grid, is inserted between the filament and anode. Normally this grid has no effect on the electron stream, but when a positive or negative potential is applied to it (as is the case when a signal is being received) the current through the valve is increased or decreased.

This variation of the electron flow results in an alteration of the voltage on the anode of the valve, and it is important to notice that a very small change in the voltage on the grid results in a much larger

the filament a greater number of electrons must be available to produce the same flow of current in the anode circuit, for many of them will get lost in the intervening space.

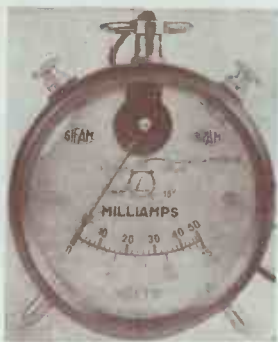
From this it will be clear that what we are really doing by altering the electrodes of the valve is to vary the resistance or impedance that the electron stream has to overcome, and it is this quality of impedance by which valves are usually designated for various purposes.

The object of the valve designer is always to produce a type having the greatest possible amplification with the lowest impedance, but this is a very difficult thing to accomplish.

Valves for high-frequency amplification (that is in the case of three-electrode valves used in neutralised or balanced circuits) usually have an impedance between 60,000 and 20,000 ohms, the magnification factor varying from about fifty to twenty.

Detector and low-frequency valves are so chosen that their impedances match up with the couplings connected in their anode circuits.

Thus, with a resistance-



A simpler type of meter, useful for reading valve voltages and currents. Every listener will find one of these instruments a useful accessory

A Selection of Home-Constructor Sets

TWO-VALVE SETS

MERLIN TWO. Designed primarily for working from A.C. mains, but can be used for battery operation. Detector and transformer-coupled power valve. When used for mains working, any standard high-tension unit can be employed. Price about £6, complete with A.C. valves. For best results should be used in conjunction with "W.M." Standard A.C. Unit. Full description on page 272 of October issue. **Blueprint No. WM213, price 1s., post free.**

MUSIC MONITOR. Cheap and simple two-valver, with special dual-range coil designed by W. James. Detector and transformer-coupled power valve. A full-size layout and wiring diagram was included in the September issue; full details will be found on page 132. Cost, with valves and cabinet, approximately £4 10s. **Blueprint No. WM208, price 1s., post free.**

THREE-VALVE SETS

DE-LUXE THREE. Uses the best components obtainable and incorporates a special dual-range tuner. The circuit comprises a detector and two low-frequency stages, the first resistance coupled and the second transformer coupled. Choke output is provided. Very good for the reproduction of gramophone records, as a low-frequency volume control is provided. Cost approximately 10 guineas, complete with valves and cabinet. Full details on page 116 of September issue. **Blueprint No. WM209, price 1s., post free.**

FIVE-POINT THREE. This simple set covers both wavebands with ordinary two-pin plug-in coils by the movement of a single switch. Particularly suitable for beginners. Both wave-change and on-off switches are of the self-indicating type and all the parts are standard. Screened-grid valve, detector, and transformer-coupled power stage. Costs a little over £8 with valves. Full details on page 252 of October issue. **Blueprint No. WM212, price 1s., post free.**

NEW LODESTONE THREE. A particularly efficient set, with a neutralised three-electrode valve for high-frequency amplification—constant neutralising on all wavelengths. High-frequency amplifier, detector, and transformer-coupled power stage, with choke output. Uses the famous Binowave coils. Price about £11. Full details on page 33 of August issue. **Blueprint No. WM205, price 1s., post free.**

FOUR-VALVE SETS

INVITATION FOUR. Covers all wavelengths from 20 to 10,000 metres, with special plug-in coils. Screened-grid amplifier, detector, and two low-frequency stages, one resistance coupled and the other transformer coupled. Cost, with coils for long-, medium-, and ultra-short wavebands, valves, and cabinet, about £14. Complete description on page 579 of July issue. **Blueprint No. WM200, price 1s. 6d., post free.**

REGIONAL BAND-PASS FOUR. This set was designed by W. James and incorporates the famous Binowave coils. Circuit combination is screened-grid high-frequency ampli-

Any beginner can build his own receiver without difficulty by the use of a WIRELESS MAGAZINE full-size blueprint. These act as panel-drilling templates, layout guides, and wiring charts—all wires being numbered separately in the best order of assembly. Here we give brief details of a number of representative WIRELESS MAGAZINE sets that will appeal particularly to newcomers. The method of obtaining blueprints and back copies is explained at the bottom of the page.

fier, detector, resistance-coupled low-frequency stage, and transformer-coupled power stage. Two volume controls are incorporated and terminals are provided for a pick-up. The construction is particularly simple for a set of its type. Price approximately £13, complete with valves. Fully described on page 221 of October issue. **Blueprint No. WM211, price 1s. 6d., post free.**

PORTABLE SETS

FOURSOME. A four-valve screened-grid set with single tuning control. Circuit combination: screened-grid high-frequency amplifier, detector, and two transformer-coupled low-frequency stages. Cabinet is of the suitcase type. Price about £12, complete. Constructional details on page 18 of August issue. **Blueprint No. 206, price 1s. 6d., post free.**

JAMES PORTABLE S.G.3. A three-valve set claimed to be as good as most four-valvers. Includes a special dual-range coil, giving great efficiency. Screened-grid high-frequency amplifier, detector, and transformer-coupled power stage. Cost of construction very reasonable. Full description on page 551 of July issue. **Blueprint No. 203, price 1s., post free.**

AMPLIFIERS

SELECTO-AMPLIFIER. A screened-grid high-frequency amplifier that can be used to increase the range and power of almost any set. A dual-range tuner is incorporated. Costs a little under £5, complete with valve and cabinet. Full description on page 160 of September issue. **Blueprint No. 210, price 1s., post free.**

UNIVERSAL PUSH-PULL AMPLIFIER. Can be added to an existing set or used on its own for the reproduction of records. Costs approximately £3 10s. Complete details on page 49 of August issue. **Blueprint No. WM204, price 1s., post free.**

MAINS UNIT

"W.M." STANDARD A.C. UNIT. Gives an output of 20 milliamperes at 120 volts. Uses a Westinghouse metal rectifier. Output at 4 volts is provided for heating filaments of A.C. valves. Three fixed outputs and one variable for screened-grid valves. Complete details on page 276 of October issue. **Blueprint No. WM214, price 1s., post free.**

THIS MONTH'S SETS

FIVE-POINT FOUR, utilises two-pin plug-in coils with single wave-change switch. The **NEW BROOKMAN'S THREE** is a revised edition of a famous set first published in October, 1929. For those desiring an A.C. mains receiver there is the **FALCON THREE,** which is used in conjunction with the **FALCON A.C. UNIT,** with a valve rectifier. Full details of these sets will be found in this issue.

Tell your friends about this special supplement—they will like to read it themselves.

Applications for back copies of the WIRELESS MAGAZINE should be made direct to the Publisher, Bernard Jones Publications, Ltd., 58/61 Fetter Lane, London, E.C.4. All copies are 1s. 3d. each, post free. Applications for blueprints should be addressed to the Blueprint Department. Postage stamps should not be sent as remittances. Note that blueprints of the sets listed described above cannot be obtained under the half-price scheme, which applies only to sets constructionally described in this issue.

Look out for the next fine issue of WIRELESS MAGAZINE on Thursday, November 20.

Power for the Receiver

HAVING explained that the energy in watts received by the aerial is extremely minute and that all the received energy does is to control power already existing in the receiver, we must now consider how this power is supplied.

The power aspect of a receiving set comes into play at the last stage. In the anode circuit of the power valve is the loud-speaker; the volume of sound from it depends upon the strength of the current variations passing through its winding; the strength of these current variations depends upon the voltage applied to the grid of the power valve, which, in turn, depends upon the overall amplifying properties of the set.

With all these inter-dependent processes, the power derived from the batteries of the set is most

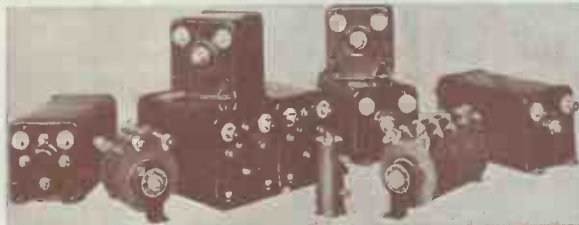
All valve sets need various sources of power for supplying the valves. In most cases this power is obtained from batteries of different kinds, but the use of electric-light mains is coming into more general use. In these notes are explained the use and advantages of various types of power supply available for the operation of radio sets.

It is not usually realised that the greater the power supplied to the valves the better will be the results from the loud-speaker.

tension battery. We have said that although it has a high voltage this battery has to deliver only a small current.

last more than twice as long as the standard size.

We hope we have established the idea that the current capacity of a high-tension battery is just as important a consideration as its voltage. Another way of meeting the large current requirements of modern sets is to use high-tension accumulators.



A group of various types and sizes of dry metal rectifiers, which are practically everlasting. They convert A.C. electric-light supplies into direct current suitable for running a radio set

important. It is to inattention to the power supply that poor reception can so frequently be traced.

There are three separate voltage supplies needed with every multi-valve set.

Firstly, there is the 2-, 4-, or 6-volt accumulator needed to heat the filaments of the valves. Secondly, there is the high-tension battery needed to provide the anodes of the valves with a positive bias. Thirdly, there is the grid-bias battery needed to bias the high-frequency and low-frequency valves negatively.

Different Outputs

Because of their entirely different functions, the three batteries in a wireless receiving set provide entirely different kinds of output. The high-tension battery is designed to provide small currents (measured in milliamperes) at a fairly high voltage, usually not less than 120 volts.

But the low-tension accumulator is designed to provide as much as .5 ampere at the much lower value of 2, 4, or 6 volts, according to the filament of the valve.

The grid-bias battery does not have to deliver any current at all. In fact, its function is to prevent grid current from flowing. This battery may have a voltage between 4½ volts and 100 volts maximum.

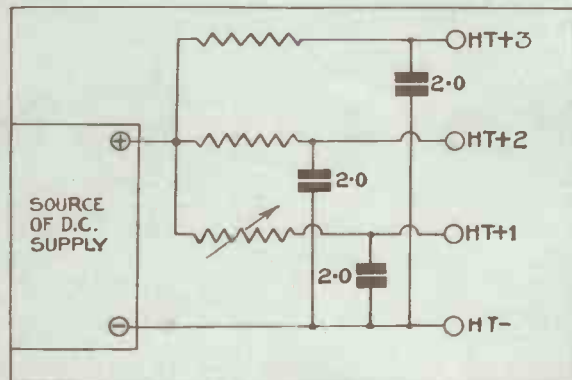
The battery needing the most careful attention is the high-

The smallest size of cell used in a high-tension battery of 120 volts can supply up to about 7 milliamperes, but if more than that is taken from it the battery rapidly deteriorates and its elements are consumed at an uneconomical rate.

Because modern valves require as much as 20 or 30 milliamperes in say, a three-valve set, much larger cells are employed, in what are known as double- and treble-capacity high-tension batteries. With such batteries a current of 15 to 20 milliamperes can be drawn without causing a rapid deterioration. It is actually cheaper to buy the more expensive double-capacity batteries, because they



A.C. (alternating current) can be stepped up or down in voltage to any required value by means of a transformer. The type shown here is for supplying 4 volts to the filaments of mains valves



This diagram shows how a circuit is arranged to divide a high-voltage source (from a mains unit) into three different values for amplification to various valves. Fixed or variable resistances are used for breaking down the voltages available at H.T.+1, H.T.+2, and H.T.+3

The cells in these batteries are constructed on the same principle as the big cells in the filament battery. They can be obtained giving current outputs up to 50 or even 100 milliamperes. Moreover, the high-tension accumulator has the advantage that it can be recharged.

Still another form of high-tension battery is the wet-cell battery. This is really the same as the normal dry high-tension battery, with the exception that the electrolyte between the elements is a liquid solution instead of a paste.

Replacing Elements

The zinc and carbon elements of a wet-cell high-tension battery can be replaced as they are worn out.

The accumulator for heating the filaments of the valves does not usually give much trouble, provided that it is recharged when necessary and not left in a discharged condition for any appreciable length of time. The current capacity of an accumulator can be fairly exactly stated; it is stated by most makers.

Knowing the total current consumption of the valves, one can easily determine how long the accumulator will last between successive rechargings. For example a three-valve set might have a total filament current consumption of .4 ampere. The accumulator might have a total current capacity of 30 ampere hours.

Hours of Use

By dividing .4 ampere into 30 ampere hours, we get the number of hours use from the accumulator, in this example 75 hours.

Before we leave battery-operated sets, we should explain that, although the grid-bias battery does not have to deliver current, it is not everlasting. In fact, one can give it a maximum useful life of, say, six months, after which it should be renewed. This is especially important in sets using large power valves; for if the grid bias is allowed to wane the anode current may rise to a value ruinous to the valve.

Use of Mains Units

In these days, power for the receiver is more often than not derived from the electric-light supply. Units are on the market which replace the high-tension battery; they are called high-tension battery eliminators, and they can be obtained with various current and voltage outputs.

The maximum current requirements of the set should be determined before buying a high-tension mains unit, because this form of supply acts rather differently

from a high-tension battery. For example, if a set takes only 15 milliamperes high-tension current at 120 volts, and a 120-volt 20-milliampere unit is fitted, it is



Most high-tension batteries, of which the above is a typical example, are provided with sockets so that various voltages can be tapped off

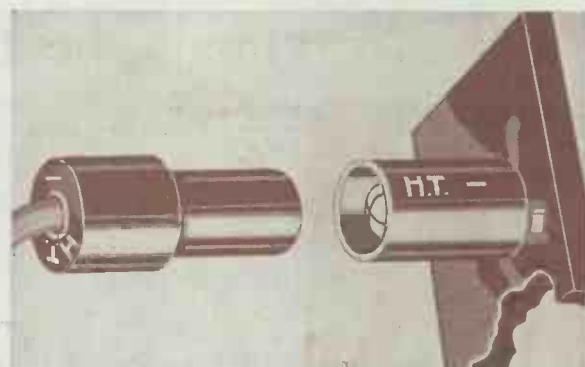
possible that the maximum voltage actually developed by the unit will exceed 120 volts.

This is because a high-tension

supply can be readily stepped up or down in voltage by means of a transformer. A.C. mains are not only useful for eliminating the high-tension supply, for it is quite easy to heat the filament of A.C. valves at 4 volts, as stepped down from the mains supply voltage.

Another great use to which A.C. mains can be put is in trickle-charging the accumulator. The voltage of supply is stepped down to a comparatively low value and then rectified, so that the resulting direct current can be used to charge the accumulator—or, rather, to keep it in its state of maximum charge. The average trickle charger is negligible in running costs and can charge 2-, 4- or 6-volt accumulators at a rate of .5 ampere or 1 ampere.

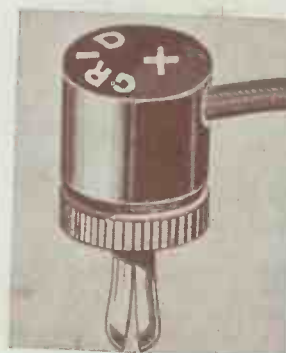
In sets working entirely from A.C. mains the grid-bias battery



Mains apparatus sometimes develops high voltages. This photograph shows an insulated plug and socket for making connections to a set

of the high-tension supply; D.C. is not recommended for charging. If the supply is A.C. much greater use can be made of it for working the receiver. The high-tension battery can be eliminated and the low-tension accumulator can be trickle-charged or also eliminated by the use of A.C.-heated valves.

We cannot be too emphatic on one point; that the power of the



Known as a wander plug, this device is plugged into the sockets of a high-tension or grid-bias battery to tap off the required voltage



In mains-operated sets it is often necessary to reduce the voltage before application to the valves. This is done by anode resistances, with which are associated fixed by-pass condensers, to prevent low-frequency oscillation or "motor-boating"

mains unit decreases in voltage output as the current output is increased. Conversely, when the current taken from the unit is much below the rated value, the rated maximum is exceeded.

Mains units are designed to work from either A.C. or D.C. mains supplies. Where the supply is D.C., the current can be utilised immediately it is smoothed; in other words, the super-imposed power-station generator ripples must be removed and then the current is suitable for a wireless set.

Rectification

But with A.C. mains supplies the current has first to be converted to direct current. This is done by means of a rectifier, which can be either a valve or a metal type. Because of the need for a rectifier in A.C. mains units they are more expensive than those designed for D.C. mains.

But there is a great advantage in A.C. mains, for this type of

is also eliminated, either by making use of part of the high-tension supply or by means of a separate rectifier. If the mains are D.C. the best use that can be made of them in conjunction with an ordinary set is for the elimination



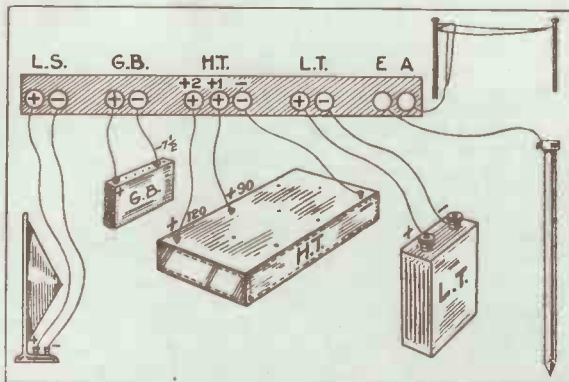
A useful adaptor for connecting a two-pin power plug to a bayonet socket used for ordinary electric lamps. Many mains sets are provided with two-pin plugs

receiver determines its performance. The received signal has no power worth speaking about; but in spite of its minuteness, the signal voltage, through the medium of tuning and valves, can control a very large amount of power—provided that it already exists in the set.

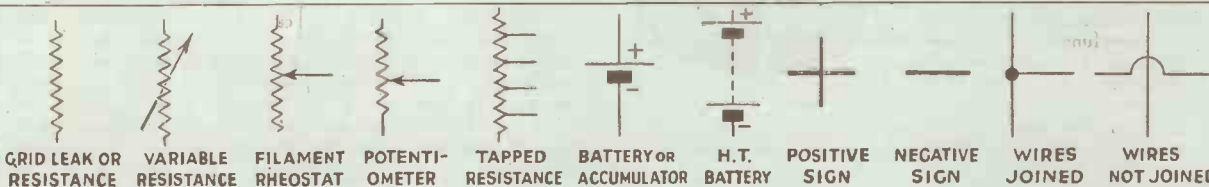
Limited Output

All too often we find evidence that the close relation between volume of sound from the loud-speaker and the power supply is not realised. When the power supply consists of only a small high-tension battery of 100 volts, the volume of sound free from distortion is also limited. Unfortunately, it is possible to increase the volume of sound even with this small power supply; and the resulting distortion is accepted as part of the nature of things.

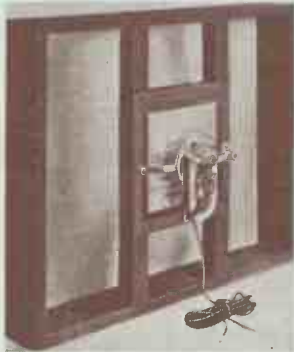
Really big volume demands a really big power supply; by that we mean at least 200 volts high-tension supply, working with a super-power valve.



This diagram shows how the external accessories are connected to the average battery receiver. There may be two or more high-tension terminals to which different voltages are applied by inserting wander plugs in different sockets of the battery



Inside the Loud-speaker



This loud-speaker has two diaphragms of tautly-stretched linen, one being much larger than the other. The centres of the two diaphragms are drawn close together and the drive is applied at this point

HERE we are at the last link in the chain of wireless reception, the loud-speaker. Its function is to transform variations of electric current into air vibrations. The variation in the electric current takes place in the anode circuit of the last valve, called the power valve. These current variations are made to produce mechanical movements in that part of the loud-speaker called the diaphragm.

The greater the movement of this diaphragm the greater is the volume of air set in motion and so the greater the volume of sound heard.

Simplest Form

In its simplest form the loud-speaker comprises a thin diaphragm set in motion by the poles of an electro-magnet; a horn is fitted over the diaphragm so that the volume of air disturbed is concentrated; the larger the size of the loud-speaker horn, and hence the greater the volume of air it contains, the greater the volume of sound, assuming that the diaphragm has a sufficient reserve of power to move the increased column of air.

The trouble with this simple loud-speaker is that the sounds emitted have a harsh resonant pitch, due to the inherent characteristics of the horn, which also has the effect of sending the sound in one direction, thus emphasising the megaphone effect.

And unless the horn is very long and widens according to a logarithmic law, low notes are not well reproduced, although top notes have a brilliance that no other type of loud-speaker can give. To overcome the disadvantages of the horn-type loud-speaker, the cone loud-speaker has been developed.

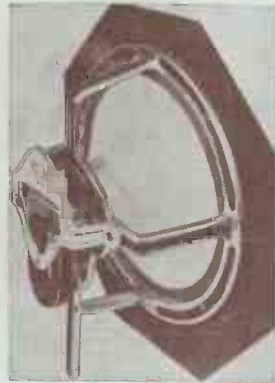
In its simplest form this consists of a large cone-shaped

diaphragm made of some non-resonant material, such as paper, linen or fibre. This large diaphragm sets such a considerable volume of air in motion that no horn is needed to provide additional sound.

Nearly all modern loud-speakers utilise a cone diaphragm, although there are different systems of setting the diaphragm in motion. The two in general use to-day are (1) the balanced-armature movement and (2) the moving-coil movement. We will briefly describe the action of each.

In the balanced-armature movement there is a powerful permanent magnet having specially-shaped pole pieces attached to each side. Two positive poles are on one side and two negative poles on the other.

Between them an armature of iron is so pivoted that it can move



A paper cone is used as the diaphragm in this model, which is built up in a metal chassis. The unit is seen on the left

from one side to the other. Round this armature is a small highly-inductive coil, the two ends of which form the loud-speaker winding. By means of a rod or reed, one end of the armature is connected to the cone diaphragm.

Now for its action. As current from the anode circuit of the power valve rises and falls in value according to the signal received, the armature moves between the



A loud-speaker of the moving-coil type has an ordinary paper cone diaphragm, but the drive works differently from usual

positive and negative magnet poles. The extent of this armature motion depends upon the value of the anode current, and the frequency with which it vibrates depends upon the frequency of the anode H current changes. This armature movement is transmitted along the connecting rod to the cone diaphragm, which in turn sets the air round it in motion and so causes sound waves

Action of Moving Coil

The action of a moving-coil cone loud-speaker is quite simple, although the mechanical means of accomplishing it are not always so simple. There was no permanent magnet in the early moving-coil loud-speakers; instead, an electro-magnet dependent upon current from a battery or from the electric-light supply was adopted.

At the present time many good permanent-magnet moving-coil loud-speakers are available. They have the great advantage, as in a balanced-armature cone loud-speaker, of requiring no external excitation.

Within the poles of the magnet is supported, not an armature, but a small coil, which forms the loud-



Headphones are still used for commercial work, although not much for broadcast reception. The type illustrated has an adjustment for the magnets

speaker winding connected in the anode circuit of the power valve. When the anode current flows, this little coil becomes an electro-magnet; and when the current varies in strength, the electro-magnetic effect also varies.

The interaction between this small coil and the large magnet around it causes the coil to move. And as this coil is connected to the cone diaphragm, its movements cause air vibrations to be set up as before.

Diaphragms have a lot to do with the performance of loud-speakers, especially in the balanced-armature type. One of the latest developments is the use of a tightly-stretched linen diaphragm. This has a characteristic specially



The first type of loud-speaker was an improved earpiece with a wood or metal horn. Many such instruments are still giving good service

desirable in all loud-speaker diaphragms; it has no pronounced resonance of its own anywhere within the audible-frequency range.

Most diaphragms resonate more readily at one part of the frequency range, and so cause either a low-pitched or high-pitched overall quality. The best loud-speakers respond equally well to all frequencies between 50 cycles and 5,000 cycles.

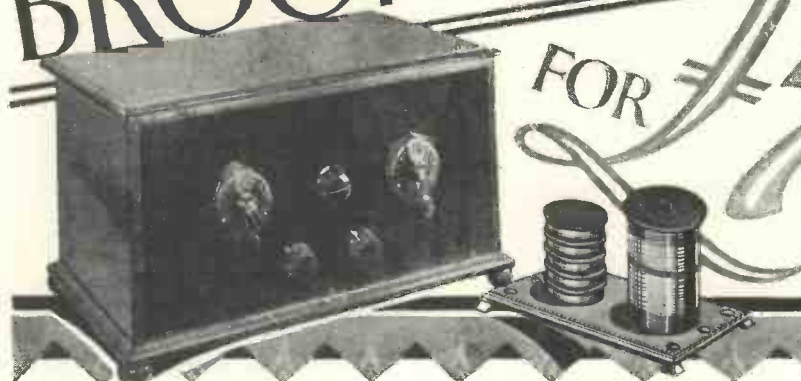
The winding of all loud-speaker movements has a certain impedance value, and it happens that the best quality of reproduction is obtained when this impedance matches the impedance of the power valve preceding it. But if the impedance of the valve is very low, thus causing a large anode current to flow through the winding, it is preferable to isolate the winding by means of a transformer or a choke-capacity filter circuit.

What to Buy

Most modern loud-speakers are enclosed in a table cabinet, so designed that it does not introduce a resonant effect commonly known as "booming." In the least expensive loud-speaker group, the plaque type is favoured. Often these non-enclosed cone-diaphragm loud-speakers give excellent results, because they are driven by well-designed balanced-armature movements. If one is not prepared to spend more than £2 on a loud-speaker, the plaque type is the best. Where £5 can be expended, a cabinet cone is the thing to buy. And where up to £10 can be spent, the new permanent-magnet moving-coil loud-speakers offer the best quality of reproduction with the least trouble of upkeep.

A New BROOKMAN'S THREE

FOR



This revised version of a famous set, built by the WIRELESS MAGAZINE Technical Staff, is cheaper to build than the original model and has a single switch for controlling the wavelength range.

It is no exaggeration to say that the Brookman's Three, details of which were published in the October (1929) WIRELESS MAGAZINE, was the most popular three-valve receiver ever described in these pages.

Now, with cheapened and in many cases improved components, it is possible to build a new model that costs a little less than £7 complete with valves. A cabinet and other accessories will be needed for the complete installation.

Designed by W. James

The original Brookman's Three was specially designed for WIRELESS MAGAZINE by W. James, who claimed that a minimum of twenty stations at good loud-speaker strength could be obtained under normal conditions.

This claim was more than borne out in practice and during the last year we have been able to publish many letters from readers all over the country reporting the successful reception of thirty, forty, and even as many as fifty stations.

Improved Coils and Valves

In great part the efficiency of the set was due to the use of Binowave coils, W. James's special design of dual-range high-frequency transformer for aerial and anode coupling. During the year these coils have been improved to give even better results with the more efficient valves now available.

The new version of the set can confidently be expected to give even better results than the original model.

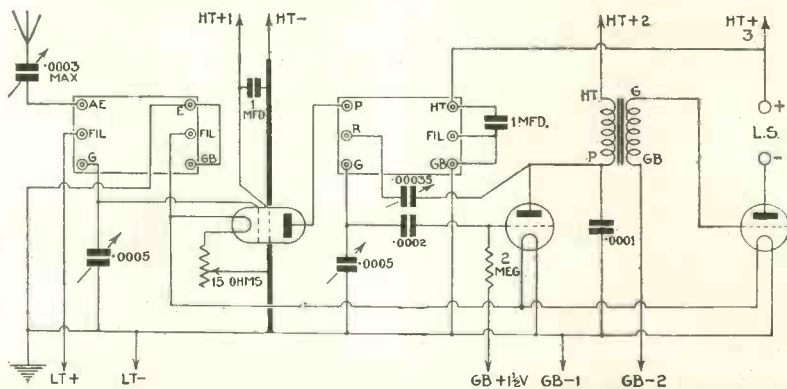
One of the greatest improvements, which will be appreciated by every

operator, is the use of a ganging arrangement for the two wave-change switches associated with the aerial and anode coils. Both switches are now controlled by a single self-indicating knob.

When turned to the right the set is switched on for long-wave reception and the letter "L" appears in a small opening on the head of the knob. For medium-wave reception, the knob

is a screened-grid high-frequency amplifier, leaky-grid detector, and a transformer-coupled power valve. This is perhaps the most efficient and satisfactory form of three-valve receiver it is possible to arrange; it is certainly the most popular.

Owing to the special design of the Binowave coils, stability is assured without the use of de-coupling resistances or any other device of the kind.



CIRCUIT OF THE NEW BROOKMAN'S THREE

Except for one or two minor alterations the new circuit is identical with that used by W. James for his original model last year

is turned to the left and the letter "S" appears. The knob is turned to its centre position to cut off the filaments of the valves and the word "Off" then appears in the indicating slot.

Before going into details, it will be advisable to discuss the general design of the set for the benefit of new readers not familiar with the original model.

The valve combination employed

The long-wave winding on the aerial transformer is astatic, while the medium-wave winding is plain; on the anode of the transformer the long-wave winding is plain and the medium-wave winding is astatic. This results in the set being particularly efficient with the minimum of screening.

In the aerial circuit there is a small-capacity condenser of the semi-variable type which enables the operator

A New Brookman's Three—Continued

COMPONENTS YOU WILL NEED FOR THE NEW BROOKMAN'S THREE

COILS

1—Pair of 1930 Binowave coils, types A and C, with ganging device, £1 17s. (Wearite).

CONDENSERS, FIXED

1—Graham-Farish .0001-microfarad, 1s. (or Lissen, Edison Bell).
1—Graham-Farish .0002-microfarad, 1s. (or Lissen, Edison Bell).
2—Franklin 1-microfarad, 4s. (or Lissen, Mullard).

CONDENSERS, VARIABLE

2—Formo .0005-microfarad, 9s. (or Utility, Jackson).
1—Formo .00035-microfarad, 4s. 6d. (or Utility, Jackson).
1—Sovereign pre-set, .0003-microfarad maximum, 1s. 6d. (or Formo, Ormond).

DIALS, SLOW-MOTION

2—Ormond, 5s. (or Brownie, Utility).

EBONITE

1—Red Triangle panel, 16 in. by 8 in., 8s. (or Becol, Trelleborg).
2—Junit terminal blocks, 1s. 4d. (or Lissen, Belling-Lee).

HOLDER, GRID-LEAK

1—Bulgin, type G6, 9d. (or Lissen, Dubilier).

HOLDERS, VALVE

2—Brownie, 2s. (or Clix, W.B.).
1—Parex screened-grid, 2s. (or W.B., Junit).

PLUGS

6—Belling-Lee, marked: Grid—1, Grid—2, H.T.+1, H.T.+2, H.T.+3, H.T.—, 1s. 9d. (or Clix, Eelex).

RESISTANCE, FIXED

1—Lissen 2-megohm, 1s. (or Watmel, Dubilier).

RESISTANCE, VARIABLE

1—Wearite 15-ohm, 1s. 6d. (or Lissen, Ormond).

The prices mentioned are those for the parts used in the original set; the prices of alternatives as indicated in the brackets may be either higher or lower

SUNDRIES

Glazite insulated wire for connecting.
Rubber-covered flex for battery leads.

1—Knob for reaction condenser.
1—Pair Lissen panel brackets, 8d. (or Keystone, Camco).
1—Parex screen to specification, 2s. 9d. (or Ready Radio, H. & B.).

TERMINALS

1—Belling-Lee, type B, marked: Aerial, Earth, L.S.+ , L.S.—, 2s. (or Igranic, Clix).
2—Belling-Lee spades, marked: L.T.+ , L.T.—, 9d. (or Clix, Eelex).

TRANSFORMER, LOW-FREQUENCY

1—Varley Ni-core 2, 17s. 6d. (or Lewcos, Philips).

ACCESSORIES

BATTERIES

2—Pertrix 120-volt, Standard type, 15s. 6d. (or Ever Ready, Grosvenor).
1—Pertrix 9-volt grid-bias, 1s. 6d. (or Ever Ready, Grosvenor).
1—Exide 2-volt accumulator, type CZG4, 13s. 6d. (or C.A.V., Lissen).

CABINET

1—Osborn, with 10-in. baseboard, 15s. (or Lock, Carrington).

LOUD-SPEAKER

1—Tunewell cabinet cone, £3 3s. (or Blue Spot, Loewe).

VALVES

1—Cossor 220SG, £1 (or Mullard PM12, Dario SG).
1—Cossor 210HF, 8s. 6d. (or Mullard PM1HF, Dario Super HF).
1—Cossor 220P, 10s. 6d. (or Mullard PM2, Dario SP).

to get the best working compromise between volume and selectivity for any particular aerial conditions.

It is also possible to control selectivity by means of the rheostat in the filament circuit of the screened-grid valve, although this is intended primarily as a volume control to avoid overloading the detector when very powerful signals are picked up.

When the filament current is reduced by turning the knob of the rheostat to the left, the selectivity of the set is increased owing to the rise in impedance of the valve itself.

By-pass Condensers

Notes should be taken of the fact that both the screening grid and anode of the screened-grid valve are by-passed to low-tension negative by two 1-microfarad fixed condensers.

For the best compromise between selectivity and sensitivity, the grid condenser has a capacity of .0002 microfarad, while the leak has a resistance of 2 megohms. An important point here is that positive bias is applied to the grid of the detector valve by tapping one end of the grid leak up the grid-bias battery.

Detector efficiency is further

improved by the use of a .0001-microfarad by-pass condenser between the detector anode and the low-tension negative side of the detector-filament circuit.

There is nothing unusual or special

How a Belling-Lee insulated screened-grid valve connector is used



about the transformer coupling between the detector and power valves. For the best results, only a good quality component should be used in this position. If desired, one of the new high-ratio transformers can be

used with a medium-impedance detector valve.

It will be seen that the circuit is electrically as simple as it can be consistent with reasonable efficiency. No unnecessary parts have been used and the cost of construction has been reduced to a minimum by the use of cheap but good-quality components.

A glance at the photographs reproduced in these pages will show that construction is very simple and can be undertaken without difficulty even by the absolute beginner.

Only four soldered connections are needed and these are for the screened-grid valve holder, which is not provided with terminals. Every other component in the set has terminals and all the other wires can be screwed in position.

Full-size Blueprint

A quarter-scale layout and wiring diagram appears in these pages, but those who desire one can obtain a full-size blueprint for half-price (that is, 6d., post free), by using the coupon at the foot of the inside back cover by November 30.

Address your order to the Blueprint Department, WIRELESS MAGAZINE, 58-61 Fetter Lane, E.C.4, and ask for No. WM218.

The construction of the set is so simple that the only point needing any explanation is the method of wiring up from the blueprint. It will be seen that each connecting lead is numbered separately; these numbers indicate the best and easiest order of assembling the wiring. Start with wire No. 1 and carry on in numerical sequence until every connection has been completed.

Revised Binowave Coils

One of the changes that have been made in the revised Binowave coils is the substitution of ebonite in place of Paxolin formers. The coils used in this set are types A (for the aerial) and C (for the anode). They are obtained as one unit fixed together by an ebonite distance piece that carries a bracket for the special ganging device.

In assembling the set it will be found most convenient to mount all the panel components first and then to screw the panel to the baseboard. After this, the coil assembly can be placed in position and the

One Wave-change Switch for Both Coils

remainder of the parts fixed down.

The results obtained will depend to a great extent on the choice of the most suitable valves, although the circuit is by no means critical in this respect.

Preferably, the screened-grid valve should have an impedance of the order of 200,000 to 300,000 ohms, although any standard type will be satisfactory.

Detector-valve Impedance

A great deal depends on the detector valve and this should have a good magnification factor. With the transformer used in the original set an impedance of 20,000 to 30,000 ohms will be suitable, that is, assuming a transformer ratio of one to three. With a higher-ratio transformer the impedance should be slightly lower, say, 15,000 to 20,000 ohms.

Quality of reproduction will depend very largely on the type of power valve used. This should have a low impedance, something in the neighbourhood of 2,500 ohms being desirable. Such a low-impedance valve may mean too big a drain on the source of high tension and in practice a compromise must be made between impedance and anode-current consumption.

The special valve table on page 324 will prove a great help in picking out a suitable type.

The question of grid bias should be given careful consideration, for if the power valve is under-biased reproduction will be distorted and the valve itself will be over-run, because too great an anode current will flow.

Positive Detector Bias

Positive bias is applied to the grid of the detector valve by tapping the normal grid-bias positive lead (that is, "Grid - 1," connected to low-tension negative in the set) into the

1½-volt socket on the grid battery.

This results in the negative bias applied to the power valve being 1½ volts lower in value than the actual mark on the battery. For instance, to apply 7½ volts bias to the power valve, it will be necessary to put the "Grid - 2" lead in the 9-volt socket.

No difficulty at all will be experienced in the operation of the receiver. There are only five controls on the panel, arranged as follows:—

The left-hand slow-motion dial tunes the aerial transformer, while the right-hand dial tunes the anode transformer. Midway between these large dials is the small knob of the reaction condenser, while below, to the left and right respectively, are (1) the combined wave-change and on-off

switch, and (2) the screened-grid valve rheostat.

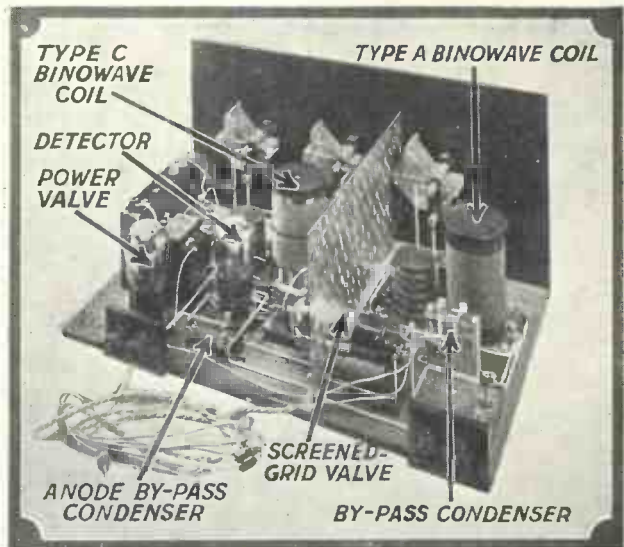
To pick up stations, the wave-change switch should be adjusted to the desired waveband as explained at the beginning of the article. The rheostat should be turned full on by rotating the knob to the extreme right.

Next, the reaction condenser should be turned a little to the right until the set is on the verge of oscillation. This is indicated by "a certain liveliness" from the loud-speaker that is not heard when the reaction condenser is at its zero setting.

Turning the Dials

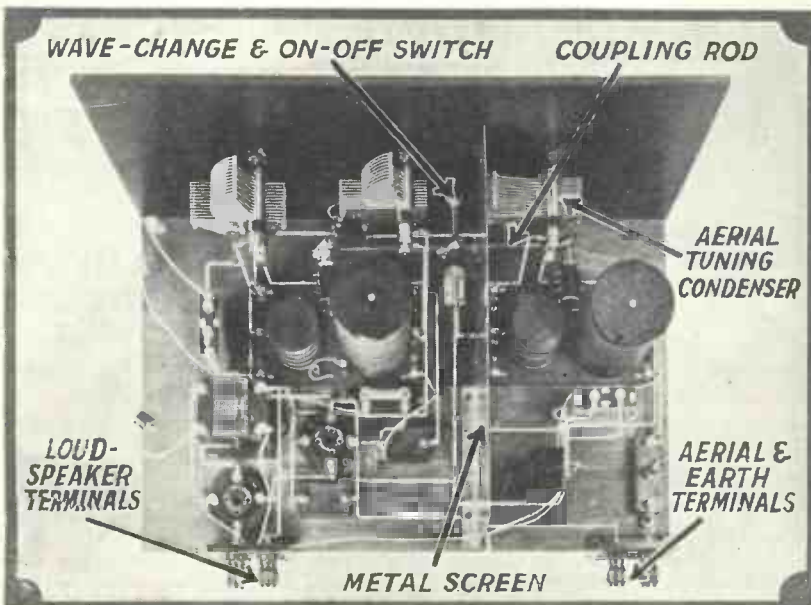
The two large tuning dials should then be slowly rotated in unison at about the same settings until a station is picked up, when the reaction control should be readjusted for the best results.

It will be found after a little use that the set has really extraordinary capabilities in



COMPACT BUT NOT CROWDED

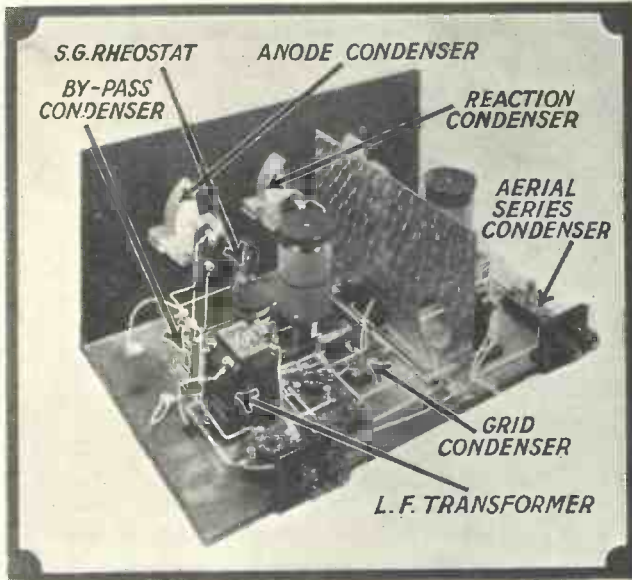
This photograph shows the new Brookman's Three complete with valves. Flexible leads are used for the battery connections; terminals can, of course, be used if desired



A GANGING ARRANGEMENT FOR BINOWAVE COILS

From this photographic plan view it will be clear how the two coil switches are ganged by a special coupling rod. This device can be obtained separately if desired and used for providing a single wave-change knob for the original Brookman's Three

A New Brookman's Three—Continued



NO WAVETRAP NEEDED

So selective are the Binowave coils that the set can be used successfully within a mile or two of a regional transmitter

the picking up of distant stations. Moreover, the selectivity is of such a high order that many Continental transmissions can be received without difficulty even when the set is used within a few miles of a regional transmitter. Indeed, the tuning is so sharp that it is essential to use slow-motion dials.

High-tension Voltages

After the set has been in use for a few hours it is advisable to readjust the high-tension voltages, particularly that applied to the detector valve.

If this has an impedance of the order of 20,000 ohms, it is probable that a value of 60 to 80 volts will give the best results.

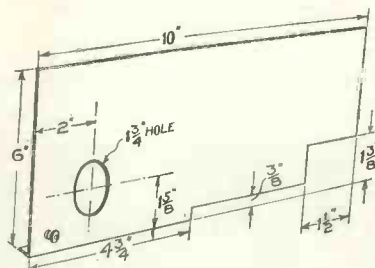
When used in outlying districts, some advantage may be gained by employing a pentode valve in the last stage, but in this case particular care should be taken to see that the high-tension source will stand the extra drain put on it. It is never an economy to take more out of a battery than its normal rated load; it is best to use triple-capacity cells.

Many owners of the original Brook-

panel or the old holes will show.

BINOWAVE COILS

For the sake of newcomers to radio, we give below some data about W. James's famous Binowave coils, which have been used with great



SCREEN DETAILS

This screen for the New Brookman's Three can be made of aluminium or copper

success in many WIRELESS MAGAZINE receivers.

Those readers who desire to make the coils for themselves will be able to do so from the complete details published in the August WIRELESS MAGAZINE.

man's Three, described in October last year, will no doubt wish to take advantage of the new ganging device for the coils. This can be obtained from Wright and Weaire, Ltd., for 3s. It includes the ebonite distance piece and bracket, a coupling bar and the self-indicating knob.

It will, of course, be necessary to make a slight alteration to the layout of the set and also to provide a new

A limited number of copies of this issue is obtainable from the Publisher, WIRELESS MAGAZINE, 58-61 Fetter Lane, E.C.4, the price is. 3d. each.

Amongst the receivers in which these coils have been used are the Brookman's Two, the original Brookman's Three, the Brookman's Push-pull Three, the Brookman's A.C. Three, the Brookman's Four, the Lodestone Four, and the Regional Band-pass Four. Each of these sets has been a great success and more than fulfilled the claims made for it.

Different Types

The type A coil, used as an aerial-grid coupling, has two sets of windings, one for the long waves and the other for the medium waves. They are mounted together on a base with a three-position switch. Selectivity and sensitivity are particular features of the design. It is recommended that ebonite coil formers should be used.

For coupling a screened-grid valve to the detector a type C coil is used. This is again a transformer, with the primary arranged to match an average screened-grid valve. These valves have widely different characteristics and the medium-wave primary is therefore tapped. The long-wave primary is not so critical and is not tapped.

With the anode of the valve connected to the tap on the medium-wave coil, the selectivity will be better, but the signal strength lower than when the full winding is used.

Great magnification with stability is a feature of the 1930 Binowave coils, which also give exceptional selectivity.

OVERLOADING THE FIRST VALVE

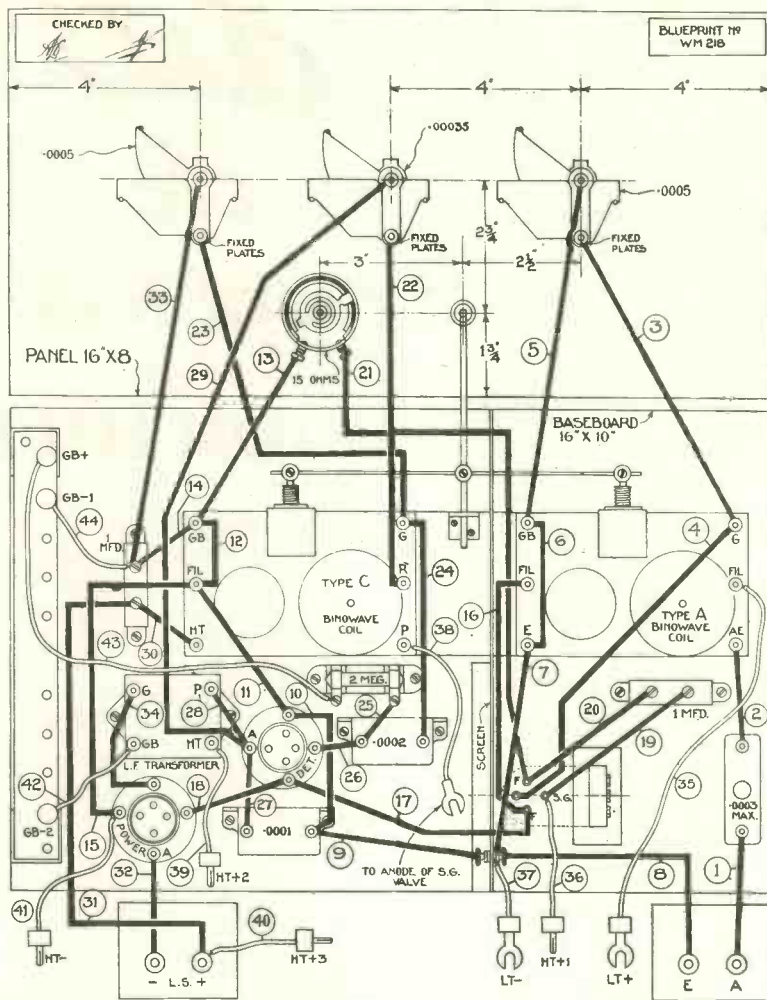
A FAIRLY common fault in these days is that of overloading the first valve in the set. You have a good aerial, a first-class aerial coil, and tune full in to the local station.

The chances are that you apply to the first valve, a screened-grid, for

All the new season's WIRELESS MAGAZINE sets are designed to meet listeners' special needs. As far as possible, simplicity of construction has been made a feature of every set, but in no case has efficiency been sacrificed to simplicity. The new models will be found to be particularly selective and sensitive.

Last month details of three receivers were published. The Regional Band-pass Four, designed by W. James, employed a screened-grid valve, detector and two low-frequency stages, with the famous Binowave coils. The Five-point Three had one screened-grid stage, detector and power valve; the "Five-point" sets cover both wavebands with

Will Receive a Minimum of 20 Stations



QUARTER-SCALE LAYOUT AND WIRING DIAGRAM

This layout and wiring diagram can be obtained as a full-size blueprint for half-price (that is, 6d., post free) if the coupon at the foot of the inside back cover is used by November 30. Ask for No. WM218 when ordering

example, a signal of such strength that either grid current flows or anode rectification takes place. Perhaps grid current and rectification are produced. It depends upon the particular screened-grid valve used, the working voltages and, of course, the position of the receiving aerial with respect to the transmitter.

Distortion is, therefore, introduced in the first stage. You may be wondering how this can be true when the volume control is turned down to soften the output.

Well, the truth is that most volume controls are not of much use. Most types do not stop this form of overloading, as they are associated with the first valve, instead of with the aerial or grid circuit.

Some listeners reduce the size of their aerial or fit a condenser in the aerial circuit for the purpose of reducing the input. This is good practice, although the distant stations are weakened a little. But still, we should arrange to receive first the local station.

W. JAMES.

WHAT USERS SAY

DURING the past twelve months we have received a record number of letters from readers in praise of W. James's original Brookman's Three. Here are some extracts:—

PLUMSTEAD: "... a very fine set, bringing in at least thirty stations on the loud-speaker."

MIDDLESBROUGH: "... I have had nearly seventy stations already."

RANMOOR: "The volume is terrific and an average of twenty-seven stations can be obtained."

MAIDSTONE: "... my set puts up a performance equal to many of the five- and six-valve sets in the district; in fact, it surpasses some of them."

CLAPTON: "I won't weary you with a list of stations received. ... I won a 10s. bet against one of the best-known chassis sets on the market with the Brookman's Three."

IPSWICH: "I can bring in about forty stations at present and have not finished yet."

MANCHESTER: "... I can receive forty-seven stations at decent loud-speaker strength."

KENSINGTON: "I am more than satisfied. My log to date is forty-three stations."

YORKSHIRE: "I have already logged forty-seven stations, all on the loud-speaker."

MANCHESTER: "I have logged and identified fifty-six stations."

ROTTERDAM (Holland): "The volume is excellent and the distance-getting properties are extraordinary."

Now that you are convinced as to what the set will really do, get down to the job and build it at once so that you can make the best use of the long winter evenings!

a single change-over switch, although standard two-pin plug-in coils are used. A Five-point Four, with two low-frequency stages, appears in this issue.

Those who prefer mains-operated receivers will be interested in the Merlin Two and the A.C. three-valver described in this issue. The Merlin Two,

described last month, uses a multi-wave tuner, and combines a detector and power valve. It is designed to work with the "W.M." Standard A.C. Unit or any standard commercial mains unit. In this issue a standard D.C. unit is described. Both the A.C. and D.C. units are intended for use with all WIRELESS MAGAZINE receivers.



Radio Knick- Knacks

By
CLIFTON HILL

THE train had started and I had already unfolded the evening paper when they wrenched open the door and struggled in.

There was a momentary jam of perspiring humanity and of ill-tied paper packages which resolved itself into a man, a woman and a camel-load of parcels. The man was very much out of breath, his tie awry, his mackintosh crumpled. He sat fanning himself with a rather discouraged-looking bowler hat, whilst his companion busied herself with packing the litter in the rack.

Small country shopkeepers, I judged them to be, returning home after a day's stock hunting, but I could think of no trade quite fitting the bucolic and yet shrewdly brazen air of my *vis-à-vis*. He was reminiscent of the farm, the auction room and the racecourse.

At the points outside Liverpool Street the carriage lurched and the woman, lurching with it, let fall an object which rattled on to my lap and thence to the floor. I picked it up and handed it to the man.

"Much obliged," he wheezed, "out o' breath . . . 'alf a mo' . . . bit of a rush . . . you know." There was a pause during which he stopped his fanning to fumble in his more remote pockets. A paper packet emerged, together with a corkscrew, some coppers and a tangle of string. All these he proffered to me with an invitation to "ave a jeejube." I declined the refreshment and asked him how he felt now.

"Doing fine," he said, breathing a cloud of eucalyptus vapour at me. "Me an' the missus cut it close this

time and no mistake. Damn near lost the column. Always the same when we comes up to town; can't get the missus away from the shop winders."

There ensued a protest and counter attack from his stout and comfortable-looking companion, after which he produced the article I had retrieved from the floor and asked me what I thought of it. I thought nothing of it.

It was the battered upper half of an electric hair-drying machine, one of those things you plug into the wall and which spout hot air faster than any M.P. I submitted that it didn't look very useful in its present state.

"Ah," he said, leaning across to pat me on the knee. "Ah; that's all you know about it. That's where you're wrong, see? You might see this in a shop winder and pass it by, never taking no notice like. But me, I'm 'ot at noticing. Ninepence, this cost me and many a ninepence it's going to earn down at Luddingford."

"Hairdresser?" I enquired.

"Hairdresser! *Neaw*," he sneered, curling in scorn his reddish moustache right up under his stub nose. "Electrical dealer, that's what I am, an' plumbers' merchant an' general dealer an' everything as good as new at 'arf price. This 'ere, what'ye think I'm agoing to do with it?"

I pondered, but had to give it up.

"This 'ere's going to be a first-class blowlamp when I've done with it. D'ye know the price of blowlamps, Mister? Fifteen bob to three quid they cost."

I still didn't see and told him so.

"Not understand? Non compree? Well, this is the BLOW, see? Now what about a spot o' petrol and a pipe up the oojah, with a whatyemaycallit on the 'andle to turn it on and off? Simple as owdoyou do when you *know*. Shoot a flame a yard long, this will," then, as an inspired afterthought, "and 'ot."

He surveyed me in placid triumph, with his hat on one side and his tie gradually climbing to his left ear, whilst his wife assured me that "Alf was a rare 'andy one for fixing things." Then, with an abrupt "Ere, look at this," he clambered on to the seat and hauled down a half-stuffed and badly tied bolster of brown paper which he assured me, with a wink, "was full of the real stuff, not 'alf."

It was less an unpacking than an evisceration which suddenly littered the seat with a medley of the most dejected and dogeared radio oddments which it has ever been my misfortune to see. All the discards from the world's least successful amateur workshops were there, the scum and waste products of a hundred failures.

In fact, there was one warped condenser with a chipped dial which I seemed to . . . but no, that couldn't be. I had thrown it in the dustbin.

"Five bob, this lot," he crowed in cheerful aggressiveness. "Five Robertos. Bloke wanted seven an' a tanner, but you can't get round me. Rare 'and at a bargain, I am.

"See these, Mister? Them two panels alone is worth the money. Stick 'em in the shop winder with an 'eap of gadgets round them and a notice: 'ALL WIRELESS REPAIRS

DONE HERE; FAMILIES SUPPLIED. CONSULT THE EXPERT,' and a few of these 'ere valves and a drawing of a circus and there you are. Sell like billyoh. Won't 'arf wipe the eye of Jimmy 'Oskins."

"Is Jimmy Hoskins," I asked, "a wireless dealer already established, whose eye you desire to put out of joint, as it were? If so, it's all fairly clear. But you'll pardon my ignorance; what has a circus to do with it?"

A look of disdainful suspicion clouded his expansiveness. "Why, Mister, don't you know *nothing* about this wireless business? The circus is the ins and outs an' roundabouts; it's the way the juice goes."

A great light dawned. "Oh, you mean a circuit."

"Well," he queried. "What's the difference. Same thing, ain't it? It's the give and take, as you might say . . . this way in and that way out. I've drawn a circuit myself and I'm going to build a set according, to stick in the winder and collect the crowd."

This was getting decidedly interesting. Perhaps he wouldn't mind explaining the circuit . . . making a bit of a diagram?

"Mind?" he said. "No, I don't mind. Johnny-kind-to-all-sorts, that's me every time." In a moment he was tracing lines on a piece of packing paper whilst he explained. The fact that the pencil was an indel-

ible one and required much sucking enhanced his personal appearance but added nothing to the lucidity of the aforesaid circus.

The train roared on and the winter gale lashed the carriage windows with spattering raindrops. With gestures and emphatic puncturings of the paper, the queer soliloquy went on, a medley of electrician's, plumber's and mechanic's jargon. What he was after he couldn't make clear; what Heath Robinsonish monstrosity might emerge from his rubbish heap to disgrace the shop at Luddingford, I knew it would be courting a quarrel to ascertain.

I had lost interest and was on the point of nodding when he ended on his irritating, cocksure note: "Well, there you are, see? Took a bit of thinking out, that did. Not that I've ever built a set, but I know them as 'ave . . . and look at them. Look at them, I say. All you want is a bit of common sense. Done harder things than that, I 'ave, and never been beat yet.

"Got to do all sorts of things to keep the pot rolling, if you know what I mean. Besides this set's only for show, really, not for the customers to 'ark at."

"Is your wife interested in wireless, too?" I asked.

"What, 'er? Lord no. She looks after the bottles and skins and does uncommon well at 'em, don't you,

Fanny?"

A station flashed past in a roar of wheels and a wraith of steam.

"That was Luddingford," I told him. "Didn't you say you live there?"

"Cripes," he shouted, suddenly galvanised into violent action. "Djermeantersay this don't stop before Sowerby Junction?"

I assured him that it didn't. In great armfuls he began to repack his bargains, wrestling with damp paper, knotted string, elusive components and a clinging mackintosh. His wife's attempt to assist him was repulsed with a "Blinkin' clever, ain't you? I don't think. Now we'll 'ave to walk back four mile, an' you'll carry this one."

For some abstruse reason he seemed to hold me also responsible for his unwise choice of a train, for I heard him mutter something about "Wasting time on idjits," and when the train pulled up at Sowerby Junction his "So long, Mister" was tinged with a hauteur in sad contrast with his previous brotherliness.

The dignity of his exit was marred, however, by the bursting of a parcel, and, when the train glided out, the last that I saw of them was two Bhudda-like figures kneeling on the platform, with their heads bent as though in worship, punching and tugging at the idol which was to preside over the future destinies of their Luddingford emporium.

OUR CARICATURIST AT IT AGAIN!



Arthur Lalley, until recently conductor of the dance band at the Café de Paris



Helen Burnell, a Ziegfeld Follies girl, broadcast in one of the "Diversions"



Irene Russell took part in a sketch broadcast from the Adelphi

A CHANGE OF HEART AT THE B.B.C.?

WITH the completion of eight years of broadcasting, the B.B.C. has, not perhaps unjustifiably, a feeling of satisfaction at the continued development of what has become a national institution.

In November, 1922, there was nothing. In November, 1930, Savoy Hill is able to look back on an average annual accretion of 400,000 licences. The service is still a long way from being stabilised; a point which any authority in favour of withholding the funds which are its due would do well to bear in mind.

The financial requirements of broadcasting cannot be assessed on the basis of past or present programme standards. Indeed, it has been realised by the B.B.C. from the very early days that a period of some ten years would elapse before the potentialities of the service could be fully envisaged.

Little More Than Toys

A chain of twenty-two transmitting stations, some of them little more than toys in the light of what is requisite in the construction of a modern broadcasting transmitter, was not the *ultima Thule* of the originators of the service.

The substitution of a new system of distribution, which should enable nearly every listener in the United Kingdom to have the choice of at least two programmes, available simultaneously, on cheap and simple apparatus, was talked of and written about in 1924; now the work of fulfilment is well in hand.

Pungent Criticisms

It was once said by a pungent critic, in comparing American, German, and British broadcasting methods, that the Americans did something and talked about it afterwards, the Germans did a thing and never talked about it, while the British talked and went on talking, but never did anything. The reader may be left to ponder whether this was intended as a gibe, or as a tribute

In this article our Special Commissioner, who has exclusive sources of information not available to other journalists, discusses recent activities at the B.B.C.'s headquarters. It is interesting to learn that feeling at Savoy Hill is not irrevocably opposed to sponsored programmes.

to the respective publicity methods.

In any event, high-power stations and alternative programmes have not been talked about in vain and the next two years will see the fruition of this part of the B.B.C.'s projects. But this will not spell the saturation point of productive and efficient expenditure on the broadcasting service.

It is a service that can never stand still. If it does not go forward it must decline. If it is to remain permanently a supplementary source of public revenue, its development must go on. It is still merely on the threshold of research work. This field opens up almost limitless vistas, bounded only by the amount of money available for investigation.

The completion of Broadcasting House, the regional scheme and the improvement in quality and variety of programmes will prove to be merely pages in the history of British broadcasting. The regional transmitters may, and are indeed, expected to fill the needs of broadcaster and listener for a further ten years; but what then?

The wireless engineer of 1935-1940 will write new pages in the story if his financial resources are not curtailed.

♦ ♦ ♦

In the early years of broadcasting it was the fashion to adopt an effusive strain in describing what the service had accomplished. "Look back," said Savoy Hill, "on the activities of the past year, or two years, and if you are not altogether satisfied with the results, pray remember that broadcasting is in its infancy."

Listeners, thank heaven, were tolerant and accepted the official slogan, "broadcasting is still in its infancy," with heartening generosity. Meanwhile, Savoy Hill was learning

its lesson and fortifying itself against captious criticism, maintaining at the same time a courteous receptiveness to the comments of its audience.

But the infancy pose is a thing of the past. The tendency now is to avoid the merely retrospective and to look to the future. Strange though it may sound, this is not found in some quarters to open up an entirely satisfactory prospect.

We come back to the old formula: "If broadcasting does not advance, it must decline." Hence Savoy Hill finds some of its leaders sighing for new worlds to conquer and asking whether broadcasting fulfils its function completely in catering mainly for those in search of amusement and entertainment in the accepted sense of those much-analysed terms.

No Stagnation

The greater minds find diminishing scope for sustained effort. Let it not be supposed, however, that stagnation has set in.

The listener must watch instead for indications of the belief which exists in influential quarters that broadcasting has a mission to fulfil more important and certainly more ambitious than anything revealed in the activities of the past.

At the time of the General Strike of 1926 it was plain that broadcasting was the only medium by which intimate and instant touch could be maintained with the masses. No political party machinery possessed any like facility. Government, under the emergency regulations, could, of course, have taken over the service; but such a step would not have been approved by the wiser party leaders.

Universal Favour

Nor would any future effort, either to control the service permanently, or commandeer it in times of domestic emergency, be likely to find universal favour, for the reasons, among others, that broadcasting, while it is a national power, holds the goodwill and even the affection of the public,

that it is never likely to be used by its present leaders for the purpose of doping listeners and that its support will be always available for the preservation of law and order and the life and liberty of the individual.

A feeling exists, then, that in the anxious times through which Great Britain will pass before she reaches anything approaching her pre-war standard of happiness and prosperity, broadcasting may be found to provide an instrument through which may be achieved more than it is possible to accomplish through the old political shibboleths.

A Robot-Mussolini

Broadcasting has never yet been called upon to give the nation a lead. There are those who think that it may become a sort of Robot-Mussolini and that eventually through the machinery of broadcasting will be found economic salvation.

♦ ♦ ♦

Other aspects of future service developments are exercising the minds of the leaders of broadcasting. It is felt by the more progressive element that the restrictive influence of the Licence and Agreement appended to the Royal Charter of 1927 can become a real drag upon the machine.

While, for example, the B.B.C. may broadcast matter provided by any outside person, such matter must be supplied gratuitously and no monetary or other valuable consideration may be accepted by the Corporation

in respect of the item broadcast.

The Civil Service mind, as applied to the finances of the great spending departments where only the debit side of a cash account is recognised, is evident in this restriction. Every farthing received by the B.B.C., says the Licence in effect, must be paid to it by the Post Office.

If, therefore, the Post Office pays the B.B.C. half a million pounds, the Corporation must live on that half-million alone.

The B.B.C. may see a way of doubling its income by some form of co-operation with trading enterprise; but, apparently, it were sacrilege to suggest that an organisation having semi-official contact with Government departments should turn its attention to financial dealings with the business world.

This is coming to be regarded as a matter very much open to doubt. Up to the limit of its powers, the Corporation provides certain types of programme of more or less stereotyped value, and no section of the organisation may exceed its particular allocation.

Thus, out of the 10s. licence fee paid by each of the last 200,000 listeners, approximately (the total number of licencees being estimated at 3,200,000 in December next) only 5s. goes to the Corporation. Roughly, 3s. 9d. of this sum is allocated to music, leaving only 1s. 3d. for drama, talks, special transmissions, etc.

The listener can, therefore, see what his individual contribution to

broadcasting amounts to over a whole year.

Singularly enough, the Post Office, on the other hand, is not under any obligation to take action to recover payment of any fees from listeners, although action is sometimes taken against listeners for installing and working a receiving set without a licence. The scales, therefore, are weighted against the B.B.C., which at present has no scope for redressing the balance.

Sponsored Programmes

One way in which this could be done later is by the introduction of some form of sponsored programme. Feeling at Savoy Hill is not irrevocably opposed to this evolution. The B.B.C. must naturally retain the prior rights, the monopoly, in short, over all broadcast matter; but with proper safeguards co-operation with big business would introduce into the purely entertainment side of broadcasting a measure of variety and vitality which would not be unacceptable to many listeners.

So runs the argument, an argument which is fraught with revolutionary changes in the policy of British broadcasting. If ever such a change came about, and the shadow on the horizon is at present no larger than a man's hand, it may be assumed that no reduction in the licence fee would follow.

But with additional revenue at its command, broadcasting could attain a greater strength than it has yet known.



FROM THE ARC DE TRIOMPHE TO THE UNITED STATES—A SPECIAL BROADCAST

The scene at the Tomb of the Unknown Soldier in Paris when the Commander of the American Legion in France delivered an oration which was transmitted to New York. American listeners also heard the "Sammies" sound the Last Post

Your Loud-speaker Where You Want It!

There are many reasons why you may desire to extend your loud-speaker leads; large numbers of people, for instance, would like to run a wire through to the kitchen and provide a cheap loud-speaker for the housemaid. In these notes W. JAMES explains how to extend a loud-speaker system without spoiling the quality.

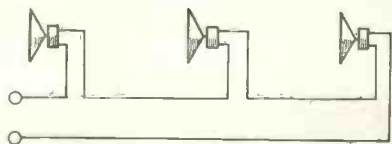
This article was suggested by Mr. W. E. Lowe, of Wylde Green, who has been awarded a prize of half a guinea.

THERE are many people who would, I know, like to have loud-speakers in several rooms of the house.

But how to arrange this without considerable expense is something of a problem. Straightforward loud-speaker extension points are easily enough arranged.

The volume cannot be controlled from the points, however; neither can the set be turned on or off.

Further, the set cannot be tuned from any of the extension points. In



Loud-speakers arranged in series

its simplest form, then, the loud-speaker extension points are merely connections, such as terminals on jacks joined to the last valve in the set.

For safety's sake, a choke-condenser filter ought to be used, although a transformer has advantages. When a choke is connected, and loud-speakers are placed in parallel, the net impedance in the anode circuit of the last valve is usually such that the output is reduced and overloading occurs. A transformer of suitable ratio would have avoided this, although one ratio would not suit various loud-speakers.

This is, indeed, the whole difficulty

of working extensions. If all the loud-speakers were always connected (they seldom are) the output circuit could be arranged to provide good quality and the maximum of volume.

In practice the number in use varies and, therefore, the output and quality vary as well. A choke or a transformer output must be used in order to keep the high-tension from the extensions. If, therefore, they can be arranged to suit average conditions, so much the better.

Extension wiring ought to be carefully carried out, using good quality insulated wire. Some provide a terminal block at each point; others use a plug-and-jack system, it then being possible for the set to be turned on or off, using a relay included in the wiring.

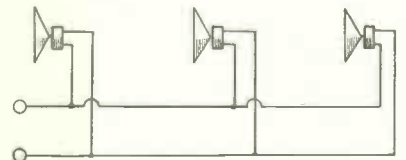
It should be clearly understood that the simple method of wiring-up extension points in parallel is never likely to be really satisfactory, for the reason that both tone and volume vary with the number of loud-speakers connected. When there are fixed points the results may be better, as it is usually possible to arrange the output transformer to suit the combination, or to connect loud-speakers in series or parallel according to circumstances.

What happens when a poor loud-speaker is connected with a good one? Surely the reproduction from the good one is affected, and in my experience quite a difference in quality is to be noted by joining various instruments one after the other to a good one.

When a single output stage is used an individual adjustment of volume is not possible. The adjustment of volume at the loud-speaker end of a set is, as a matter of fact, not a sound proposition without rather special apparatus. The resistance methods

which are sometimes seen suggested are poor, quality varying with the volume.

In an installation having several points the best results are obtained when each point has its own power valve supplied from the set. The

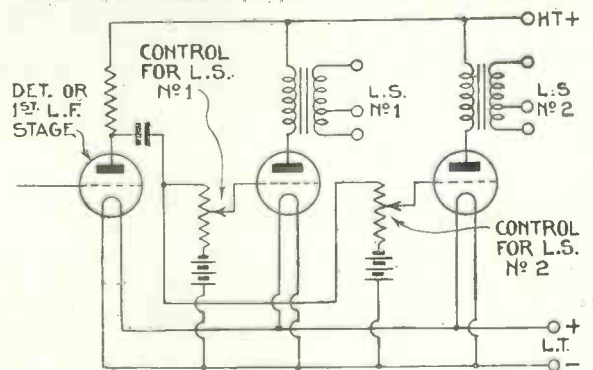


Loud-speakers arranged in parallel

separate points will not then alter in any way as others are connected or turned off, and an individual adjustment of volume is possible by controlling the input to the separate valves.

Tuning from distant points may be effected with suitable apparatus, which is, of course, costly. In one scheme an electric motor is used to turn the shaft of the tuning condenser—very slowly, of course—and means for regulating the volume are provided. This is an ideal arrangement in many respects, the wireless being under complete control at any extension point. The cost of a good installation is such that it is out of reach of most of us.

Care is needed when arranging extensions in order that the tone shall not be spoilt. Too much wiring



Method of using separately controlled output valves

VOLUME CONTROLS AND ECONOMY

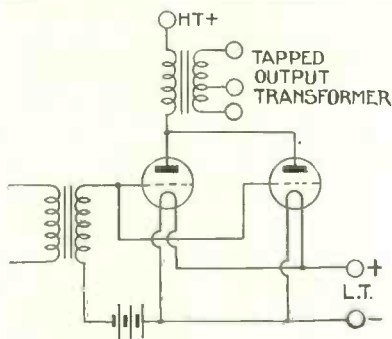
leads to a reduction in the strength of high notes, and all joints and connections must be properly made, or noises may appear with the broadcast.

I do not like the idea of using a single-wire circuit with an earth return. It may—and, in fact, no doubt, does in many instances—work satisfactorily.

But the two-wire system, both wires being insulated, is not much more expensive and is a sounder electrical job.

A tapped output transformer might with advantage be used. The best tap can be chosen according to the loud-speakers in use and will ensure that the last stage is working effectively. If it is remembered that the last valve is capable of producing only a certain amount of power, and that this is used by the loud-speakers, it will be realised that when a second loud-speaker in a different room is added the volume from the first must decrease.

The old trick of using two or three



Using a tapped output transformer

loud-speakers of different types in one room so as to obtain a more pleasing result is worth remembering. But here, again, try both the series and the parallel connection, and note that a transformer of suitable ratio may help.

Most sets are fitted with a small output valve, one just about able to supply from one loud-speaker a useful volume of sound. When two reproducers in different rooms are used, something suffers—quality or volume. The one small valve cannot drive the two loud-speakers properly.

With two valves joined in parallel or push-pull additional output becomes available. Possibly the use of two separate output valves would be better, as separate output transformers to suit the loud-speakers can easily be connected.

ONCE upon a time we used to think that in sets where the volume control is simply a rheostat in the screened-grid H.F. valve filament leads, it was definitely harmful to lower the filament temperature below a certain point.

Wiseacres said that the falling-off in emission caused by the lower temperature would upset the "rejuvenating" action of the coated filament. Valve makers were asked to experiment with new filament coatings

which would work well when nearly cold!

And yet, on looking up the records of two H.F. valves in a four-valver I am constantly using, I cannot see that the one H.F. valve which is "volume-controlled" has given any worse service than the other, which has always had a full two volts across it. Really there seems to be no reason why anyone need be afraid of using the H.F. valve rheostat. It was made to be used. K. U.

BATTERY COSTS "HELP YOURSELF"!

THOSE who use dry batteries for anode current because they must ought to consider very carefully the relative costs of various types.

Small batteries are not economical when used with a big set. They are only cheaper in first cost; as they discharge quickly, a new set must soon be purchased.

It used at one time to be said that those who employed dry batteries for the anode-circuit supply could not obtain really good reproduction. But that is hardly true to-day.

Now there are good battery valves. They provide a reasonable amount of output.

A push-pull circuit, using two effective battery power valves, will provide enough output for normal domestic purposes without too quickly discharging a large-size dry battery. Over-bias the power valves a little, if necessary, to keep the current down. This will not introduce much distortion, and a big saving in current may easily be effected.

W. JAMES.

EVERYBODY has heard of the "Help Yourself Annual," which is published every year at 2s. 6d. by the Stock Exchange Dramatic and Operatic Society in aid of their Christmas Charity Fund. Subscribers have a chance of winning valuable prizes.

Amongst the wireless gifts offered this year we note the following:—

- An Ormond mahogany console four-valve set and electric gramophone, valued £50.
- A Baird Televisor.
- A Celestion C24 mahogany loud-speaker, value £21.
- An Ekco-lectric three-valve set.
- A Pye portable receiver.
- A Varley all-electric two-valve set and gramophone amplifier for either A.C. or D.C.
- A Standard super-capacity 126-volt wet battery in three Unibloc trays.
- A Phonixion electric gramophone, value £15 15s.
- A Mullard type C loud-speaker.
- An Ormond four-valve portable set, value £16 16s.

Full particulars will be found on page 113 of the "Help Yourself Annual," which is on sale at every bookstall.

THE LEAKY GRID

I SAW an account of a bride who wept at her wedding because her long plaited hair suddenly came down during the ceremony. That is the first case of a moving coil being unsatisfactory that has come under my notice.

An elderly vicar was forced to bring his sermon to a conclusion, says a newspaper, on account of his having nearly swallowed his dental plate. He survived, so I suppose he had an output choke on his set.

I read that the Berne transmitter is stationed at Nuremchen-buchsee. That does not mean that Swiss listeners get their programmes free; they are not buckshee.

A suggestion for a wireless ballad programme: "O dry those tears," sung by Arthur de Greef.

Frascati's Orchestra is conducted by Georges Hæeck. He is the sole conductor, of course; no one may take his place. W.-W.



Sponsored Programmes

MANY listeners were interested in the suggestion made by the Editor of WIRELESS MAGAZINE last month that sponsored programmes might be the "spiced morsels" in the regular run of broadcasts.

An occasional item of this nature would undoubtedly give an added zest to many jaded ears. I have heard rumours that the B.B.C. are considering the question, but enquiries at Savoy Hill are met with the usual denials.

Across the Atlantic

In this connection it is interesting to recall some remarks made by Dr. Lee de Forest in his presidential address to the Institute of Radio Engineers.

"I have consistently condemned the practice (direct advertising by broadcasting) as perverse, pernicious, reflecting on the good name of radio and distinctly retarding its development," said the "Father of Radio Broadcasting."

Powerful Potentialities

But this rather startling condemnation is relieved by a remark that followed. "I did not foresee the fine excellence of the sponsored programme or its powerful potentialities in building up the almost incredible demand for receiving apparatus."

So although there is everything to be said against the plain advertising broadcast there is much in favour of the sponsored programme.

I hope the authorities at Savoy Hill will not be too bigoted to con-

sider the question in the light of entertainment value—there should be nothing educational about such a broadcast!

♦ ♦ ♦

Too Many Power Supplies

There is no doubt that the development of all-electric sets is being restricted because of the many different power supplies in use all over the country. I heard an official of the Western Electric concern, who are of course vitally interested in this question because of their talkie installations, declare the other day that his company had to contend with no less than forty-six different kinds of supply in this country.

There are six different supplies in the Strand alone!

♦ ♦ ♦

Marked Components!

For many months now I have had it in the back of my mind to launch upon a startled radio world an organisation called the League of Enraged Amateurs Demanding Marked Apparatus!

I should elect myself to the position of Chief Grouser and the avowed object of the members would be to electrocute all the manufacturers who make components with unmarked panel controls.

Radio Puzzles

If you are a constructor you will appreciate my wrath. You build a set with four or five knobs on the front. Inevitably it has to be operated at some time or another by an uninitiated member of the family;

very often with pitiable results.

Your wife wasn't sure whether you had said she was to pull out the left-hand switch to put the set on or whether the middle knob had to be turned to left or right to change the wavelength range.

In desperation you draw out on a card a diagram of the front of the set and label all the knobs clearly for future reference.

A Great Need

Why cannot manufacturers use their imagination and turn out panel controls with proper markings? Every on-off switch should be so marked that you can see whether it is on or off. The same applies to pick-up switches, wave-change switches, volume controls and other gadgets that appear on a modern set.

I am aware that there are a few components so marked, but they are exceptions and not the rule.

Component manufacturers must be made to realise that the home-constructed set must be as easy to use as is the complete commercial job. For this reason we must have clearly marked components.

♦ ♦ ♦

American Television

I have just read an account of the reception of a television programme from the United States by a British amateur using a six-valve short-wave set. I suppose I ought to be interested but, frankly, the news leaves me cold.

I am one of those who believe that the too-early publicity that was given to television has proved a great

set-back. At the time of all the highly-coloured newspaper reports that appeared a year or more ago everybody thought television had "arrived."

The fact of the matter is that we are as far as ever from a satisfactory service of television entertainment—the present transmissions seem to have very little interest even for experimenters, judging from the conversations I have had on the subject with radio men.

The Coliseum

I feel that the recent demonstration at the London Coliseum, where television was put on as a "star turn," did great harm to the progress of what will inevitably be the most important branch of radio.

Mr. Reyner tells me that his local garage man, after seeing the "act," came away with the impression that televisors would be on the market within a few weeks at a cost of about £3 10s. and that he would be able to spend his spare moments looking in at all kinds of interesting things.

The poor fellow was soon disillusioned!

Loud-speaker Guarantees

Several manufacturers have turned their attention this autumn to the production of moving-coil loud-speakers with permanent magnets. Hitherto these instruments have been regarded with some suspicion, for prospective users have asked themselves the question "How long will the magnets last?" without getting any satisfactory answer.

Mr. A. H. Whiteley, who made the Lodestone loud-speaker when it was first described by Mr. W. James for the benefit of WIRELESS MAGAZINE readers, is one of those who has turned his attention to the permanent magnet job and I am interested to note that he gives a five years' guarantee.

Talkies in the Making

A few days ago I was privileged to see a short Western Electric talkie demonstrating the nature of sound. It was most interesting to note the effect on speech and music of the progressive cutting out of all the high frequencies and, later, of all the low frequencies.

I wish all the low-note fiends I have met could have heard this film. It shows very clearly that high notes are essential for brilliance in reproduction. As soon as they are cut

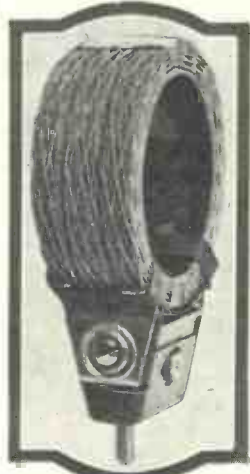
out the reproduction becomes flat and lifeless.

Botched and Boggled

Writing of talkies reminds me that a well-known American pioneer in this field—he is also well known in radio—recently accused film directors who have taken over the management of recording of having "botched and boggled the process." He added it was necessary to bring back real music and real voices to the theatre in place of the deplorable results of engineering indigestion, "or, if not, let an outraged and long-suffering

STILL AS POPULAR AS EVER!

One of the old standard radio components that still retains popular favour is the two-pin plug-in type of coil. These have the merit of cheapness and simplicity. Many listeners with such coils are on the



look-out for modern sets that will make the best use of them. Such receivers are the two new WIRELESS MAGAZINE screened-grid models, the Five-point Three (described last month) and the Five-point Four (described on page 378 of this issue).

public rise in its righteous wrath and curse us!"

Nothing like speaking plainly sometimes, is there?

Foreign Valves

Many people have the impression that the foreign valves offered for sale on the British market are dumped here by obscure manufacturers. The impression is quite wrong, however, for many of the foreign valve companies are gigantic concerns.

A friend has just told me of a conversation that he had with Monsieur Fèvre, who looks after the des-

tinies of Dario valves in this country. "We sell 8,000,000 valves a year," said this genial Frenchman, "our company has a capital of several million francs, and we own a chain of broadcasting stations in South America."

Nothing very obscure about that, is there?

To Be Made in England?

I learn that there is a possibility of some of these foreign valve manufacturers putting up factories over here and starting production in this country.

If any such plans mature I think we should see some interesting patent squabbles.

B.B.C. Takes to Talkies

Mr. Baynham Honri's name will be known to readers of WIRELESS MAGAZINE and *Amateur Wireless* as a contributor of occasional very interesting articles. At one time he was a B.B.C. engineer, but he forsook Savoy Hill in favour of the talkie studios.

I was interested to note that he is responsible for the recording of the talkie, *Lord Richard in the Pantry*, which was shown at the New Gallery, in Regent Street, recently.

I thought the reproduction was most satisfactory.

Where the Bacon Comes From

Recently I had an interesting talk with Mr. Tage Byskov, a Danish radio man, who was in England on his first visit.

Mr. Byskov is a regular contributor to a Danish monthly wireless paper, and designs many constructors' sets. He told me that there is considerable interest among Danes in British radio gear—there is now some sort of boycott against all German apparatus.

Power for All

Those who have not been to Scandinavia do not realise how complete is the electrical network in those countries. I told Mr. Byskov how impressed I had been in Norway to see electric light in small cattle sheds on lonely mountains.

"Yes," he replied, "when you had the War we made much money selling you butter, bacon and eggs—so we bought ourselves electric-light installations everywhere. I think we have more mains sets than you have here."

BM/PRESS

One-knob Tuning for Modern Sets

By W. JAMES

WIRELESS sets having numerous knobs and dials are all very well—or those used to tuning.

The expert is, of course, able to produce remarkable results when the various circuits are separately controlled. He is able to reduce the volume a little and to bring up the

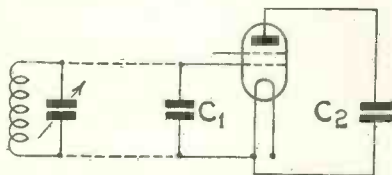


Fig. 1.—Effective valve capacities that must be considered

reaction in order to remove a trace of interference; or to effect delicate adjustments, the cumulative result of which is to bring in distant stations with a strength and clarity surprising to the novice.

Unskilled Operators

However, not every user is skilled in the art of tuning. Some of us cannot master a number of controls, nor even use them effectively. We are, therefore, grateful when the designer groups some of the controls and so enables us to obtain a fair average of results by knocking some of the tricks out of tuning.

In a sense, something is lost by simplifying the tuning. It is so much easier to turn one three-gang condenser knob than to adjust three separate ones with the result that those experienced in tuning wonder whether a little more could not be obtained by adjusting the separate circuits a little.

Little Is Lost

As a matter of fact, with a good ganged set having sufficient tuned circuits, little is lost. With only two circuits, careful adjustments are needed in order that the pair of circuits will hold in tune over the range.

Ganging is not so easy as it might

seem. Given perfect coils and tuning condensers, something can, of course, be accomplished. But we have the circuit effects to consider, and they are important.

For this reason I have drawn Fig. 1, which shows the valve capacities. You must remember that the condensers shown are made up of the capacities of the various electrodes of the valves, valve holders, and circuit wires.

To begin with, we have the capacity of the grid of the first valve to earth, condenser C_1 .

Now, what does this represent? First, the capacity of the grid of the valve itself to the filament added to the capacity of the grid to the screen. Then there is the capacity in the valve holder and more due to the wiring.

When, therefore, a tuned circuit is connected to the grid of a valve the wavelength changes. Now, much depends upon the value of the tuning condenser in the circuit. Thus, if the tuning condenser is set at a fairly low value, such as .0001 microfarad, the change is considerable.

If, on the other hand, the condenser is set near its maximum, the change is not so great in proportion. That the tuning is altered by connecting the circuit to the grid of a valve is known by everybody, and so is the fact that the aerial may alter

the tuning. We will return to the aerial presently, however.

Now let us consider the tuned circuit connected to the anode of a screened-grid valve as indicated in Fig. 2. Here we have across the coil the condenser C_2 , made up of the capacity of the anode of the valve to earth and other capacities, and also the grid capacity of the second valve.

High Anode Capacity

The anode capacity may be relatively high, as it is due partly to the capacity of the anode plates inside the valve to the screen, and we also have in this circuit the grid capacity of the second valve. When this is a detector, the capacity will depend to an extent upon the value of the anode

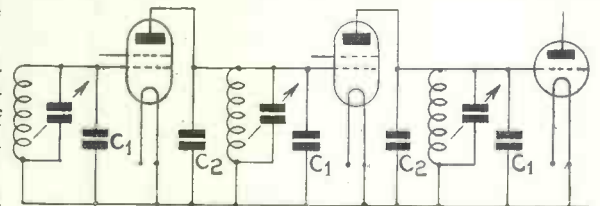


Fig. 3.—Two-stage screened-grid amplifier with three tuned circuits using plain coils

by-pass condenser fitted and upon other factors. It may be a variable quantity and, in any case, is of a serious amount.

In many circuits two screened-grid stages are used, the circuit then being something like Fig. 3, which shows plain tuning coils. In a circuit of this description the effect of the valve and other stray capacities is the maximum, for they are across the whole of the tuning coils.

Their effect can be minimised by connecting the anodes to taps on the coils, or by using transformers having a ratio of more than unity. Whether the position as a whole is simplified by fitting tapped coils or their equivalent transformers is a nice point to decide. It depends upon various factors and may not be worth while.

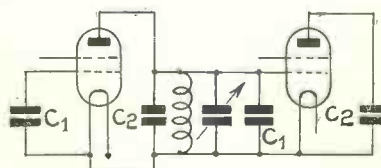


Fig. 2.—Tuned-anode circuit of screened-grid valve

Now let us look at the coil problem. Our coils must have equal values of inductance when connected to the set, and for that matter the total inductance of the separate circuits ought to be equal.

Lengths of wire have inductance, and when included in a circuit with a coil and condenser, will vary the total inductive value. This is a point which can be attended to, however. Much more difficult is the problem of how to produce tuning coils having practically identical inductive values.

For many reasons, the plain single-layer coil takes some beating. We can specify them accurately enough and the various parts can be measured with ease.

A good specification for a coil to be included in a gang-tuned set would, therefore, be a single-layer winding of wire having a certain thickness, or a former of the right length and diameter.

With the winding length and the number of turns fixed, and with formers of the correct diameter and wire of the chosen thickness, coils of similar inductive values can be produced.

They should be measured, of course, but I believe the single-layer type described to be the most satisfactory. Manufacturers, being able to control their products can, of course, produce coils having the desired uniformity, but I am considering amateurs, who must either build their own coils or purchase them and want to know they will be as nearly right as possible.

For the Long Waves

For the long waves exact matching is desirable for the sake of consistency, but is not necessary from the point of view of tuning. It is easy to tune too sharply on the long waves, and the difficulty is to be avoided by mis-tuning. But it is hardly practicable for consistent results to be obtained with coils not matched.

Having, let us suppose, obtained a set of good coils, what is the next step? We must first arrange to use them so that their working inductive values are satisfactory.

It would not do, for example, to place one coil in a metal box and another coil well away from shielding. All coils must be treated alike, or else the circuits must be adjusted. Then the condensers ought to be arranged in symmetrical fashion, so far as is possible, in order to avoid too large differences in the tuning of the circuits to begin with.

Then, finally, the circuits must be balanced to take care of the various stray capacities referred to above. In some circuits a choke is used in the anode circuit of the screened-grid valve, as illustrated in Fig. 4. Obviously, the separate chokes ought to be of the

same pattern or the circuits will be thrown out.

The aerial circuit is, of course, a difficult one to deal with.

Aerials vary in size and, therefore, in capacity. If we connected the aerial to the top of the coil (Fig. 5), we should throw the tuning out.

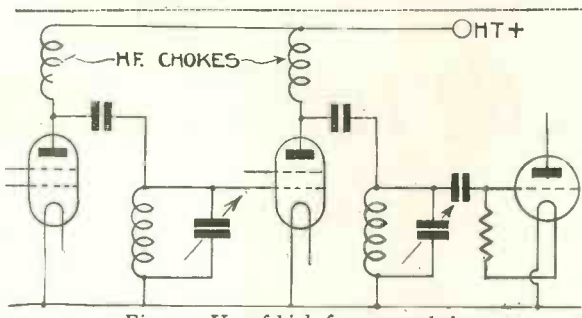


Fig. 4.—Use of high-frequency chokes

combination of tapped coil and a small condenser in the aerial lead may be used.

Signal Strength

The best scheme in practice depends, as usual, upon various factors, amongst which signal strength is of first importance. As the tapping point is taken towards the earthed end of the coil, the strength of the signal created across the ends of the coil changes, so that usually a connection satisfying the requirements of strength, selectivity, and tuning, so far as this is possible, is chosen.

Having seen to the aerial circuit, and to the coils, all that you now have to do is to put the circuits into tune, using trimming condensers across the circuits.

Occasionally it is possible so to adjust matters that the circuits remain in tune over both the long and medium waves, but often the best results are obtained when a fine adjustment is made in the aerial circuit.

Aerial Trimmers

A proportion of manufactured sets are of the one-knob wavelength tuning type, but have an aerial circuit trimmer. Other sets have true one-knob tuning, the sets being satisfactory with any and every aerial.

By careful design and manufacture it is, of course, possible to produce true one-knob sets, but for amateur sets I feel that an adjustment must be provided. This would not be necessary if all parts could be guaranteed up to the desired standard, but who would do this, I wonder?

In an early issue W. James will describe a powerful receiver with three screened-grid high-frequency stages. It will be a real distance getter!

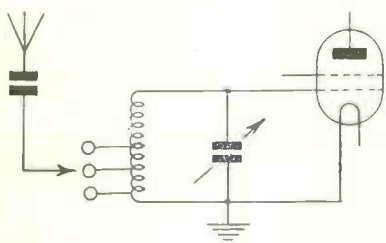
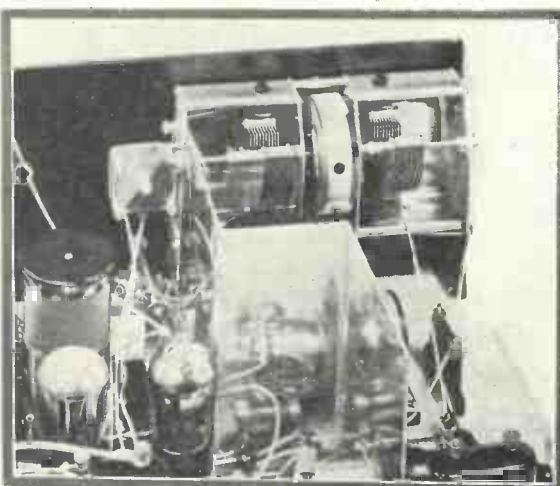


Fig. 5.—Connections to aerial tuner



W. JAMES'S BEST FOUR-VALVER

This photograph shows the two-gang condenser used in the Regional Band-pass Four, described in detail last month. A further article appears elsewhere in this issue.

By tapping down the coil the effect of the aerial upon the tuning is decreased and is the minimum when the aerial is joined near the earthed end.

A primary coil could, of course, be used with similar results, and a

Current Comments on Radio

The Appeal of Novelty!

THERE was so much to be seen at the Radio Exhibition that it is difficult to pick out the "plums." Not that Olympia was all quantity and no quality. On the contrary, the sets showed a distinct all-round advance on last year's standard. But with a surfeit of good things, it is often some comparatively minor point of design that strikes one most forcibly—simply because of the appeal of novelty.

The Ferranti Model No. 32 is a case in point. Ganged control is used on both the long- and medium-wave bands, with a change-over switch from one to the other. The tuning scale has two different divisions, one relating to the long and the other to the medium waves.

Now note the little touch of genius. The operation of the change-over switch, say from medium to long, automatically screens the "medium-wave" scale and leaves only the correct or "long-wave" scale visible. When the switch is reversed, the superfluous scale is again hidden.

A small improvement, perhaps, but very convenient. I know what it is to go searching for a certain programme and after wondering what on earth was the matter discover that I had been combing out the ether well above the 1,000-metre mark instead of between 300 and 400 metres.

Cheap Trickle-charging

Another instance worth mentioning is the ingenious adaptation of a high-tension eliminator to the task of trickle-charging. Many listeners today have installed a mains unit in place of the old dry-cell battery, though they still supply the filaments from an accumulator.

This means that one must either take the accumulator to the nearest garage for periodical recharging, or else install a separate unit for home-charging.

It is now possible to get a high-tension unit which, when it is "off duty" on the set, is connected across the accumulator so as to keep it up to the mark by trickle-charging. This seems quite a simple idea, but it has not been prominent on the market until this year.

By
MORTON BARR

A Promising Development

Again, it is interesting to pick out certain features which, although perhaps not yet fully developed, show promising possibilities in the future. In this connection, the Mullard Company are marketing a new series of *directly-heated* mains valves, in which raw A.C. current is fed directly to the filament or cathode.

These are quite distinct from the *indirectly-heated* type, where the raw A.C. current is taken by a special "heating-element" separate from the cathode proper.

The first directly-heated valve to appear on the market was the old "Point-eight," so called because the filament took .8 ampere at .8 volt.

THE BEST SHILLINGSWORTH!

WIRELESS MAGAZINE is breaking all records. The October issue contained 140 pages and a special broadcast log-map of Europe was given with each copy. All available stocks—and many extra thousands had been printed—were sold out within a week of publication!

This issue again contains 140 pages and a special 16-page supplement is included. Many of your friends will be glad to know about this fine number, which is undoubtedly "the best shillingsworth in Radio."

To make certain of getting a copy of WIRELESS MAGAZINE every month it is advisable to place a standing order with your news-agent. The next issue will be published on Thursday, November 20. This will be a special loud-speaker number and will contain full information about all the new types.

This did not prove very successful in practice owing to the difficulty of supplying "juice" at so low a voltage. The terminal voltage had to be maintained at the figure mentioned, otherwise there was a tendency to "hum" and also a risk of burning-out the thin filament.

In the new Mullard series the filament takes 1 ampere at 4 volts. This allows the use of a more robust filament, and simplifies the design of the supply transformer. There is much to be said in favour of the directly-heated filament. By rendering a special "heating-element"

unnecessary, the valve is simplified and the cost of manufacture reduced. This is all to the good.

A drop in the price of mains-heated valves is, in fact, overdue. They did not share in the last all-round reduction, and at their present price they remain rather an expensive luxury to the average listener.

Electric Gramophones

The time seems to be ripe for a big development in the electric gramophone. Most of the first-class radio sets are at present fitted for "pick-up" reproduction as an alternative to the broadcast programme.

Meanwhile special mains-driven amplifier units are available solely for use in gramophone reproduction. In one way or other I expect to see a big push in this direction during the coming season.

There is plenty of scope for manufacturers and a big market—practically untouched so far—provided they can get prices down to a more reasonable level. Now that every gramophone record is produced by electrical means, common sense indicates the use of the same method in reproduction. Otherwise it is impossible to get back the full colour and "brilliance" put into the record in the first instance.

Unfortunately, as in the early days of wireless, a certain amount of prejudice has been created by the use of imperfectly-designed apparatus. For instance it is not fair to attach a pick-up to the ordinary broadcast receiver and then expect perfect reproduction from the gramophone. One "snag" is that of providing proper volume control.

The best method is a potentiometer shunted across the pick-up, but it is very essential to "match" the resistance of the potentiometer with the inductance of the pick-up. If the resistance is too low most of the high-frequency notes will be lost.

Generally, it is advisable to write to the maker of the particular pick-up used, and ask him to specify the correct value of resistance necessary. If this is for any reason impossible, then I suggest trying out the effect of two different potentiometers—one of 10,000 and the other of 100,000 ohms—and keep to the better of the two.

"WM" FOUR-VALVERS IN REVIEW

STANDARD-COIL FOUR

AT Carlisle the Standard-coil Four (WIRELESS MAGAZINE, February, 1929) is giving good results in conjunction with a linen-diaphragm loud-speaker:

I have just built this set up and am well pleased with the performance. I omitted the gramophone pick-up and put an R.I. and Varley super transformer in instead of the second R.C. unit. Also, I inserted a fuse in the H.T.—lead.

Loud-speaker Stations

I am using Mullard valves, with a super-power in the last holder, and 120-volt H.T. accumulators. The coils I had by me were Nos. 200, 150, and two No. 60's centre-tapped. I use the No. 200 in the aerial holder and No. 150 in the anode. This gives me the National, Eiffel Tower, Kalundborg, Hilversum and the Midland Regional (this without fading) at full loud-speaker strength.

This gives me a good choice of programme without coil changing, as the stations on the smaller coils do not come in as well in the daylight. When I am using the two No. 60 C.T. coils, I find the set fairly selective, and at night the list of stations I can get with careful tuning is a big one.

The oak cabinet encloses the set and all batteries. Two small holes at the back take the aerial and earth wires, and a loud-speaker plug is used, as I have a horn and double-diaphragm model as well. I tune in on the horn and then use the cone.

For the double cones I use (will cloth; for the dope flour starch made like

a thick jelly. I soaked the cloth well for first stretching, and then gave another four or five coats, stretching every time. This gives a good diaphragm.

Using a Blue Spot unit, the results are excellent and well worth making. The size of the cones are 22 in. and 18 in. The cabinet for the speaker is got up black and polished; the fret painted gold, with blue cloth at the back, gives a nice effect.

I made one of these cone speakers with 13½-in. and 11½-in. diaphragms, which gave good results and does not take up as much room. I am a reader of WIRELESS MAGAZINE and *Amateur Wireless*, your weekly paper, and find them both helpful, as at present I am trying to build a short-wave set.

BROOKMAN'S FOUR

GOOD results on an indoor aerial are reported by an Uckfield (Sussex) reader with his Brookman's Four (WIRELESS MAGAZINE, January, 1930):—

I have built several of your bigger sets. First, J. H. Reyner's old Solodyne; next, the Phoenix Five; then, the Empire Five. All these sets were really first-class.

But though the Brookman's is only a four-valve set, it's the best of the lot. If I have been more than usually lucky in building your sets, I put it down to one thing: I always use the same components as were used in your original set.

I am giving this set 180 volts high tension and my loud-speaker is a Magnavox moving-coil. I use an indoor Negrolac aerial for most stations and switch over to an outdoor one when I want to tour round the Continent.

The cabinet, which is a good job, was made by Pickett's.

And now, to sum up, the Brookman's Four is all Mr. James claims for it, and the best "four" I have ever handled.

Wishing you all success.

A READER at Groolfontein (South-west Africa) reports good reception on stations 900 to 1,500 miles distant with his Brookman's Four:

The set is quite O.K. Johannesburg just about tears my Mullard H. speaker with no reaction (about 900 to 1,000 miles), Capetown (1,500 miles), on a decent night, is nearly as powerful as SHB, with no reaction, and Rome, quite often with just a trace of reaction, fills a decent-size room quite nicely.

I used to pick up London at times with the Brookman's Three.

GRAMO-RADIO FOUR

A ROTHERHAM reader sends an interesting photograph of his Gramo-

Radio Four (WIRELESS MAGAZINE, May, 1928), which he uses with a linen loud-speaker:—

Please find enclosed a photo of my version of the Gramo-Radio Four, which for quality on your linen loud-speaker cannot be beaten. The sizes of the diaphragms are 34 in. and 12 in., and



GRAMO-RADIO DE LUXE

This fine gramo-radio outfit, assembled by a Rotherham reader, includes a double-diaphragm linen loud-speaker

the cabinet acts as an excellent baffle, being 18 in. deep. The panel layout is slightly modified.

SUPER Q FOUR

EXCELLENT results on the long waves are reported by a St. Albans reader with the Super Q Four (WIRELESS MAGAZINE, April, 1930):

I am writing to congratulate you on the Super Q Four. Its performance is simply splendid, for the dials, on both waves, are alive with stations. I am surprised Mr. Reyner did not give a list of stations in his article. It would have been a long one, I feel sure.

Brookman's Park is a little troublesome, but there is no interference on the long waves, whereas with most sets I have tried stations up to about 1,200 metres are blotted out. With best wishes for continued success.

DOMINIONS FOUR

AS far distant as Cape Town, the Dominions Four (WIRELESS MAGAZINE, May, 1929) is giving excellent results, as this letter shows:

I have handled some big sets in my time, the Empire Five being the last, but, for a sheer joy to work, commend me to the Dominions Four. Of course, in the dominions we know what distance

Here we publish reports from a number of readers about their "W.M." sets. These letters are something more than just praise for the WIRELESS MAGAZINE; they are good indications of what various types of set will do in different localities.

They are therefore of great value to the prospective builder of a set.

Half a guinea is paid for each photograph of a home-constructed "W.M." receiver printed in these pages.

If you have recently built a "W.M." set let us know what it will do—other constructors will benefit from your experiences.

"W.M." Four-valvers in Review—Continued

is and last night I had Johannesburg (1,000 miles) and Durban (800 miles) at full moving-coil speaker strength without any reaction.

But the reaction is the most wonderful of all; commencing at zero and slowly advancing the reaction, the volume increases progressively until it reaches double strength with the reaction condenser right in, and this without loss of quality or throwing the receiver into oscillation.

I have got used to expecting something exceptional from your sets, but I hardly expected to get anything approaching the performance of the Dominions Four.

AT Birmingham one listener has identified forty stations and picked up thirteen more with his Dominions Four:

The enclosed list of forty identified stations speaks for itself, especially when I tell you that all can be received at sufficient loud-speaker strength for any ordinary room. In addition to this list, I have received another thirteen stations not yet identified.

I have used nothing but a loud-speaker when tuning-in and my aerial is of average height (15 ft.; length, 40 ft.). I can bring in Stuttgart with only just a faint background of Brookman's Park.

My only complaint is that with the specified coils and condensers I cannot tune above Oslo on the broadcast waves.

I think you will agree that this is a very fine performance, and it is certainly the best of a large number of sets I have assembled. The most amazing part is that while volume is not overwhelming on the locals, it is almost as good on distant stations.

Congratulations on a very fine set. I hope to be equally successful on the short waves when I build the Adaptor later on.

LONG WAVES	
Huizen	Eiffel Tower
Radio Paris	Motala
Königswusterhausen	Kalundborg
5XX	Hilversum
BROADCAST BAND	
Oslo	Göteborg
5GB	Cardiff
Langenberg	Bordeaux
Rome	Turin
Dublin	British Relay
Frankfurt	Bratislava
Toulouse	Kaiserslautern
Manchester	Barcelona (EAJ13)
Hamburg	London, No. 2
Algiers	Hörby
Stuttgart	Gleitwitz
2LO	Münster
Graz	Cologne
Barcelona	Cork
Brno	Flensburg
Breslau	Leeds

OUTPOST FOUR

THOSE interested in short-wave working should read the following letter from a reader at Alexandria (Egypt) about the Outpost Four (WIRELESS MAGAZINE, November, 1929):

You might be interested to have the

following details of the results on the Outpost Four. I constructed the instrument from parts obtained locally, both British and American. Valves used are Mullard SG, DX2, P2, and P252. I have since found that a Cossor HL210 works better in place of the P2.

At first I could get no results on the short waves, but could get all round the dial with the medium waves; from London 261 to Budapest, 550, I think, sometimes tuning-in as many as twenty-eight stations between these two points, which come in on the dial at 5 and 98 degrees respectively. These could all be received at loud-speaker strength, using a Brown Vee unit and cone.

For the past three months, however, short-wave stations have been coming through with very good strength; this without any actual alteration of the set. The only adjustment I found necessary was with the coils, which are Dimic. For the two lower coils, SW 3 and 4, I could only obtain the modified type. However, I rewound these with bare Glazite wire, putting an extra two turns on the reaction side. This appears to have done the trick.

I am using a home-made mains H.T. unit and a 2-volt L.T. accumulator. The mains are A.C. (105 volts), which my unit transforms to 160 volts D.C. at 30 milliamperes.

With the set as described I get the following results:

Chelmsford G5SW, full loud-speaker strength every evening, rather weaker during the midday hour, but the Empire News transmission between April 22 and May 17 was received exceptionally well every evening. Of course, we get a lot of fading, but we are prepared to make allowances for this. The broadcast of the Cup Tie Final came through fairly well.

Rome testing comes through with tremendous strength, but as one has no idea of the times of transmission, one's reception of it is a matter of luck.

Higher up on the dial Zeesen, at 31.38, and Eindhoven, at 31.28, do not come in very clearly, though on one or two nights they have come in fairly clearly.

Lower down on the dial a German station, whose announcement included the word "Telefunken," came in at terrific strength one night; this station also has evaded me since.

Then I have received what I conclude to be the Rugby beam station, as when the talk on the United States was broadcast to America the other night (about a fortnight ago) I heard all the conversation between the engineers relative to the reception by America of the speech. Various other wireless telephony comes through on other readings lower down.

Then one night I received Schenectady on 19.56 metres at fairly good strength. Huizen PHI comes through practically every afternoon here. This at times is as loud as Chelmsford. I also received Marconi talking from his yacht in Genoa some little time back.

From this you will see that the set is working very satisfactorily, but my main station is still Chelmsford and the programmes are very acceptable.

CELERITY THREE

PRaise for the Celerity Three (WIRELESS MAGAZINE, January, 1930) comes from a listener at Stoke-on-Trent. It is this reader's first effort in home construction:

I applied to you a fortnight ago for a blueprint of the Celerity Three, and I am delighted to tell you that I have fixed it up and got it going, and it is the best that I have heard.

You are to be congratulated on your success, as I can tell a good set when I hear one.

To all whom I come in contact with, I shall recommend the Celerity Three. It is astonishing what results I get from it; I can hardly tell you all the stations that I have got, but I have got quite a lot, and I will write you again.

I should like to say that this is the first set that I have completed, and I did it with great ease.

The Celerity Three ought to have a great sale, and I wish you every success. My opinion is that it is a wonderful set. I would not wish for anything better, especially for simplicity of control and construction.

A READER at Exeter wants tips regarding the use of the Celerity Three on ultra-short waves:

I have built the Celerity Three and consider the set excellent, both for volume and quality. For the time being I am using plain coils instead of a tapped aerial coil, and consequently on the long waves selectivity is not very good, although tuning is exceptionally sharp on the medium waves and I can get all the good foreign stations at good loud-speaker strength.

At first results were very erratic, and this proved to be due to a screened-grid valve (new) with a loose internal connection, and I have recently read of a similar trouble with a new valve of this make and type.

I shall be pleased to read in your magazine any tips concerning the use of this receiver on short waves.

Wishing your magazine every success.

IMPROVED LINEN LOUD-SPEAKER

"THE best I have heard yet" is the comment of an Irish reader on the Improved Linen Loud-speaker (WIRELESS MAGAZINE, December, 1929):

Those of us who have "stuck" to the WIRELESS MAGAZINE from its first issue have nothing to complain of in regard to the information on wireless matters it has given us. At one time I had been taking four wireless papers each month, but one by one they dropped off until only the WIRELESS MAGAZINE is left.

One of the finest jobs turned out by it is the Linen-diaphragm Loud-speaker. I have four loud-speakers, cone and horn, ranging in price from £8 8s. to 25s., and yet it is always the linen speaker I use.

Let the success of this loud-speaker be due to the WIRELESS MAGAZINE Technical Staff or to the Blue Spot unit, I have no hesitation in saying it is the best I have heard yet.

BEFORE YOU BUY

THAT NEW RADIO SET!

VOLUME controls still need a lot of attention from the manufacturers. We have not yet settled down to a standardised method of controlling volume; whether to control the signal before detection or after detection puzzles both amateur constructor and manufacturer.

There is, as W. James has pointed out, a prevailing fear of overcrowding the control panel. Thus we find, in the average set tested, volume being controlled either before or after detection, but seldom in both ways. We take the line that no control that really has a job to do should be left out.

In radio gramophones, especially, two volume controls are essential. One of the big firms marketing this type of instrument has cleverly combined the two functions of a volume control in a single knob. Here is a chance for other set makers to show their mettle.

In several battery sets recently tested we note that the makers suggest using a pentode in place of the power valve normally specified if greater amplification is wanted. While the pentode is certainly effective as an additional booster of weak signals, especially in the average three-valve set, it may easily interfere with the quality of reproduction unless an output transformer is inserted between the output terminals of the set and the loud-speaker.

Few battery sets include an output transformer, which is not absolutely essential with a normal small power valve. Some low-pitched loud-speakers sound much better with a pentode, which tends to emphasise the high notes, adding brilliance to an otherwise muffled quality.

The P2 type of power valve recently introduced by more than one valve maker has a special application in many of the portable sets recently tested. It is a useful compromise between the smallest 2-volt power valve and the super-power 2-volt power valve. Filament and anode currents are both moderate, but the



increased power and tonal quality of the output is quite appreciable.

Where the high-tension battery in a portable set has a maximum value of 108 volts, the user should take care to keep down the volume; the limit of distortionless volume is quickly reached

This feature, conducted by the "W.M." Set Selection Bureau, is intended for the guidance of non-technical listeners who wish to buy their radio sets. In the following pages will be found detailed reports on four commercial receivers, while on this page we summarise some of the impressions gained during the month's work in our laboratories.

unless the anode voltage is upwards of 150 volts.

Many a good portable found to give excellent quality at moderate volume has produced an appalling noise when the volume has been too greatly increased.

FREE ADVICE TO PROSPECTIVE SET BUYERS

To take advantage of this service it is necessary only to mention (1) the maximum price and whether this is for a complete installation or the bare set; (2) where the set will be used; (3) what particular stations are desired; (4) whether a self-contained set (with or without aerial), or an ordinary set with external accessories is preferred; and (5) in the case of mains-driven sets, whether the mains are A.C. or D.C. A stamped-addressed envelope for reply is the only expense.

In nearly all the sets tested recently, we find terminals provided at the back for the connection of a gramophone pick-up. In most sets the detector and low-frequency amplifying equipment is brought into play for gramophone record work, but some form of volume control is often needed, due to the great amplifying properties of modern valves. We see no reason why set-makers should omit a pick-up volume control. It would be very easy to fit one near the two gramophone pick-up terminals.

Testing sets for A.C. mains brings home to us a drawback of the British A.C. valve. We refer to the long time required for the valve to heat up before coming into operation. Sometimes we have had to wait as long as 45 seconds after switching on the mains for the set to start working. That there is no difficulty in designing quick-action A.C.-heated valves is proved by operating an American set. The American valves take no more than 7 seconds to heat up.

Drum dials for tuning sets have evidently been accepted as standard; as this is so we may as well ask ourselves whether the drum dial really is more convenient to handle than the knob-dial. Properly arranged, nothing can be more convenient than a drum dial, but unfortunately the way in which many of them are mounted tends to make tuning operations awkward. Where the dials are mounted against a vertical panel it is sometimes quite difficult to make fine adjustments; but where the panel is sloping the operation of a drum dial is a very pleasing process.

The new season's sets are notable for the improvement in control. One of the most pleasing advances is in the proper illumination of the tuning dial. Many A.C. mains sets have a bulb fitted above or behind the graduated scale to facilitate the logging of stations received. The bulb is of the flashlamp type, heated with A.C. at 4-v.

Ediswan Battery Three

Maker: Edison Swan Electric Co., Ltd.

Price: £9 18s. 6d.

Power Supply: Batteries.

Power Consumption: 9 milliamperes at 120 volts.

Valve Combination: S.G., D., P.

IN the Ediswan battery-operated three-valve set we see just what can be done with modern valves. A screened-grid high-frequency amplifying valve precedes a highly efficient detector valve, which is transformer coupled to a small power valve. The extraordinary efficiency of Mazda valves is amply demonstrated in this set.

Although it is battery-operated, the Ediswan standard three-valver has a wide range of reception, as our tests have proved. And we are able to add that volume and quality, in the reproduction of stations of local origin and from the Continent, are of a high standard, provided that the high-tension battery is working properly.

Designed for use on medium and long wavelengths, this set is very suitable for modern conditions. We have found it possible to tune out strong local stations with great ease and to bring in foreign stations.

Upkeep Costs

The upkeep costs of the set must be considered. A high-tension battery of not less than 120 volts is essential. And since the measured anode-current consumption was found to be just over 9 milliamperes, a double-capacity battery is advisable. To use a standard-capacity battery of lower price would be a false economy, because such a battery would be completely exhausted in a few weeks. A double-capacity battery would provide good results with the Ediswan set over a period of several months.

A cable of coloured wires is taken from the back of the

set to the high-tension and low-tension batteries. The voltages of each high-tension lead are clearly marked. The grid bias is fitted inside the cabinet, but the three leads to it are not, for some reason, marked in any way.

But the instruction book supplied with this set clears up any doubts about battery connections, by indicating the voltage values associ-

ated with the different colours of the leads.

Reaction, controlled by a large knob between the tuning dials, was found to be necessary in the reception of nearly all stations within range. It has to be operated in conjunction with the tuning controls.

The switch lever seen at the bottom of the esutcheon plate is set to its centre position to switch off the set; pushed up it gives the medium waves and pulled down the long waves.

Aerial, earth and loud-speaker terminals are conveniently mounted at the back of the cabinet. There is a plug and two sockets for the earth terminal; in socket No. 1 the earth plug gives more selective tuning than in socket No. 2.

In the reception of foreign stations the Ediswan set gave a very good account of itself. Rome at 55 degrees on the left-hand dial and 50 de-

grees on the right-hand dial was just as strong as Midland Regional, which came in at 65 and 58 degrees. We were impressed to find that Langenberg could be brought in at 62 and 57 degrees quite clear of the Midland Regional. The London Regional, which

was at its maximum strength at 38 and 31 degrees, could be tuned out entirely within five degrees of each side of the main tuning points.

The London National station was even more sharply tuned, disappearing within three degrees each side of 12 and 5 degrees on left- and right-hand dials respectively.

Long Wave

On the long wavelengths, five stations were received. One of these was Zeesen, which came in at 58 and 55 degrees on left and right dials respectively. This station suffered from some interference by Daventry, but the Eiffel Tower, Radio Paris and Hilversum were all quite clear of interference and were received at good loud-speaker strength.

Test Certificate

With the Ediswan set is given a "certificate of test," which indicates the correct settings of the aerial and anode tuning condensers to receive five of the most powerful broadcasting stations. These include the London Regional and National stations, the Midland Regional station, and Radio Paris.

These readings will be found invaluable when the set is first put into operation. We commend the makers for taking this trouble in the interests of the set-buyer.

The makers suggest using a pentode if greater volume is wanted than can be derived from the set with the normal small-power valve. Full details are given for fitting the Ediswan pentode. A pentode choke, price 18s., is recommended in order to get the best from this valve.

In our opinion, based on the results of our extensive tests, the Ediswan battery-operated three-valve set will meet the needs of the average listener not blessed with an electric-light supply. This set behaves well when worked near powerful stations, cutting them out with great ease.



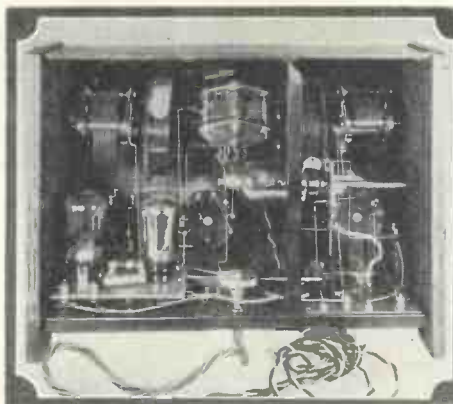
NEAT CONTROL PANEL

All the controls of the Ediswan three-valver are mounted on a single metal plate. The drum controls are commendably large and give easy control

ated with the different colours of the leads.

With its oak cabinet and sloping front for the controls, this Ediswan set is a solidly-built product whose outward appearance inspires confidence. The controls are unusually robust in construction and all are very clearly marked.

To tune in a station, two thumb-operated dials have to be rotated. The aerial-tuning dial is on the left and the tuner for the high-frequency coupling is on the right. Both dials are convenient to manipulate and their degree divisions can be read with ease. From tests we can say that these dials keep fairly constantly "in step," so that once the difference between the two readings has been noted, by tuning in the local station,



COMPACT BUT NOT CRAMPED

While the design of the set is compact all the parts are accessible and open to inspection



Columbia Model 307 Three-valver

Maker: Columbia Graphophone Co., Ltd.

Price: £21.

Power Supply: A.C. or D.C. mains.

Power Consumption: 30 watts (for the A.C. model tested).

Valve Combination: S.G., D., Pen.

IN producing model 307, the Columbia Company set themselves no mean task, for they entered radio last year with a five-valver that immediately placed them in the front rank. Model 307 is only a three-valver, so after much forceful argument on behalf of the five-valver, one must tread warily in estimating the *raison d'être* of the three-valver.

Selectivity

In our review of the model 304, which had five valves, we took care to emphasise the great advantage of its three high-frequency stages in conferring two attributes—selectivity and sensitivity. In that set selectivity was gained without reaction, a control that, in the nature of things, introduces an undesirable personal element.

The Columbia model 307 has only one high-frequency valve and two stages of tuning. But the sensitivity is still very great, because reaction is introduced. And selectivity, considering the fact that there are only two tuned circuits, is exceptionally good.

Let us frankly ask ourselves where the model 304 Columbia set, with its five valves, stands in relation to the 307 Columbia set, with its three valves. Well, the prices alone are significant; the 304 is 26 guineas and the 307 is £21. Now we do not ask why, when there is a perfectly good Morris car at £300, there should also be a £200 Morris car. We appreciate the fact that two distinct markets are being explored

So with model 307; it opens up a market to Columbia that would be denied it with only model 304.

As a three-valver, the Columbia model 307 is, in our opinion, one of the best of its class. It is good to look upon; delightful to operate; and ready in its response to any reception demands made upon it. Having crystallised our verdict, based on a two-week's experience with the set, let us give some details.

The cabinet work of model 307 is solid, with an escutcheon plate at the front carrying the controls. Two thumb-operated tuning dials, side by side, occupy the central position. Above them is a small cowl, hiding a bulb that illuminates the dials whenever the set



AN EFFICIENT ALL-ELECTRIC SET

This Columbia three-valver maintains the standard of efficiency set by the five-valve model, which was first put on the market last year.

the calibrated dial. But once the correct relative positions of one dial to the other has been determined, by receiving a local station, other stations can be readily tuned in by a simultaneous rotation of the two dials.

In effect, the Columbia 307 has one-knob tuning, with the advantage of independent tuning if necessary.

Below the tuning dials are two small knobs, one on the left marked intensifier and one on the right marked reaction. The intensifier is a volume control; it varies the amplification of the screened-grid valve, so that if the incoming signal is too strong it need not be amplified to the fullest possible extent before passing on to the detector and power valves. Whereas the volume control is wanted to decrease the strength of stations that are initially too strong, the reaction control is wanted to increase the strength of stations that are initially too weak.

With volume on the left and reaction on the right, all grades of signal strength can be dealt with to produce a

uniform output. That, at all events, is the theory; and in practice that is what happens with the Columbia 307. The set has a great power without reaction; even when this is at zero, numerous stations are heard.

The back and top of the set are easily removed. Two useful controls are provided inside the set. One completely eliminates the hum from the mains, provided that it is correctly adjusted. Near the aerial and earth sockets is a very useful selectivity control. It certainly helped to separate some of the stations received.

Model 307 is completely mains driven; there is no grid-bias battery as in model 304. The model tested was for A.C. mains; no less than six different input voltages are provided for.

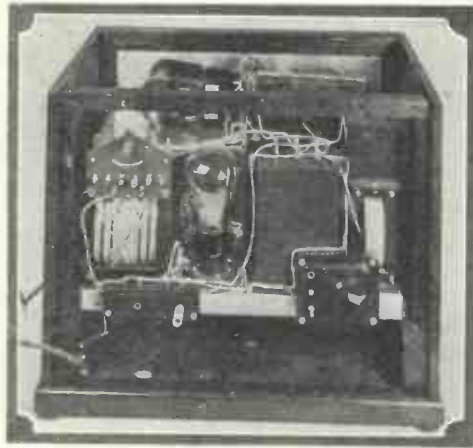
A Night's Log

During one night's test, carried out after dark, we counted 19 separate signals on the medium wavelength band; each one of those logged could be fairly claimed as an alternative to the local station.

Over one dozen stations were brought in by the simultaneous rotation of the tuning dials. The other stations required some readjustment of the left-hand dial. The veriest tyro at operating a set would have a completely successful evening with Columbia model 307.

In testing the Columbia Model 307

We were pleased to note how easily the National station on 261 metres and the Regional station on 356 metres could be eliminated in favour of foreign stations. There was no need to use the selectivity control at the expense of volume. The makers have achieved a good measure of selectivity while retaining enough volume to satisfy ordinary domestic requirements.



USES A VALVE RECTIFIER

This A.C. model—the set is also available for D.C.—uses a valve rectifier for the anode supply

is switched on for use.

The right-hand dial is marked in wavelengths; on its right edge are medium waves between 225 metres and 540 metres, in steps of 25 metres; on its left edge are marked long wavelengths, in steps of 100 metres from 1,000 metres to 1,900 metres.

The left-hand dial, marked in degrees, is intended to be adjusted independently of



Varley Senior Three-valve Set



HANDSOME IN APPEARANCE

This Varley set is supplied in a particularly well-finished walnut cabinet and looks what it is—an exceptionally good receiver

Maker: Varley, Limited.

Price: £26.

Power Supply: A.C. or D.C. mains.

Power Consumption: 30 watts (for the A.C. model tested).

Valve Combination: S.G., D., P.

“WHAT a handsome-looking set,” was the natural remark spontaneously evoked by the Varley Senior three-valver when it arrived for test. We have never really found out just what is the difference in manufacturing costs between a really good cabinet and a shoddy box. But even if the cabinet of the Varley set does cost the makers a lot more than usual, they will certainly be rewarded by the support of discriminating set-buyers.

On the Big Side

There is no attempt to reduce the size of this Varley cabinet to absurdly small dimensions. In fact, for a three-valve set the cabinet is on the big side. Still, there is something in pride of possession, a sentiment to which the Varley set panders.

Looking inside the cabinet, by removing the back wooden panel, we saw the reason for the generous proportions of the cabinet. There are two large cylindrical shaped tins, one at each end of a very well-made metal chassis.

Inside these tins are coils very accurately matched in order that they may be tuned by a gang condenser. The Varley tuning is done with a single knob.

The interior would impress a layman; a technical man would be even more impressed, finding evidence of real design as opposed to the mere assembly of standard components.

The inside of the new Varley set shows that the designers have now forsaken purely English methods and, although we hate to say it,

there is an Americanised look about the general interior of the construction.

This is really to the good; it does not mean that we are copying the American set-designers, but that we have arrived at the same end—metal chassis, screened coils, ganged tuning, pressed-out parts and the rest.

There are four valves in this set. Three are for signal amplification and the fourth is for converting the A.C. mains current into direct current for the high-tension supply. The first valve is a screened-grid high-frequency amplifier, the second is a highly efficient detector and the third is a super-power output valve. All three valves are heated by the A.C. supply stepped down to four volts.

In this batch of valves is more than meets the eye; the new A.C. valves are amazingly efficient and give enormous amplification. We have seldom if ever tried a three-valver that made so much of its valve stages. On test the Varley set put up a wonderful show. The depth of tone, the great volume and the great range were exceptionally impressive.

What purpose would it serve if we enumerated the stations received on this set? A mere recital of the Prague Plan or of a list extracted from page 334 would be an unjust way of commenting

upon the performance of this new Varley set—unjust because that could be done of almost any good three-valver.

What we should like to convey is our impression of the quality that accompanied the reception of the many distant stations received; and the ease with which, by the turn of one dial, station after station was located.

Operation

Let us examine the set from the operator's point of view, contenting ourselves with the observation that everyone who operates the set is in for a pleasant experience.

The main control is a brilliantly illuminated dial divided into 180 degrees. Just below this is a small knob for auxiliary tuning. We did not have to use it during tests. In line beneath the tuning control are three knobs; left for volume, centre for wavelength range, and right for reaction. All three knobs are well engraved in white lettering. The panel layout is one of the best we have seen.

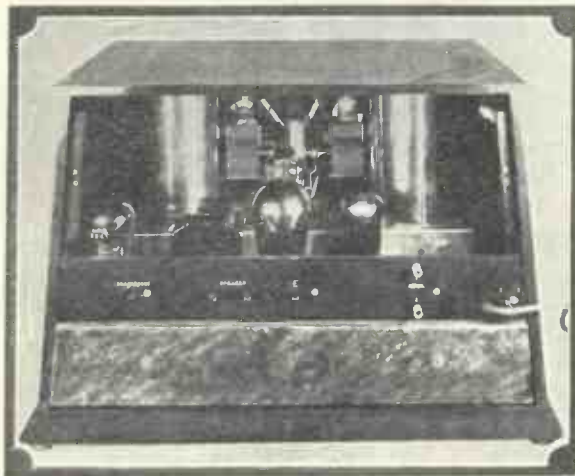
No Fiddling

The tuning knob is very satisfying in operation; one can get a station for nearly every degree, without fiddling with minor adjustments. Volume control provides a wide range for audibility. Reaction control is fairly constant in action over the available wavelength ranges; one can set it to the maximum point of sensitivity and travel over a considerable portion of the tuning dial.

Selectivity is good; London Regional came in at 90 degrees, but at 80 degrees and 100 degrees it had completely disappeared. The London National came in at 30 degrees but had gone again at 40 degrees and 15 degrees. We consider this an excellent performance in view of the terrific strength of both stations.

On the long waves the Varley set passed the only test that counts. It got Radio Paris and Eiffel Tower quite clear of the intervening Daventry.

As a gramophone amplifier the Varley set also did very well.



ALL-METAL CHASSIS CONSTRUCTION

All the vital parts in the set are adequately screened by metal shields, which give the set great efficiency



Electrocet Table Radio Gramophone

Maker: *The Electrocet Radio Co.*

Price: 18 guineas.

Power Supply: *A.C. mains.*

Power Consumption: 23 watts.

Valve Combination: *D., Pen.*

FOR once we have been trying out something new in radio—the Electrocet table radio gramophone. The makers have conceived the novel idea of combining the functions of a full-size radio gramophone with that of an all-electric transportable.

Full Description

As neither type of set may be familiar to every reader, we feel a fuller description is merited. The Electrocet instrument is a table model all-electric two-valver.

To pick up broadcasting stations it needs a good external aerial together with an efficient earth. The two valves consist of a highly-efficient detector of the A.C. type and a pentode power valve. With the normal outside aerial equipment, the Electrocet can receive the local stations and several foreign stations.

On top of the cabinet is a mechanically-driven gramophone turntable. The makers have asked us to state that they are now producing an Electrocet with a B.T.H. electric motor instead of the spring motor included in the instrument tested. The retail price of the modified Electrocet is £24 complete.

One of the great advantages of a radio gramophone working from the mains is the abolition of the tedious winding process; for this reason the modification will probably appeal to readers interested in the instrument.

Near the gramophone turntable is the pick-up and arm, with a volume control at its pivot.

We have said that the two-valve set is all-electric; by this we mean that the high-tension current and grid bias are derived from A.C. mains, by means of a Westinghouse metal rectifier. The low-tension supply is also derived from the A.C. mains supply.

As a radio set, this instrument employs the Mazda A.C. valve for detection, but

during the reproduction of gramophone records this valve becomes a low-frequency amplifier connected to the gramophone pick-up.

One end of the cabinet, which is of oak, carries the radio reception controls, which are very simply arranged. There are two slow-motion knobs, the left one for tuning and the right one for reaction. The dial settings can be clearly seen and logging of stations is therefore exceptionally easy.

Between these two tuning controls is a fairly big knob for changing the wavelength



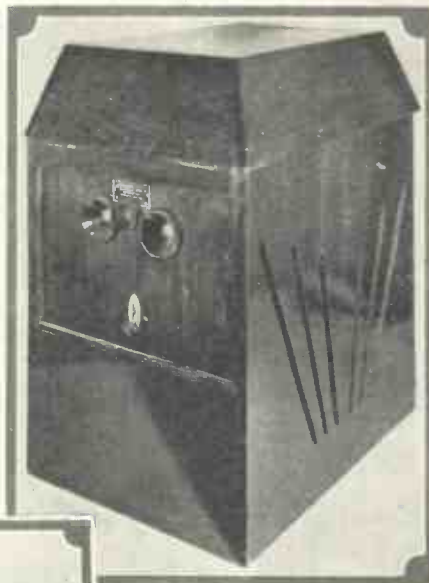
READY FOR USE

Everything about the set is easily accessible. Much of its efficiency is due to the use of a Binowave coil for tuning

range from medium to long waves. This knob has to be turned to position "A" for stations between 250 and 550 metres; and to position "B" for stations between 900 and 2,000 metres.

Another switch mounted lower down provides the alternatives of radio or gramophone reproduction.

As would be expected, control of the Electrocet is simple, although to the uninitiated some experience would have to be gained in



AN UNUSUAL DESIGN

Many people will be attracted by the original appearance of this two-valve radio gramophone

order to get the best results from the re-adjustment.

On the opposite side of the cabinet is the winder of the gramophone motor, which works quite smoothly and silently. Just below this handle is the mains on-off switch, which also works well.

Altogether, the layout of the Electrocet is very sensible. Great care has been taken to make the most of the available components. We started our tests by using the Electrocet as a gramophone. We were agreeably surprised at the results. Pleasing quality, with plenty of bass and ample volume without distortion was immediately apparent.

The volume control on top of the gramophone pick-up arm works within wide limits, so that the reproduction can be varied in volume from a faint whisper to the maximum permissible.

The volume control cannot be advanced to the maximum possible position, because the reproduction then

becomes distorted. But there is ample volume short of this setting to satisfy the average domestic requirement.

Turning on the radio side we had another pleasant surprise. In fact the volume from the National station was so good that we undid the back of the set to see what accounted for such good performance. Inside we found a James Binowave coil, which, as constructors of WIRELESS MAGAZINE sets will agree, is sufficient reason for good results.

With a 70-foot aerial the selectivity was such that no inter-

ference between the National and Regional stations was experienced. And sensitivity was such that the Midland Regional was well received; so was Daventry on the long waves. We are quite sure that, given a little experience in tuning, every operator of the Electrocet would be able to bring in a number of the more powerful stations in addition to the British stations within normal range.

Foreign Stations

We ourselves got Toulouse, Rome and Nürnberg on the medium waves at quite good loud-speaker strength. Radio Paris was fairly good on the long waves.

The performance of the Electrocet, both for gramophone and radio work, frankly surprised us. The makers have shown what a lot can be done with simple apparatus.

Moreover, they have indicated a line of development in combination radio and gramophone instruments that might well be extended. We see no reason why the table-cabinet type of radio-gramophone should not become very popular indeed.



The Truth About the Programmes!

By W. OLIVER



EVEN the most enthusiastic wireless listeners generally seem to have a "grouse" of some sort against the B.B.C. programmes. From time to time indignant letters find their way into the correspondence columns of the Press, airing these various grievances, over pseudonyms such as "Fed-up," "Anti-jazz," "Tired of Talks," "Exasperated Ether-searcher," etc., etc.

One section of the listening public, for instance, complains that there are far too many talks. These listeners seem to be firmly convinced that the officials of the B.B.C. are conspiring to "educate" them willy-nilly, and that talks are gradually ousting nearly everything else from the programmes.

Nothing But Jazz!

On the other hand, some listeners of a more high-brow turn of mind assert that there seem to be nothing but jazz and raucous-voiced comedians "on the air" whenever they tune in. So they implore the B.B.C. to "give us more good, classical music, plays, poetry, and interesting talks."

Some other enthusiasts, however, with a fondness for light music, vaudeville, military bands and so forth, are quite sure that the programmes contain an appalling preponderance of what they term "high-brow stuff—opuses and things, inter-

This article throws fresh light on the vexed question of the B.B.C. programmes—a subject on which every listener has an opinion, but about which few, probably, realise the actual facts!

larded with depressing poetry and the screeching of operatic sopranos."

And so it goes on, each type of listener asserting that the B.B.C. devotes too much of the programme time to items that the public *doesn't* want, and too little to items that the public *does* want!

Unfortunately, the opinions of these various types of listeners nearly all contradict one another, more or less; and it is evident that, while such conflicting ideas about the programmes may, or may not, be all wrong, they certainly cannot *all* be right!

If, for example, there really *is* the overwhelming preponderance of "educational stuff" that some of the low-brows love to complain about, then the programmes can hardly be filled up with such an extortionate amount of jazz, etc., as some of the highbrows would have us believe.

Bewildered, we turn to the published programmes to find out the facts. I spent several fascinating hours one evening recently working out a complete analysis of the current week's programmes from the National transmitter, the London

Regional, and the Midland Regional.

My aim in working out this analysis was to discover exactly what length of time during a typical week was devoted to each class of broadcast matter. I want to make it quite clear that the figures which I am about to give are combined totals for the three programmes, and that they refer to actual programme time, not to mere transmission time.

Certain sections of the day's programme are available through two or more stations simultaneously when relaying is taking place, and therefore to have analysed the bald transmission times would obviously have given misleading results for the present purpose.

Your Pet Theories

Now, before going any further I feel I ought to warn you that the figures I *am* about to quote will probably upset all your pet theories about the programmes. You don't mind that? Very well, then, let's look at the figures and see what this analysis reveals as regards the composition of broadcast fare.

Music-lovers, you're in luck's way! The Brookman's Park twins and the Midland Regional offer you, between them, no less than 5,350 minutes of music during a typical week! (I am giving all these figures in minutes so as to make comparisons easy).

Some of those who complain about the proportion of music to talks in the programmes say that he who pays the piper (or, rather, the P.M.G.) should be permitted to call the tune. But from the above total one may deduce that, actually, the average licence-holder can call a good many tunes, and gets pretty fair value for his money in view of the fact that he pays the piper only ten shillings a year!

Much-maligned Talks!

Secondly, we come to that much-maligned item—talks! Altogether, there were in the three programmes only 765 minutes of "jaw" during this typical week of mine—and under this heading, be it noted, I have included not only lectures, but all readings and everything, in fact, that could possibly be construed as a talk.

Now, compare this total, please, talk-haters, with the aforesaid 5,350 minutes of music, and you will realise that you are not at present in any real danger of being overwhelmed with a mass of "educational stuff"!

Mes enfants, you come next on our list. There are 540 solid minutes each week during which the aunts and uncles play and sing and talk from the National transmitter and the Midland Regional for your especial entertainment and edification! (As a matter of fact, this total was, admittedly, rather a surprise to me; I had not realised that the Children's Hours occupied such a relatively large proportion of the programme time.)

The fourth place is held by the weather and news, which together occupy 480 minutes in the week. This may seem rather a large figure, but you should remember that it includes the time spent over the shipping forecasts which are repeated, in the mornings, at a slow dictation speed.

Religious broadcasts of various kinds (comprising week-day and Sunday services, a short talk for children on Sundays, and the Epilogues), amounted to 365 minutes, while transmissions to schools totalled 355 minutes.

In the particular week under review, vaudeville occupied 295 minutes, and 220 minutes were devoted to plays. The remainder of the programme time was occupied with experimental transmissions of television (150 minutes); the Saturday afternoon football commentary and

an eye-witness account in the evening of University sports (110 minutes); a Gilbert and Sullivan operatic relay (105 minutes); the feature known as "Diversions" (55 minutes); and, last on the list, the telling of a story, on which a well-known author spent 25 minutes.

Now, it has occurred to me that you may reasonably retort: "Yes, those figures are all very well in their way, but they don't represent what any one listener can actually receive in the course of a week, because a certain percentage of the totals given refers to different items that are running concurrently from two or more stations—and, unless one has a very selective set, one can't hear more than one programme at a time!"

To meet this objection, I propose to give the corresponding figures for the National programme only, for the same week. In this case, programme time and actual transmission time are identical (as only one transmitter is involved), and the figures represent what could actually be heard during the course of the week by leaving a receiver tuned to the National programme transmitter.

Here, again, music heads the list by a big margin, and talks have second place. The actual figures are as follows:—

	<i>Minutes</i>
Music	2,450
Talks, readings, etc.	590
Weather and news	410
Schools transmissions	355
Children's hours	270
Religious broadcasts	260
Television	150
Football commentary, etc.	110
Operatic relay	105
Vaudeville	105
Drama	90
"Diversions"	55
Story	25

Little Difference

At first glance you may be surprised to see that, as far as certain items are concerned, there is little or no difference between the totals given above for the National programme, and those previously given for all three programmes. On second thoughts, however, you will appreciate that certain items are simultaneously broadcast from all stations, while others in the list are put out from the National and/or Daventry 5XX only.

For example, the morning weather forecast occurs only in the National programme; the other weather forecasts and the general news bulletins are broadcast simultaneously, or repeated, from all stations. These

items total 410 minutes of actual programme time. Adding to this figure the time occupied by the short bulletins of "Regional news" (on weekdays only) and sports bulletins from the London and Midland transmitters, we get 480 minutes, which is the total given for the three.

The figures for the schools transmissions, television, football, operatic relay, play, "Diversions," and story are, of course, identical in both lists, because these items occur in the National programme only.

Too Much of This and That

Some listeners claim that there is too much of this kind of music and too little of that kind of music. Let me point out the following facts which show what a wide choice is available: The orchestral, choral, etc., items in the National, Midland and London programmes during the week on which I based my analysis were contributed by studio orchestras, restaurant orchestras, cinema orchestras, chamber-music orchestras, military bands, dance bands, church organs, cinema organs, choirs, choruses, madrigal singers, octets, quintets, quartets, etc.

There were also solos on the piano, violin, violoncello, viola d'Amore, harp, flute, piccolo, banjo, vibraphone, xylophone, and—yes, even on the saw! Songs were sung by sopranos, mezzo-sopranos, contraltos, tenors, baritones, and basses. And there were duets, both of the vocal and piano variety.

Among the various points of interest revealed by the detailed analysis from which I obtained the figures quoted above, I noticed that dance music, as such, accounted for about one-fifth of the total time devoted to music of all kinds in the three programmes. (This, of course, is irrespective of any individual dance numbers which occur in the course of vaudeville entertainments, cinema and restaurant relays, etc.)

One item stood out as being but poorly represented in the programmes, and that was poetry.

Well, those are the facts; what conclusions can be drawn from them? I leave that to you. But my personal impression is that the programmes, taken as a whole, are remarkably well balanced, and that, as a rule, every available item is allotted just the time and place in the week's transmissions which its general interest or importance seems to warrant.

The Five-point Four[★]

A
SCREENED-
GRID SET

WITH
PLUG-IN
COILS



★ FIVE SPECIAL FEATURES

OUR object in designing this receiver was to produce a cheap and efficient screened-grid set that would appeal particularly to beginners.

Every effort has been made to make the set a convenient one to use. The controls have been reduced in number to a bare minimum and they are arranged in the simplest possible way, so that the set can be operated without difficulty even by the inexperienced listener.

Extra L.F. Valve

This set is a companion to the Five-point Three described in the last issue of WIRELESS MAGAZINE; that set had one screened-grid stage, a detector and a transformer-coupled power valve. The new set is similar

- 1.—Standard two-pin plug-in coils are used, but both wavebands are covered by the operation of a single switch.
- 2.—Considerable range is assured by the special arrangement of the circuit and provision is made for the use of a gramophone pick-up.
- 3.—Selectivity can be controlled to any desired extent by the use of an aerial series condenser, tapped coils, and a special screened-grid control.
- 4.—Two volume controls are provided. One helps to control selectivity and the other can be used for both radio and gramophone working.
- 5.—The cost of parts, which are all standard and easily obtained, is only about £7.

2.—Not only has the set a very considerable range for the reception of broadcast programmes but terminals are also provided for the connection of a gramophone pick-up when it is desired to reproduce records electrically.

3.—With its two tuned circuits the set is selective and has good range. Without the changing of any coils the set covers a range of approximately 200 to 550 metres on the medium waveband and 1,000 to 2,000 metres on the long waves.

4.—Two volume controls are provided. The first is associated with the screened-grid valve and also acts as a selectivity control, while the second is of equal utility for either radio or gramophone working.

5.—The cost of construction is particularly low for a set of this type and the construction is quite straightforward. There is no need for any soldered connections and all the leads are clearly numbered in the best order of assembly.

tages of cheapness and simplicity in use.

Unlike most sets using plug-in coils, however, these two models are so arranged that the medium and long waves are covered by the operation of a single switch. There is no necessity to change the coils at all once they have been inserted in their holders.

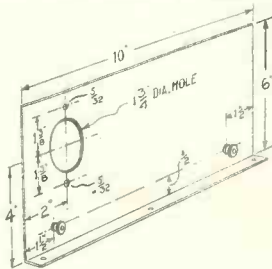
To assure readers that the Five-point Four is better in design than the majority of sets of its kind we are enumerating below its five special advantages:—

- 1.—Two-pin plug-in coils are used, and both medium and long wavebands are covered by the operation of a single switch that is clearly marked with its "Long" and "Short" positions. This makes the set very simple for use by all members of the family.

Standard Parts

Only standard parts have been used in the construction of the Five-point Four. There should be no difficulty in getting all the components from your local wireless dealer.

The circuit used for this set is a



AN IMPORTANT ITEM

A great deal depends on the proper screening of the set. Aluminium or copper can be used

but has an extra resistance-coupled low-frequency stage.

Both the Five-point Three and the Five-point Four have one feature in common, that is the use of two-pin plug-in coils which have the advan-

Use this set with the
"W.M." Standard A.C.
Unit or the Standard
D.C. Unit for high
tension

well-known one that has been in constant use now for a number of years and has proved satisfactory in every respect. The actual valve combination is a screened-grid high-frequency amplifier, leaky-grid detector, resistance-coupled low-frequency stage, and a transformer-coupled power valve.

Tuning Arrangement

The arrangement of the tuner and its switching will be clear from the circuit diagram reproduced in these pages.

In the aerial circuit it will be seen that a 60-turn coil is placed in series with a 150-turn coil, the latter being short-circuited for medium-wave reception. A similar arrangement is used in the grid circuit of the detector valve, but in this case a third coil is used for reaction, this being placed between the medium- and long-wave tuning coils.

Directly in the aerial lead is a semi-variable or pre-set condenser with a maximum capacity of .0003 microfarad. This is a great help in controlling the selectivity of the set to meet with local conditions.

Controlling Selectivity

The smaller the capacity of this condenser (that is, the further the knob is screwed out), the more selective does the tuning become, but this extra selectivity is only obtained at the sacrifice of signal strength. In practice it is necessary to adjust the condenser to give the best compromise between selectivity and volume.

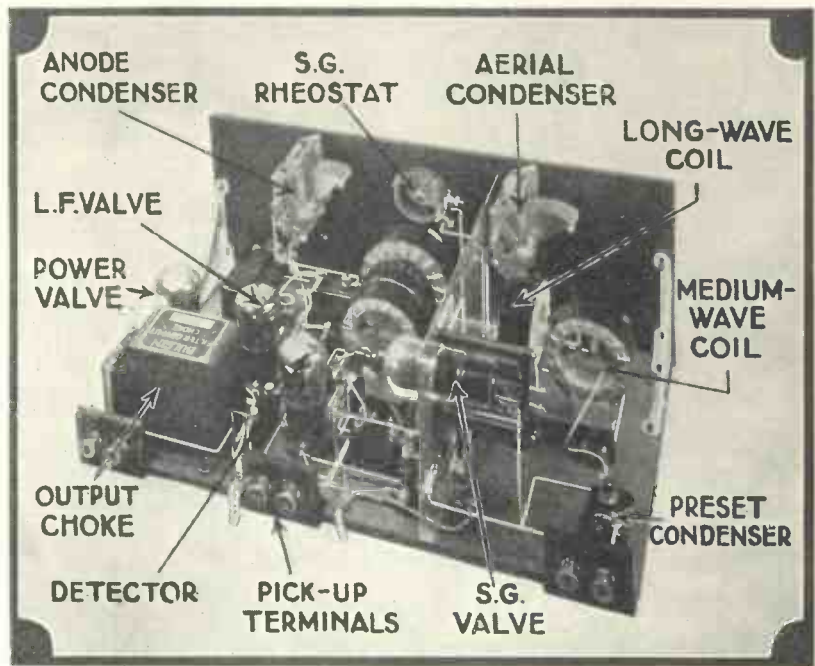
It will be seen from the photographs that a vertical metal shield is used for screening the high-frequency

valve and its associated tuning circuit from the remainder of the components. The screened-grid valve itself is mounted in a special holder bolted near the top of the screen.

Not only has mechanical screening been considered, but electrical interference is prevented by the use of de-coupling resistances and by-pass

arrangement gives the set great stability and accounts very largely for its fine performance.

The tuning circuit between the screened-grid valve and the detector is arranged on the choke-feed principle. In the anode circuit of the screened-grid valve there is a high-frequency choke. When signals are



AN IDEAL RECEIVER FOR GENERAL FAMILY USE

With the clearly marked photographs and diagrams that appear in these pages no difficulty will be encountered in the construction of the set

condensers associated with the screened-grid valve.

In both the anode circuit and the shielding grid circuit of this valve there is a 600-ohm resistance by-passed to low-tension negative by a 1-microfarad fixed condenser. This

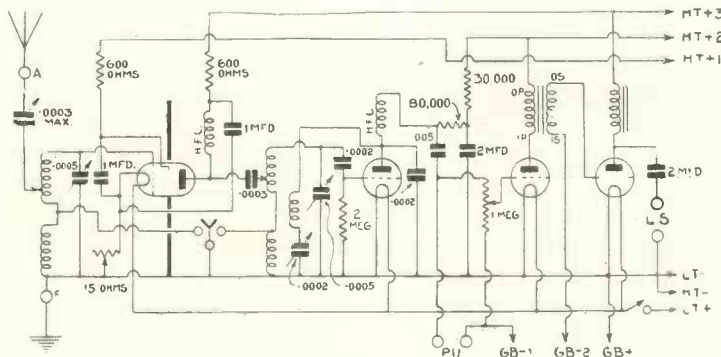
received voltage variations are set up across this and passed to the tuned grid circuit of the detector valve through a .0003-microfarad coupling condenser.

The arrangement of the coils in this circuit has already been explained and it will be noticed that the connection from the anode circuit is tapped down on the medium-wave coil, as in fact may be desirable with the aerial lead connected to the first medium-wave (aerial) coil.

Types of Coils

It will be realised that either centre-tapped or double-tapped coils can be used in these positions. Under normal circumstances the set will not be sufficiently selective if the connections are taken direct to the grid ends of the two medium-wave coils.

Leaky-grid detection has been used for the sake of sensitivity and simplicity. The grid condenser has a value of .0002 microfarad and the leak has a resistance of 2 megohms. The



CIRCUIT OF THE FIVE-POINT FOUR

This set includes a screened-grid valve, detector, one resistance-coupled low-frequency stage, and a transformer-coupled power valve. The circuit is arranged for the use of a gramophone pick-up without any alteration and two volume controls are provided. Five standard two-pin plug-in coils are needed to cover both wavebands

The Five-point Four—Continued

first value can be changed if desired to .0003 microfarad.

A second high-frequency choke is placed in the anode circuit of the detector valve in order to obtain a good reaction effect. In some cases it may be found that this choke can be dispensed with, but if this is done reaction is liable to be erratic and high-frequency currents may leak through to the low-frequency circuits and cause noises.

these components are wire wound and quite as satisfactory in use as the old standard cartridge type.

Two resistances are actually employed, the first having a value of 80,000 ohms and the second a value of 30,000 ohms. The 30,000-ohm resistance, in conjunction with a 2-microfarad by-pass condenser, acts as a de-coupling device and effectively prevents the possibility of low-frequency oscillation, or "motor boat-

It will be seen that by this arrangement no special provision is made for switching out the screened-grid and detector valves which, of course, are not needed when a pick-up is in use.

Switching Off Detector

The screened-grid valve can be switched off by means of the rheostat mounted on the panel. Provided that the user has no objection to supplying current to the detector valve there is no reason why this should be switched off. If desired, however, the valve can be removed from its holder while the pick-up is in use or a separate on-off switch can be mounted at the back of the base-board.

There is nothing unusual about the arrangement of the low-frequency transformer coupling the first low-frequency valve to the power valve. The ratio of this component should preferably be about 1 to 3, but any other value can be used provided that a suitable impedance valve is chosen to precede it.

Choke-capacity Output

For the sake of stability and also to protect the loud-speaker from the heavy anode current that will flow in the anode circuit of the last valve, a choke-capacity output is provided. This consists of a low-frequency choke having an inductance of the order of 15 to 20 henries, and a 2-microfarad by-pass condenser.

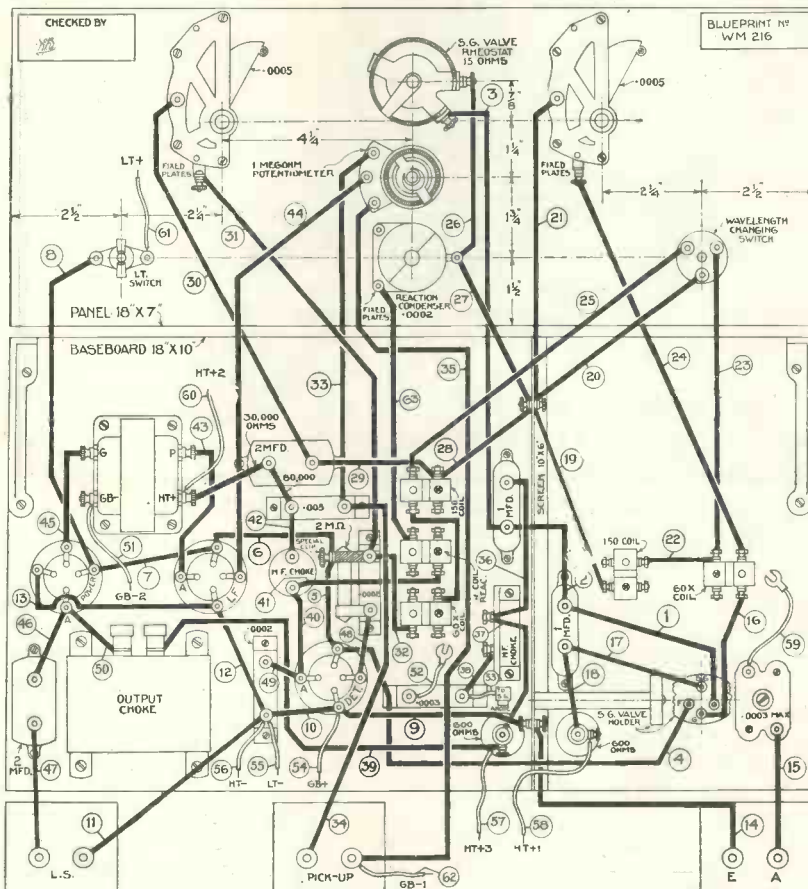
As far as the controls of the Five-point Four are concerned we should like to draw attention again to the fact that marked switches have been used. The wave-change switch at the extreme left of the panel gives an automatic "Long" and "Short" indication when it is operated, while the extreme right-hand switch automatically shows "On" and "Off" when the knob is pulled out and pushed in.

Slow-motion Dials

Of the two slow-motion dials, that on the left tunes the aerial circuit, while the right-hand dial tunes the detector-grid circuit.

Unfortunately we have been unable to find any marked dials for the three components arranged vertically in the centre of the panel.

The top knob is that of the rheostat associated with the screened-grid



QUARTER-SCALE LAYOUT AND WIRING DIAGRAM OF THE SET

If desired, a full-size blueprint can be obtained for half-price (that is, 9d., post free) if the coupon on the inside back cover is used by November 30. Ask for No. WM216

Another feature in connection with the detector valve that should be carefully noted is the use of an anode by-pass condenser. In this case we have used a value of .0001 microfarad, but a higher capacity can be employed if desired.

Again for the sake of simplicity and cheapness, we have used the new flexible type of resistance for the coupling between the detector and the first low-frequency valve. Many amateurs do not seem to realise that

ing" as it is more generally termed. The value of the coupling condenser is .005 microfarad.

In place of the usual fixed grid leak associated with the first low-frequency valve we have employed a 1-megohm potentiometer. This acts as a very efficient volume control both for radio and gramophone reproduction. The pick-up, when one is used, is connected directly across this potentiometer, no alteration to the wiring of the set being needed.

A Screened-grid Set with Standard Coils

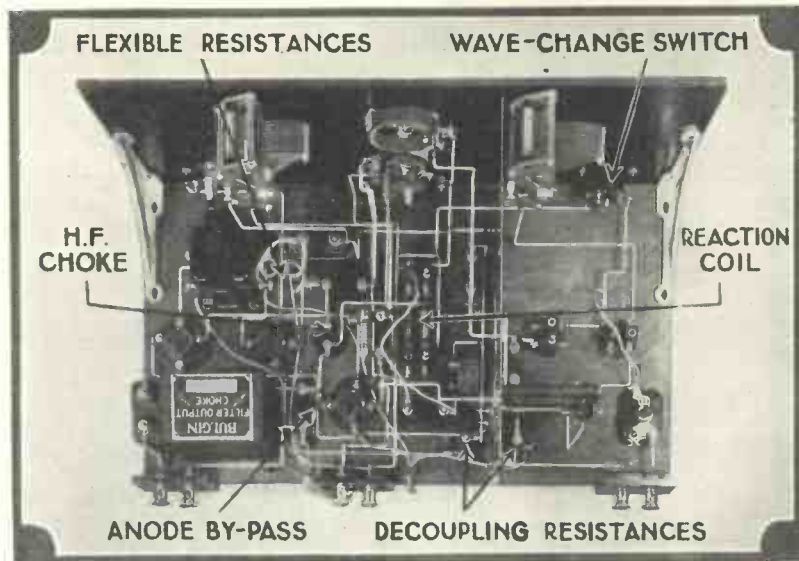
valve. This should be turned as far as possible to the right for maximum volume; when it is turned to the left volume is decreased and selectivity is increased.

The centre control is the potentiometer associated with the first low-frequency valve and should also be turned to the right for full volume. For radio work this control should be used in conjunction with the screened-grid rheostat for the best results. It can also be used for controlling volume when a gramophone pick-up is in use.

Reaction Control

The bottom control of the three is the reaction condenser. This again is turned to the right for increased volume, but as little reaction as possible should be used consistent with good range. The reaction condenser should never be turned so far round that the set begins to howl or whistle, for reception will only be spoilt.

Whilst all the essential details for construction are included in these pages many readers will prefer to work from a full-size blueprint, which acts as a drilling template, layout guide and wiring diagram. A blueprint can be obtained under the special half-price scheme (that is, for 9d., post free) if the coupon at the



BUILD THIS SET AND USE UP YOUR OLD PLUG-IN COILS !

Many constructors who have a stock of plug-in coils will want to use them as a basis for this modern and efficient screened-grid design

foot of the inside back cover is used.

Address your inquiry to Blueprint Dept., WIRELESS MAGAZINE, 58-61 Fetter Lane, E.C.4., and ask for No. WM216. A copy will be sent by return of post.

The first part of the construction to be undertaken is the drilling of the panel and the mounting of panel components.

Beginners will find this operation

quite simple if they will lay the top part of the blueprint squarely over the ebonite and mark through with a sharp point the centres of all the holes to be drilled. These are indicated by the cross lines on the blueprint. The circular holes for the wave-change and on-off switches can be drilled with a wood bit or cut out with a fret-saw.

Baseboard Components

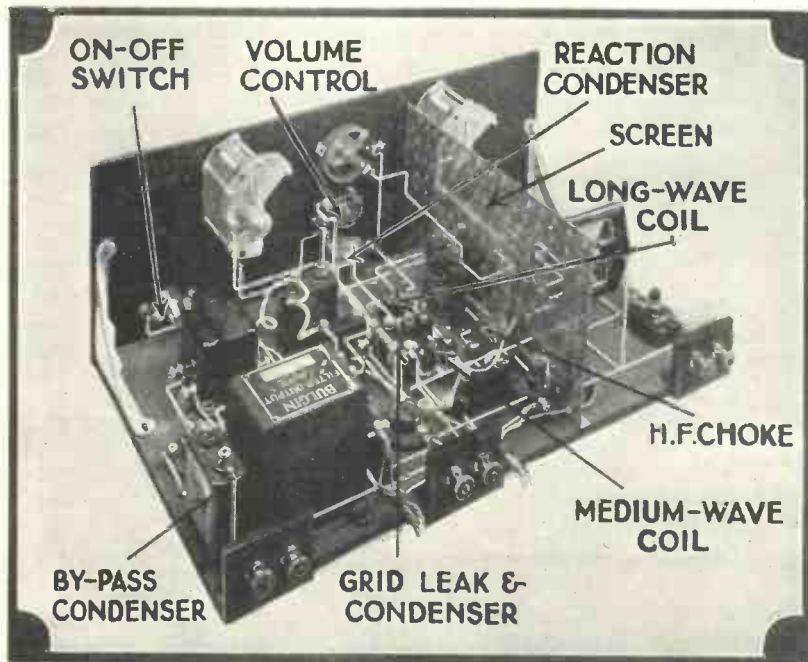
The next step is to mount all the baseboard components in position. The positions of all the parts will be clear from the photographs and the blueprint (or the reduced reproduction of the latter that appears opposite).

When all the components have been firmly fixed in position wiring up can be started. This can be done either with stiff insulated wire or rubber-covered flex; there is no need for any soldering.

Pick out wire No. 1 on the blueprint (or the reduced reproduction) and place this in position. Cross this number through on the diagram and proceed with the rest of the connections in the proper numerical order. In this way there is no chance of a mistake being made and the set will work directly it is connected up.

Coil Positions

When inserting the coils in their holders care should be taken to see that they are placed the right way round, otherwise it will be impossible to receive on the medium waves



A SIMPLE AND POWERFUL GRAMO-RADIO RECEIVER

Not only will this set receive a large number of foreign stations at good strength, but it can also be used for the electrical reproduction of records without any alteration

The Five-point Four—Continued

COMPONENTS REQUIRED FOR THE FIVE-POINT FOUR

CHOKES, HIGH-FREQUENCY

- 1—Telsen, 2s. 6d. (or Lewcos, Polar).
- 1—Ready Radio, standard type, 2s. (or Polar, Igranic).

CHOKE, LOW-FREQUENCY

- 1—Dubilier, type LF4, 12s. 6d. (or Ferranti, Varley).

COILS

- 1—Atlas No. 50 plug-in, 2s. 6d. (or Lewcos, Tunewell).
- 2—Atlas No. 60 double-tapped plug-in, 11s. (or Lewcos, Tunewell).
- 2—Atlas No. 150 plug-in, 7s. (or Lewcos, Tunewell).

CONDENSERS, FIXED

- 1—Dubilier .0002-microfarad, type 620, 1s. 8d. (or Graham-Farish, Trix).
- 1—Dubilier .0002-microfarad, type 620, with insulating clip, 2s. 2d.
- 1—Dubilier .0003-microfarad, type 620, 1s. 8d. (or Graham-Farish, Trix).
- 1—Dubilier .005-microfarad, type 620, 2s. 3d. (or Graham-Farish, Trix).
- 2—Dubilier 1-microfarad, 5s. (or T.C.C., Franklin).
- 2—Dubilier 2-microfarad, 7s. (or T.C.C., Mullard).

CONDENSERS, VARIABLE

- 2—Lotus .0005-microfarad, type LC5, 11s. 6d. (or Polar, Lissen).
- 1—Lotus .0002-microfarad reaction, 5s. 3d. (or Ready Radio).
- 1—R.I. Varicap pre-set, .0003-microfarad maximum, 2s. 6d. (or Polar, Igranic).

DIALS, SLOW-MOTION

- 2—Brownie, 5s. (or Ormond, Harlie).

EBONITE

- 1—Trelleborg panel, 18 in. by 7 in., 8s. (or Lissen).
- 3—Junit terminal blocks, 2s. (or Belling-Lee, Lissen).

HOLDERS, COIL

- 5—Magnum two-pin, 8s. 6d. (or Lotus, Lissen).

HOLDERS, VALVE

- 3—Telsen, 3s. (or W.B., Benjamin).
- 1—Peto-Scott S.G. holder to bolt on screen, 2s.

PLUGS

- 7—Belling Lee plugs, marked:— H.T.+1, H.T.+2, H.T.+3, H.T.—, Grid+, Grid—1, Grid—2, 1s. 9d. (or Eelex, Clix).

The prices mentioned are those for the parts used in the original set; the prices of alternatives as indicated in the brackets may be either higher or lower.

RESISTANCES, FIXED

- 2—Bulgin 800-ohm, 3s. (or Wearite, Magnum).
- 1—Magnum 30,000-ohm, spaghetti type, 1s. 6d. (or Bulgin).
- 1—Magnum 80,000-ohm, spaghetti type, 1s. 6d. (or Bulgin).
- 1—Dubilier 2-megohm grid leak, 1s. 9d. (or Watmel, Lissen).

RESISTANCES, VARIABLE

- 1—Ormond 15-ohm, 2s. (or Gecophone, Varley).
- 1—Igranic 1-megohm potentiometer, 6s. (or Rotorohm).

SUNDRIES

- Insulated wire for connecting (Glazite).
- Length of rubber-covered flex (Lewcoflex).
- 1—Pair Keystone panel brackets, 2s. (or Lissen, Camco).
- 1—Peto-Scott screen to specification, 2s. 6d. (or Ready Radio, Neophone).

SWITCHES

- 1—Gripso single-pole, marked "On-Off," 1s. 9d.
- 1—Gripso three-point, marked "Long-Short," 2s.

TERMINALS

- 6—Eelex, marked: Aerial, Earth, Pick-up (2), L.S.+ , L.S.—, 2s. 2d. (or Burton, Igranic).
- 2—Belling-Lee spades, marked:— L.T.+ , L.T.—, 9d. (or Clix, Eelex).

TRANSFORMER, LOW-FREQUENCY

- 1—Burton, ratio 1 to 3, 12s. 6d. (or Telsen, Brownie).

ACCESSORIES

BATTERIES

- 2—Columbia 60-volt, £1 15s. (or Siemens, Lissen).
- 1—Columbia 9-volt grid bias, 2s. (or Siemens, Lissen).
- 1—Oldham U.S.L. 2-volt accumulator, 9s.

CABINET

- 1—Carrington, oak, £1 4s. (or Osborn, Pickett's).

LOUD-SPEAKER

- 1—Hegra cone cabinet, type T, £2 12s. (or W.B., Amplion).

VALVES

- 1—Six-Sixty 215SG, £1 (or Lissen SG215, Marconi S215).
- 1—Six-Sixty 210RC, 8s. 6d. (or Lissen H210, Marconi H2).
- 1—Six-Sixty 210HF, 8s. 6d. (or Lissen HL210, Marconi H2).
- 1—Six-Sixty 220P, 10s. 6d. (or Lissen P220, Marconi P215).

the battery or mains unit that will be used it is then possible to work out what margin is left for supplying the last valve. A suitable type can then be picked out very easily.

Buy Large Batteries

We would particularly emphasise the fact that it is not an economy to buy cheap batteries and take more out of them than the rated maximum load. It always pays in the long run to buy double- or triple-capacity cells that will supply the required current without being overloaded.

Almost any standard mains unit will be suitable for supplying this set. To those who wish to build their own apparatus entirely we recommend either the "W.M." Standard A.C. Unit (fully described in the October issue) or the "W.M." Standard D.C. Unit (described on page 398 of this issue).

Care with Grid Bias

The question of grid bias should receive careful consideration both for the sake of quality and economy. If in doubt it is better to overbias than to underbias. The average values indicated in the valve table already referred to will act as some guide in this respect.

In the component specification for the Five-point Four we have indicated the sizes of coils needed to cover the ordinary broadcast wavebands. It will be understood, however, that if the appropriate coils are obtained the set can be adapted for reception on any wavelength from about 200 metres upwards to 5,000 metres or more.

This set is a companion to the Five-point Three described in detail in last month's WIRELESS MAGAZINE

We do not recommend that the set should be used as it stands for ultra-short wave reception, although those who have the necessary plug-in short-wave coils may like to try it.

It has already been explained that selectivity can be controlled by tapping down on the medium-wave grid coils. In most cases it will be found that centre-tapped coils will give all the selectivity that is desired, but in

(Continued on page 401)

because the medium-wave coils will be shorted out of circuit instead of the long-wave coils.

It will be found that the circuit is not at all critical as regards valves. Two-volt valves will be quite suitable, but six-volters will be found to give better results in most cases.

Valve Impedances

Any standard screened-grid valve will be suitable for the first position, while the detector should have an impedance between 30,000 and 50,000 ohms. This value is not critical but the valve should have a high amplification factor.

The first low-frequency valve should have a slightly lower impedance, and should preferably be between 10,000 and 20,000 ohms. It will be found that this valve is the least critical of all.

The choice of a power valve is always the most difficult problem

because it depends so much on the type of high-tension supply that is available.

Many of the valves that would give the best results take an anode current which it is undesirable to take from dry batteries on the score of economy. The impedance should be in the neighbourhood of 2,500 ohms, but a careful eye should be kept on the consumption.

The best plan is to estimate the total consumption for the first three valves (a matter that is not difficult if the special WIRELESS-MAGAZINE valve table on page 324 is consulted). Knowing the maximum capacity of

The construction of this set will be greatly simplified by the use of a full-size blueprint



"TO" SAVOY HILL

It is an ambition of most listeners to visit one of the B.B.C. studios while a broadcast is in progress. Here E. A. ROBERTS, who will be known as one of the "W.M." caricaturists, gives his impressions of such a visit to 2 Savoy Hill, the B.B.C. headquarters

I RECEIVED definite proof that the age of miracles had not passed when one morning there arrived by post a permit entitling the bearer to witness the performance in the vaudeville studio at Savoy Hill on the date mentioned.

It is a well-known fact among listeners that it is far easier to receive America at full strength on a crystal set than to obtain one of these coveted studio passes.

On the fateful night I threaded my way up Savoy Hill, in and out dozens of parked cars, towards the north entrance. The vaudeville programme (hereinafter called variety for the sake of pronunciation fiends) was, according to the papers, due to start at 7.45 p.m.—my ticket begged my presence at 7.35 p.m., so naturally I arrived at 7.25 p.m.

After some minutes waiting, a small boy appeared and requested, in his best B.B.C. manner, "Would the audience kindly come this way."

The audience, including myself, kindly did so, and proceeded up two flights of stairs. We then passed

through a spacious waiting room, upon the tables of which WIRELESS MAGAZINE and *Amateur Wireless* were prominently displayed. Next a short winding passage and we came to a large pair of double doors, from behind which came the strains of various musical instruments in various stages of tuning.

The studio is a large heavily-draped room, roughly grouped into three portions. The centre one contained the microphone and artistes, and the other two were occupied by the supporting band and audience.

A number of reserved seats at one side are for the use of broadcasters and other privileged beings, while built in one corner is what appeared to be to my layman's mind "an adult call office." However, it turned out to be a control room from which an idea as to how the programme comes over is obtained.

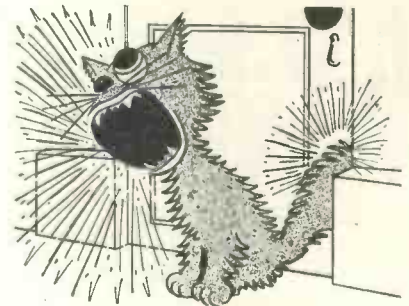
Then an announcer entered—I was certain he was an announcer apart from the fact that he had the programme of announcements in his hand. He had the sort of face that one expected would go with "Good evening, everybody."

The red lights over the studio doors began to flicker ominously and with a sweet but stern "Silence, please," which had the effect of producing a sphinx-like atmosphere, the announcer took up a nonchalant attitude in front of the "mike," and as the red lights adopted a steady glow he began his announcements in a dark brown voice.

As the programme was being detailed, the conductor of the band

stood poised with one eye on his confederates and the other on the announcer (this in time gradually produces a squint—technically known as a broadcast!) waiting to strike up the opening bars for the forthcoming turns.

As we, the audience, sit behind the



ROBERTS:

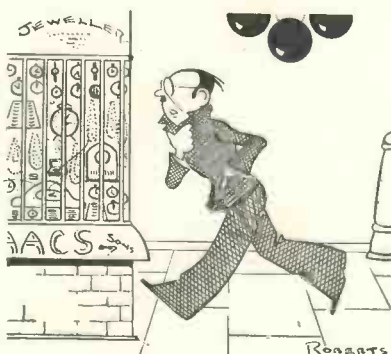
Began his announcements in a dark brown voice

"mike," the artistes appear to be performing for our special benefit with the microphone dividing us in place of the footlights.

The programme on this particular evening was one of the "mixed all-sorts" type—vocalists, instrumentalists, humorists and a short sketch or two.

At the end of the opening song, the audience, including myself, seemed dubious as to whether it was in order to clap or not, so very tactfully one of the staff began to applaud and eventually we joined in with great gusto, and subsequent turns received our appreciation without any prompting.

I think that in the case of sketches
(Cont. in third col. of next page)



"An adult call office"

A WIRELESS ALPHABET

By Leslie M. Oylar



*the Umbrella Aerial,
I do not like him never shall;
His useful cousin one can lend—
Or borrow from a trusting friend,
But he can never keep off rain,
Such homely work he would disdain.
Though I don't care for him a scrap
He is a fine upstanding chap,
And very wiry, far from fat,
In justice I must tell you that!*



*for the darling little Volt
Who frisks about just like a colt
With Ohms and Ampères, how they play!
They brighten up a gloomy day!
They have electromotive force
But they must be controlled, of course,
For if they realised their strength
Their pranks might go to any length.
The wireless expert is a dolt
Who does not love the little Volt!*



*for the Wander Plug;
Though swanky wireless parts may shrug
Because he has no settled home
He very much prefers to roam.
He is not lazy, though they mock,
He frequently connects some socks
Ets in high tension batteries,
Thus very skilful work is his.
He is a nomad, and, alas!
I grieve to say, as bold as brass!*

“To” Savoy Hill—Cont.

and cross-talk items it rather took from the interest by seeing the artistes reading their lines from type-written sheets, instead of just hearing them and visualising the surroundings but, of course, we had the advantage of seeing their facial mannerisms, by which means many a joke can be put over better than by words.

It was, however, not until later in the evening that my great opportunity occurred. A comedian, after singing one or two songs, announced that he would greatly appreciate the fact if the thousands of listeners would join in his choruses, and would the studio audience also assist.

It was then that I remembered that as a child I had sung in the village choir, so when we all started off, my “Tweet, tweet, shush, shush, now, now, come, come” could be heard with the best of them, and just before the second time round I recollected that I had relations in Wigan who no doubt would be listening.

Well, of course, it is a well-known fact that Wigan is a long way from London, so that necessitated louder singing, which I managed, but it did not call for the jealous remarks about a “mike” not being needed.

At a few minutes to nine the programme closed with a final number by the band, the red lights flickered and extinguished, the double doors were thrown open, and we filed out to retrace our steps to the entrance hall.

After retrieving my hat and coat from the cloakroom, I passed into Savoy Hill, with a blasé air and my hat feeling somewhat tight. After all it is not everyone that has er—broadcast.

Fate of the Eiffel Tower

FOR some time past rumours have been rife in Paris regarding the dismantling of the Eiffel Tower and its consequent suspension of wireless signals.

From what I hear the structure is proving too useful to the military authorities to be sacrificed in this manner, but on the other hand there is a strong possibility that the famous *Tour Eiffel* may in 1931 find its time entirely devoted to official purposes and that concerts on 1,445 metres will be no more.

J. S. A.

Wireless Magazine Gramo-Radio Section

A SPECIAL SECTION FOR THOSE INTERESTED IN ELECTRICAL REPRODUCTION

Burmese Colour and Electrocolor Needles

By H. T. BARNETT, M.I.E.E.

FROM South Africa I have just received a packet of each of the two needles now made by the Burmese Colour Needle Co., of Grahams-town, Cape Province.

Both appear to be made of some hard wood: one is marked "loud tone" and is varnished and the other is called the "Burmese electric needle," and is unvarnished.

Needle Weight

Now, on my electrical reproducer I have a B.T.H. pick-up carried on a Linit arm carefully set for correct track alignment; the counter-weight is screwed down fully so that there is only three ounces weight on the needle and the needle angle I use is 50 degrees.

My Edison-Bell amplifier has a big reserve of power—I never use more than a third of its capacity for my five loud-speakers—so there is no need whatever to use a loud steel needle when reproducing.

The needle that gives me the least and the least insistent surface noise without sacrificing any instrumental or vocal detail is the H.M.V. soft-tone steel needle; it has a very fine point and, being of good hard steel, it is perfectly safe to use each needle to play both sides of a 12-in. record. All my records are better than new; where there was any initial roughness use *burnished* it away.

Broadcast Record

I tested the Burmese needle on a new Broadcast record (these records now have a beautiful surface) and afterwards played the record with an H.M.V. soft needle.

The Burmese Colour needle gives a similar surface noise and equal tone volume to that from the steel needle and, when new, its definition is nearly as good.

The Burmese Electric needle

gives a little less surface noise and a little less tone than the H.M.V. soft-tone steel needle.

We are told that after playing one side of a record the Burmese needle should be given a third of a turn round in the needle socket. I find that when this is done I can play four sides with the new point before it fails.

Also we are told how to re-sharpen the needles on a little emery file that is given in each packet. I regret to say that after several trials in which I failed to produce a point nearly so good as the original I

SPECIAL NOTE

DURING a recent demonstration of the Burmese Electrocolor needle, which took place in the Georgian Hall, Piccadilly Hotel, under the auspices of the sole agents, Keith Prowse & Co., Ltd., the inventor, Mr. Ramsay, said to a WIRELESS MAGAZINE representative:—

Impressive Results

"We claim that the Electrocolor gramophone needle gives perfect tone." Subsequent reproduction on an Electromonic radio gramophone was most impressive; the tone of the violin sounded particularly true.

Mr. Ramsay assumed the mantle of a prophet when he said: "I think the gramophone of tomorrow will undoubtedly be an electrical reproducer. And the gramophone of the day after tomorrow will probably utilise a photo-electric cell, and instead of records we shall play strips of paper."

Talking of the predecessor of the Electrocolor needle, which was the well-known Burmese Colour needle, the inventor said: "So far I have not made any money out of the business. My chief interest in it has been as a keen musician striving for realism. I should be the last to say that we have reached finality in gramophone needle design."

Musician's Opinion

Whatever may be the verdict of those who heard the new Electrocolor needle there is no question that the Burmese Colour needle greatly impressed the musical fraternity. Kubilik is reputed to have said: "In my opinion, compared with the ordinary steel needle, the Burmese Colour is as a Strad to an ordinary violin."

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had to give up the repointing as a bad job.

In view of the extreme ease with which fibre needles are repointed by cutting I cannot see why those who like the slightly blurred reproduction of the wooden class of point should forsake the old love for the new.

I wonder the makers of these needles do not turn them out triangular in cross section so that they may be repointed in the ordinary fibre needle cutters. If the material they are made of is better than bamboo for a needle point, they would then find a much larger purchasing public.

MAKING YOUR OWN RECORDS

LAST month I was able to give some particulars of a simple device that enables anyone to make their own records.

When that article was written the device was not in full production, and one or two small modifications have been made subsequently.

For example, experiments on various gramophones showed that the centre pin was not sufficiently true to enable reliable tracking to be obtained. A small tie-rod has, therefore, been added to the equipment, as illustrated in Fig. 1.

Fitting the Device

This is carried on a pillar which is fixed to the baseboard just clear of the turntable. One end of the tie-rod is provided with a small hole which fits over the spindle projecting through the top of the gearbox, while the other end is slotted and fits over the pillar, so that the length is adjustable.

In operation the gearbox is pushed over the centre pin of the turntable; it grips by its own friction. There is no chuck as described in the previous article. The tie-rod is then fitted over the projecting spindle in the top of the gearbox, the knob on top of the pillar being loosened to allow the length to be adjusted satisfactorily.

Now lift the tracking arm clear of the turntable and hold it lightly in the hand. Start the motor and note whether the spindle of the gearbox is running true. It will be found convenient to tighten up the knob on the pillar, and then to loosen it and re-tighten it once or twice.

This action usually automatically centres the spindle, and after one or two attempts it will be found to run quite true. A small wobble is permissible, but for best tracking a little care should be taken with this operation, as then the grooves will be evenly spaced on the record and there will be no danger of one running into the next.

It has also been decided to provide a sapphire cutter instead of a steel

*J. H. REYNER, B.Sc., A.M.I.E.E.,
in this article explains how you
can set up your own recording
studio*

one, and for the best results this cutter should be dead vertical. In order to obtain a proper cut it is necessary to have adequate weight on the cutter. The effect of placing a small piece of lead inside the neck of an ordinary tonearm may be tried if desired.

Any such additional weight must, of course, be rigidly fixed, and not allowed to rattle, as otherwise it will introduce distortion in the recording.

For those who have tonearms specially designed to suit electrical pick-ups, it may be necessary to add further weight. In most cases the pick-ups are provided with a spring mechanism to take some of the weight off the record. This is the reverse of what is required for recording, where a weight of several ounces is required on the record.

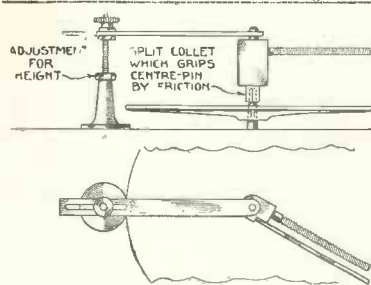


Fig. 1.—Arrangement of tie-rod on the Cairns Morrison recording device

Therefore, remove any tensioning devices, and endeavour to adjust the weight on the record around a figure of 4 to 5 ounces.

A point on which I think some comment is desirable, too, lies in the reproduction of these records with electrical pick-ups. Many readers will be using a pick-up complete with tonearm, their gramophone being all-electric, or perhaps a mechanical motor with an electrical pick-up.

This is quite satisfactory provided that the tonearm is perfectly free, but

in many cases I have found that the tonearms supplied to-day are a little too stiff for satisfactory reproduction.

The effect of this is that the somewhat shallow groove on the record is unable to carry the pick-up along, and it will jump the track, tending to remain in the same groove and repeating the same phrase over and over again.

My Own Difficulty

I had great difficulty with my own pick-up until I realised what was happening. The record was playing quite satisfactorily on a standard portable gramophone, but would not play on my electrical equipment.

When I eventually realised what the trouble was I oiled the various pivotal points on the tonearm, so that it was able to move across the usual arc from the outside to the inside of the record perfectly freely. This immediately overcame all the difficulty, and no further trouble was experienced.

Fibre needles must, of course, be used always when playing these records. A steel needle will damage the record irretrievably. Those readers who have pick-ups or soundboxes which will take the usual triangular needle can use this form quite satisfactorily.

If one's equipment, however, is only designed to take the usual circular steel needle, it is necessary either to use a fibre needle adaptor, or preferably to use a Burmese Colour needle. These are made the same size as the ordinary steel needle, and will, therefore, fit the ordinary type of pick-up. (They cannot be used in pick-ups of the needle-armature type since such devices depend on the magnetic effect of the steel for their operation.)

The oil remaining on the record is a little troublesome for the first few playings, particularly with the triangular fibre needle. This oil forms a grinding compound, which wears the point off the needle with considerable rapidity. It is quite common

to find that it will not play more than half the record before it becomes "woolly."

Working Out the Oil

Raising the needle and removing the fluff and oil from the end with one's finger overcomes the difficulty temporarily, but it is often not until the record has been played two or three times and the greater part of the surplus oil has been worked out that satisfactory reproduction results.

After this initial period, however, reproduction will be found to be remarkably good, and the needle will play through the whole record without any undue wear.

We may now pass on to the question of making one's own records as opposed from using a broadcast item, or re-recording an existing gramophone disc. I dealt principally in the last article with the device itself, and did not discuss the accessories at all.

The complete outfit, however, includes a small microphone with its attendant transformer and battery, and this, of course, is used in order to record one's own voice or any particular item which one may perform.

The microphone, as most readers will be aware, consisted in its simplest form of a receptacle filled with carbon granules of relatively fine texture. One side of the receptacle is flexible, and on speaking towards this device the pressure on the carbon granules is varied according to the speech waves.

Current Fluctuations

If, therefore, one connects a battery to the device, thus passing a current through the carbon, the varying pressure causes variation in the resistance, and consequently the current fluctuates.

A transformer is inserted in the circuit, and these variations in the original battery current are transformed up and give us speech currents such as we obtain from a gramophone pick-up.

Speech leads are connected to the input of the amplifier in some suitable manner. If one's receiver already has provision for a gramophone pick-up, it is merely necessary to disconnect the pick-up and connect the

microphone in its place. Fig. 2 gives a skeleton circuit of a microphone connected to a suitable amplifier, and indicates the whole principle.

If one's receiver has no provision for a gramophone pick-up, the best plan is to use a gramophone adaptor. This is a device which contains four sockets on the top and on the bottom four pins. The adaptor is inserted in the detector socket and the detector valve is fitted into the sockets on the top.

The connections are then taken through the filament pins and the anode pin, but the connection to the grid of the valve does not go through the radio set as before, but is brought out to a terminal on the side. By

connect one's amplifier first of all to the loud-speaker and then on to the recorder. Such a device is incorporated in the Fig. 2 arrangement. One can adjust the strength and quality on the loud-speaker and then throw over on to the recorder when ready.

Volume Required

Good volume should be obtained in order to produce the best recording. Overloading must not be present, of course, for best results, but it is desirable to have the volume distinctly louder than one normally listens to, in order to make sure of obtaining a good cut on the record. If the cut is too fine the surface noise tends to be excessive, and the reproduction contains an abnormal amount of scratch.

The best plan is to take a 6½-in. aluminium disc, and to re-record a gramophone record which is of fairly uniform strength. Alternatively if one likes to enlist the services of an assistant who will count up to ten over and over again in the same tone of voice, and at the same distance from the microphone,

this will do equally well.

In re-recording a gramophone record, of course, the microphone is disconnected and an ordinary electrical pick-up is inserted in its place. The signal is then applied to the loud-speaker, and changed over to the cutter when ready.

Cutting the Disc

Whichever arrangement is adopted the procedure is as follows. Place the cutter about ¼-in. from the edge of the record, and start the motor, having previously connected up the tracking device as already described. The record will now last for about two minutes, during which time one can make a number of tests.

First of all throw the two-way switch on to the loud-speaker and note the volume. It is desirable to start with ordinary "room" volume. Do not spend more than a few seconds in this position—just enough to impress the volume on one's memory—and then throw over the switch on to the cutter. Record in this manner for fifteen seconds.

Now throw over the switch to the loud-speaker again and increase the volume slightly. Having noted the

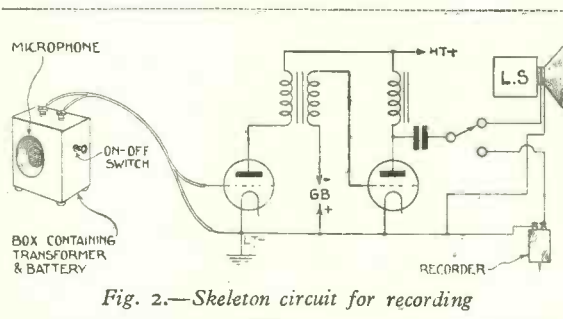


Fig. 2.—Skeleton circuit for recording

connecting the microphone to this terminal and to low-tension negative, the arrangement will work satisfactorily.

This method is convenient for those who possess portable receivers, many of which have no provision for a gramophone pick-up, although the more modern ones are provided with a jack for the purpose. If one is in any doubt, however, references to the pages of WIRELESS MAGAZINE will show various methods in which an electrical pick-up may be connected to a set, and the connection of the microphone is exactly similar.

The amplification required for this arrangement is not large. The microphone supplied with the outfit is a sensitive one and will give signals of the same order as the average pick-up. Therefore, a simple two-valve set will give all the necessary volume for ordinary recording.

Generally speaking an output in the neighbourhood of 1 watt is desirable, but satisfactory recording can be carried on with only a few hundred milliwatts, that is, satisfactory loud-speaker volume for a small room.

It is convenient to arrange a change-over switch of some sort, to

Making Your Own Records—Continued

volume mentally, throw the switch back to the cutter and record for another fifteen seconds.

Four Different Strengths

In this way it will be possible to obtain at least four distinct strengths on the record, the last being adjusted until the loud-speaker is working almost at its fullest capacity. The record may then be re-played, and the effect of the varying strengths noted.

It will probably be found that one particular strength suits the arrangement best, and as far as possible all future recording should be carried out at about the same level.

Various other tests may conveniently be carried out on the 6½-in. disc, when trying out various other alterations. It should be remembered that when one gets within two inches of the centre of the record, quality begins to deteriorate, and it is desirable not to place too much credence on any tests taken on the last ½-in. of the record.

For any serious work, therefore, it is desirable to use the larger discs (8 in. and 10 in.), and to record on the outer portion of the disc only, in order to maintain good quality throughout.

When using a microphone great care must be taken to prevent any feed-back between the loud-speaker and the microphone. If the loud-speaker is in the same room as the microphone this audible coupling will almost certainly occur. The sound waves from the loud-speaker affect the microphone and, owing to the amplification of the system, a continuous howling will be set up. This is overcome by putting the microphone in an entirely separate room, and in any case this is a good plan since the studio can be kept absolutely quiet.

Picking Up Mains Hum

A little difficulty may occur when using a long lead if there is any electric light in the vicinity, because mains hum is picked up. This may be overcome by earthing one of the leads to the microphone. The lead chosen, of course, should be the low-potential one which is connected to the low-tension side of the set and, of course, if the set is already earthed,

this additional precaution is not necessary.

Lead-covered wire is also useful in avoiding induction, the outer casing being connected to earth, but in the ordinary course of events plain twisted flex will be found to be quite satisfactory. If any difficulty still persists try connecting a 1-to-1 transformer in circuit actually at the input to the set. Fig. 3 illustrates the point diagrammatically.

It is a good plan to connect an additional pair of leads between the studio and the actual recording point. One can then connect a flashlamp at the microphone end, and a battery and key at the other. A series of signals can be arranged, one to tell the performer when to start, and the

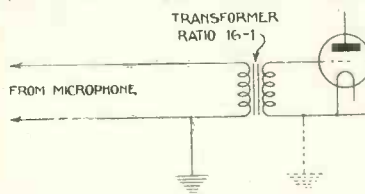


Fig. 3.—Connections of microphone and microphone transformer

other to give him a warning that he has only a few more seconds to run, and the third to tell him peremptorily to shut up, after which he can come round and hear what his voice sounds like, having first switched off the microphone.

Do not forget this apparently simple point, because otherwise you will find that your microphone battery is run down just when you want it.

With a little experience it is possible to make up fading panels, whereby one can fade in from one effect to another. For example, I have made one or two records in which I have brought in a musical introduction or accompaniment from a gramophone record. The gramophone was played from an ordinary pick-up which was "faded in" to the record either just before my own little bit of work, or perhaps concurrently therewith, so that I obtain a musical accompaniment to my words of wisdom.

Another thing which I did was to whistle the air of popular dance tunes while the dance tune itself was being played in the background, again re-recorded from a gramophone disc.

The same thing may be done with radio items, and if one has any particular need to do it, it is possible to fade up any one of the three, either one's own microphone, a gramophone record or the radio. No end of fun can be obtained by making records in this way.

Listening to the Cutter

It is desirable in some cases to know what is happening. If one is at work in a recording room quite separate from the microphone room, it is possible to hear what is going on by listening to the cutter. This will "sing" while it is cutting, and one is able to obtain some idea of the performance from this. In fact it may be taken that one should just be able to hear the cutter sing if the strength is of the right order.

There are, of course, various possible arrangements whereby one can actually listen on a loud-speaker at the same time without robbing the cutter too much.

I think enough has been said to enable the user to obtain a great deal of enjoyment from this new development, and he will no doubt find out for himself many of the little difficulties as I have, and will overcome them with equal success.

EDITOR'S NOTE

THIS article refers particularly to the Cairns Morrison home recorder, but, of course, many of the hints apply equally well to other systems that have been put on the market.

The complete Cairns Morrison home-recording "kit" costs £4 12s., and includes six double-sided blanks. Additional blanks can be obtained for 4d. each.

Further details can be obtained from Cairns & Morrison, Ltd., of 33 Percy Street, W.1.

Another home recorder is the Sound Services system, distributed by Hillman Brothers, of 123-5 Albion Street, Leeds. This outfit costs 5 guineas and includes a stand microphone, microphone transformer, grooving machine, cutting diamond, cutting solution, and twelve assorted blanks. With a special Phonovox pick-up already mounted the price is 6 guineas.

We hope to give more complete details of this apparatus in an early issue.

Around the Turntable

Light Orchestral Music

Aldershot Command Searchlight Tattoo (1930), (d.s.), 4s. 6d. **H.M.V. C1986-7**

This is admirably produced. It contains, in two complete records, a bugle fanfare, the opening, massed drums and fife bands, the light cavalry, Coldstreams, massed pipe bands, Queen Elizabeth's visit to the Armada Camp, etc., etc. The finale on the fourth side contains "Abide with me," the Last Post, National Anthem, cheers for H.M. the Queen, and the March Off. It is an amazing production and I sincerely recommend it to those to whom such things appeal.

Blue Danube Waltz (Strauss), Paris Sym. Orch., 1s. 3d.

Quite a good version of it. There is an attraction on the other side in the shape of Waldteufel's *Estudiantina*. I recommend this record.

Chant of the Jungle, Alfredo and His Band, 1s. 6d.

This is from the sound film, "Untamed." On the other side is the shepherd's serenade (a capital waltz), from the sound film, "Devil May Care." Both are attractive and excellent records for the open air.

Colonel Bogey, H.M. Scots Guards Band, 1s. 3d.

This is of the usual type of military band music, by which I mean that it will appeal to those who like such things. The *March of Triumph* on the other side is a well-known tune and is well played. I recommend the record.

Columbine, Viennese Orch., 1s. 6d. **PIC 590**

This and *In Pierrette's Garden* make an attractive light lunch-time music record. Nothing outstanding in either work, but just pleasant.

Crown Diamonds (Auber), Sir Dan Godfrey and Bournemouth Municipal Orchestra, 4s. 6d. **COL DX77**

This overture is of a distinctly light type and should appeal to lovers of light music. There is nothing in Dan Godfrey's rendering that is worth remarking upon, but there is nothing wrong with it. The recording is good.

Distant Greeting, Band of H.M. Life Guards, 2s. **BRDCST 5186B**

This, by Loring, is backed by *The Thunderer*, by Sousa. The H.M.L.G.'s are up to standard.

Down South, Band of H.M. Welsh Guards, 1s. 3d. **BRDCST 606B**

In the Sudan, on the other side, is very attractive and wild. Both sides are well worth hearing. For military band record collectors here is a good addition.

REVIEWS OF RECORDS BY WHITAKER-WILSON, the "W.M." MUSIC CRITIC

King of Jazz, Alfredo and His Band, 1s. 3d. **RAD 1364**

This is a double-sided and contains all the tunes from "King of Jazz," with which I am familiar. Very good production.

Pomp and Circumstance (Elgar), Vienna Sym. Orch., 1s. 6d. **WIN 5143**

A favourite with all "Prom." goes, this should appeal far and wide. It is well played, and can be thoroughly recommended.

Poupee Valsante, Tom Jones and His Orch., 2s. **BRDCST 5185A**

Poldini's *Dancing Doll* is here played on very sweet-toned instruments. Indeed, the record is outstanding on that account. *Demande et Repoust* from Coleridge-Taylor's small suite is always this record. I recommend this record.

Shepherd's March, Ceylon Military Band, 1s. 6d. **IMP 2312**

This and the *Old Comrade's March* make an excellent military band record. I recommend it to those of you who like such things.

Sweepin' the Clouds Away, the Clevelanders, 1s. 6d. **PIC 2306**

This is, of course, quite well-known and is here played well. I like the waltz called *Romance* on the other side. Excellent recording.

Light Opera & Songs

Battle Eve, Hubert Eisdell and Norman Allin, with piano, 4s. 6d. **COL DX79**

Two fine voices, of course; but why on earth do they not sing something worth hearing? I am surprised at them. This is sheer "tripe"; *Excelsior* is on the other side so you can tell what the record is worth!

Cheery Song Memories, soloists, chorus and dance band, parts 3 and 4 (d.s.), 1s. 3d. **BRDCST 603**

This seems to be a travesty-medley of many songs I had hoped forgotten. I cannot pretend to advise you on these records, of which I have only sides 3 and 4; you had better ask to hear them.

English Medley, Maestros, with orch., 4s. 6d. **COL DX80**

For those who like bits and pieces—and, judging by the number of medley records issued they must be legion—here is a very good one. *A Hunting We Will Go; Sally, in our Alley;*

Here's a Health; British Grenadiers; A Fine Old English Gentleman; O Dear, What Can the Matter be, etc., etc.

Exactly Like You, Elsie Carlisle and orch., 1s. 6d. **IMP 2318**

She sings it very well and in her own fashion, as she does *I Like to Do Things for You*, on the other side.

Floral Dance, Edward Halland, with piano, 1s. 3d. **RAD 1371**

Quite a good rendering of it, though the piano is not up to much. On the other side is a good rendering of the *Yeoman's Wedding Song*.

Golden Gates of Paradise, Al Benny, 1s. 3d. **BRDCST 602A**

Ballad lovers may like this, and *They Cut Down the Old Pine Tree* on the other side. Both are in the Victorian ballad style, and are sentimental enough for anyone I should imagine.

I am a Friar of Orders Grey, Malcolm McEachern, with piano, 3s. **COL DB174**

How nice to hear a good bass! He is very stimulating. On the other side he sings *Drinking*, as a good bass should! Very effective. His production is so good that I recommend the record to students who are themselves either baritones or basses.

I Feel You Near Me, Patrick Ward, with orch., 1s. 6d. **IMP 2316**

You know this, of course, and I need say nothing about the actual song. The other side is the *Rose of Tralee* from the same production, "Song of My Heart." Patrick Ward sings both effectively.

I Know of Two Bright Eyes, Norman Cross, ten., with orch., 2s. **BRDCST 5184A**

The companion being *Where My Caravan Has Rested*, I need make no remark on the music but on the voice alone. Very sympathetic, and not overdone in any way! He is better in the "Caravan" than in the other.

Lass with the Delicate Air, Beryl Costello, sop., 1s. 6d. **WIN 5146**

On the other side Miss Costello *Wanders Down the Mountain Side*; she sings both these old airs charmingly. Here is a good recording voice.

Let Me Sing and I'm Happy, Irving Kaufmann, and orch., 1s. 6d. **IMP 2317**

I am not over keen on this, but you probably like it better than I do. Kaufmann's voice is fair only. On the other side Robert Gwynn sings *It Happened in Monterey*, which is much better and makes this record worth getting.

Livin' in the Sunlight, Lovin' in the Moonlight, Maurice Chevalier, bar., with orch., 3s. **H.M.V. B3517**

This is from the sound film, "The Big Pond," and very good it is, too. I don't like the singer, but he suits the occasion. He sings *You Brought a New Kind of Love to Me*. I can't recommend him but the song is attractive.

Mikado; Tit Willow and A More Humane Mikado, Harold Williams, bar., and orch., 3s. **COL DB180**

I need say nothing about the song. Harold Williams is good—very good! If you like these two songs I recommend this, for its diction alone, which is admirable.

Negro Spirituals, Marcus Browning, with piano, 1s. 6d. **WIN 5141**

Contains, on two sides, *Barry By; I've Been in the Storm so Long; Sometimes I feel Like a Motherless Child*, and *I Got a Robe*. Marcus Browning's voice is rich and full, and he knows how to sing these songs. A splendid record of its type—perhaps the best I have heard up to now.

Now Sleeps the Crimson Petal, Hon. W. Brownlow, bar., 3s. **COL DB179**

This is one of the most beautiful songs of modern times in my opinion. It is quite well sung though the Hon. W's. vowel production is not perfect; he wants some good lessons. He sings very effectively, but his top notes are too much inclined towards falsetto for my liking. On the other side he sings another song of Quilter in which he is more manly and virile. Ask to hear the record, by all means.

Song of the Dawn, Layton and Johnstone, with piano, 3s. **COL DB220**

This is a very effective little number (from the "King of Jazz"), Layton and Johnstone produce it in their customary excellent manner. On the other side they give a good account of the classic *Stein Song*.

Song of the Dawn, Sam Browne and orch., 1s. 3d. **RAD 1365**

This is from "The King of Jazz." The record also contains *It Happened in Monterey*, from the same film. Both are well produced.

Swing Low, Sweet Chariot, Kentucky Singers, Male Octet, 3s. **H.M.V. B3536**

I have a soft spot in my heart for this; there is something wild and woolly about it. Ask to hear it; I think you will agree with me. *Witness* is on the other side. Excellent.

There's a Good Time Coming, Albert Whelan, 1s. 6d. **IMP 2313**

This is my first Imperial record. The song is very jolly; so is the *Empire Parade*, which is on the other side. The recording is good and the record is good for the price.

Around the Turntable—Continued

They All Fall in Love, Norah Blaney, and Gwen Farrar, with piano and 'cello, 3s.
COL DB219

Either Norah or Gwen must be a *man*! I find that it is not so, on inquiry, but Gwen certainly records like one! She plays her 'cello effectively, however, and the record is pleasing. *My Love Affair* is on the other side, but Gwen does not play her 'cello this time. Quite effective!

Until (Sanderson), Aroldo Lindi, ten., 3s. COL DB173

The other side of this is *Geehl's For You Alone*. Both are recorded in the Central Hall. All I need say, as the songs are so hackneyed, is that the singer has a good voice, but has an atrocious way of enunciating his words.

When the King Went Forth to War (Koenemann), Watcyn Watcyns, with piano, 1s. 6d. WIN 5145

Do you know this? Get it if you don't; it is one of the most stirring baritone songs in existence. Watcyns sings it well. On the other side he gives a good rendering of Moussorgsky's *Song of the Flea*. A good vocal record. (Both songs are of Russian origin.)

Classical Orchestral Music

Caliph of Bagdad (Boieldieu) (overture), Berlin State Opera Orch. (d.s.), 3s.
H.M.V. B3482

This is an excellent rendering of a popular work in overture form. It is the sort of music of which no "medium-brow" need be afraid. Ask to hear it; I think you will end by purchasing a copy.

Die Meistersinger Overture (Wagner), Bruno Walter and Sym. Orch., 4s. 6d.
COL DX86

Quite a good rendering and well recorded. Lovers of Wagner need have no hesitation in adding this record to their collection; I have every admiration for it.

Russian and Ludmilla (overture), Chicago Sym. Orch., 6s. 6d. H.M.V. D1808

This, by Glinka, is a very attractive piece of music. To those who make a practice of collecting orchestral overtures, or works of a similar nature, I recommend this. The other side is a splendid rendering of Wagner's *Dreams*.

Chamber Music

Au den Fruhling (Grieg), Scala Trio, 1s. 6d.
WIN 5142

Backed by *Fruhlingsrauschen* (Guiding), as played by this excellent trio, these two attractive works assume the standard

of chamber music. For lovers of light classical music this record is ideal.

Violin Concerto, Op. 35 (Tchaikovsky), Mischa Elman and London Sym. Orch., 8s. 6d.
H.M.V. DB1405-8

This is one of the best violin records I have heard recently. The Tchaikovsky concerto is too well known amongst lovers of violin music for me to indulge in a detailed description of it here. There are three complete records—all excellent.

Organ Music

Anno Domini, The Year of the Master, Squire Celeste Octet, with choir, trumpets, and organ, 4s. 6d.
COL DX76

This is a kind of mystery play and very well it sounds, too! I should have preferred the carols omitted and had just dialogue and incidental music. We are so tired—at least, I am—of the average carol that we seem to stop thinking intelligently at the sound of one. Columbia should produce something in this nature which is really high-class. Although the idea of this is beautiful, the production is really rubbish.

Prelude, Fugue, and Variations (César Franck), Marcel Dupré, organ (d.s.), 6s. 6d.
H.M.V. D1843

This is, of course, well played, though a little too unemotional for so modern a composer. The Queen's Hall organ records moderately well. The record is not an outstanding success by any means, but it is better than some I have heard. You should ask to hear it if you are interested in César Franck's organ music.

Piano Solo

Tango, Wilhelm Backhaus, pianoforte solo, 6s.
H.M.V. DA1018

The tango is by Alb ring. It is truly Spanish, but do not be misled—it is an artistic piano solo and not a dance movement. Unfortunately, the recording is slightly below standard and Backhaus "blasts" badly in his louder passages. The other side is Schumann's *Auschwung* (Soaring), of which he gives an excellent rendering, as he always does of Schumann.

Spoken Records

Conan Doyle Speaking (d.s.), 4s. 6d. H.M.V. C1983

His subjects are why he wrote *Sherlock Holmes*, and why he became a spiritualist. He is exceedingly interesting and I think the record is worth having; those who, like myself, knew Sir Arthur personally, will like to hear his voice again.

Down in a Sussex Farmyard, 2s. BRDCST 5183A

Quite amusing and very realistic. At first I thought the needle had given way, but I found the record to be a very realistic production of a farmyard. The other side is *Evening in the Village Inn*, which is not nearly so entertaining. It rather bored me, but the record is worth hearing for the other side.

Death of Nelson, descriptive ballad recorded in Central Hall, Westminster, with full chorus and orch. (d.s.), 4s. 6d. COL DX85

I really do not know what to say of this. Personally, these descriptive things miss me by miles. A number of songs of the Britannia-rites-the-waves style are sung with some other matter, equally boring. The only thing I can do is to suggest you hear the record for yourself and judge. There must be people who like these things or Columbia would not produce them. I have included this amongst the spoken records, because I don't know where else to put it!

To Meet the King, a one-act play by H. O. G. Stevens, Jack Hobbs; Lewis Casson, Jane Comfort, Sybil Thorn-dike, 4s. 6d.
COL DX82

Well, there's the title, and also the names of the people in the cast. You must ask to hear it if the names attract you. Personally, it bored me, but there is no reason why you should not enjoy it. That is the fairest thing I can say for you—and the record.

Grand Opera and Classical Arias

Das Susse Lied Verhault (Wagner), Kate Heidersbach and Max Lorenz, with Berlin State Opera Orch., 4s. 6d. H.M.V. C1899

An excellent Wagner record—one of the best I have heard. The other side is *Ist Dies Nur Liebe*, also from *Lohengrin*. Ask to hear it if you want to hear Wagner well sung; both artistes are splendid.

Desert Song, Savoy Light Opera, singers and players, 1s. 6d. WIN 5138

I consider this a very pleasant light operatic record. The recording is excellent. Both chorus and soloists are splendid. A description will take too much space; ask to hear it.

Pirates of Penzance (Gilbert and Sullivan), soloists, chorus, and orch. (d.s.), 2s. BRDCST 5182

This, I imagine, must be one of a series of Gilbert and Sullivan issued by this firm. If I remember accurately I have liked all their Savoy productions. This, certainly, is excellent.

Humorous Records

Any Rags, Bottles or Bones? Jack Payne and his B.B.C. Orch., 3s. COL CB 100

Rather of *Jollity Farm* order, this is quite amusing and a good tune. The dialogue is quite virile, but there is an element of elementary vulgarity in it, which is a pity. The other side is *Will Anybody Here Have a Drink?* The dialogue, in the form of a stump speech, is good fun for the most part.

Barmaid's Song, Florrie Ford, with orch., 1s. 3d. RAD 1368

This is rather a low type of effusion; there is nothing attractive about it. The other side contains a further imbecility called *Those in Favour Should "Hear, hear"*; I loathed it.

(a) **Future Mrs. 'Awnkins (Chevalier), (b) Knocked 'em in the Old Kent Road (Ingle), (c) Our Little Nipper (Ingle), Vernon Watson, com., with orch., 4s. 6d.**
H.M.V. C1922

On the other side is *Fallen Star and My Old Dutch*, so you have a goodly selection withal! Vernon Watson's cockney is splendid. A very enjoyable record; the band is most sympathetic.

Potter's Sporting Broadcast, Gillie Potter, 8s. 6d.
COL DB165

Very amusing, as he always is. He makes admirable records, because he never allows his good humour to interfere with his good English. I recommend this unreservedly.

She was Poor, but She was Honest, Billy Bennett, chorus, piano and guitar, 3s. COL DB164

The other classic on this amusing record is *Don't Send my Boy to Prison*—two entertaining titles! I am not struck with the good Billy's voice, but I imagine he has no idea himself of applying for a job at Covent Garden. The song, I imagine, is thorough y characteristic of him. Both songs are very amusing the way he does them; the record will be a success, of course!

That Rests Entirely with Me, Norman Long (entertainer), 3s. COL DB185

I cannot see much that is funny in this, but humour is so difficult to judge. The title, as a catch-line, should be fertile—with the writer of this it is totally sterile. The other side is *What Would Mr. Gladstone Say to That?* Again a good title. The song is rubbish. Sorry! I cannot laugh at everything sent in, even by the good Columbia.

There's a Good Time Coming, Bobbie Comber, com., with orch., 1s. 3d. BRDCST 601A

Not bad, but not a scream by any manner of means. The *Alpine Milkman* on the other side is simply silly; however I must put it *somewhere*, so it had better decorate the section labelled *Humour*!

Whitaker-Wilson's Review of the Records

You Die if You Worry, Randolph Sutton and Melody Boys, rs. 3d.

RAD B66

This is too well-known to need description so far as the tune goes. The North country dialogue is amusing and well recorded. The other side contains *Will Anybody Here Have a Drink?* effected by the same people.

Dance Music

Alone With My Dreams, Sam Lanin's Dance Orch., rs. 6d. **IMP 2305**

This is a good tune—one of the best of the popular ones and, as played and sung here, is excellent for dancing. The other side contains *Blue is the Night*, played by Bert Lown and the Billmore Hotel orchestra which seems to be a very good band. A good record.

Any Time's the Time to Fall in Love, Val Layton, rs. 3d. **BRDCST 600A**

All Alone Monday is the other effusion. I am a bit tired of both and there is nothing I can say about either except that they are well produced here.

Dancing with Tears in My Eyes, Ben Lelvin, and orch., 3s. **COL CB119**

The technical difference between CB119 and CB218 is that Ruth Etting sings the vocal refrain in the former and the whole song in the latter. Both are good records.

Ruth Etting, with orch., 3s. COL CB218

This is as good a version as I have heard of this popular (but rather stupid) dance tune. On the other side in the *Springtime in the Rockies* effusion, equally well done. I should have thought everybody had a version of these works but, as I say, I have not heard a better.

Irving Kaufmann and Orch., rs. 6d. IMP 2314

This, I suppose, is one of the tunes of the moment, and deservedly so. It is well done here. On the other side Hubert Wallis sings the *Cuban Love Song* quite effectively.

Piccadilly Dance Band., rs. 6d. PIC 605

Quite well done. If you want the fox-trot *I Love You So Much*, and this at the same time, now's your chance—for 1s. 6d.!

Dark Red Roses, Jack Gordon, with orch., rs. 6d. IMP 2315

This has *Falling in Love Again* on the other side. Both are played to death on the wireless, of course. Here they are effectively recorded and you need have no fear in ordering a copy.

Falling in Love Again(w), Manhattan Melodymakers, 2s. BRDCST 2586A

This I have heard several times—so have you, I expect. *The Kiss Waltz* is not so familiar to me, but I like it as a tune. The Manhattans, ever good, are well up to their usual form here.

Fine Alpine Milkman (f.), Jack Hylton and His Orch., 3s. H.M.V. B5874

This has a yodelling touch about it; it is a very good tune, one I do not remember having heard before. The other side is *I Don't Wanna Go Home*, which I do not care for, a fact I have recorded before.

Gipsy Melody (w.), Midnight Merry-makers, rs. 3d. BRDCST 608A

Quite a good melody, though not in the least Gipsified. *When You're Smiling*, its companion, is better because it does not pretend to be anything it is not!

Have a Little Faith in Me, Roy Smeck's Hawaiian Trio, rs. 6d. IMP 2311

This trio is rather virile in tone but makes a good dance record on that account. On the other side "it" plays *Cryin' for the Carolines*. Both have a vocal refrain.

Hawaiian Capers, King Nawahii's Hawaiians, 3s. COL DB225

I don't know where to place this. It is not classical, instrumental music nor light chamber music. As it is labelled *Capers* it

Merrymakers, rs. 3d. BRDCST 607B

The *Springtime in the Rockies* is the companion of this. I am tired of the latter and not too greatly impressed by the former, but those of you who like either need not fear to buy this edition; it is quite good.

King of Jazz, Broadcast Talkie Boys (d.s.), rs. 3d. BRDCST 598

You know it all, of course. Very well done here and you can safely purchase it.

Livin' in the Sunlight, Lovin' in the Moonlight (f.), Manhattan Melodymakers, 2s. BRDCST 2585B

This has *You Brought a New Kind of Love to Me* as its companion. Both are too well-known to need even as much description as I can give them in these columns. Being Manhattan records there is nothing wrong with either of them.

My Little Hope Chest, the Clevelanders, rs. 6d. IMP 2309

Quite a rhythmical band playing a rhythmical work. This should prove useful for dance purposes. Evidently

Monterey for its companion. Quite good renderings of two popular works.

Sittin' on a Rainbow (f.), Ted Summer's Dance Devils, 2s. BRDCST 2583A

Sing, You Sinners! is on the other side, which you will, of course, have heard. The Devils do their "bestedst" with both a success.

Albert Whelan, rs. 6d. IMP 2319

I Don't Wanna Go Home is the companion to this. Both are well known and both receive effective treatment here.

Song of Swanee (f.), Nat Lewis and His Dance Band, rs. 3d. BRDCST 609B

I am not struck with this, though it is well played. *Sing, you Sinners!*, on the other side, is preferable so far as I am concerned.

Sweepin' the Clouds Away, Bob and Alf Pearson, rs. 3d. BRDCST 599A

They still keep on *Dancing With Tears in Their Eyes*, which seems to me to be so silly. Anyhow, that is the companion to the more cheerful effort of cloud-sweeping, which Robertus et Alfredus do quite well here.

Telling It to the Daisies (f.), Al Benny's Broadway Boys, 2s. BRDCST 2582A

This is useful for dancing owing to its broad rhythmic swing. The lyric is not worth much, but the tune is quite passable. *Dust*, from "The Children of Pleasure," is a splendidly orchestrated fox-trot. The words are, again, not up to much. I think more care should be taken over the words so long as vocal refrains are in vogue.

There's One More River to Cross (f.), Paul Tremaine and Orch., 3s. COL CB111

It makes a surprisingly good fox-trot, and I admire the ingenuity of the man who thought of the experiment. On the other side is *Swing Low, Sweet Chariot*, which I have always liked. I think this is, altogether, an admirable dance record.

What Do I Care? Hollywood Dance Orch., rs. 6d. IMP 2307

This is a good dance record on an electric machine; well toned up, it will fill a large dance room. On the other side Vincent Lopez and his orchestra play *Singing a Vagabond Song*. A good dance record!

When Its Springtime in the Rockies, Three Virginians, rs. 6d. PIC 588

This (and *Cryin' for the Carolines*) is well rendered. I find it hard to go through all these hackneyed effusions this hot weather, and find it harder still to say anything intelligible about them.

When the Little Red Roses (f.), Ted Summer's Dance Devils, 2s. BRDCST 2584A

The Devils are in good form. *Sing a Little Theme Song* is their other effort. Both are good and too well known to write an article on!

DO YOU WANT A GRAMO-RADIO SET?

If you desire to build a good grammo-radio set that will be equally satisfactory for radio reception or the electrical reproduction of records, you cannot do better than look at the designs for the Regional Band-pass Four (described by W. James in the previous issue) or the Five-Point Four (full details of which will be found on page 378).

Both these sets have one screen-grid valve and two low frequency stages. The Band-pass Four uses the well-known Binowave coils, while the Five-point Four, which is cheaper to construct, employs standard two-pin plug-in coils.

had better go amongst the dance records. Anyhow, it is a cultivated taste and to one which, thus far, I have not aspired. But lovers of twanged music should certainly get it for its "twangage" is amazing.

If I Had a Girl Like You (f.), Nat Lewis and His Dance Band, rs. 3d. BRDCST 610B

This, and the popular *Let Me Sing and I'm Happy*, are two typical Nat Lewis records. He has struck out a line for himself and his records are always good from the dance point of view.

I'm Falling in Love Again (w.), Jack Payne and His B.B.C. Orch., 3s. COL DB106

This is from "The Blue Angel," and is, of course, quite well known by now. I think it is an excellent tune and thoroughly recommend this splendid version of it. The other side is the *Springtime in the Rockies*, which is equally popular. Personally, I am tired of it—but the rendering here is good. This record will be popular.

I'm Singing My Way Round the World (f.), Midnight

Imperial studies the needs of the dancers. On the other side, by way of a change, the Missouri Dance Band, in which a singer sings *Sing you Sinners, Sing*. Both are good.

Old New England Moon (w.), Paul Whiteman and Orch., 3s. COL CB120

This is rather taking, especially in the rhythmical sense; a very well-built tune. But I do wish these dance singers would sing; they merely make noises in their nasal cavities. The recording here is splendid. *Sittin' on a Rainbow* is very well done on the other side by the same people. A thoroughly good dance record.

Paramount on Parade, Bidgood's Symphonic Dance Band, 2s. BRDCST 5181A

This is a selection of dance rhythms and makes a good record for that purpose. The only fault I can find is an occasional alteration in speed which might irritate keen dancers. *Mammy* seems to be a continuation of the same idea on the other side.

Should I? White Star Syncopators, rs. 6d. PIC 603

This has *It Happen!* in

PIANOFORTE RECORDS

DURING the last few months something new and very beautiful has been achieved by the Parlophone Co. in the production of recorded piano tone. The tone has a full rich quality and the touch is of velvety softness; one is certain all the time that the piano hammers really are well felted.

Examples of the piano alone are E10086 (4s. 6d.), the *Andante* from Mozart's *Sonata in C major*, with Schubert's *Moment Musical* No. 3, played by Conrad Ansonge, and E11032 (4s. 6d.), Hummel's *Rondo*, with the third movement from Bach's *Italian Concerto*, played by Alannah Delius.

An example comprising string tone so very true as to prove that the piano tone is genuine and not the result of some electrician's jugglery is E11031 (4s. 6d.), *Chant Hindou*. H. T. B.

SIR LANDON RONALD

FROM the Gramophone Co., Ltd. (H.M.V.), we are interested to hear that Sir Landon Ronald, principal of the Guildhall School of Music has accepted an invitation to join the Board of Directors. For thirty-three years this eminent conductor and composer has been one of the leading gramophone enthusiasts.

So convinced has he always been of the value of the gramophone as a means of musical education that in 1910, when he became Principal of the Guildhall School of Music, he introduced the gramophone as a definite adjunct to the teaching.

Through Sir Landon Ronald's hands have passed at least 30 per cent. of the leading young artistes who are heard to-day on the English concert platform and by radio. S. H.

WHO HOLDS THE RECORD?

WITH several firms competing to produce the cheapest possible receiving set, it would be interesting to know who is marketing the most expensive radio gramophone. Surely the new Kolster Brandes model at 250 guineas must be near the top.

This luxurious radio gramophone

has two turntables, but they are by no means the only outstanding features. The cabinet work is superb.

The use of such an instrument in the average-sized room of a suburban villa would not, we imagine, be advised even by the makers, who market other less powerful machines.

But these super radio gramophones fill a definite niche. They are ideal for restaurants, tea-shops and small dance halls, or in fact at any public function. With a selection of recordings by the most famous bands in Europe and America, such an instrument would obviously be a great attraction at a dance than would an indifferent "live" combination.

In eating houses the radio gramophone is rapidly gaining favour. It will have been noted how these machines show to advantage under such circumstances; for the volume and sound can be readily reduced to a level that does not interfere with conversation, yet serves as a pleasant background to the clatter of dishes and the chatter of diners. D. G.

ACCOMPANIMENT RECORDS

AFTER years of steady request these are now obtainable, thanks to the Gramophone Company (H.M.V.). I fear that many readers may not know of them for they were not announced on the ordinary monthly list and very little literature in connection with them was sent to dealers.

The first issue comprises four ten-inch at 3s., numbers B3366 to B3369 inclusive, and two twelve-inch at 4s. 6d., numbers C1862 and C1863. The accompanying instrument is the piano alone played by Gerald Moore.

The songs are all well known and every gramophonist should have the whole group, if not for himself to sing to or play an instrumental solo to, then at least perhaps for his friends to use when they come to see him. The words of the songs are on cards given with the records.

On the radio-gramophone my friends tell me they are better than a pianist, because one can, by means of the volume control, get more light and shade in tone. H. T. B.

MADAME BUTTERFLY

"MADAME BUTTERFLY," Puccini's beautiful and popular opera, completely recorded by principals, orchestra and chorus of La Scala, Milan, figures in the latest list of His Master's Voice. Madame Marguerite Sheridan, who was heard at Covent Garden this season and is an H.M.V. celebrity artiste, sings the part of Cho Cho San.

She is supported by Lionello Cecil as Pinkerton, Nello Palai as the English Consul and Madame Ida Mannarini as the faithful servant, Suzuki.

In the second act one picks out the Flower Duet between Suzuki and Butterfly.

Dipping into the supplement we can find infinite variety with such entertaining efforts as the Band of the Coldstream Guards doing the Stein Song and the Old Comrades March; the International Novelty Orchestra again making comedy out of melody in the Tap Dance Medley; the new Mayfair Orchestra with hits from the London Hippodrome's big success, "Sons o' Guns"; Peter Dawson in a couple of breezy ditties: "The Song of the Kettle," and "Cheery Souls," and the accordion and banjo blended in the famous waltz, "The Skaters." A. S.

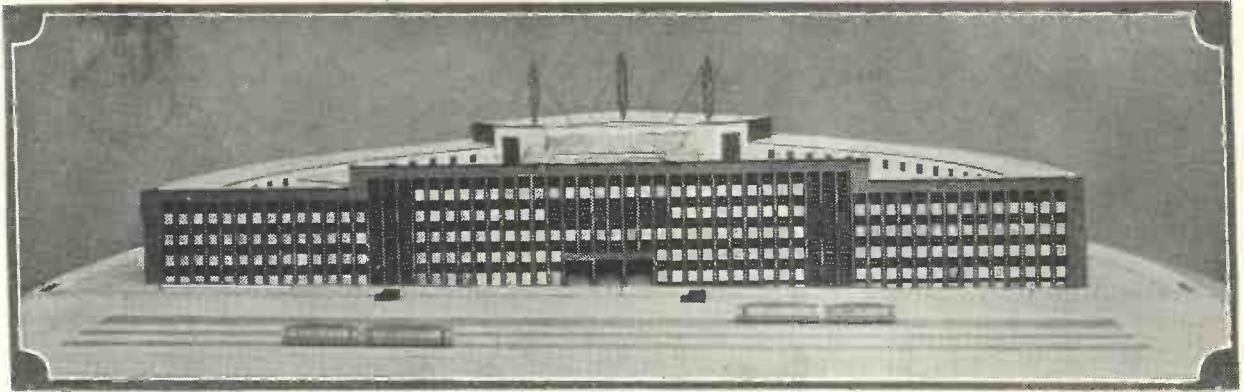
BROADCAST RECORDS

THE September and October bulletins of these records mark an enormous advance in their manufacture.

The material they are now made from is so exceedingly good that not only is surface noise negligible under any reproducing conditions but the relative roughness in the music itself hitherto apparent on a powerful machine has given place to a smoothness of tone that is all that need be desired.

At the same time I must give the highest praise to the selection of numbers, the performances, and the recordings, with a special mention for the St. Saën's *Pianoforte Concerto*, three discs at 2s. each.

This is not quite so full of tone on the ordinary gramophone as some other concertos I have, but for electrical reproduction it is the very best on my files. H. T. B.



FINE NEW HEADQUARTERS OF GERMAN BROADCASTING ACTIVITIES

This fine building, built in the shape of a crescent, houses the staff of the German broadcasting organisation

Putting Over Sponsored Programmes!

"TO advertise or not to advertise" is a question I find easy to answer when it refers to broadcast programmes. To my mind there is no question; we *should* allow advertising interests to enter broadcasting, for only by that means can we hope for better programmes.

In his editorial last month, Bernard E. Jones, Editor of *WIRELESS MAGAZINE* and *Amateur Wireless*, clearly showed the B.B.C. how to introduce advertising to the advantage of listeners. He suggested that programmes sponsored by advertisers would be the "spiced morsels" in the regular broadcast menu.

Rumours that the B.B.C. is considering such a scheme recur with rather surprising regularity. Denials follow, but I am always left with the feeling that a denial is not quite good enough as a dismissal of such an important proposal.

Sir John Reith

Yet Sir John Reith himself has said, in unmistakable terms, that selling time by the B.B.C. is neither necessary nor desirable. I take leave to question the contention that leasing the ether is unnecessary; if so, must we not assume that the B.B.C. has enough revenue to carry out its ideal programme? And that the lack of "high lights" in the general programmes is intentional—not caused by lack of revenue?

Here ALAN S. HUNTER explains how the suggestion made by the Editor last month could be put into operation

Because if we can assume these things, the B.B.C. stands condemned in the eyes of thousands of listeners as an organisation that simply will not or cannot understand the meaning of entertainment.

No; I think we had better retain our illusion that the B.B.C. would do much better if it had more revenue. As things are, the B.B.C. does not receive nearly enough of the available licence revenue. The Post Office and the Treasury extract large slices of listeners' money that would otherwise be available for improved programmes.

"Nor desirable" the Director-General has added to his contention that outside financial interests are unnecessary. Yet the B.B.C. must know how advertising is closely related to broadcasting in many other countries.

Near at hand we have stations such as Radio-Paris sending out programmes sponsored by British manufacturers. These programmes are intended for British listeners; the items are announced in English as well as French.

We have to consider what is really an extraordinary state of affairs;

while on a Sunday evening the B.B.C. is transmitting a church service, or a chamber concert, or a missionary talk, or a religious epilogue, Radio-Paris and other high-power Continental stations are transmitting dance music, musical comedy and other forms of secular entertainment, specially devised to attract British listeners.

Radio waves know no frontier: the B.B.C. cannot be blind to the fact that their clientele is being offered an alternative programme very different from their own conception of a broadcast programme. But the B.B.C.'s contention that advertising programmes are undesirable is not, of course, limited to Sunday broadcasting.

Public Verdict

It senses a fundamental difference between a programme arranged by the programme department and a programme sponsored by an advertiser. For whereas the B.B.C.'s only criterion of its public's likes or dislikes is the post bag, the advertiser looks to quite a different quarter for his public's verdict; he looks at his sales curve. If the public likes his programme, they will buy his products.

That may sound a little fantastic to some Britishers; but the power of association of ideas must not be under-estimated. It is true that we

Putting Over Sponsored Programmes!—Cont.

do not, as a nation, regard advertising in quite such a respectful way as the Americans; nor are we so easily duped by advertising: but allowing for this difference of sentiment, we can draw a parallel between what does happen in America and what might happen here.

The B.B.C. let us assume for one fantastic minute, agrees to allow sponsored programmes. How are these programmes to be put over? Well, the machinery for engaging artistes is already made at Savoy Hill; the studios are there; some of the best announcers in the world are there; in fact, apart from a Big Programme Idea, the stage is already set for national advertisers to enter broadcasting.

Liaison Committee

Remember, the programmes are to be sponsored, and not riddled with interjections by the advertiser. He would pay for the talent required to put over his star programmes. The rest would be done by a liaison committee acting between him and the programme department.

In New York last year I was greatly impressed with the organisation of the National Broadcasting Company. They advise the advertiser how he can best represent his commodity or manufacturing process in terms of programme appeal; they suggest how much space he should take in the newspaper press to back his broadcasting; they even take on the job of displaying his press advertisements for him; and they book his artistes, arrange their salaries and frame the opening sentence that will in all probability contain the only reference to his product.

In fact the N.B.C. is a fine example of the logical development of sponsored programmes.

Making A Start

The B.B.C. could make a start with one hour every evening through the regional stations, extending the sponsored period as advertising demands warranted. If one may judge by the recent activities of British advertisers in connection with sponsored programmes from the Continent, the difficulty would be, not to find enough big advertisers, but to find enough broadcast hours for them to sponsor.

According to the size of the firm and the repute of its product, programmes sponsored by advertisers would naturally vary both in standard and in conception. The B.B.C.'s fear that sponsored programmes would be undesirable seems to be based on the assumption that the advertiser would encroach too much

ARE YOU IN FAVOUR?

When you have read this article you will realise the benefits that sponsored programmes would give you as a listener. But how can you get them even if you do want them?

We invite you to write to WIRELESS MAGAZINE if you are in favour of sponsored broadcasts. If your comments are favourable, we will pass them on to the B.B.C., for it is only by the pressure of public opinion that any change will be made in Savoy Hill's avowed policy. Write and let us know your opinion NOW!

upon his allotted period with references to his product.

Again we can learn a lesson from America, where it has been proved that the most successful sponsored broadcasts, both from the advertising point of view and the listeners', are those that merely associate the name of the firm or product with a special programme of really

genuine entertainment value.

In this sense, the recent Continental sponsored programmes are an unfortunate example; I have not yet heard a really fine concert from the stations in question. They seem to be concentrating on jazz and novelty orchestras. This is in contrast to present practice in America, where some of the big advertisers sponsor the very finest musical combinations in the country. One of the most popular sponsored American hours last year played classical music exclusively.

"High-spot" Items

Just imagine what a week of sponsored hours would sound like through a B.B.C. station. The routine item ends when the announcer says, "Now, ladies and gentlemen, you are to be the programme guests of the Moonlight Soap Company. The Moonlight Symphony Orchestra will open the programme with——." That would be all the advertising; the rest would be a good programme.

Next night; the announcer says "The Selfridge Sextet are again with us. They will start their programme of popular numbers with——." Again no further advertising. And so on through the week, every evening would have a "high-spot" entertainment sandwiched between the normal programmes.

Germany's Radio "Ads."

THROUGHOUT Germany radio is being utilised for advertising. The broadcasting stations are owned by the German Reich, which has sold advertising time for a long period. The Post Office authorities are in charge of the management, in co-operation with private companies. Programme material is prepared by the latter, while the technical administration remains in the hands of the Government.

Before the end of the year there will be about 3,000,000 registered listeners in Germany, each paying a fee of two marks monthly, regardless of the type of receiver used. These funds are received by the Post Office and part turned over to the private companies to pay for the programmes and incidental expenses. Estimates give four listeners to every registered

set, so one-eighth of Germany's population "listen in."

The amount of radio advertising is curtailed in the Reich. By that rule it has become effective and graciously received. Only thirty minutes of the entire day at each station is devoted to the purpose of exploitation, taking the form of business information, hints to listeners, the quotation of prices, and industrial news.

No "Hook-ups"

Advertisements are broadcast both in the afternoon and at night. Each station files its own schedule. There is no such thing as a hook-up for a sponsored programme for the simultaneous announcement of an advertisement on a national scale. However, three stations, Hamburg, Leipzig and Stuttgart, are sometimes connected for an advertising period.

A Case for the B.B.C.'s Consideration

Musical selections are given between every two announcements. In addition, so as to attract a larger audience, the announcers possess velvety voices. "The voice with a smile" is in great demand. Only

Frankfurt permits "ads" from 10.15 to 10.30 p.m., and Gleiwitz after 10 p.m. In Berlin the period starts at 6 p.m. In Münster the usual session opens at 2 o'clock. Announcements on the powerful

tisement. When it takes the form of a lecture the rate goes up to 500 marks. Bremen's rates are 40 and 210 marks respectively. Hamburg assesses a fee of 80 marks for an announcement and 420 marks for a



POWERS BEHIND AMERICAN BROADCASTING

The National Broadcasting Company of America has had a great experience in the handling of sponsored programmes. In

speakers of proven personality are permitted on the air during advertising sessions. And the majority of these are women. They laud the bargains with real vim and enthusiasm—as might be expected.

"A Nice Frock"

"It is not only necessary to give the broadcast advertisement a nice frock; it also wants a new cloak," is the way Erich Curth, director at Hamburg, describes it. "That nice cloak has to consist of music and entertainment. We have slowly arrived at the present level of broadcast advertising. It consists of a limited number of advertisements which take the form of little essays, which are rendered by competent artistes."

Mr. Curth says: "Of course, there are listeners who simply refuse to tolerate advertisements and switch off their sets when the advertising period comes. However, every kind of advertising has friends as well as opponents, who are very few compared with the number of friends."



A BROADCAST BIRTHDAY CAKE?

Why, yes, those things are done in America! When station WLW, located in Cincinnati, Ohio, was four years old, it was presented with a birthday cake made by Mrs. Judith Anderson, culinary expert on the staff. Here she is shown presenting the "thing," candles and all, to the owner of the station, Powell Crosley, Jr.

Langenberg station only are scheduled for 2.30, but when Langenberg is connected with Koln, Münster and Aachen the advertising may be given between 10 and 11 p.m.

Berlin charges 200 reichsmark for what is classified as a simple adver-

the centre is M. H. Aylesworth, President of the N.B.C. On the extreme left and right respectively are J. J. Aronte and A. C. Marks, Jr., both of the American organisation.

talk. The average among the twenty other German stations is about 50 marks for an announcement and 200 marks for a lecture.

On Saturdays the fees are boosted 25 per cent., and on Sundays and holidays the rates go up 50 per cent.

On Sundays Hamburg, Kiel, Hanover and Bremen broadcast advertisements from 1 to 2 p.m.

Fifteen Lines

The wording of a "simple advertisement" may consist of not more than fifteen type-written lines, phrased so that "it will be clearly understood that the customer, not the broadcasting company, is doing the advertising."

No advertising is permitted to start with "I" or to be given from the "I" point of view.

Advertisements in lecture form, lasting ten to fifteen minutes, must be on a subject of general interest. They are generally put on during the afternoon. Notice regarding them is incorporated in the official advance printed programme of the station.

Stringed Instruments

Those interested in the technical side of radio will find an equal attraction in the mechanical features of musical instruments. In this article, WHITAKER-WILSON, the "W.M." Music Critic, discusses the construction and mode of vibration of the stringed instruments that play so great a part in most orchestral transmissions

THE outstanding feature of a stringed instrument that has always appealed to me is its amazing simplicity. When I look into my grand piano or examine the organ in my church, I always fall to wondering why more does not go wrong than



TWO BROADCAST—

Sydney Kite is the conductor of Ciro's Dance Band

is the case, for there seems so much *mechanism* about both instruments.

Yet my piano, a fine Blüthner Grand, has never cost me a penny, beyond tuning, since I have had it; as for my organ, there have been some very ordinary expenses, mainly replacing odd things here and there that have been affected by the very cold weather, but practically nothing else.

The violin, as an example of the family of viols, seems to have no mechanism about it; all one can conclude is that it is made a convenient size for the average person to handle and, for the rest, it is a matter of the quality of the substances used in construction and a certain precision in the balance of its constituent parts.

There is no actual difference

between any of the stringed instruments excepting in the matter of size, so I have taken the 'cello as my first example in diagram form; if you will study it carefully you will appreciate that shape and accuracy of construction is responsible for its tone (Fig. 1).

When any viol is played, the bow causes a vibration by friction, such vibrations being communicated to the bridge across which the strings are stretched. The bridge, which is carved underneath to fit the table with the greatest accuracy, transmits the vibrations to the table itself, when they instantly spread themselves—the air, both inside and outside the instrument, becoming affected, the former carrying on the vibratory transmission to the back of the viol as well as to the ribs.

Thus the whole instrument is in a state of sympathetic vibration.

The greatest precision has to be observed so that the strings are free to vibrate and yet do not rattle against the finger-board; on the other hand, if they are raised too high the player will find the stopping a very tiring process. The bridge, therefore, is an important part of the instrument.

In every one of the viol family the lowest string, being thicker, requires a little more room to vibrate successfully; the fingerboard is, therefore, cut away a little to allow for this.

There is an upright pillar of pine wood inside all stringed instruments, called the sound post, which is of the greatest importance. It is carefully shaped to fit the table and back of the instrument; as in the case of the bridge, perfect contact must be ensured.

Acoustical contact, if one may be permitted such a term, is as essential to a stringed instrument as electrical contact is to a wireless set.

The sound post is kept in position entirely by the pressure of the strings on the table, its correct position being of importance. It is placed under—slightly behind, if anything—

the right foot of the bridge. The entire area of variation in its position cannot cover more than a quarter of an inch; moreover, its diameter affects the tone and is a matter for acute adjustment.

The object of the sound post is to render the vibrations regular and to prevent them from becoming intermittent; it also helps to convey them to all parts of the instrument. Incidentally, it acts as a support for the right foot of the bridge, the bass bar (see Fig. 2) supporting the left foot.

No Waste!

This has always interested me. The sound post *has* to be under the foot of the bridge to perform its duties, but no one has ever thought of employing a *separate support* for the bridge; there is no waste in a fiddle! The bass bar is made of pine and is glued (in a state of tension) into its position under the left foot of the bridge, its function being to spread the vibrations, especially the powerful ones of the lower strings.

A hundred years ago the standard pitch was considerably raised; it was



—VIOLINISTS

While Tiny Maitt does the same thing at the Hotel Splendide

then found that this increased the pressure of the strings on the table, and bass bars of larger dimensions were inserted.

The ribs, which give the instruments their attractive shape, do not actually affect the tone very much, but they determine (by their position) the volume of air enclosed in the body—another important factor. The *f*-holes naturally bring the air inside the instrument into contact with that outside, but they also serve to make the instrument flexible.

Corner Blocks

Corner blocks (see Fig. 3) were introduced to strengthen the projection at the extremities of the centre bouts, and also to help secure the table and back to the ribs. The varnish is of protective value only, and although it has been said that its influence upon the tone of the instrument is of value, I doubt the truth of the statement. Ornament and protection are its functions.

The woods used in violins and other stringed instruments are sycamore (in other words, maple) for the back, ribs, neck and bridge; pine for the table, bass bar, blocks, linings, and sound post; ebony for the finger board, tail piece, nut, and pegs.

The strings are made of sheepgut, which is cut into thin strands, after much preparation; these are twisted by a ropemaker's wheel. Three, or perhaps four, are used for a fiddle E string, four for an A, six, seven, or even eight for a D, more still for the thicker strings of the larger instruments.

The use of metal strings for the fiddle is now common; the result is not so good tonally, but violinists are weary of their strings constantly breaking. The tone suffers most in *pizzicato* passages; I noticed the *ting* of metal the other night when listening to Beethoven on the wireless from Queen's Hall.

Sensitive Adjusters

Durability, after all, means something and violinists prefer their metal E strings, with their sensitive little adjusters for tuning purposes, the peg not being used except when putting in the string initially. The pegs at one time used to be of boxwood, but for many years now it has been the custom to fashion them of rosewood, which is the least likely to slip.

A full-size violin is about $\frac{1}{2}$ in. short of 2 ft. in total length, the body

being about 14 in. long. The body of a viola is usually about 16 in. in length; that of a 'cello roughly 30 in. ($48\frac{1}{2}$ in. total length); the total length of a full-size double bass is generally something just under 6 ft.

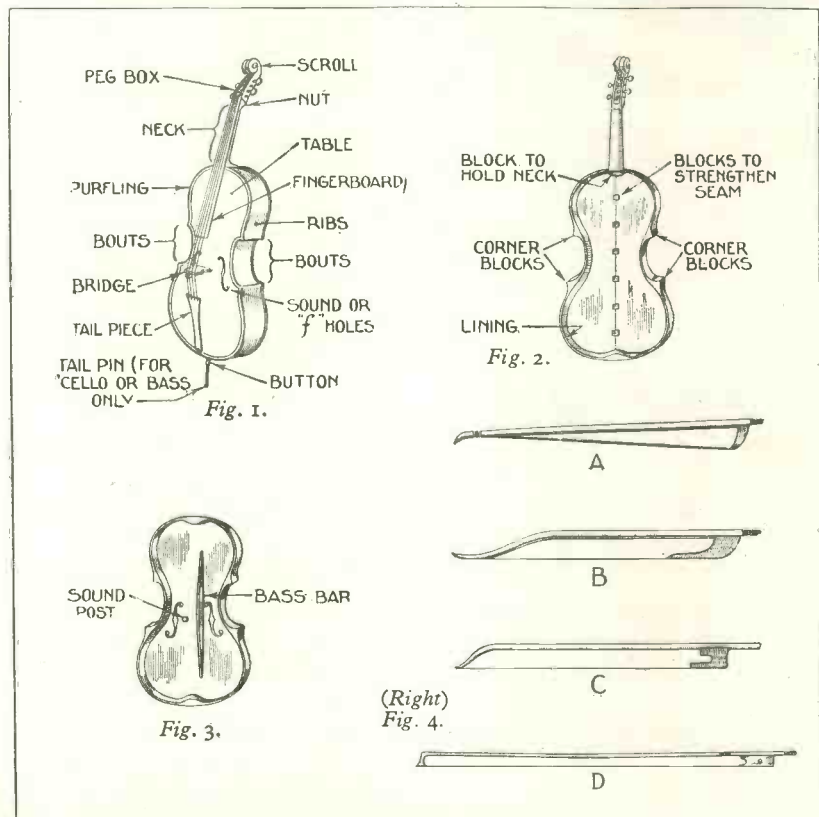
The bow has undergone many changes in both size and shape (Fig. 4). The stick is made of Brazilian lancewood, and is cut on the straight, following the grain of the wood, and is afterwards slightly curved by the application of heat. Experiments have been made with various woods for this purpose, but

part of it is enough to cause serious defects. A violin, one imagines, will last for ever; certainly those by Stradivarius, Guarnerius, and Amati are younger to-day than the day they were varnished.

100 Years Ago

What other type of instrument can we point to and say the same thing? Not to the piano. It is only a hundred years since the piano came into being, and no one has any use for an old piano if he can get a new one.

There is something about a piano



ESSENTIAL PARTS OF STRINGED INSTRUMENTS

Fig. 1.—Various parts of a 'cello. Fig. 2.—Interior of a violin, showing the back and ribs. Fig. 3.—Under side of a violin table. Fig. 4.—(a) violin bow of the early Stuart period, 1610; (b) at the time of the Restoration, 1660; (c) the type used by Bach in 1710; and (d) the present-day violin bow

the lancewood from Brazil seems to be practically universal now.

The nut is made of ebony, tortoiseshell, or ivory. White horsehair is used for all stringed instruments, except the double bass, for which black is employed. The 'cello bow is slightly shorter than that used for either the violin or viola, but the principle is the same.

It is little short of amazing how simple the construction of a stringed instrument really is; seemingly, there is nothing to go wrong, and yet the slightest derangement in almost any

when it is new that is unmistakable and unapproachable in the tone-production sense. It is the same with an organ; although old pipes are certainly of value, no one wants to play on an old-fashioned organ; modern up-to-date action is always required.

With a violin, it is a very different story; the cry is always for a pedigree instrument, the older the better. Violin-making is, on the other hand, by no means a lost art; very fine instruments are made in England, to play on which no artiste need be ashamed.

THE "W.M." STANDARD D.C. UNIT

SUITABLE FOR ALMOST ANY SET



Set-users with direct-current mains will find this unit an economical source of obtaining high tension. It has been specially designed by the "W.M." Technical Staff.



MANY listeners do not seem to realise that it is very much simpler to obtain high tension for a radio set from direct-current (D.C.) mains than it is from alternating-

This unit will supply up to 30 milliamperes at the voltage of the mains to which it is connected

current (A.C.) mains. The apparatus required is simple in the extreme and considerably less expensive.

This unit is a companion to the "W.M." Standard A.C. Unit, which was described in detail last month and is intended for use with the majority of WIRELESS MAGAZINE receivers to be published during the new season.

One of the great advantages of working from D.C. mains is that no rectifying apparatus is needed. It is necessary only to provide apparatus (1) that will smooth out any irregularities in the supply and (2) some kind of voltage control.

Maximum Voltage

The maximum voltage obtainable is only a few volts lower than the actual mains voltage, the slight drop being occasioned by the resistance of the low-frequency choke used for smoothing. On 200-volt mains, for instance, the maximum voltage will be in the neighbourhood of 185, while with 240-volt supplies

a maximum of over 220 volts will be available.

In practice, the output from the unit depends upon the current-carrying capacity of the choke. If too much current is passed through the choke its inductance will drop to such a low value that it will cease to smooth efficiently and reception will become noisy. In this instance it is recommended that not more than 30 milliamperes be taken from the unit.

In order to make the instrument suitable for use with the majority of receivers, three separate output terminals are provided.

The first of these, marked H.T. + 1, is intended for supplying voltage to the screen of a shielded valve; the

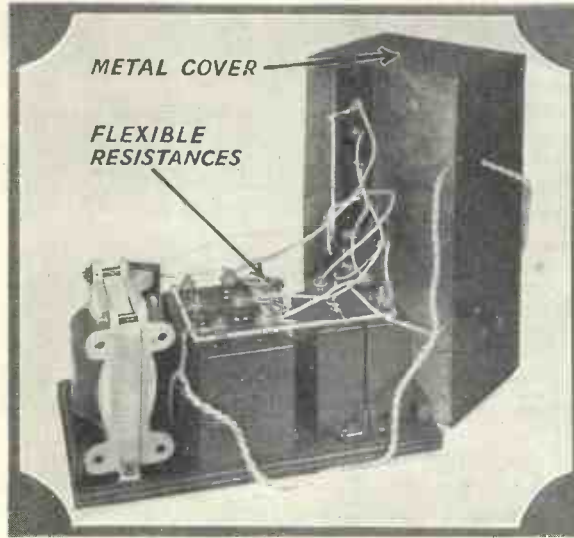
maximum voltage obtainable from this tapping will never exceed half of the actual mains voltage.

For the Detector Stage

The tap marked H.T. + 2 is intended for supplying a detector or first-stage low-frequency valve. H.T. + 3 is capable of giving a slightly higher voltage than H.T. + 2 and is suitable for a second-stage low-frequency amplifier, while H.T. + 4 provides very nearly the full mains voltage for a power valve.

It should be clearly understood that the maximum voltage obtainable from the unit can never exceed the voltage of the mains. Therefore, the unit will not be of very much use if used on 100- or 120-volt supplies. In the case of A.C. mains it is, of course, possible by means of a suitable transformer to step the voltage up or down to any required value. This is where A.C. scores over D.C.

This unit supplies only high tension and filament current



NO LARGER THAN A DRY BATTERY

The overall dimensions of this simple unit are 8 1/4 in. long, 5 1/2 in. deep and 4 in. high. There is one variable tapping for screened-grid valves

Running Costs

There is an idea prevalent amongst a large number of beginners that it is extravagant to run a radio receiver from the mains. Assuming that this unit is used on 200-volt mains and the consumption of the set is 20 milliamperes, then the total power used is only 4 watts, one-fifteenth the power required by an ordinary 60-watt electric lamp!

It will thus be clear that the cost of obtaining high tension from the mains is almost negligible.

A glance at the photographs

and diagrams reproduced in these pages will show the simplicity of the unit, which occupies no more space than a 100-volt dry battery. It has the obvious advantage over a battery, however, that it can never run out.

Flexible resistances are used and the result is a particularly neat and compact job

It will be seen from the circuit diagram that, associated with the leads marked H.T.+1, H.T.+2, and H.T.+3, there are various fixed and variable resistances.

Screened-grid Supply

In series with H.T.+1 is a 50,000-ohm variable resistance and a 50,000-ohm fixed resistance. When the slider of the variable resistance is so placed that its value is at a maximum, the voltage obtained at H.T.+1 is half the mains voltage. It will, therefore, be obvious that with 200-volt mains it will be necessary to place the slider about two-thirds of the way

voltage lost across the controlling resistance is the product of the actual resistance multiplied by the consumption in milliamperes. Thus with a 100,000-ohm resistance and a load of 2 milliamperes the voltage drop is 20, while with a load of 5 milliamperes and a resistance of 50,000 ohms the voltage drop would be 50 volts.

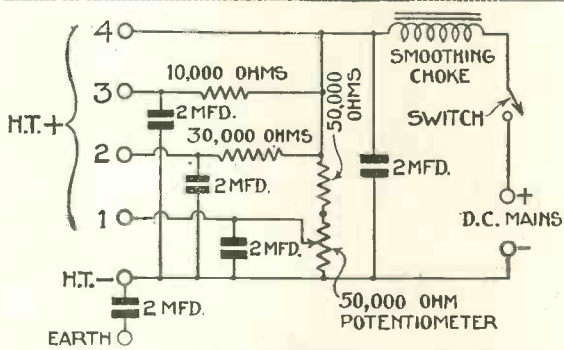
Knowing the consumption of the valve at a particular anode voltage, it is therefore a simple matter to calculate the best value of resistance to use.

Assuming that an average load for a low-frequency valve is 6 milliamperes, the voltage dropped across the 10,000-ohm resistance in series with H.T.+3 will be 60, so that the value actually applied to the valve anode (with 200-volt mains) will be 140 volts.

It will be seen that each resistance is by-passed to earth by means of a

the smoothing will suffer if too great an output is taken from the unit. The output can be raised to almost any figure, however, provided a suitable low-frequency choke is employed.

In districts where mains hum is very pronounced it may be desirable to increase the capacity of the



CIRCUIT OF THE HIGH-TENSION UNIT

It will be seen that each tapping has a voltage-controlling resistance and a 2-microfarad condenser which effectively stops motor-boating

smoothing condenser from 4 microfarads to 8 microfarads.

Half-price Scheme

It will be evident from photographs and layout that the construction of the "W.M." Standard D.C. Unit is well within the capabilities of any amateur. All the essential details are reproduced in these pages, but if desired a full-size blueprint can be obtained from the Blueprint Department, WIRELESS MAGAZINE, 58-61 Fetter Lane, E.C.4.

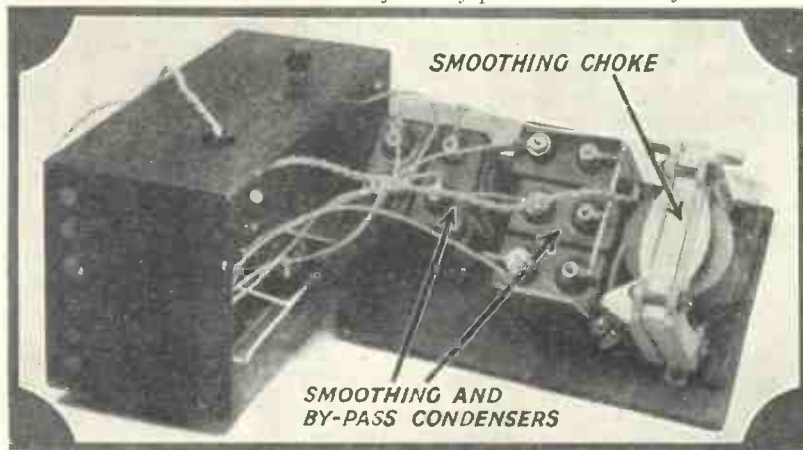
The number of this blueprint is WM215, and a copy can be obtained at the special half-price rate (that is, 6d., post free), if the coupon at the foot of the inside back cover is used by November 30.

It will be seen that the majority of the components are mounted on a wooden baseboard, while the variable resistance and terminals are mounted on an ebonite strip bolted inside the tinplate cover which slips over the other components.

Metal Safety Box

This cover is provided with an earth terminal and acts as a safety box. If desired a fuse can be fixed on the baseboard, but this is not absolutely essential and has been omitted for the sake of simplicity.

It will be noticed also that there is no switch on the unit itself. We recommend that a push-pull switch of the type illustrated should be inserted in the main lead between the



A HIGH-TENSION SUPPLY THAT NEVER RUNS OUT!

This unit is suitable for almost any receiver and will give an output up to 30 milliamperes. A companion A.C. unit was described last month

round to get 60 volts for supplying a screened-grid valve.

In series with the tapping H.T.+2 we have shown a 30,000-ohm fixed resistance. A load of 3 milliamperes for a detector valve connected to this tapping will produce a voltage drop of approximately 90, so that with 200-volt mains the approximate potential applied to the anode will be about 110 volts.

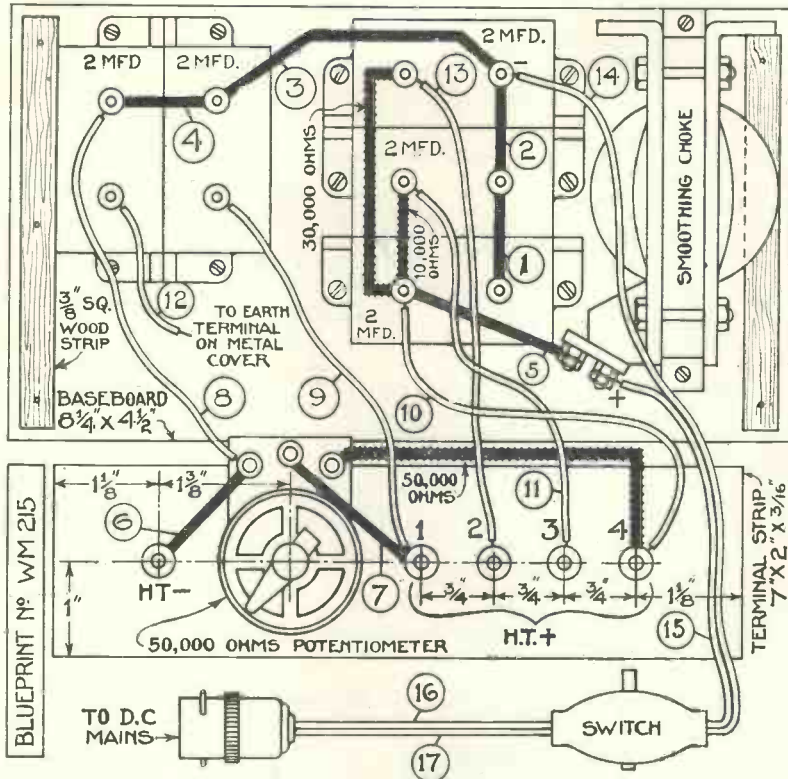
This resistance can, of course, be varied to suit any required conditions. It should be remembered that the

2-microfarad fixed condenser. These effectively prevent any possibility of motor-boating, for the voltage-controlling resistances also act as decoupling devices.

It has already been explained that

Three fixed and one variable output are provided, the latter being for screened-grid valves

The "W.M." Standard D.C. Unit—Continued



HALF-SCALE LAYOUT AND WIRING DIAGRAM

This layout can be obtained as a full-size blueprint for half-price (that is, 6d., post free), if the coupon at the foot of the inside back cover is used by November 30. Ask for No. WM215. Wire up the leads in numerical order

power socket and the unit itself.

Most of the details of construction will be clear from the photographs and diagrams. On the baseboard are mounted the five 2-microfarad condensers and a smoothing choke.

The five terminals and 50,000-ohm

There is no possibility of motor-boating being experienced when this unit is in use; special by-pass condensers prevent it

potentiometer are fixed to a small ebonite strip which is then bolted into the tinplate cover, which is already provided with a bushed hole for the insertion of the mains lead.

It will be noticed that in this unit we have used the new flexible type of resistance in place of the old standard cartridge models. The flexible resistances are wire wound and have the great advantages of compactness and cheapness.

They are available in the usual ranges, and other values from those specified can be obtained if desired. The method of finding the resistances for various purposes has already been explained in detail.

When the unit is being used it should be noted that the tapping marked H.T. + 1 should be employed only for supplying the screening grid of a shielded valve.

If it is desired to have a variable source of supply for any ordinary anode circuit, the 50,000-ohm potentiometer and fixed 50,000-ohm resistance should be replaced by an ordinary two-terminal resistance of the compression type, such as a Clarostat or Volustat.

It is of the utmost importance that a fixed condenser should be placed between the high-tension negative and the earth terminal on the unit. When this unit is in use the earth lead should be removed from the main receiver and taken to the earth terminal on the case of the high-tension unit. If this is not done,

there is a possibility of the mains being short-circuited.

An additional precaution is to place a 1- or 2-microfarad fixed condenser in series with the aerial. Then there is no possibility of getting a shock by touching the aerial, even if the positive main is earthed.

Those who read the description of the "W.M." Standard A.C. Unit in the October issue of WIRELESS MAGAZINE will remember that a low-tension winding was provided on the transformer for running the valve filaments.

Transformation Impossible

Such an arrangement is not at all easy in the case of D.C. mains, as it is not possible to step down the voltage to the low value required.

When D.C. mains are used for filament supply, it is necessary to provide a resistance that will waste so much of the mains voltage that only the value required for the filaments is obtained. For instance, to run 2-volt valves from a 200-volt supply it is necessary to waste 198 volts, all of which must be paid for.

It will, therefore, be seen that it is much more economical to run the valve filaments from a low-tension accumulator in the ordinary way.

Constructors should note that the three flexible resistances, although actually forming connections between the other components, are not numbered as are the other leads. Care should therefore be taken not to omit them.

COMPONENTS REQUIRED FOR THE "W.M." STANDARD D.C. UNIT

- CHOKE, LOW-FREQUENCY**
1—Igranite, type C30, 15s. 6d.
- CONDENSERS, FIXED**
5—T.C.C. 2-microfarad, type No. 50, 19s. 2d. (or Dubilier, Ferranti).
- EBONITE**
1—Terminal strip, 7 in. by 2 1/2 in.
- RESISTANCES, FIXED**
1—Bulgin 10,000-ohm link, 1s. 6d. (or Magnun)
1—Bulgin 30,000-ohm link, 1s. 6d. (or Magnun)
1—Bulgin 50,000-ohm link, 1s. 9d. (or Magnun)
- RESISTANCE, VARIABLE**
1—Rotorohm 50,000-ohm potentiometer, 6s. (or Regenstat, Colverton).
- SUNDRIES**
Rubber-covered flex (Lewcoflex).
Stiff insulated wire (Glazite).
1—Baseboard, 8 1/4 in. by 4 1/2 in.
1—Bulgin mains switch, type S18, 2s.
1—Wholesale Wireless metal box, type No. 5, 4s. 6d.
- TERMINALS**
6—Belling-Lee, type R, marked: H.T.+1, H.T.+2, H.T.+3, H.T.+4, H.T.—, E, 1s. 6d. (or Ealex, Clix).

YOUR FAVOURITE TYPE OF SET

Some Notes by the Staff of the "Wireless Magazine" Set Selection Bureau

IN analysing the past six months' correspondence handled by the "W.M." Set Selection Bureau, which has advised hundreds of readers on suitable makes of the different types of sets on the market, several very interesting facts have come to light. The majority of the letters have expressed definite decisions as to type, or have outlined conditions that have in themselves defined the type of set required. The Bureau has then recommended suitable makes for the type involved in each letter. The analysis, therefore, gives a trustworthy indication of actual radio wants—so far as WIRELESS MAGAZINE readers are concerned.

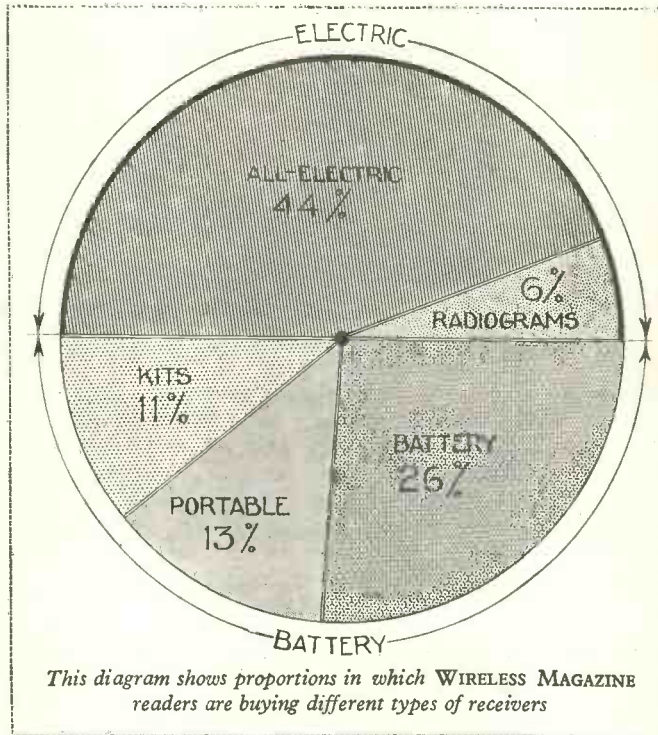
Probably the most striking result of the analysis is the elevation of the all-electric set over all other types. Sets working from the mains, whether transportable, table-cabinet or radio gramophone, account for 50 per cent. of the total number of sets recommended.

This is the more surprising when one considers the high cost of all-electric sets in conjunction with the restricted distribution of electric-light in the British Isles.

Prosperous People

Our view is that a large proportion of readers who buy sets, as distinct from those making sets, are prosperous people who can afford to insist upon the installation of electric-light in place of gas.

Simple battery sets with external accessories account for a quarter of the total; two conflicting reasons may be put forward to account for this result. The undoubtedly low cost of a battery set compared with an all-electric set, having a similar number of valves, probably influences many set buyers. Some of them, with electric-light, cannot afford to



This diagram shows proportions in which WIRELESS MAGAZINE readers are buying different types of receivers

take advantage of the supply.

As against this is the fact that many who cannot afford to buy a good set prefer to make a good set instead of buying an inferior set.

together with an admirable simplicity that tempts many a would-be set-buyer into the interesting realm of set construction.

(See also page 371)

The Five-point Four—Continued from page 382

exceptional circumstances double-tapped coils can be used.

Constructors who have a stock of plug-in coils in their workshops will be able to try various sizes in the different holders to get the best results. We do not mean that sizes different from those recommended will give better range or volume, but with a little experimenting it will be possible so to adjust the coil sizes and the pre-set aerial condenser that the main tuning dials are more or less in step over the entire range of wavelengths.

An output choke and by-pass condenser are not, of course, essential and can be omitted if it is desired to cut down the expense of construction. On the other hand, those who already have a suitable output transformer can use this in place of the output choke, in which case the asso-

ciated 2-microfarad by-pass condenser can be omitted.

Another alteration that some constructors may desire to make is in the mounting of the screened-grid valve. The holder for this can be placed on the baseboard provided that a slight rearrangement of the other components is made.

Best of Its Type

There is nothing else that can be usefully said about the set. *We are satisfied that it is the best and cheapest receiver of its type that it is possible to produce with modern components*, and we confidently look forward to receiving many satisfactory reports from the hundreds of readers who will undoubtedly be attracted by the convenient and efficient design of the Five-point Four.

Wireless in A Cavern

SIXTY millions of years ago there was no such thing as radio—and a true conception of the infancy of this marvellous science comes when one glances at the lacelike wonders of nature which make the Carlsbad Caverns in New Mexico the most amazing underground recesses on earth.

Awesome Experience

It therefore was positively awesome to sit in one of these ancient chambers, amid thousands of glistening formations, and to find that invisible waves were speeding through them from and to the most distant points of the outside world.

It was no wonder that the prospect of tuning-in in such a location gave me one of the real thrills of my adventures in radio—and it proved even more exciting in the happening and memories thereof.

Just imagine: I was the first to install a radio instrument at a place that is considered by geologists the oldest of its kind. Doing something that has not been done in 60,000,000 years certainly gives one a peculiar feeling.

The installation of radio gear was not without difficulty. Constant dripping from the stalactites made the caverns very damp. The apparatus was always in danger of ruin by moisture. It was finally placed on a table in a corner away from stalagmites—all comprising just a tiny speck in a colossal room more than 200 feet high and at least 100 ft. wide—more than 400 ft. below the surface—with gorgeous shapes at every turn perpetually glistening.

Apparatus Used

First I wired up the transmitter, generally made up of parts from my home station W2ATZ in Brooklyn, a 50-watt outfit with 1,000 volts on the anode, using two rectifying bulbs. Nothing out of the ordinary was used. The receiver was the Grebe CR18 Special, with detector and two steps of peaked amplification. The aerial was of the voltage-feed Hertz type favoured by amateurs.

Carlsbad Caverns are in government hands. The property is now a national monument and a number of

A Special Article by ERIC PALMER, Jr., America's "Radio Kid"

the large rooms already explored have been supplied with electricity, so that the ever increasing number of visitors might view the scenes.

The Department of the Interior has employed rangers as guides. With their permission I tapped the power lines, stepping up the 110 volts with the customary transformer. The only handicap was that the power was usually shut off at 4.30 p.m., so that the radio tests were always in daylight and not at hours when a large number of experimenters on short waves would be counted on for listening in.

The short aerial was fixed to a stalactite. Another aerial was created by running an insulated wire all the way to the entrance of the cavern, with a condenser in series—

A SPECIAL LOUD-SPEAKER NUMBER

Everybody interested in radio wants all the latest information about loudspeakers. Full details of all the new models will be published next month. Don't miss the December issue of WIRELESS MAGAZINE. It will be on sale everywhere on

THURSDAY, NOV. 20

and that resulted in great signal strength. But I heard some stations without any aerial at all; the coils within the receiver and the earth connection were sufficient.

Much to the surprise of everyone, stations rolled in the minute the receiver was connected up. The first heard was W2XAF. That is the General Electric plant at Schenectady. It was daylight in New Mexico, but the music came through nicely over the 2,400 miles. Next W2XE was reported; this is the short-wave auxiliary of WABC. WENR, Chicago, represented by W9XF, was logged, with tremendous volume.

Realisation followed expectancy. It was obvious that the Hertzian waves were penetrating to the

caverns. The next thing was to try out the transmitter. A CQ call on 20 metres was flashed out. I nervously awaited a response. In a few moments it came: W9BCT was calling W5QK, the designation assigned to me at the cave. A glance at the list of amateurs showed that W9BCT is Neil B. Coil, at St. Paul, Minn. That is 1,500 miles from Carlsbad.

Bats Flying About

Probably I gave Coil the surprise of his life when I clicked out the information that I would have to shut down because the bats were flying about and making life rather miserable. He inquired for details. I told him that I was far underground.

Florida and California were heard calling—scores of stations that very afternoon and during succeeding sessions at the key.

One thing was noticed in reception from great distances—an echo effect. It was quite uncanny. High-power commercial stations in South America were noticeable particularly because, on testing, their letter V sounded as if it was chasing itself about. Probably I was listening to both the ground and the sky wave.

When the V came I actually came across two V's, the first strong, the second weak. That meant, according to the accepted theory, that the sky wave was following a longer course, due to rebounding from the Heaviside layer, the atmospheric roof.

On G5SW, Chelmsford, the British Broadcasting Corporation's high-frequency transmitter, the same thing happened—also with PCJ, Eindhoven, Holland. When words were spoken it seemed, several times, as if the person stuttered just a trifle. But that did not always happen—and G5SW and PCJ were noted about a dozen times.

A Special "Kick"

What gave me a special "kick" was when I brought in PY1AW. This is an amateur station which I have operated. It is located in Rio de Janeiro. Amateurs in France, England, Chile, and other countries were heard on the 20-metre band, which is considered superior for daylight work.

THE FALCON THREE



This set is intended for use with A.C. mains. It can be used in conjunction with any standard mains unit giving high tension and a 4-volt supply for heating the A.C. valves. A specially suitable A.C. unit with a valve rectifier giving outputs up to 75 milliamperes is described on page 406

A LARGE number of amateurs already have in their possession mains units which they wish to use as the basis for an all-electric receiver. This set has been so designed that its high-tension supply can be obtained from any standard mains unit, but for those who want to build up a complete job we have designed a special battery eliminator, which is described in detail on page 406.

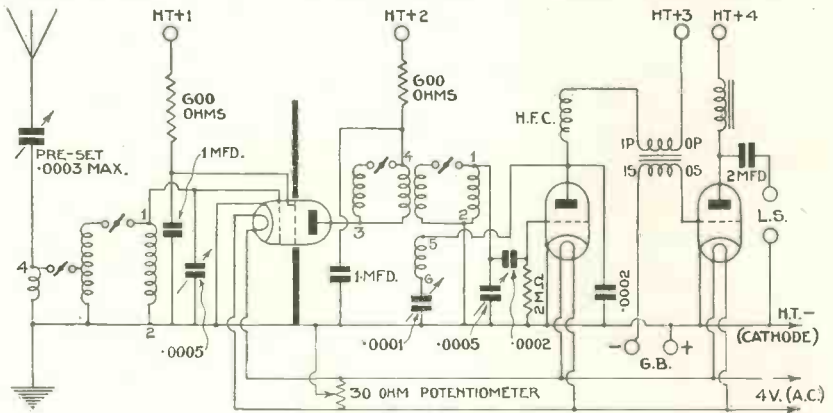
Use of A.C. Valves

The Falcon Three consists of a screened-grid high-frequency amplifier, leaky-grid detector, and transformer-coupled power stage with choke output. The valves used are of the A.C. type, taking raw A.C. at 4 volts, which can be obtained from the secondary of a suitable mains transformer.

It should be clearly understood that this set can be used only with A.C. mains and will not operate from D.C. supplies

A number of mains units on the market incorporate a 4-volt output which can be used for running the

to the cathodes) takes the place of the ordinary low-tension negative connection so far as what may be called



CIRCUIT OF THE FALCON THREE

The combination of valves used is a screened-grid high-frequency amplifier, leaky-grid detector, and a transformer-coupled power stage with choke output

valves in the Falcon Three, but if it is desired to make use of an existing unit giving only high tension it will be necessary to provide a separate transformer with a 4-volt secondary. These instruments are standard, and can be obtained from a number of manufacturers.

For convenience in use, the tuning coils are of the dual-range type, that coupling the screened-grid valve to the detector being a tuned transformer. This form of coupling gives greater stability than a plain tuned-anode circuit with a single coil.

As the A.C. valves are of the indirectly-heated type, the wiring of the filament circuits is a little different from an ordinary battery receiver. The actual heaters are wired separately and supplied with A.C. at 4 volts. The extra connection (that is,

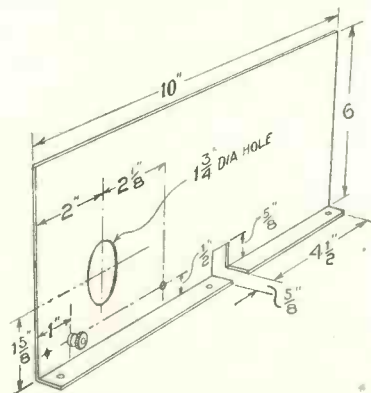
the "return" leads are concerned.

In other words any lead that would normally be taken to low-tension negative in a battery set is in this case taken to the cathodes.

Decoupling Resistances

Mains valves are now very much more reliable than they were a year ago, but in order to make sure that the set is quite stable, decoupling resistances are included in the screening-grid and anode circuits of the shielded valve. In each case a 600-ohm resistance is used in conjunction with a 1-microfarad fixed condenser.

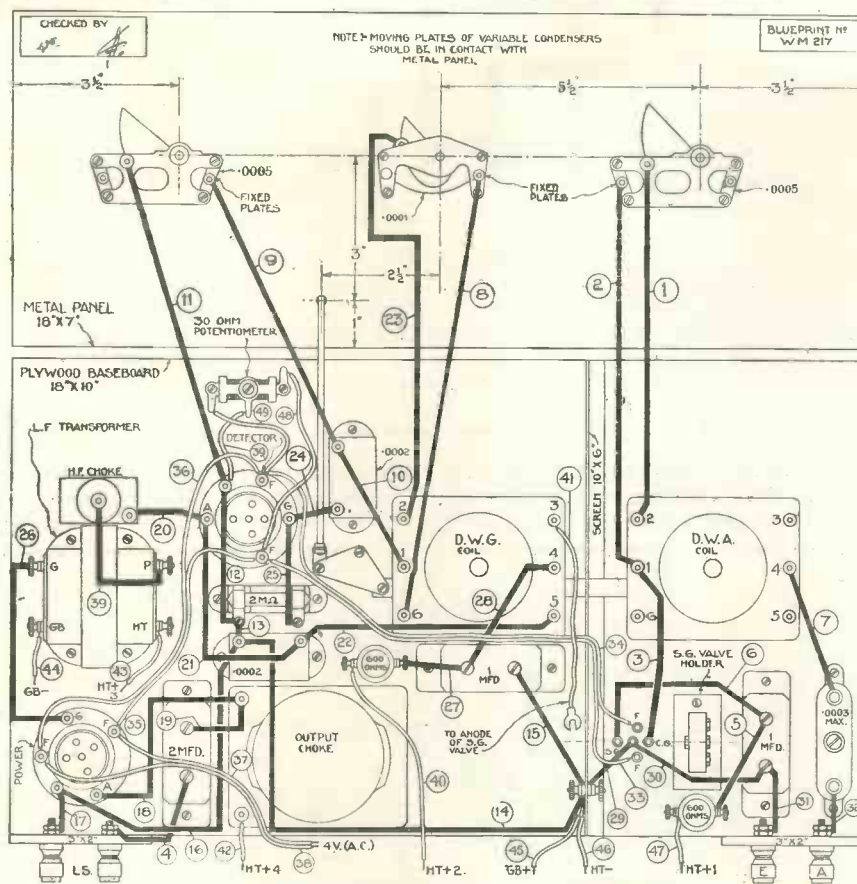
In order to prevent mains hum being heard from the loud-speaker, it is necessary to connect the cathodes of the valves to a centre point on the 4-volt secondary used for supplying



AN IMPORTANT DETAIL

This aluminium or copper screen is used for shielding the high-frequency valve

The Falcon Three—Continued



QUARTER-SCALE LAYOUT AND WIRING GUIDE

This layout and wiring diagram can be obtained as a full-size blueprint for half-price (that is 6d., post free) if the coupon on the inside back cover is used by November 30. Ask for No. WM217

the filaments. If the transformer is not provided with a centre tapping one can be obtained artificially by the use of a potentiometer connected across the ends of the 4-volt transformer winding. In this case the cathodes are connected to the slider of the potentiometer, which is moved round until no hum is audible.

Panel Controls

Both coils are tuned by a .0005-microfarad variable condenser, these being arranged at the extreme left and right of the panel. The condenser on the left tunes the aerial circuit and that on the right controls the anode circuit.

Capacity-controlled reaction is provided in the ordinary way, the amount of feedback being controlled by a .0001-microfarad variable condenser mounted in the centre of the panel.

It will be seen that there is a small

knob on the panel, slightly to the right of the reaction control. This is a switch controlling the wavelength range of both coils, which are coupled together by a special fitting. When this knob is pulled out the set is adjusted for the medium waves, and when it is pushed in long-wave stations can be received.

High-frequency Currents

There is nothing unusual about the connections of the low-frequency transformer. In series with the primary of this is a high-frequency choke, which prevents high-frequency currents passing from the detector into the low-frequency circuits, where they would cause interference and instability.

Getting Grid Bias

We have not thought it worth while to provide grid bias from the mains, and terminals are provided in the ordinary way for the connection of a grid-bias battery. Normally this will have a life of about a year before it needs replacing.

From the photographs that appear in these pages it will be seen that the layout and construction are quite straightforward. It should be noted that a metal panel is used, but as the fixed plates of all three variable

COMPONENTS REQUIRED FOR THE FALCON THREE

CHOKE, LOW-FREQUENCY

- 1—Bullphone, 10s. 6d. (or Atlas, Lotus).

CHOKE, HIGH-FREQUENCY

- 1—Ready Radio Hilo, 4s. 6d. (or British General, Lissen).

COILS

- 1—Lewcos dual-wave, type DWA, 15s.
- 1—Lewcos dual-wave, type DWG, 15s.
- 1—Lewcos ganging switch, type SM5, 2s. 6d.

CONDENSERS, FIXED

- 2—Watmel .0002-microfarad, 2s. (or Formo, Magnum).
- 2—Hydra 1-microfarad, 4s. 4d. (or Lissen T.C.C.).
- 1—Hydra 2-microfarad, 3s. (or Ferranti).

CONDENSERS, VARIABLE

- 2—Cylton .0005-microfarad Junilog, 17s. 6d. (or Igranic, Burton).
- 1—Polar .0001-microfarad, Volcon type 5s. 6d. (or Dubilier, Bulgin).
- 1—Ormond Varycondenser, .0003-microfarad maximum, 2s. (or Lewcos, Polar).

DIALS

- 2—Ormond plain, 1s. 6d. (or Cylton, Jackson).

HOLDERS, VALVE

- 2—Benjamin 5-pin, 3s. 6d. (or Lotus, W.B.).
- 1—Parex, S.G. type, 2s. (or Junit, W.B.).

PLUGS

- 0—Belling-Lee, marked: H.T.+1, H.T.+2, H.T.+3, H.T.+4, H.T.—, G.B.—, G.B.+ , 2 plain red, 2s. 3d. (or Ealex, Clix).
- 1—Belling-Lee S.G. anode connector, 6d.

POTENTIOMETER

- 1—Clarostat 30-ohm Hum Dingir, 2s. 9d.

RESISTANCES, FIXED

- 1—Watmel 2-megohm, with holder, 1s. 6d. (or Dubilier, Lissen).
- 2—Magnum 600-ohm, 3s. (or Wearite, Simmonds).

SCREEN

- 1—Parex, 10 in. by 6 in., 2s. (or Peto-Scott, H. & B.).

SUNDRIES

- 1—Parex metal panel, 13 in. by 7 in., 7s. 6d.
- Glazite insulated wire for connecting.
- 1—Pair Keystone panel brackets, 2s. (or Lissen, Camco).
- 6—Yards rubber-covered flex (Lewcos).

TRANSFORMER, LOW FREQUENCY

- 1—Lissen Super, ratio 1 to 3, 17s. 6d. (or Brown).

ACCESSORIES

CABINET

- 1—Peto-Scott, with 10-in. baseboard, £1 5s. (or Pickett, Lock).

LOUD-SPEAKER

- 1—Lamplugh standard cabinet inductor, £5 10s. (or Brodersen, Geophone).

VALVES

- 1—Mullard S4V, £1 5s. (or Cossor 41MSG, Six-Sixty SS4SGAC).
- 1—Mullard 354V, 15s. (or Cossor 41MPH, Six-Sixty SS4GPAC).
- 1—Mullard 164V, 17s. 6d. (or Cossor 41MP, Six-Sixty SS4Det.AC).

A Set for Operation from A.C. Mains

condensers are at earth potential there is no need to insulate these components on the panel itself. The use of such a panel means that hand-capacity effects are entirely eliminated.

Although all the essential details of the construction are given in these pages, many amateurs will prefer to work from a full-size blueprint. One of these can be obtained under the special half-price scheme for 6d., post free, if the coupon at the foot of the inside back cover is used by November 30.

Address your inquiry to Blueprint Department, WIRELESS MAGAZINE, 58-61 Fetter Lane, E.C.4, and ask for No. WM217.

Straightforward Construction

There is little that need be said about the actual construction, which will be obvious from the photographs and diagrams. It will be found convenient to couple the dual-range coils together before finally screwing them down on the baseboard.

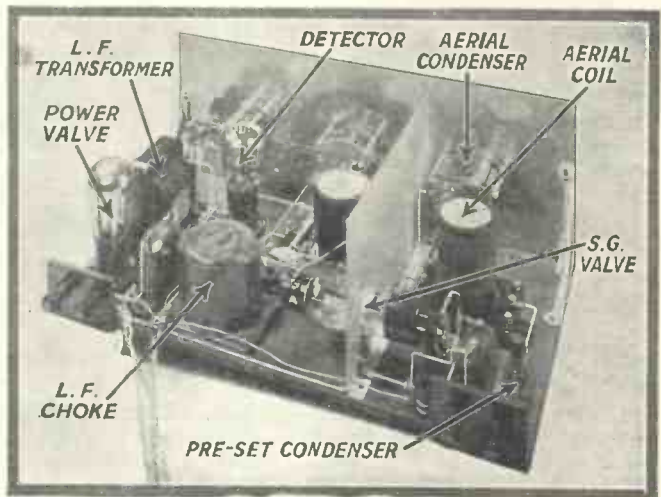
In wiring up the set the blueprint (or the reduced wiring diagram on page 404) will be found a great help. It will be seen that all the wires are numbered separately; for the best and easiest assembly they should be connected in the numerical order indicated.

The choice of valves for the Falcon Three is not a difficult matter.

The screened-grid valve can be of any standard make.

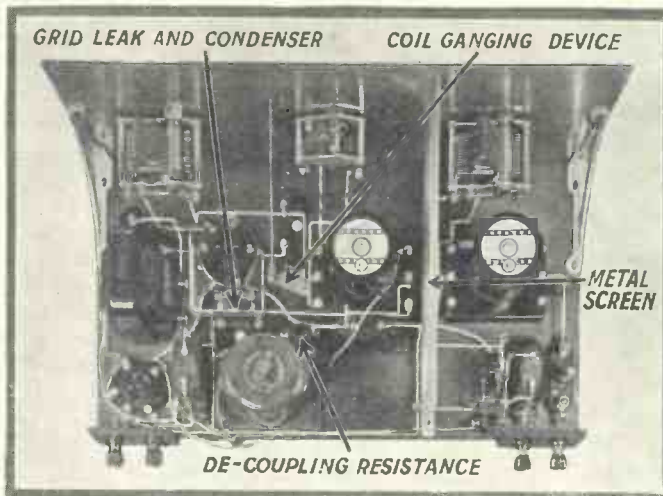
For the detector, a medium-impedance valve should be used; 20,000 ohms will be found about right.

The power valve



ALL READY FOR USE

Here the set is seen, with valves in position, ready for connection to a suitable mains unit, such as the Falcon A.C. Unit on page 406



NOTHING DIFFICULT ABOUT CONSTRUCTION

It will be seen from this plan view that all the parts are easily accessible and not at all cramped

should, of course, have a much lower impedance, but with a mains valve the value need not be so low as it would be with an ordinary battery valve. A value of about 5,000 ohms will be found satisfactory.

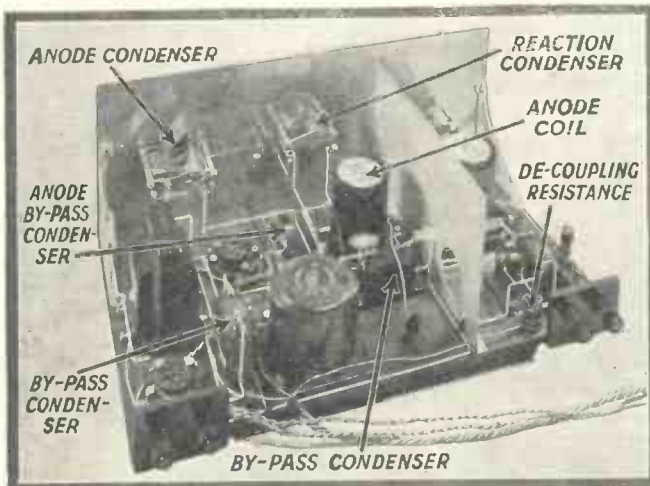
It is important so to choose the valves that their total anode-current consumption is not in excess of the capacity of the high-tension source. If the Falcon A.C. Unit is used, there will be no difficulty on this score.

Four high-tension positive points are provided on the set. The first, marked H.T.+1, supplies the shielding grid of the high-frequency valve and should be given approximately 60 volts. It will be convenient to connect this point to a variable tapping on the mains unit, so that a quick adjustment can be made if desired. It will be found that a variation of the voltage applied to this point results in an effective control of volume.

Choosing the Best Anode Voltages

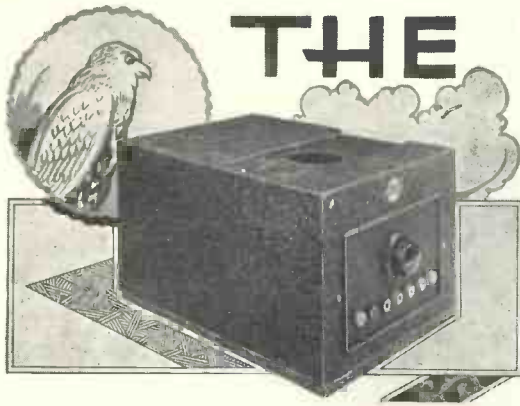
The leads marked H.T.+2, H.T.+3, and H.T.+4 supply respectively the anodes of the screened-grid, detector, and power valves. It will be found that 120 to 150 volts can be applied to H.T.+2, while a slightly lower value will, in most cases, give the best results for the detector valve.

The anode of the power valve can be supplied with a much higher voltage, in fact in most cases the higher the better, although care should be taken to supply sufficient grid bias in order to avoid overrunning.



AN IDEAL MAINS SET FOR THE FAMILY

There are only three controls on the panel, apart from the wave-change switch, and the operation of the set can be undertaken by any listener



THE FALCON A.C. UNIT

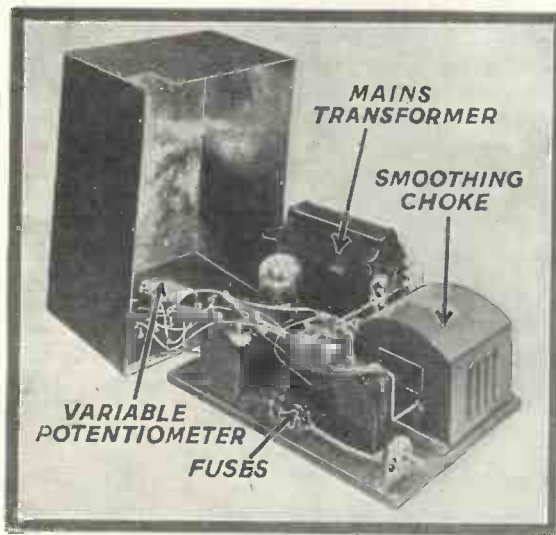
Although designed primarily for use with the Falcon Three, this unit can be employed for supplying any other set with high tension from A.C. mains. Four- and six-volt secondaries are provided for running valve filaments in an A.C. receiver

ALTHOUGH this unit has been specially designed for use in conjunction with the Falcon Three, it can be used for any other set.

converted to direct current. In this unit rectification is carried out by means of a valve, which is of the two-electrode type. It has a filament that consumes 1 ampere of A.C. at 4 volts.

ing is the negative high-tension connection for the direct-current output.

It will be seen from the circuit that the primary of the transformer is provided with tappings for use on 200-, 220-, or 240-volt A.C. mains. A twin fuse is provided in the main lead to protect the gear in case of an accidental short-circuit.



ANYBODY CAN BUILD THIS UNIT

This simple unit will provide a constant source of high tension at 240 volts, 75 milliamperes from alternating-current mains. Its output is sufficient to run the largest type of receiver in ordinary use

The method of connecting up this valve will be clear from the circuit diagram at the foot of the page. The filament is run from a 4-volt secondary on the mains transformer, which is provided with a centre tap. It is important to note that the centre tap is the high-tension positive connection for the direct-current output.

Smoothing Circuit

The direct current obtained from such a valve rectifier is not sufficiently pure for immediate application to the set and the supply is smoothed out by means of a low-frequency power choke and two 4-microfarad fixed condensers. The latter should be of the type tested at 500 volts.

The voltage available after smoothing is in the neighbourhood of 240 volts; this is the value that can be obtained from the output point marked H.T. + +.

Full-wave rectification is obtained by the use of the two anodes in the valve, each side being provided with 250 volts from a 500-volt

secondary on the mains transformer. The centre tap on this 500-volt wind-

The output available for high tension is approximately 240 volts at 75 milliamperes, while a special secondary winding on the mains transformer supplies A.C. at 4 or 6 volts for running the filaments of mains valves.

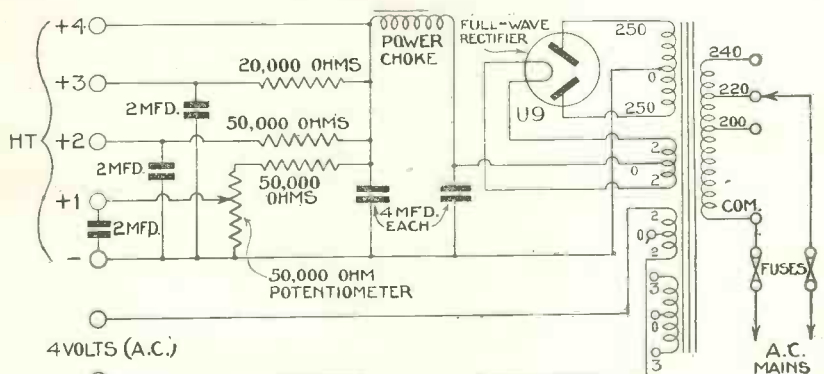
Four Outputs Available

As shown, the unit gives four positive outputs, three being fixed and the fourth being variable for supplying the screening grid of a shielded valve. If desired, more tappings can be provided or, on the other hand, one or other of those now incorporated can be omitted if not required for the particular set with which the unit is to be used.

Before alternating current can be used for supplying a radio set with high tension it must be rectified and

secondary on the mains transformer. The centre tap on this 500-volt wind-

(Continued on page 408)



CIRCUIT OF THE FALCON A.C. UNIT

Full-wave rectification is obtained from a valve, four positive outputs (three fixed and one variable) being available



Varley—the TALK of OLYMPIA!



Varley All-Electric Receivers and Radio-Gramophones captured the imagination of the thousands who saw and heard them at Olympia. Their brilliant reproduction startles by its faithfulness. Clear treble and powerful bass. Majestic volume or a whisper at will. Europe's Stations on a single dial. Realism from radio or record.

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Varley All-Electric Radio-Gramophone (A.C. or D.C.) **85 Gns.**
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D.C. Model. List No. AP11 **£16:16**
Valves and Royalties included.

Hire Purchase facilities are available for Varley All-Electric Receivers and Radio-Gramophones.



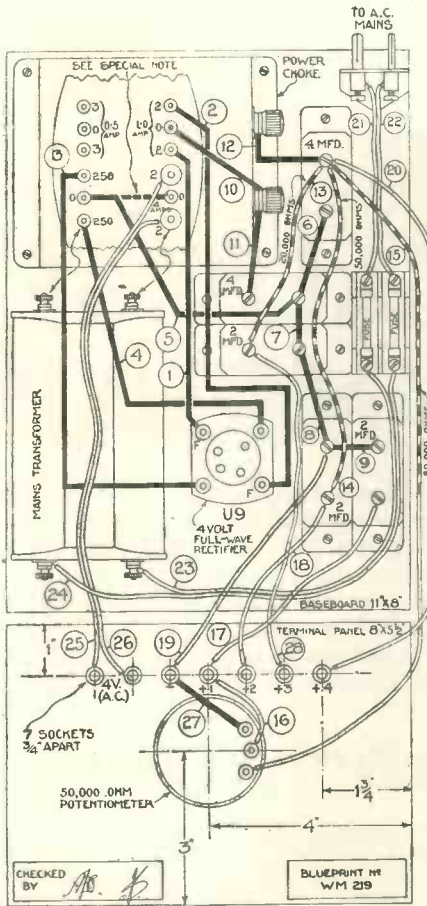
Varley Senior All-Electric Transportable Receiver



Advertisement of Oliver Pell Control Ltd., Kingsway House, 103, Kingsway, London, W.C.2. Telephone: Holborn 5303.

Advertisers like to know you "saw it in the 'Wireless Magazine'"

The Falcon A.C. Unit—Cont.



LAYOUT AND WIRING GUIDE

This layout and wiring guide can be obtained as a full-size blueprint for half-price (that is, 6d., post free) if the coupon on the inside back cover is used by November 30. Ask for No. WM219

It will be seen that in series with the leads marked H.T.+2 and H.T.+3 there are resistances of 20,000 and 50,000 ohms respectively. Associated with these are two 2-microfarad by-pass condensers to prevent the possibility of low-frequency oscillation or "motor-boating."

These values of resistance can be changed as desired to meet particular conditions. The point to remember is that every milliamper flowing through a resistance produces a drop of 1 volt for every thousand ohms.

Thus, if 5 milliamperes were taken from H.T.+3 the drop in voltage across the 20,000-ohm resistance would be 100, so

that the voltage actually available would be approximately 240 minus 100, which is 140 volts.

Similar reasoning applies to the output obtained from the point marked H.T.+2. As an example, we can assume a load for a detector valve of 3 milliamperes. This would result in a voltage drop of 150; in other words, the voltage actually applied to the valve would be about 90 volts.

The output at H.T.+1 is obtained from a potentiometer, which consists of two 50,000-ohm resistances joined in series. One is a fixed resistance and the other is a variable potentiometer. The voltage drop across these two resistances will be equal in each, so that the maximum value that can be tapped off from the potentiometer is 120 volts. In order to obtain 60 volts for a screened-grid valve it will, therefore, be necessary to put the potentiometer slider approximately in its centre position.

For the Falcon Three

When this unit is used with the Falcon Three it can be connected exactly as it stands to the corresponding high-tension tapings on the set.

It will be seen that for running the filaments of A.C. valves a separate 4-volt secondary winding is provided. When this is used for supplying a set other than the Falcon Three with low-tension current, the centre tap of the 4-volt winding must

be connected with the centre tap of the 500-volt winding. This connection is shown dotted in the wiring diagram, but is not indicated in the circuit diagram.

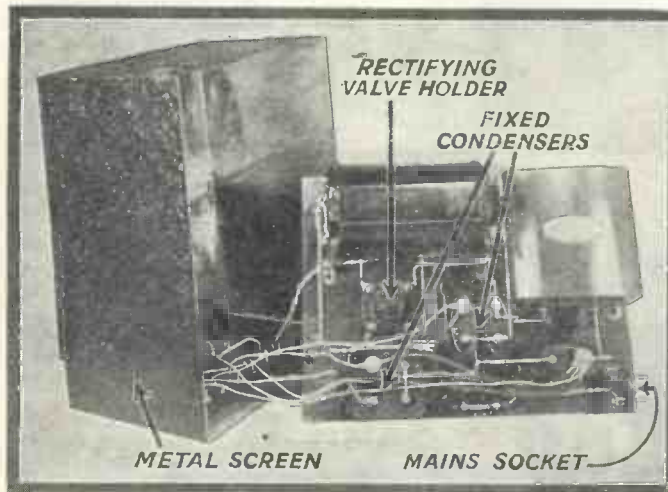
COMPONENTS REQUIRED FOR THE FALCON A.C. UNIT

- CHOKE, LOW-FREQUENCY**
1—Regentone, type LR, £1 5s. (or Ferranti, Atlas).
 - CONDENSERS, FIXED**
3—Hydra 2-microfarad, 8s.3d. (or Franklin, T.C.C.).
2—Hydra 4-microfarad, 12s. (or Franklin, T.C.C.).
 - EBONITE**
1—Panel, 8 in. by 5½ in.
 - FUSE**
1—Bulgin twin fuseholder, complete with fuses, 2s. 6d.
 - HOLDER, VALVE**
1—Benjamin Vibroder, 1s. 6d. (or Clix, W.B.).
 - PLUGS AND SOCKETS**
7—Clix, marked: H.T.+1, H.T.+2, H.T.+3, H.T.+4, H.T.—, and two plain, 2s. 0½d. (or Belling-Lee, Ealex).
 - RESISTANCES, FIXED**
2—Bulgin 50,000-ohm, flexible type, 3s. 6d. (or Magnum).
1—Bulgin 20,000-ohm, flexible type, 1s. 9d. (or Magnum).
 - RESISTANCES, VARIABLE**
1—Centralab 50,000-ohm potentiometer, 10s. 6d. (or Rotorohm, Regentstat).
 - SUNDRIES**
Glazite insulated wire for connecting.
Short length of rubber-covered flex.
1—Baseboard, 11 in. by 8 in.
1—Sensite metal box, 7s. 6d.
1—Bulgin safety mains plug and socket, 3s. 9d.
 - TRANSFORMER, MAINS**
1—Heayberd, type 719, £2
 - VALVE**
1—Marconi U9, £1 (or Osram U9)
- The prices mentioned are those for the parts used in the original set; the prices of alternatives as indicated in the brackets may be either higher or lower

It will be obvious from the illustrations reproduced in these pages that construction is quite straightforward. Those who desire one can obtain a full-size blueprint under the special half-price scheme for 6d., post free, if the coupon at the foot of the inside back cover is used by November 30.

Ask for No. WM219 and address your inquiry to Blueprint Dept., WIRELESS MAGAZINE, 58-61 Fetter Lane, E.C.4.

It will be seen that the mains transformer used has no fewer than four separate secondary windings. The use of three of them has already been explained. The fourth provides an output at 6 volts and can be used for supplying a 6-volt power valve in the last stage of the receiver.



VALVE RECTIFICATION IS USED IN THIS UNIT

This mains unit is quite foolproof and will give good service in use. No ordinary set will overload it

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Phone: CLERKENWELL 3570

Grams: "BLUOSPOT, SMITH, LONDON"

Distributors for Northern England, Scotland and North Wales: H. C. RAWSON (Sheffield and London) LTD., 100, London Road, Sheffield; 22, St. Mary's Parsonage, Manchester; 183, George Street, Glasgow.

Better service results from mentioning "Wireless Magazine" when writing to advertisers

UNDER MY AERIAL

HALYARD'S CHAT ON THE MONTH'S TOPICS ILLUSTRATED BY GLOSSOP

New Season's Goods

HAVE any of the new season's wireless goods reached your local shops yet, or are your dealers still showing you the same old stuff they had in the summer?

If you travel about the country a good deal, as I do, you cannot help but notice the great difference there is in the time it takes new goods to get through to different places. Thus, you might visit one town which is very go-ahead in all wireless matters and find all the new season's goods in evidence. The next day you might visit another town not many miles away and find absolutely none of those goods.

Should you be disappointed because you have not yet found any of those attractive new sets or components you saw at the exhibition, or saw described in WIRELESS MAGA-

ZINE at exhibition time, don't blame the manufacturer before you find out whether your dealer is to blame or not.

It may be your dealer who is not as progressive as he might be. If



Very go-ahead in all wireless matters

there is something you particularly want just now, a new type of valve, a new loud-speaker, or a new transformer, say, be persistent with your dealer. He ought to be able to get the desired article for you. If he won't, then go to some other dealer.

If he can't, then is the time to write to the manufacturer.

Wireless and Employment

One of the very best things about wireless these days is the way in which it is finding employment for thousands of people during the present prolonged period of trade depression.

I wonder if you have ever seen any figures giving the number of people employed in the wireless industry in the British Isles. I have some kind of a recollection of having seen such figures for the United States of America, but I do not remember having seen figures for our own country.

This wireless of ours is not merely producing a certain fixed amount of employment. It is producing more (Continued on page 412)

TANNOY

PRODUCTS
"ALL-ELECTRIC"
RADIO-GRAMOPHONE



PRICES
from
45 Gns.

INCORPORATING M.C. SPEAKER

SENIOR MODEL
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All Electric H.T., L.T., Grid Bias, matched transformer coupled moving coil speaker, slow speed Induction motor, four valve receiver, high stage gain Screen Grid H.F., power detector, one R.C. Stage, and 10 Watt power output stage, fitted with illuminated dials.

Tannoy Products, 1-7 Dalton St., S.E.2



Better pass a danger
once than be always
in fear. Better still
fit Hydra condensers
now and never so
much as worry.


HYDRA

LOUIS HOLZMAN Ltd.

37 Newman Street, W.1
Telephone: Museum 2641

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JACKS SWITCHES AND PLUGS



The smallest component can make or mar the performance of the finished set. Lotus Jacks, Switches and Plugs are designed and constructed to give trouble-free reception. Make certain of your set's success by using Lotus Components.

Lotus Jacks from 2/-
Switches from 1/6
Jack Plug 2/-
From all Radio Dealers.

Write for illustrated Catalogue to
GARNETT, WHITELEY & Co., LTD., LIVERPOOL

LOCAL STATIONS
REGIONAL STATIONS
FOREIGN STATIONS

PICK THEM OUT!

Why worry about old fashioned plug-in coils when the new British General Aerial Tuning Unit covers the full tuning range of 200 to 2,000 metres by means of a single dial. Easy to fix, simple to tune and guaranteed effective.

From all dealers or direct from the manufacturers.

BRITISH GENERAL
 MANUFACTURING CO., LTD.,
 Brockley Works, LONDON, S.E.4

PRICE **14/6**



PUT YOUR UNIT ON VIBRANT!

IT MUST IMPROVE THE TONE

Size: 24 in. x 24 in. x $\frac{3}{8}$ in.

THE **SUPER ONE-PIECE BAFFLE**

CAN BE FIXED IN A CORNER, HUNG FROM THE PICTURE-RAIL, OR—IF FITTED AS ILLUSTRATED—PLACED IN ANY CONVENIENT SPACE.

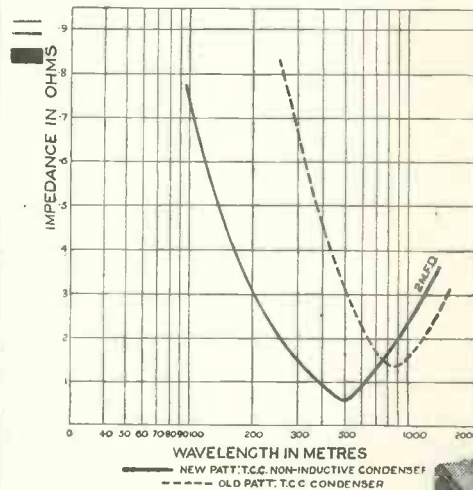


SUPPLIED IN SIX ATTRACTIVE FINISHES at 9/6, 10/6 and 11/6 each SCREEN FITTINGS (as shown above) OXIDISED COPPER, 5/3 set OXIDISED SILVER, 6/6 set

FROM RADIO DEALERS
 or
CHAS. BORST & SONS
 306-308 EUSTON ROAD, LONDON, N.W. 1

Non-inductive Condensers

the Latest T.C.C. Development



Here's the latest T.C.C. development—a Non-Inductive Condenser at no extra cost. The advent of the Screened Grid Valve has emphasized the need for a condenser having the minimum of impedance in order that small high frequency currents may be readily passed. How the new T.C.C. Non Inductive Condenser achieves this result is shown on the curve above. The ordinary 1 mfd. condenser has a resonant point at about 900 metres whereas in the new T.C.C. Non-Inductive Condenser this has been reduced to nearly 500 metres. Be wise: always use



Available in all capacities from .005 mfd. to 2 mfd. from all wireless shops.

The above illustration shows the T.C.C. 2 mfd. Non-Inductive Condenser in moulded case 3/10.

Telegraph Condenser Co., Ltd., N. Acton, W.3



Always ahead in Condenser Design

Advertisers take more interest when you mention "Wireless Magazine"

Under My Aerial—Continued



Employed in the wireless industry

and more employment each year, and nobody can say when a maximum will be reached.

There are certain districts where wireless factories have solved the local unemployment problem. Such districts are very fortunate indeed, since their wireless factories will undoubtedly expand and demand more labour than the district can supply perhaps.

I am very interested in this question and I am watching developments very carefully. A point that interests me is this. Where will the wireless industry ultimately establish itself? Will wireless be to some county or district what cotton has been to Lancashire and wool to Yorkshire?

Certainly considerable portions of the wireless industry have established themselves in and around London, in Cambridge, and in Manchester. Where will our main wireless industry establish itself in the future; in one of the places named or somewhere entirely different?

The Welsh Regional

Doesn't it seem rather strange that the search for a site for the new Welsh Regional station should be taking place outside Wales? One might reasonably conclude that the Welsh Regional transmitter would be situated in Wales, but the B.B.C. engineers have been hunting around for a site on the Somerset side of the Bristol Channel.

If you look at a density-of-population map of the British Isles you will see a most important point in favour of a site in Somerset for the new regional station. A transmitter erected on the Somerset coast, somewhere between Bridgwater and Minehead, say, would be right opposite the most thickly-populated area of Wales, the Cardiff and Swansea area.

Such a station would serve that thickly-populated area and yet not be in that area, a vital point in these days of high-power broadcasting

stations with pronounced wipe-out areas round them. A station in Somerset would also serve the thickly-populated area round Bristol from outside that area.

What I should like to know particularly, though, is whether the transmission from a regional station in south-west England would penetrate more easily into the deep valleys of Wales than would the transmission from a similar station at Cardiff. My impression is that, to be really successful in penetrating into the Welsh valleys, the new station should be situated further away from Wales, on



As high a wavelength as possible

high ground in Devon, possibly, and more important still, as high a wavelength as possible should be used. What do you think about it?

Pleasing Permanence

It is a little late in the year to talk about holidays at the seaside, but I happen to have had a late holiday at one of our east-coast resorts, and I must tell you of one rather striking wireless feature of that place, the permanence of its aerials.

When I first looked out of my bedroom window I saw no less than ten aerials, each one of which had been erected in a manner which suggested that wireless had certainly come to stay.

Every one of the ten aerials had at least one iron bracket attached to wall or chimney. Some of the aerials had two such brackets attached to chimneys at opposite gable ends of the house.

Those iron brackets interested me. They seemed so strong and permanent. I could not imagine how any one of them would give way for



Wireless has become deeply rooted

centuries. In fact, I concluded that, if any one of those iron brackets should budge, the house would budge with it.

The more I think of those permanent aerials the more I like them. I look upon them as being one of the best signs I have seen lately of the way wireless has become so deeply rooted in our present-day civilisation.

Back to the Battery

Whilst we in this country are making our greatest progress in the direction of all-from-the-mains receivers, America is—well, what? If I were to allow you one guess you would say that America is progressing towards the valve which requires neither batteries nor mains, wouldn't you?

Such a guess would be wrong. Here we are in this country progressing mightily with our mains-driven sets, whilst our American cousins are actually returning to the dry battery. Don't remind me that America is a dry country. George has already done that.

Yes, America has recently realised that the dry battery, or the high-tension battery as we call it, reigns supreme in certain branches of wireless. For example, great developments have been made this last year in America in the manufacture of



Returning to the dry battery

sets specially designed for use on motor-cars and in motor-boats. High-tension batteries have been found indispensable in such sets.

Again, sets designed for remote American farms where electric power is not available use dry batteries not only for the supply of plate current, but also for the supply of filament current. Lastly, dry batteries are being used on American aeroplane receivers more than was previously the case.

Strange, isn't it, that America should be taking what appears to be a backward step in some respects?

(Continued on page 414)

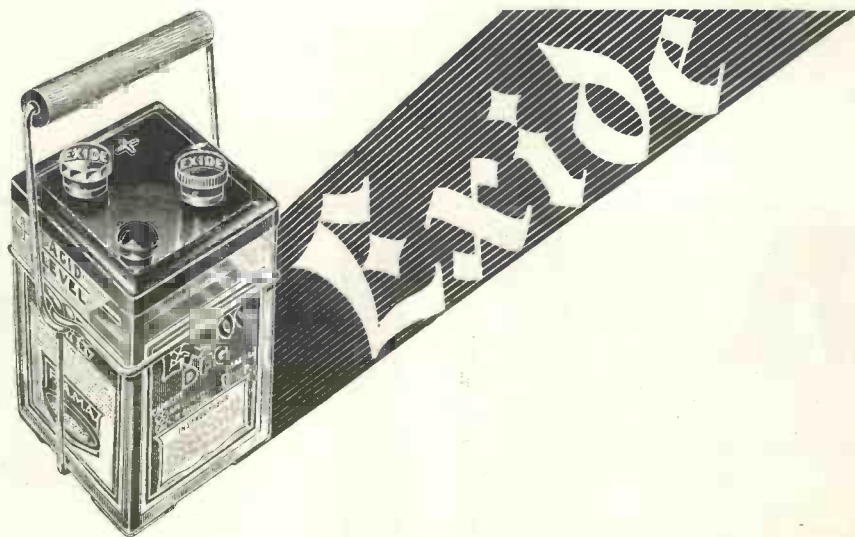
Now less recharging!

Exide "D" Series L.T.

Batteries can last a long time on one charge . . . they are made for modern economical valves . . . they allow you to use a battery of sensible size . . . they don't sulphate even under the most severe conditions.

See how you save!

You get an Exide "D" Series Battery of twice the size of older types at the same price . . . add to this the saving in upkeep and you have the world's most economical battery.



The battery for your set . . . a gem of construction . . . differently coloured and shaped terminals distinguish positive from negative even in the dark . . . completely acid proof . . . strong metal carrier free. Remember, next time, Exide "D" Series for Low Tension.

Prices per 2-volt cell: DTG, 20 amp. hrs. 4/6 DFG, 45 amp. hrs. 8/6 DMG, 70 amp. hrs. 11/- DHG, 100 amp. hrs. 14/6

Obtainable from Exide Service Stations or any reputable dealer. Exide Service Stations give service on every make of battery Exide Batteries, Clifton Junction, near Manchester. Branches at London, Manchester, Birmingham, Bristol and Glasgow

L12

Please mention "Wireless Magazine" when corresponding with advertisers

Under My Aerial—Continued

George Explains

Are we likely to have a second long-wave station in this country? Some little time ago it was reported that the B.B.C. engineers were considering the possibility of such a station, and I have been wondering whether any real progress has been made towards the establishment of a second 5XX.



B.B.C. engineers considering the possibility

The great thing about long waves is that they travel so much farther and better than short waves. I have heard it said that two long-wave stations, one in the Isle of Wight and the other in the Isle of Man, would serve Great Britain and Ireland as effectively as five short-wave stations placed in the most advantageous positions.

Why is it that long waves travel so much better than short waves? I put this question to George last night, and this is what he said :

"Have you ever seen a short, fat man with short legs walking alongside a tall, thin man with long legs?"

"Possibly I have, George, but why?" I asked.

"The little man's strides are the short waves, the tall man's strides the long waves. They walk along together and, therefore, have the same speed just as short and long wireless waves have the same speed. The little man expends his energy in moving his legs rapidly in order to make the necessary number of short strides. The tall man swings along easily; he does not expend anything like the same amount of energy. The little man, puffing and blowing and perspiring in his efforts to keep up the pace, cannot go anything like as far as the tall man. See?"

That is George's way of explaining this most interesting wireless phenomenon. Can you go one better than George?

Charging Days

You know how certain days of the week have become associated with certain activities. For example, Monday is universally regarded as wash day, Friday is fish day in many homes, and Saturday is, if you are lucky, a holiday. Did you ever hear, though, of a "charging day"?

I ran across the expression in a



Definite charging days

business trip to the north of England last month. I had my portable with me and, as my accumulator needed charging, I sought out a charging station in the little town in which I was staying.

It happened to be on a Tuesday night that I sought and found the station. As I handed over my

(Continued on page 416)



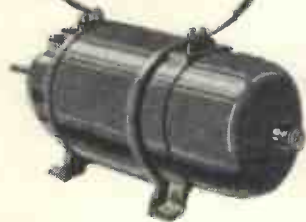
The



D.C. to A.C. ROTARY TRANSFORMER

provides the best means of running a Standard A.C. All Electric Receiver on D.C. Circuits

Write for "The Book of the M-L Rotary Transformer" to Radio Dept., The M-L Magneto Synd. Ltd., Coventry.



IDEAL FOR RADIOGRAMS NO INTERFERENCE if you fit a **PAILLARD** ELECTRIC INDUCTION MOTOR

No brushes or commutator to cause interference. No belt. The motor runs smoothly and silently, without variation in the revolution speed even with largely fluctuating mains current. 12" velvet-covered turntable, automatic brake and cut-out. For 100-130 and 200-250 v. A.C. 7 $\frac{1}{4}$ " x 5 $\frac{1}{2}$ " x 5 $\frac{1}{8}$ ".

£4/17/6 (without Unit Plate, £4/10/0).

Super Pick-up and Arm, £2/2/6.
Portable Gramophone Cabinet fitted with Paillard Motor, Super Pick-up and volume control, £8/15/0 complete.

APOLLO GRAMOPHONE CO., LTD.
4-5 Bunhill Row, London, E.C.1

TESTS EVERYTHING



**VALVES
FILAMENT · ·
ANODE & GRID
COMPONENTS
AND CIRCUITS
H.T. AND L.T.
MILLIAMPS
*Everything!***

The All-in-One Radiometer gives you a definite answer to every question you put to it. It will tell you, at once, whether a valve is "good" or "dud." If your batteries are fading it will show you just where you stand, giving you

the exact output in volts and milliamps. Mains Units, too, can be tested. When you build your new set you can test every component, every inch of wiring—before you switch on. You will never burn out a valve if you check over first with the All-in-One. It is calibrated to give an accurate reading, is as simple to understand as an alarm clock and is built to last. Let it solve your problems—let it save you money. Ask for our booklet or write direct to Pifco Ltd., Pifco House, High St., Manchester

12/6

Obtainable through all good wireless dealers.

**PIFCO
All IN ONE
RADIOMETER**

P.4



MIDNIGHT REVIEW

"I wonder if it's the battery?" said father after puzzling over the set till midnight: and when he tried an Ever Ready instead, the reception was perfect. That's what the Ever Ready was designed for—to give perfect reception as well as to last a long time. All through its long life it stays up to pitch. You get no fading. You have no distortion. The Ever Ready is made by an exclusive process—an exceptionally thorough and careful process. It stays alive for months, and while it's alive it's awake! Every Ever Ready battery is guaranteed to give satisfactory service by a company which has been making reliable batteries for 28 years.

Ever Ready batteries are made for all wireless sets. If you own a portable you can obtain an Ever Ready of the right size and shape to fit it. Write for free list, which gives full particulars, including exact dimensions in inches.



**BRITISH MADE
HIGH TENSION
BATTERIES**

The batteries that give unwavering power

The Ever Ready Co. (Gt. Britain) Ltd., Hercules Place, Holloway, London, N.7

Advertisers like to know you "saw it in the 'Wireless Magazine'"

Under My Aerial—Continued

accumulator to the proprietor, I asked when it would be ready for me.

"First thing Saturday morning," was the reply.

"Can't I have it before then?" I asked.

"I'm afraid not," was the reply.

"It seems rather a long time," I remarked.

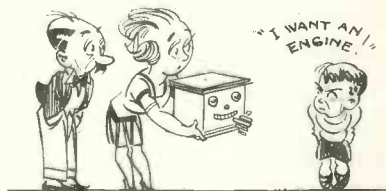
"Perhaps so," said the local charger, "but you see our next charging day is Friday. We have two charging days a week, Tuesdays and Fridays. I start the engine at seven o'clock in the morning on charging days and let it run until night. I don't run it other days."

Do you happen to know any small place like this where they have definite charging days in the week?

Good for the North

The allocation of 5GB's present wavelength of 479 metres to the regional transmitter of the new Northern Regional station when that station comes on the ether is something in the way of a valuable wireless gift to northern listeners.

5GB's wavelength is far and away the most valuable of the medium wavelengths granted to British stations. You know it is not just merely the highest of our medium wavelengths, but it is so much above the next highest British medium wavelength.



A valuable wireless gift

At present the next highest medium wavelength to 5GB is that of Glasgow, 399 metres. 5GB's wavelength is, therefore, no less than 80 metres above that of Glasgow, whereas Glasgow's wavelength is only 23 metres above the next highest—376 metres, used by Manchester.

The reason why the transmitter of the Northern Regional station is to be so highly favoured in the matter of wavelength is because this highest medium wave will suffer less than any other in its travel through the mountainous Pennine district.

I know one part of the Pennines pretty well, the Peak district of

Derbyshire, and I have an idea that the 479-metre wave of the Northern Regional station will not travel so far to the south as it will in other directions.

Our Announcers

"I'm so sorry. I misread the last item. I will read it to you again."

When the above words came to me from my loud-speaker a few minutes ago, I really felt as if I should have liked to shake hands with that announcer and sympathise with him. Those words seemed to make him become suddenly so very human.

Do you think we make enough of our announcers? Do we appreciate sufficiently their work for us? I often wonder if our announcers like to remain unknown to us as they do at the present time. Their anonymity is the soulless anonymity of a mere talking machine. I doubt if the importance of the work and status of our announcers will ever be fully recognised while they remain anonymous as at present.

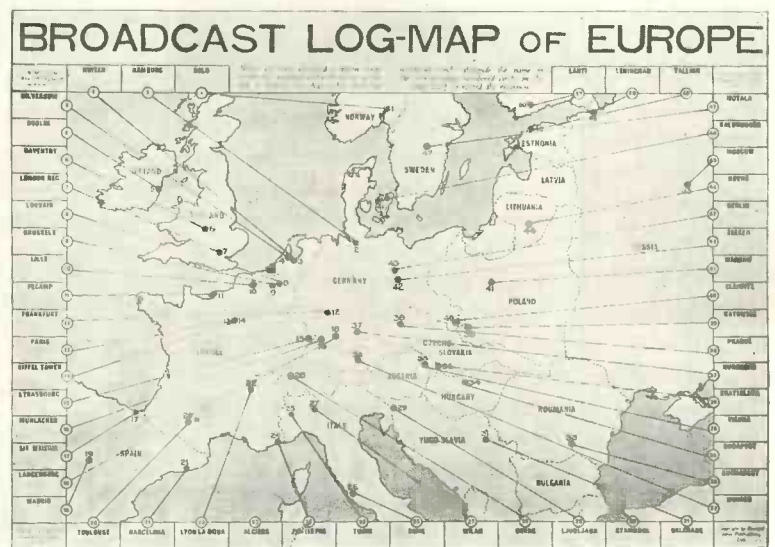
If I were an announcer and I had the choice of being known to my listeners or remaining anonymous, I should choose to be known. I would rather go down to broadcasting history as the announcer who said soup-er-flou-us than not go down to broadcasting history at all.



Down to broadcasting history

America could spare us a little of the honour and glory with which she surrounds her announcers. Everybody in America knows everything there is to know about the American announcer. Don't you think that the ideal position for the wireless announcer would be about half-way between the extravagant publicity of the American announcer and the dull anonymity of the British announcer?

Last Month's Free Gift



ONE of the most popular gifts ever given to its readers by WIRELESS MAGAZINE was the Station Identifier and Broadcast Log-Map of Europe presented with the previous issue. So great was the appeal of this to listeners that the whole stock was sold out within a few days.

The photograph above shows how lines are drawn from the sides and

bottom to the numbers on the map itself to record the reception of stations. The dial readings should be filled in under the name of the station. The lines then give a quick reference to the country of origin of the transmission.

Of course, normally the number of lines drawn will not be as many as shown on the above example.

FIRST
THE AMAZING PERTRIX
NON-SAL-AMMONIAC
DRY BATTERY **NOW...**
THE IMPROVED PERTRIX ACCUMULATOR

YOU have already been introduced to the Pertrix Dry Battery, and **NOW** the Pertrix Accumulator is here—here to give you the same sterling service as its well-known stable companion. The makers of Pertrix Accumulators have 40 years experience behind them in the manufacture of storage cells, and these super life accumulators embody all the most up-to-date features—features that were originated by the designers, and have since become standard practice.

Ask your dealer, or write for complete list, it gives full particulars of all types.



Type PXG2.
 Capacity:
 20 a.h. at 20 hr. rating
 Price: 9/6
 and more than 100 other types.
 Complete list on application.

THE IMPROVED
PERTRIX
SUPER LIFE
ACCUMULATORS
“Built for Service”

PERTRIX LIMITED,
 BRITANNIA HOUSE,
 233, SHAFTESBURY AVENUE, LONDON, W.C.2.
 Works: REDDITCH

PERTRIX ONCE — PERTRIX ALWAYS

Advertisers like to know whence the business comes—please mention “W.M.”

LEAVES FROM A LISTENER'S LOG

By **JAY COOTE**

IN some Continental cities the chimney-sweep is a municipal official; house-owners get their chimneys swept at periodical intervals whether they like it or not.

In Berlin, not long after the establishment of the broadcasting system, the authorities noticed that the number of the registered licences did not increase as it should; it was not commensurate with the large quantity of wireless receivers sold.

Finding the Pirates

The chimney-sweep was brought into action; he was deputed to send in reports. In the course of his wanderings over the house tops he was in a position to note the number of outside aerials; in the same way, his visits to flats and apartment houses revealed the presence of a wire slung across a room and his daily observations led to the discovery of numberless pirates who were dragged to court and heavily fined.

Possibly the same policy was imitated in other countries, for today the Warsaw chimney-sweeps have threatened to lay down their brushes in protest if measures are not taken to introduce a standard type of aerial.

They complain—rightly, no doubt—that this network of wires on every house roof constitutes a danger to their lives and that their work under such conditions is no longer a joy.

Since the advent of high-power broadcasting stations, aerials have been slung up everywhere, and although work at dangerous heights does not daunt them they refuse to take courses in "acrobatics" to permit them to earn a living; as to spying out radio pirates, there is nothing doing.

So again—and, perhaps for the last time—the Hilversum and Huizen

studios have exchanged wavelengths. To-day it is a case of "as you were," for the A.V.R.O., the V.A.R.A. and V.P.R.O. transmissions revert to 1,071 metres.

Not for long, I am afraid, as Oslo is already working on that wavelength. While the Norwegian station uses 500 watts, but little interference may be caused to local listeners to Hilversum, but as you know, the new 60-kilowatt transmitter is due to operate shortly.

Better System Wanted

The Dutch wireless fans have already foreseen this eventuality and have risen in their masses. Petitions are pouring into Government offices pleading for some more satisfactory working arrangement by which the Hilversum broadcast may not be relegated permanently to the lower waveband. Either that or a complete reorganisation of the unprac-

(Continued on page 420)

A STARTLING RADIO-GRAM DEVELOPMENT

The ELECTROCET Table Radio-gram is something of a new departure in radio. It combines a highly selective 2-valve all-electric radio receiver with an efficient gramophone to form an unusual but attractive table radio-gram.

Easy to control, inexpensive to run, selective and of superb tone, this remarkable radio innovation can be obtained for the amazingly low price of **18** guineas.

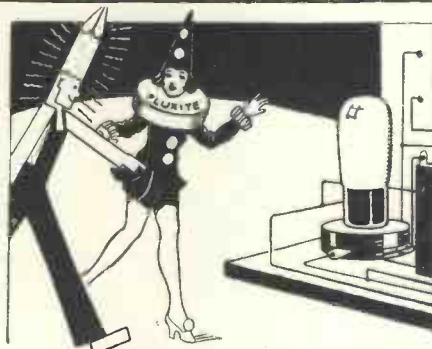
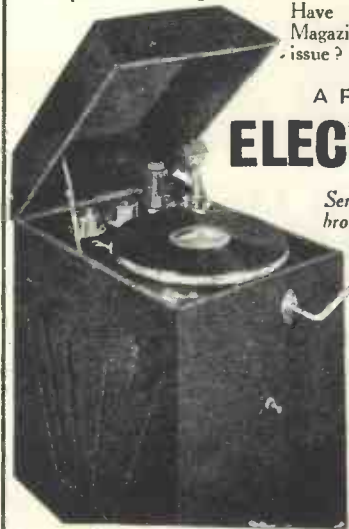
Have you read the "Wireless Magazine" Test Report in this issue?

A PRODUCT OF ELECTROCETS

Send to-day for our illustrated brochure and Deferred Payment Terms sent free on request.

We have an agent in your district who will gladly give you a demonstration, and install the set for you.

THE ELECTROCET RADIO COMPANY, Solihull, Birmingham



"We're Fluxite and Solder—The reliable pair Famous for Soldering, Known everywhere If you're fixing up Wireless, There's no need to fret, Let US join the connections—Then Perfection you'll get!"

See that Fluxite and Solder are always by you—in the house, garage, workshop—anywhere where simple, speedy soldering is needed. They cost so little but will make scores of everyday articles last years longer! For Pots, Pans, Silver and Brassware; RADIO; odd jobs in the garage—there's always something useful for Fluxite and Solder to do.

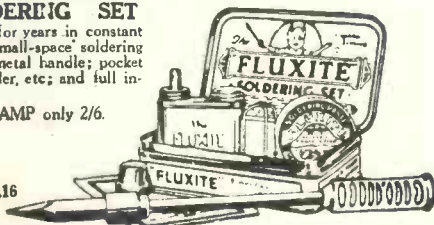
ANOTHER USE FOR FLUXITE. Hardening Tools and Case Hardening. Ask for Leaflet on improved method.

FLUXITE SOLDERING SET Simple to use and lasts for years in constant use. Contains special 'small-space' soldering iron with non-heating metal handle; pocket blow-lamp, Fluxite, Solder, etc; and full instructions.

COMPLETE 7/6, or LAMP only 2/6.

FLUXITE LTD., (Dept. 332) ROTHERHITHE, S.E.16

All Hardware and Ironmongery Stores sell Fluxite in tins, 8d. 1/4 and 2/8.



ALL MECHANICS WILL HAVE
FLUXITE
IT SIMPLIFIES ALL SOLDERING

"IT FITS YOUR PORTABLE"



**UNRIVALLED FEATURES
IN ALL-MAINS RADIO**
**for any set
standard or
portable**

This wonderful Combined Eliminator and Trickle Charger is the finest All-Mains Unit yet produced and is as simple to connect and as compact as an H.T. Battery and every bit as safe. It has no moving parts nor valves, incorporates the Westinghouse Metal Rectifier and is fully guaranteed for 12 months. Small enough to fit the Battery space in portable and cabinet receivers, it provides smooth and constant High- and Low-tension current entirely free from hum.

There are two variable tappings of 0/100 and 0/120 volts respectively and one fixed of 150 Volts. Output 25 m/a at 150 volts—the highest of any unit designed for portables. The Trickle Charger caters for 2-, 4- and 6-volt L.T. Accumulators.

**PRICE
£6:0:0**

Cash or 10/- down and the balance in 7 monthly instalments of 15/6 each and one of 14/6

ASK YOUR DEALER OR WRITE FOR FOLDER 55

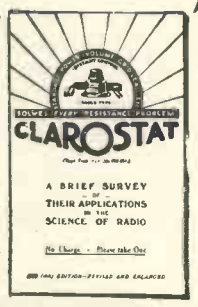
**"CLARKE'S
ATLAS"**

ALL-MAINS UNIT A.C. 188
H. CLARKE & CO. (M/CR), LTD., OLD TRAFFORD
MANCHESTER

SOLVES EVERY RESISTANCE PROBLEM
CLAROSTAT

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Leaves from a Listener's Log (Continued from page 418)

tical system now prevailing in Holland.

It is put forward, with considerable truth, that Hilversum was one of the very first European stations to transmit a wireless concert over the ether, and it seems only fair that such pioneer work should be recognised, taken into consideration and suitably rewarded.

Feeling the Draught

Recently, in a London daily, I read that the itinerant street organ-grinder is feeling the draught since the rapid growth of broadcasting in the United Kingdom. Grinding out music by the wayside may soon be a lost art; it appears that it is not what it was in pre-war days, for since the general public has invested in wireless sets and gramophones it is not lavish in its encouragement of other street noises.

In pre-war days, the Italian and his simian assistant were common sights; to-day—well, personally, I cannot recall when I saw one last. It is evident that the piano (organ-muted or staccato) is a poor substitute for the musical fare provided by loud-speakers or gramophone records and its waning popularity even, if to some degree pathetic, is understandable.

But why not try up-to-date methods for street entertainment? When, a month or so ago, in Brussels, I heard the strains of a dance band in a side street not far from my hotel, curiosity prompted me to investigate, with the result that I discovered a flat barrow drawn by an out-size in dogs.

The owner of the hybrid mastiff had equipped the barrow with a wireless receiver, frame aerial, loud-speaker and gramophone complete. He was doing good business. I stood by for over half an hour listening to his relay of Radio Belgique, taking syncopated music from one of the popular "dancings."

Talks Not Appreciated!

On my inquiry regarding the necessity for a gramophone, he replied curtly: "Monsieur, my artistic audience does not appreciate talks; I use *un pickopp* (pick-up) and so soon as the studio loses interest I give my listeners the best operatic records."

And there you are. I did not enter into the question of licence, copy-

right or right to broadcast, but I admired the man's ingenuity and push. Perhaps in the past he had also been content with a street-organ; I did not ask him, but as the French say, it gave me "furiously to think."

Now and then in the Press you may notice a reference to some "mystery" transmitter. As a rule, a listener reports having picked up music outside the usual broadcasting hours, and on some unusual wavelength. Others, a day or so later, will also write to the editor and provide further details, following which the heading "Mystery Station" is printed in thicker type.

If, by elimination, you can satisfy yourself that it is not an official transmitter furnishing a regular daily service it is possible to narrow down the search considerably for you may take it from me that these mystery studios always have their home in a country which does not possess an organised broadcasting system.

In Europe, to-day, there are but few and you may wager that the secret transmitter will be located in either France or Belgium; in fact, the betting is Fetter Lane to a grid condenser that the culprit is to be found in France. Try it next time.

When referring to this matter I had in mind such a station as Paris Experimental Radio, which for some time has been sending out a formal programme on smartish paper with an equally important-looking printed heading. So far as I am able to gather, the studio is at Paris and the transmitter somewhere in the region of Suresnes, not far from the French capital. But, no address is given; neither is it announced during broadcasts.

I understand that the station is not authorised to work and that neither the police nor the telegraph officials have discovered its exact whereabouts.

Anyhow, you may hear its transmissions on 40.9 metres and simultaneously on 299.5 metres, the latter being a 250-watt relay of the short-wave broadcast sent out with 1 kilowatt in the aerial. It can be picked up on most evenings.

Listen for the new Trieste (Italy) transmissions on 247.7 metres (1,211 kilocycles). At the time of writing I am informed that the station will be

officially inaugurated on October 28. During the early days of its life you may be given an opportunity of hearing local programmes, but arrangements are in progress to link up Trieste with Genoa and, consequently, with Milan and Turin.

Puzzling Multiple Call

It is this multiple call given out by Signorina Rizzi of Milan and by her colleague, Maria Rosa Corsini at Turin, which puzzles so many listeners. The average fan when tuned in to "the nightingale" expects to hear a familiar call instead of which "Radio Milano, Torino e Genova" is brought to his ears.

Later, as stated, the fourth station may be added. Possibly, similarly to the *Eh-yah* (E.I.A.R.) shorthand transcription of Ente Italiano Audizione Radiofoniche, an abbreviation may be found for the Northern "Quartet" of the Italian broadcasting net.

In any case, it is essential that listeners should bear in mind that many Continental studios use the original *native* names of their cities when putting out the call and not the place names such as we are accustomed to use in English for them.

Previously in these notes I have referred to the military bugle call relayed by Cracow as an opening and interval signal, from the old St. Mary's tower in that city. Once upon a time, the sentry—he was on his lonesome!—was on duty at night when Cracow was besieged by an enemy. Hearing "noises off" the gallant soldier sounded an alarm, but was struck by an arrow before the end of the last bar. (I refer to music and not to a place of refreshment.)

Unfinished Fanfare

To-day and regularly since those medieval times the unfinished fanfare has been blown at intervals throughout the day. Up to the present, Posen relayed it as a dignified opening to its broadcasts, but in order to be independent of telephone lines it has installed in its studio a base mechanical substitute which is a colourable imitation of the real goods.

Just a small contraption consisting of an electric motor, a clock, a pump, an air-bag and a species of miniature accordion, the noises of which still thrill the ears of listeners, recalling that gallant historic episode.

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Broadcast Music of the Month

AMONG the many outstanding features of the last month's broadcasting activities has been the large number of outside broadcasts.

Correspondence has proved conclusively that these relays form the part of the programme that is most appreciated by the listener. One does not have to search very far to find the cause for this popularity.

Atmosphere

Atmosphere is one of the greatest aids to the complete enjoyment of broadcast programmes. The lack of echo that is usually associated with studio entertainments makes them appear to be an unnatural and even "forced" performance.

Concert relays from the principal hotels on Sunday evenings are the only mainstay of Sunday programmes and without them the thought of wireless entertainment on Sunday would send a shudder



Teddy Brown, xylophonist, is an artiste who has been attached to some of the most famous dance bands in Europe. His recitals on the xylophone are features of broadcast vaudeville

through many a listener. Atmosphere cannot be cultivated in the studio, so let us have more "O.B.'s."

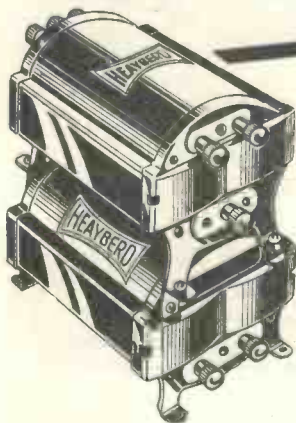
An interesting and notable relay was that heard on the occasion of the "Belgian National Programme" broadcast recently. The programme was given by the Radio-Belgique Symphony Orchestra, conducted by Rene Teller and included many popular works by Belgian composers.

Finish of the "Proms"

The "Proms" have finished. Many will be congratulating themselves on the fact that there may now be time for the B.B.C. to radiate something more to low-brow tastes; others will be sorry that the 36th series of these famous concerts has come to an end.

The last night always provides one of the best concerts to be heard

(Continued on page 424)



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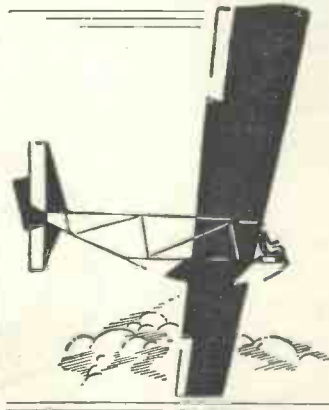
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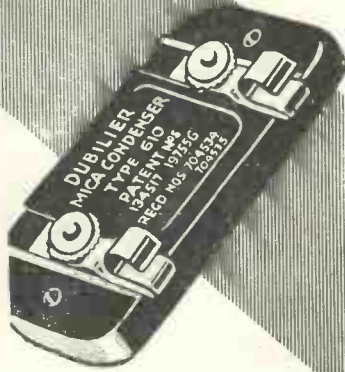
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Broadcast Music of the Month—Continued



Jack Payne and His B.B.C. Dance Band. This unconventional photograph shows the band rehearsing in the Savoy Hill studio



Arthur Rubinstein, pianist, an artiste who is broadcasting on October 29

and the programme changes very little year in and year out. Bach was predominant with his Toccata and Fugue in D minor for full orchestra; it was an excellent performance.

Other famous compositions, played equally as well, were Liszt's Second Hungarian Rhapsody and Elgar's Pomp and Circumstance March, No. 1.

Sir Edward Elgar, the greatest living English composer, is 73 years of age, set out with the intention of composing a series of six military marches. The first of the series was published in 1902; the second and third works followed shortly afterwards, and No. 4 appeared in 1907. Now, after an interval of twenty-three years, No. 5 was recently given its first performance at the Queen's Hall.



Ernest Ansermet, famous Swiss conductor of the Russian Ballet

Finest Series of Concerts Yet

It is an admirable piece of work, full of vitality and worthy of its creator. We take our hats off to Sir Edward.

The 1930-1931 winter season of B.B.C. Symphony Concerts will present to the British listener the finest series of concerts, together with performances by the very best artistes that they have yet been privileged to hear.

Among the very best at the earlier concerts we may include Guilhermina Suggia, the Italian 'cellist; Elizabeth Schumann, the eminent soprano; and Arthur Rubinstein, one of the famous pianists of the day. This will be the first time that the new B.B.C. Symphony Orchestra will have appeared at its full strength of 114 players.

(Continued on page 426)



Dr. Adrian Boult, a world-famous conductor, now broadcasting



Joseph Lewis was musical director of the B.B.C. at Birmingham



Benno Moisewitsch, pianist, a Russian artiste who will be heard this winter



Sir Dan Godfrey, the noted conductor of the Bournemouth Municipal Orchestra

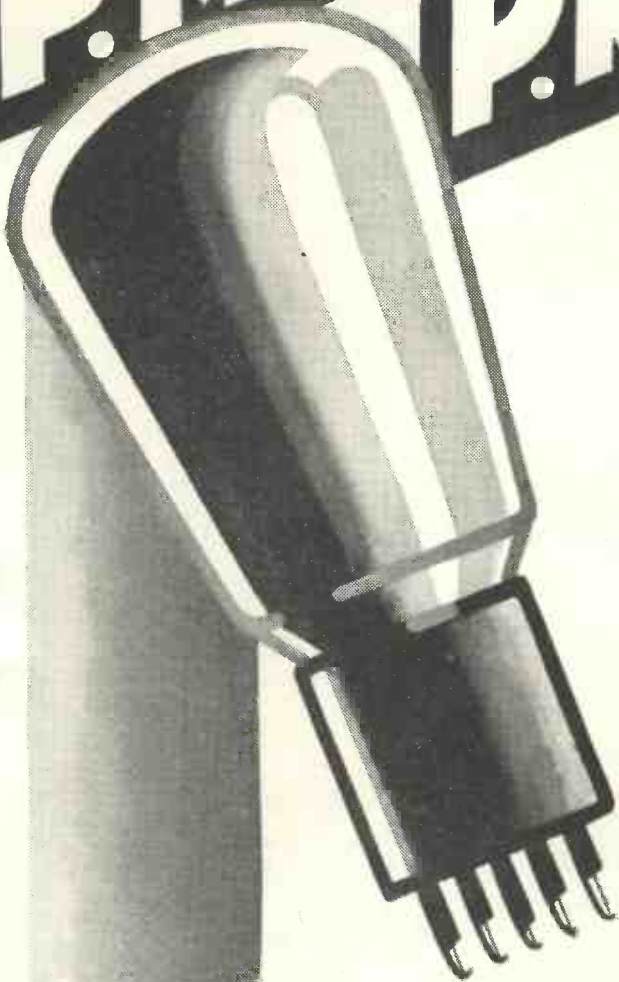


Alfred Cortot, a concert pianist, who has toured all over the world and is known to all music lovers



Isolde Menges, violinist, a popular artiste who is noted for her fine playing and technique

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Broadcast Music of the Month—Continued

Last month special mention was made of Ravel's *Bolero for Orchestra*, and it is interesting to note that this remarkable composition will be played again on November 26.

Many notable conductors will appear, among them being Sir Henry Wood, who is so well known that he needs no further introduction; Dr. Adrian Boult, the new musical director of the B.B.C.; and Ernest Ansermet.

First Appearances

Three world-famous artistes will make their first appearance before the microphone when they appear at these concerts. They are Alfred Cortot, the famous pianist; Adolph Busch, the violinist; and Pablo Casals, who is now considered to be the finest 'cellist in the world.

Great interest has been aroused by the recent denunciation of the orchestral policy of the B.B.C. by Sir Hamilton Harty, the well-known conductor, at a meeting held in connection with the Hallé



Reginald King, a clever pianist and leader of his own orchestra.

concerts at Manchester. He accuses the B.B.C. of approaching a number of the best players in the Hallé

Orchestra and offering them tempting financial inducements to go to the B.B.C.

Only two members had accepted the offers made to them.

He asked that the seventy years hard work that had been put into creating the present-day orchestra should not be spoilt. The Hallé Orchestra has provided splendid concerts for listeners all over the country during the last few seasons, and its standard of performance makes this combination rank amongst the finest in the country.

Orchestra of Wales

At the same time it is interesting to note that the B.B.C. has issued a memorandum concerning its future attitude in the matter of financial support towards the National Orchestra of Wales.

The existing arrangement, costing the B.B.C. £10,000 a year, comes to an end in March of next year and, according to the memorandum, unless a suitable solution is

(Continued on page 428)

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Broadcast Music of the Month—Continued

to future financial backing can be found, the abandonment of the orchestra is almost certain.

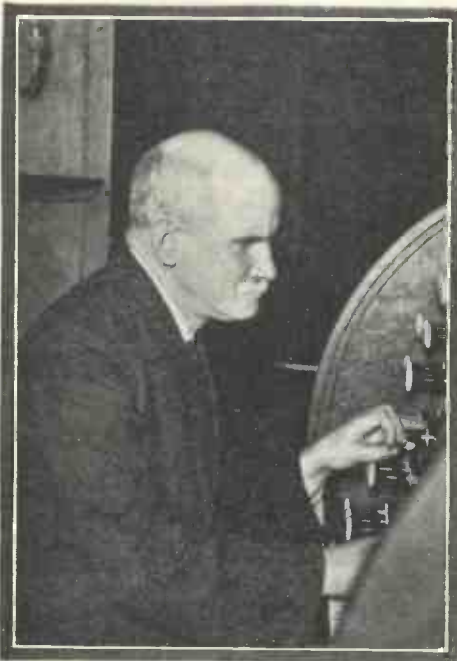
Several arrangements to avoid this catastrophe are being considered, but its whole fate apparently depends on the monetary support of the public. There is no doubt that this orchestra has fostered a musical revival amongst the Welsh people and its disbandment would be a loss.

A Good Influence at Savoy Hill

Many pleasant performances have been broadcast by the B.B.C. Orchestra from Savoy Hill. Joseph Lewis has left Birmingham and his pleasing influence is being infused into this small combination of about twenty-four strong with great success. Their programmes are light, well-chosen, and make a pleasant change from the "heavier stuff."

The Northern Wireless Orchestra, under the direction of T. H. Morrison, is still living up to its reputation. "Dancing Time," broadcast some time ago, was a good example of the popular type of programme broadcast by this orchestra.

Cinema orchestras are still a popular feature, and the



William Wostenholme, a noted blind composer, who is organist of the National Institute of the Blind, recently broadcast a special recital

excellent playing by Joseph Muscat and the Commodore Grand Orchestra, from the Commodore Theatre, Hammersmith, is well worth hearing.

Other smaller combinations that have played remarkably well include Reginald King and his Orchestra, and the new Midland Wireless Nonet, directed by Frank Cantell, who play from the Birmingham studio.

Chamber music is not as a rule appreciated by many listeners, but nevertheless some of

the finest instrumentalists are to be heard during these recitals.

An interesting concert was that heard during the latter part of September, when the International String Quartet broadcast a concert which included the seldom heard quartet by the famous French composer, Fauré.

Many fine vocalists have been heard lately and it is interesting to note that a number of old-timers are making reappearances before the microphone. Among these we may include Kenneth Ellis, an excellent bass. Other popular artistes who have been heard this month are Dennis Noble, baritone, Sinclair Logan, and Carlton Gauld.

Sopranos have been well to the fore recently and many enjoyable performances have been heard. Among the best have been Margaret Balfour, May Busby and Elsie Suddaby, who has a delightful voice.

Those who wish to hear some good solo instrumental work should study the pamphlet that has been issued by the B.B.C. concerning their 1930-1931 concerts. In this are detailed forthcoming engagements by some of the finest instrumentalists it is possible to hear.

During the last month well-known B.B.C. artistes have given their usual excellent performances. Among this group we may include Hilda Dederitch and Maurice Cole, pianists; and Isolde Menges, violinist.

Organ Recitals

Nothing outstanding has occurred in regard to organ transmissions. It has been a pleasure to hear Walter S. Vale back at All Saints, Margaret Street, and his playing of Bach's organ music is a great pleasure. Mention must also be made of the fine recitals given by Edward d'Evry.



May Busby, soprano, a member of the late B.N.O.C.

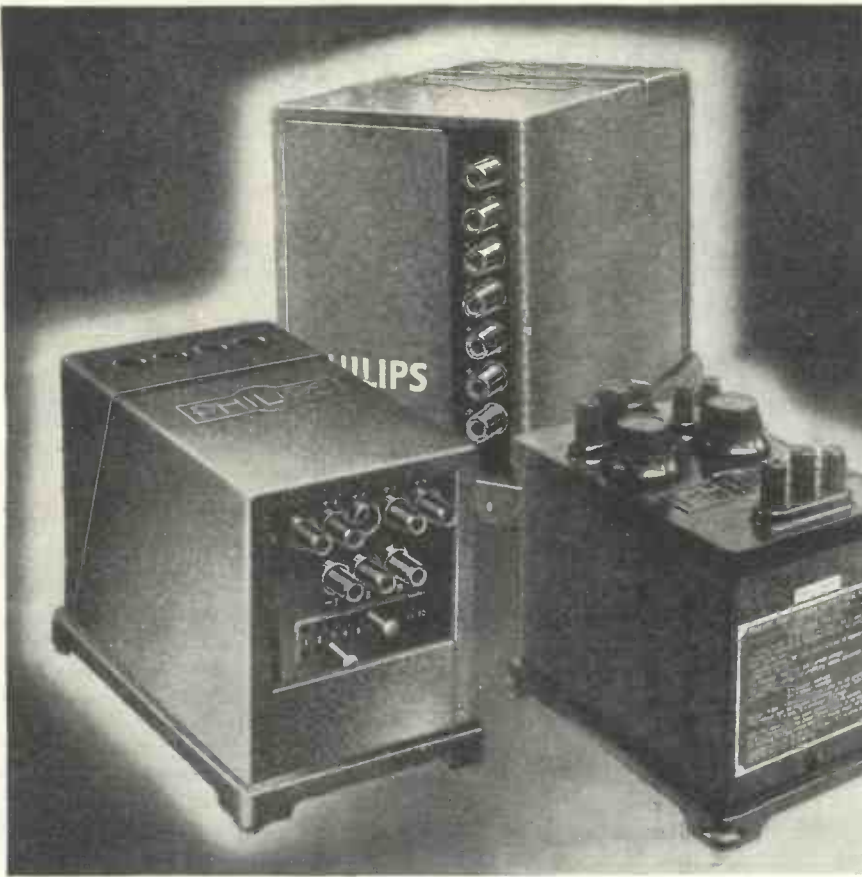


Elsie Suddaby, soprano, a popular singer of Bach's arias

Two articles in this issue that should be read by every listener are "A Change of Heart at the B.B.C.?" on page 360 and "The Truth About the Programmes!" on page 376



Frank Cantell, a brilliant violinist, who is now leader of the new Midland Wireless Nonet at the Birmingham studio



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How They Affect Static, Fading, and the Heaviside Layer.

By MORTON BARR.

aspects of radio transmission and reception.

For instance, it goes far to explain why signals are subjected to "fading" and atmospheric disturbance, and also largely accounts for the formation of the Heaviside layer—that mysterious shell of ionised air which serves to guide wireless waves over the curved surface of the earth.

The sun is immensely hot and is therefore constantly emitting electrons in much the same way as a heated valve filament. Since every electron carries with it a negative charge of electricity, the sun is in this way robbed of its normal quota of negative electricity. This is merely another way of saying that it possesses a high positive charge, which has in fact been estimated at the

enormous figure of three billion volts.

Matters are somewhat complicated by the fact that, owing to this enormous positive charge, the sun also acts as a centre of attraction for all the stray electrons and negatively-charged ions that are scattered throughout space.

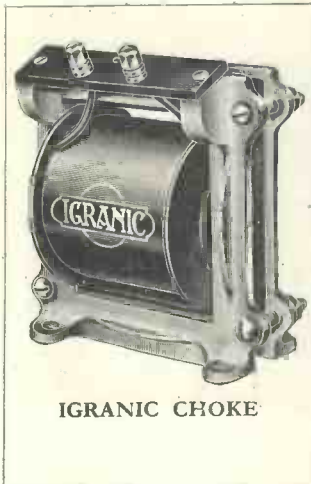
It tends to gather them in, even from regions far beyond the solar system, striving to neutralise its surplus positive charge and so attain electrical equilibrium.

Another Factor

Another factor now comes into play. As the attracted electrons move on towards the sun, they first reach the outer and cooler regions of the sun's atmosphere. Here they form a nucleus for condensation, in much the same way as a cloud of fine dust tends to condense moisture from the air into tiny raindrops.

There is no water vapour present
(Continued on page 432)

NEW IGRANIC Components



IGRANIC CHOKE

IGRANIC CHOKES

The new range of Chokes includes the following sizes :

Type C.15 Has a constant inductance of 20 henries with polarising currents up to 15 milliamps. D.C. Resistance 1,000 ohms.

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IGRANIC
Differential Condenser
·00015 mfd. each side

Type C.15	-	Price	10/6
„ C.30	-	„	15/6
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DIFFERENTIAL
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When you see the diamond trade-mark of PARMEKO, you may be sure that the apparatus on which it appears is perfect in every detail. All PARMEKO Transformers, Chokes and Eliminators are the work of expert designers, ably supported by skilled workmen and the finest materials and machinery.



There is a PARMEKO Transformer and Choke for every circuit featured in the technical press, and we also make apparatus to your own specification.

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Go now to any Radio Dealer and insist on hearing a Peter Grassmann Moving Coil Loud-speaker. You will be amazed at its sensitivity, even response, ability to handle tremendous volume, richness of tone and absolute fidelity. This Loud-speaker is suitable for 3-Valve Sets.

In case of difficulty write to us for our 18-page booklet and we will arrange a demonstration for you without obligation.



PRICES
 6v., 110v., 240v., D.C.
£4 17 6

Universal A.C.
 110 v., 125 v., 220 v.
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ROTOR ELECTRIC LTD.,
 2/3 Upper Rathbone Place, London, W.1.
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 Enables BEST PERFORMANCE of your set! No dust—interference—no long untidy leads. The improvement also of PIANO TONE BAFFLE for your Moving Coil or Cone speaker unit.

75/- to £15/15/0. De-Luxe Radio Furniture. Sent ON APPROVAL—direct from the makers.

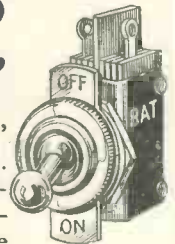


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Photographs and full particulars FREE!

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 "M.G." WORKS, BEXLEYHEATH, KENT
 Established at the beginning of Broadcasting

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Lyons "B.A.T." 750 watt Q.M.B. Switches are designed and manufactured to give efficiency. Use them confidently in High Frequency circuits, also H.T. and L.T. Battery Eliminators, Trickle Chargers, Gramophone Motor Switches, Moving Coil Loud Speaker Field Switches, Starting small Electric Motors, etc.

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used and recommended by best-known Experts & Cinema Operators. Perfect Tone, free from Scratchy Vibration. Fits needle groove without wear.

Once tried you will use no other. Sample box 100 needles, 9d. post free.

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The Stradivarius of Gramophones
 76, CITY ROAD, LONDON, E.C.1

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 T.14 PLUGS AND SOCKETS
 Socket Id. Plugs 3d. 6 colours. Name plates, 40 kinds, Id. Write for list P78.
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BECOL EBONITE (British Made)				Becol Standard Size Panels Packed in Cartons. Price 1. Ready for use.			
SIZE	R mat quality. Each	R Polished quality, one side mat. Each	Grained, polished one side, mat other. Each	SIZE	R mat quality. Each	R Polished quality one side mat. Each	Grained, polished one side, mat other. Each
	s. d.	s. d.	s. d.		s. d.	s. d.	s. d.
6x9x1/8	2 8	3 0	4 2	7x14x1/4	5 5	5 11	8 3
6x9x1/4	3 0	3 3	4 7	7x18x1/4	6 11	7 7	10 7
				7x21x1/4	8 3	8 11	12 4
				8x12x1/4	5 3	5 9	8 1
				8x16x1/4	7 0	7 8	10 9
				8x20x1/4	8 10	9 7	13 5

SOLE MAKERS: THE BRITISH EBONITE CO. LTD.

HANWELL

LONDON, W.7.

Advertisers like to know you "saw it in the 'Wireless Magazine'"

Electrons from the Sun—Continued

in the sun's atmosphere, but there are gaseous constituents such as calcium, sodium, and other metallic vapours. These are accordingly deposited upon the electron particles, and form tiny droplets which attain to a diameter comparable with the wavelength of visible light.

At this stage the surface area of each droplet has increased more rapidly than its mass. Accordingly the pressure of light, that is the outward thrust of the light rays from the sun, becomes more powerful than the inward gravitational pull towards the sun, so that the cloudy mass is thrown back again into interstellar space.

Violent Discharges

Some of these repelled electrons reach the earth, carrying their original negative charge with them. However, they form only a comparatively small portion of the total invasion to which we are subjected. Added to the regular "rain" of electrons which forms our catch of the steady thermionic emission first referred to, there are occasional violent discharges in which electrons are projected, in dense streams, from the so-called sun-spots, and bombard us directly.

There is a peculiar type of atmospheric disturbance known to wireless operators as "whistlers" because of their characteristic long-drawn-out sound. In some cases the "whistler" is sustained for several seconds, though more usually it lasts for only a fraction of a second. The longer ones are peculiarly in evidence during sun-spot periods.

Collision with Air

T. Eckersley has shown that when a stream of solar particles enters the earth's atmosphere at high velocity, it is gradually slowed up by collision with the rarefied molecules of air, and is then stopped abruptly at a height depending upon its initial velocity and the density of the air.

The sudden stop gives rise to an intense electromagnetic impulse, which is spread out by the dispersive action of the Heaviside layer so that the higher frequencies reach a receiving aerial before the lower frequencies, thus giving rise to the peculiar and long-drawn-out "whistler" effect.

Another type of atmospheric, called

the "grinder," can also be identified with the impact of solar electrons upon the atmosphere. A "grinder" starts with a grating sound, followed by a noise like that made by a handful of gravel thrown against a window, and ends up with a subdued slushy whisper or hiss.

This sequence corresponds to the initial impact of the stream of electrons, its subsequent dispersal, and final slow arrest.

On the other hand the familiar form of "static" known as "clicks" is caused by direct electrical movements from a point of high potential to one of low potential (that is, a miniature lightning discharge) occurring at comparatively low atmospheric levels.

It is interesting to note, in passing, that the intense thermionic emission which reaches the earth direct from a sun-spot area is usually accompanied by brilliant displays of the Aurora Borealis or Northern Lights.

Perhaps the most important aspect of the solar electron stream is the part it plays in the formation of the Heaviside layer. Here other factors must also be taken into consideration, such as the action of ultra-violet light rays, and the impact of radiation of still shorter wavelength (Millikens rays) which come to us from interstellar spaces far beyond the sun.

In the early days of wireless, long-distance work was at first held to be impossible because it was thought that wireless waves must travel like light in a straight line. If this were so they would leave the curved surface of the

earth after a very short distance and pass into outer space.

Experience, however, proved the contrary, and the scientists were left to find a reason for this apparent anomaly. They first postulated, and later on proved, the existence of a region of ionised air located at the outer limits of the earth's atmosphere.

The Heaviside layer, as it is now known, is a spherical shell of rarefied air surrounding the surface of the earth.

It is highly ionised, that is, it contains free ions. In other words, electrical movements can take place, so that the layer acts as a conducting medium.

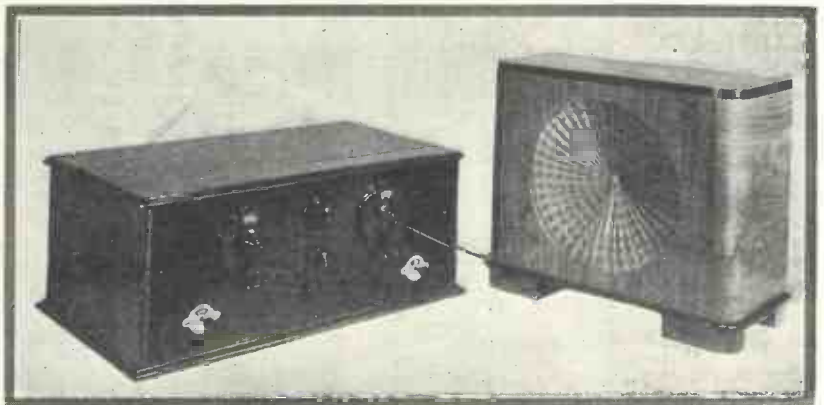
Wireless waves travel in the space between two conducting surfaces.

Conductivity of the Layer

The essential conductivity or ionisation of the layer is due (a) to the liberation of free electrons from the molecules of air by the action of ultra-violet light and cosmic radiation, and (b) to the electrons and negatively-charged ions emitted by the fierce heat of the sun and projected directly across intervening space.

Finally the elusive "fading" to which short-wave signals are specially liable is due to the action of the Heaviside layer. It is caused partly by dispersion effects, partly by phase differences between the "earth-bound" and reflected waves, and partly by changes in the plane of polarisation which occur as the signal waves are reflected from the layer back towards the earth.

A FINE INSTALLATION



Here you see the Five-point Four connected to a Hegra loud-speaker—a combination that gives particularly good results. See the special article on page 378 of this issue

Highest actual amplification!

**— due to its
abnormally low
inter-electrode
capacity**

The effective H.F. amplification per stage that can be obtained in any Screened Grid Set is largely controlled by the inter-electrode capacity of the S.G. Valve. It is well known that the lower the self capacity of the valve the greater its effective stage amplification. Important features in its design and construction permit the inter-electrode capacity of the new Cossor 215 S.G. to be reduced to the order of .001 micro microfarads. This is substantially lower than the self capacity of any other Screened Grid Valve on the market. It follows, therefore, that this new valve permits a big increase in effective amplification. In fact, results are obtained which, a year ago, would have been considered quite impracticable.



Cossor 215 S.G. 2 volts,
'15 amp. Impedance 300,000.
Amplification Factor 330.
Mutual Conductance
1.1 m.a/v. Normal working
Anode Volts 120. Positive
Voltage on
Screen approx.) **20/-**
60. Price

**THE NEW
COSSOR
215 S.G.**

G R E A T E S T E F F E C T I V E S T A G E G A I N

A. C. Cossor Ltd., Highbury Grove, London, N.5.

5939 ♡

VALVE BURN-OUTS

HOW many people burn out a set of valves in these days? Not many, I should think.

Not that we are more careful than formerly, but rather that the valves are not so easily destroyed.

The filament switch is now usually included in the positive side of the filament circuit, with the negative high tension joined to negative low tension.

Many people also include a fuse in the anode circuit supply, a flash-lamp bulb or a special fuse being fitted. Even with metal panels and bases, there should be but little fear of damaging the valves. W. JAMES.

REVERSED POLARITY

HAVE you ever connected the accumulator to the set with the polarity reversed—positive going to negative?

In a set having a screened-grid valve the mistake is usually noticed at once because of the loss in amplification.

The tuning is broadened, too, and probably the reaction is a bit different. It is a mistake easily made, but without serious consequences. J.

TO AN OLD SET

*Friend, when I dwell upon your faded beauty,
Your mottled panel and your splintered door,
I think of one who nobly did his duty
And helped to cheer me, back in '24.
I do not join with those who so defame you
For clumsiness and ugliness combined,
Nay, friend o' mine, I neither chide nor blame you—
I am not so unkind.*

*A time there was when envious old stagers
Beholding in amaze your polish high
Indulged among themselves in private wagers,
Deciding who might have you should I die.
I recollect one relative displaying
An envious glance, a stealthy sidelong look,
What time he wondered how much I'd been paying—
A mental note he took!*

*And now, old friend, good-bye—those days are ended,
For you and I must part, sad to relate;
A lot of things have lately been invented
And put you very sadly out of date.
No more will your emitters glow with glory,
No more your worn-out batteries be tapped,
For soon you'll reach the finish to your story—
In short, you're to be scrapped!*

C. P. P.

THE CABINET OLYMPIA ADMIRER



*The
"Waverley"*

"The Finest Radio-Gram Cabinet at the Show"

was the unanimous opinion of thousands of enthusiasts who saw this magnificent Camco "Waverley" Cabinet at Olympia. Beautifully made; supplied with 15 in. Baseboard; takes panels 18 in. x 7 in. Height 40 in. Speaker Compartment, 18 x 18 x 15 in. Suitable for electric or clockwork motors. Oak £5 10s.; Mahogany, £6 15s.. Polished panel drilled for new Orgola circuits, 4s. extra. Send Coupon for 24 pp Catalogue to CARRINGTON MFG. CO., LTD., 24 HATTON GARDEN, E.C.1. (Factory: Croydon).



Send Catalogue to:—

Name

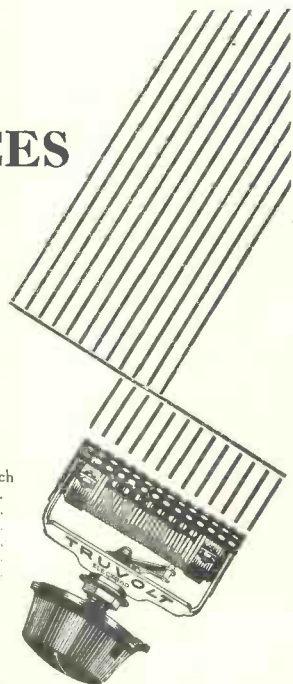
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W.M.

ELECTRAD TRUVOLT RESISTANCES

Truvolt wire-wound variable potentiometers simplify the construction of H.T. Eliminators and positively do away with all guesswork. The resistance element is a nickel alloy wire. There is no wire to rust or zinc to oxidise. Truvolt are air-cooled and give a positive and lasting service. All the units listed below are rated at 25 watts. Electrad originated the Truvolt. Note these reduced prices and ensure that the units you buy have the name Electrad stamped upon them.

Type.	Resistance Ohms.	Current Milliamperes.	8/- each
T.5	500	224	8/-
T.7.5	750	182	8/-
T.10	1,000	158	8/-
T.20	2,000	112	8/-
T.25	2,500	100	8/-
T.30	3,000	91	8/-
T.50	5,000	71	8/-
T.75	7,500	58	8/-
T.100	10,000	50	8/-
T.200	20,000	35	8/-
T.250	25,000	32	8/-
T.500	50,000	22.5	8/-

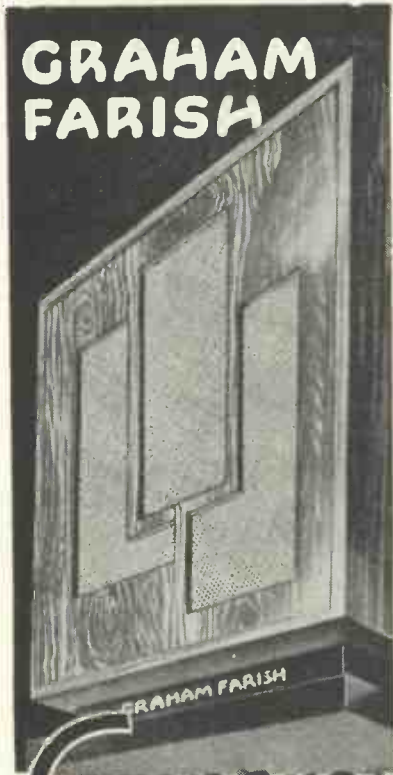


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GRAHAM FARISH

GRAHAM FARISH

Compare

—and no other Speaker gives such value at the price

We can think of no flowery adjectives to describe our new Speaker—they have all been used up on other Speakers.

We make these two claims—and you are the judge—

1. The new Graham Farish Speaker tells the truth—it never distorts.
2. Compare—and you will agree that no other Speaker offers such value at the price.

Driven by adjustable 4 pole unit, the Graham Farish Speaker is obtainable in three attractive finishes: Mahogany, Walnut or Oak, price 42/-

GRAHAM FARISH
BROMLEY · KENT

42/-

Wire Wound Resistance Links.

What's the use?

They are essential to the efficiency of all modern circuits. Incorporated in your set they stabilise the H T, eliminate Motor-boating, avoid multiplicity of H.T. tappings and prevent feed-back. The cheapest form of reliable decoupling ever devised. They actually form a flexible connecting link between components.

OBTAINABLE FROM ALL GOOD DEALERS

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List No.	Resistance	Price
600 or 1,000 ohms	12 M/A	0 9
2,000	10 "	1 0
3,000, 4,000 or 5,000	8 "	1 0
10,000	5 "	1 0
15,000 or 20,000	4 "	1 3
25,000	3 "	1 6
50,000	2½ "	1 9
60,000	2½ "	2 0
80,000	2 "	2 6
100,000	2 "	2 9

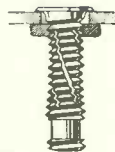
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9, 10, 11 CURSITOR STREET
CHANCERY LANE, LONDON, E.C.4
Telephones: Holborn 1072 & 7072

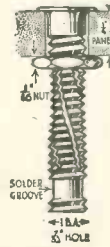
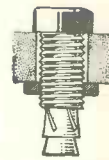
NEW CLIX LINES



No. 23. Pro. Pat.
RESILIENT SOCKET.
Short, uninsulated for thin panels. Flush mounting. **1d.**



No. 24. Pro. Pat.
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Insulated. For use with metal, or any type of panel. Red or black. **2d.**



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Long, uninsulated. For panels up to ¼ in. thick. Flush mounting. **1½d.**

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Maximum tensile strength. For use with Resilient Sockets, engraved or plain. Red or Black. **2d.**

RESILIENT SOCKETS.

The Clix revolutionary method of plug and socket contact in which the helically slotted resilient socket grips the plug, is the only means of obtaining perfect contact with every type of plug.

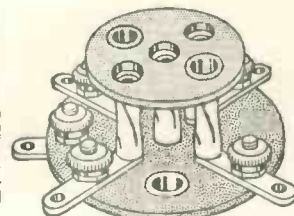
NEW "ALL-IN" TERMINAL



(Pat. Pro. Pat. Reg. Desg.)
No. 15. Incorporating the Clix Resilient Socket and Solid Pin. The only terminal completely insulated from the panel whether connected or disconnected. No spade or other tag required. Black; engraved with full range of markings. Flex portion - 4d. Panel portion - 4d. Price Complete 8d.

4/5 PIN VALVEHOLDER

No. 27. Incorporating the new Resilient Sockets. Perfect contact with solid or any other type of valve pin with easy insertion and withdrawal of valve. Sockets air-dielectrically insulated and self-aligning. Type B for Baseboard mounting. With screw terminals - 10d. Without screw terminals 8d.



No. 27. Pro. Pat. Reg. Des.
WRITE FOR COMPLETE ILLUSTRATED LIST.

LECTRO LINX, LTD., 254 VAUXHALL BRIDGE RD., S.W.1

Advertisers like to know you "saw it in the 'Wireless Magazine'"

CATALOGUES WE HAVE RECEIVED—

FROM the British Ebonite Co., Ltd., of Nightingale Road, Hanwell, W.7., an eight-page price list of Becol panels and coil formers.

Burddebt Wireless (1928), Ltd., of Eastnor House, Blackheath, S.E.3., have issued an eight-page booklet on their A.C. radio gramophone (publication S7.).

From Burne-Jones & Co., Ltd., of 296 Borough High Street, S.E.1., three folders—"Magnum Universal Three and Short-wave Converter" (six pages), "Magnum A.C. Mains Receivers and Portable SG4" (eight pages), and "Magnum Radio Components" (twelve pages).

A twenty-four-page catalogue of Camco cabinets from Carrington Manufacturing Co., Ltd., of Sanderstead Road, South Croydon.

"Radio Labels" is the title of a four-page price list received from the Cell-grave Co., of 6 and 8 Kent House Lane, S.E.26.

From E. K. Cole, Ltd., of Ekco Works, Southend-on-Sea, four folders—"Ekco All-electric Radio Receivers," six pages (NS2); "H.T.—L.T. Rectifier and Trickle-charger Units," six pages (HTU3); "All-power Supply Units," eight pages (APU4); and "Ekco-lectrify Your Portable!," six pages (PU5).

An eight-page folder on radio gramophones from the Columbia Graphophone Co., Ltd., of 102-108 Clerkenwell Road, E.C.1.

A. C. Cossor, Ltd., of Highbury Grove, N.5., have sent us a forty-eight-page catalogue of Cossor New Process valves.

"Edison Bell Radio, 1931" is the title of a 28-page catalogue received from Edison Bell, Ltd., of Glengall Road, S.E.15.

All Ediswan apparatus for the new season is described in a forty-page catalogue issued by the Edison Swan Electric Co., Ltd., of 123-5 Queen Victoria Street, E.C.4.

Two twelve-page booklets have been received from the Ever Ready Co. (Gt. Britain), Ltd., of Hercules Place, Holloway, N.7.; one deals with batteries and accumulators, and the other with torches and lamps.

"The Construction of Supply Units for Radio Receivers" is the title of a fifty-six-page booklet (W522) received from Ferranti, Ltd., of Hollinwood, Lancashire, who have also sent an eight-page catalogue of mains components.

Three booklets from the General Electric Co., Ltd., of Magnet House, Kingsway, W.C.2.—"Osram Wireless Guide" (fifty-six pages), "Osram A.C. Mains and Rectifying Valves" (twenty-eight pages), and "Osram Valves for Power Amplification" (40 pages). We have also received an 8-page folder describing Magnet high-tension batteries.

Five publications from Graham Amplion, Ltd., of 26 Savile Row, Regent Street, W.1—a four-page folder (WL50) on the Amplion portable, four-page folder (WL52) on the mains two-valver, four-page loud-speaker folder (WL53), four-page folder (WL54) on the two screened-grid cabinet set, and a 36-page booklet (WL56) dealing with all the sets and loud-speakers.

An eighteen-page stock list of Higgs' motor and dynamos, from Higgs' Motors, of Witton, Birmingham.

Many readers will no doubt desire to have copies of some of these catalogues for reference. Application should be made direct to the manufacturers concerned, mention being made of WIRELESS MAGAZINE. It should be clearly understood that these catalogues cannot be obtained under the special "In Tune with the Trade" scheme, full details of which will be found elsewhere.

A four-page folder describing the Sound Service Home Recorder from Hillman Bros., of 123-125 Albion Street, Leeds.

From Louis Holzman, of 37 Newman Street, W.1., an eight-page leaflet describing Hydra condensers.

Lissen, Ltd., of Lissenium Works, Worple Road, Isleworth, Middlesex, have sent us a sixteen-page booklet dealing with their valves, which have recently been reduced in price by 50 per cent.

Lewcos radio products for 1930-31 are fully described in a seventy-two-page catalogue received from the London Electric Wire Co., and Smiths, Ltd., of Church Road, Leyton, E.10. The same firm is also issuing a sheet of four blue-prints of recommended circuits using Lewcos parts.

A new sixty-six-page booklet on Marconi valves, entitled: "When Buying Valves—Remember!" from the Marconiphone Co., Ltd., 210-212 Tottenham Court Road, W.1.

"The Book of the M.L. Rotary Transformer," sent by the M-L Magneto Syndicate, Ltd., of Victoria Works, Coventry.

"Musical Recreation," a four-page folder describing the M.P.A. radio gramophone from M.P.A. Wireless (1930), Ltd., of 62 Conduit Street, W.1.

From Chas. A. Osborn, of Regent Works, Arlington Street, New North Road, N.1., a six-page folder of wireless cabinets.

From Perfectavox, Ltd., of Alexandra Works, Yeadon, Leeds, a twelve-page folder dealing with Perfectavox sets.

"The Great New Radio," a fourteen-page booklet printed in photogravure, from Pye Radio, Ltd., of Paris House, Oxford Circus, W.1.

From Radio Service (London), Ltd., of 105 Torriano Avenue, N.W.5., an eight-page folder, entitled: "Wireless Accumulator Troubles Ended!" describing a special battery service.

An eight-page folder about Ebonart panels from Redfern's Rubber Works, Ltd., of Hyde, Cheshire.

From Rotor Electric, Ltd., of 2-3 Upper Rathbone Place, W.C.1., a sixteen-page booklet, "Grassman Moving-coil Loud-speakers," and a price list of Rotorohm variable resistances.

"Six-Sixty Radio Valves and Equipment" is the title of a forty-four-page loose-leaf booklet, including a six-page folder about the conversion kit, sent us by the Six-Sixty Radio Co., Ltd., of 17-18 Rathbone Place, Oxford Street, W.1.

A six-page folder entitled: "Squire Sylphone Moving-coil Loud-speaker," from Frederick Squire, Ltd., of Leswin Place, Stoke Newington, N.16.

Eddystone short-wave apparatus is dealt with in a ten-page folder received from Stratton & Co., Ltd., of Bromsgrove Street, Birmingham.

A thirty-four-page booklet on Triotron Valves from Triotron Radio Co., Ltd., of 91, Great Russell Street, W.C.1.

From Turner & Co., of 54 Station Road, New Southgate, N.11, two publications—a twenty-page booklet on Tunewell coils and a six-page folder on Tunewell loud-speakers and units.

Westinghouse metal rectifiers are fully described in "The All-metal Way," a 44-page booklet issued by the Westinghouse Brake and Saxby Signal Co., Ltd., of 82 York Road, King's Cross, N.1.



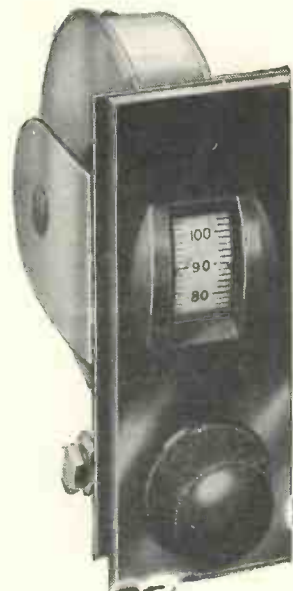
PRECISION INSTRUMENTS

Accurate in workmanship and faultless in design and finish, J.B. Precision Instruments will add to the efficiency of any receiver.

Of particular interest is the new J.B. "Chassimount" the very newest and most effective method of one-dial control for multi-valve sets.

Another new J.B. Precision Instrument is the Differential Condenser, for smooth reaction control. The capacity change is the same for both halves, and is constant throughout the range.

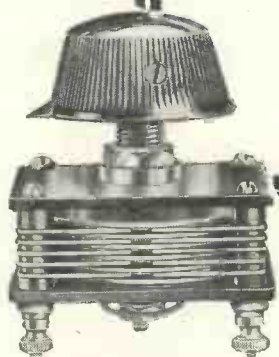
Choose your components from the J.B. Precision range. There is a model for every purpose.



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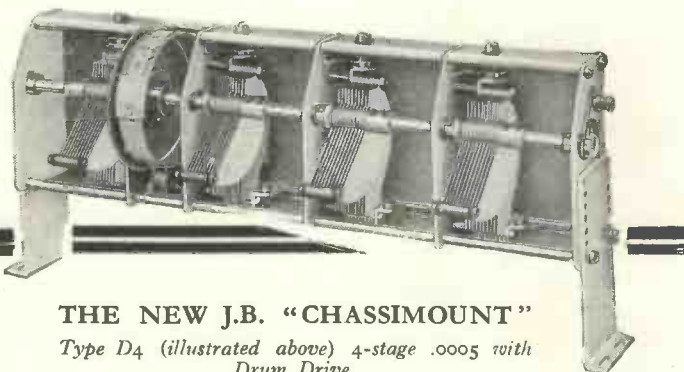
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THE HYPERDYNE RECEIVER

IT is some time now since there was any radical change in our methods of receiving wireless signals. In fact the introduction of the screened-grid valve really marks the principal development of any magnitude during the past few years.

Feeling that there was room for some novelty in design, I have carried out experiments in various directions at Elstree for many months past.

Value of the Super-het

The increasing power of transmitting stations in this country and the congestion in the ether generally has turned the attention of many people towards the old super-heterodyne system. As readers know, this comprises an oscillating detector, which changes the frequency of the received signal into some much lower frequency, corresponding to a relatively long wavelength of several thousand metres.

The principal amplification is carried out at this frequency, after which a second detector is employed, converting the signals into ordinary

Some Notes on a New Type of Receiver Designed by J. H. Reyner, B.Sc., A.M.I.E.E.

speech currents which are suitably amplified and applied to the loud-speaker.

The system is one which has much to commend it, but it has several serious disadvantages from the point of view of the British user.

The first of these lies in the two wavebands to be received. It is difficult to choose the intermediate frequency so that the results are equally satisfactory both for the medium band and for the long waves. The second difficulty arises from the fact that every station tunes in two places. This is because there are two possible settings of the oscillator frequency which, combined with the incoming signal, will give the particular intermediate frequency required.

The effect of this will readily be appreciated. It is quite possible for what we may call the "first" setting of the oscillator which corresponds to the station one requires to

coincide approximately with the "second" setting for an interfering station, working on a relatively near-by wavelength.

This results in what is known as "second-channel interference," and in the present overcrowded state of the ether this is highly objectionable.

There are other minor disadvantages, such as the tendency of the intermediate stage to pick up signals from long-wave high-power commercial (morse) stations and the fact that the intermediate-frequency transformers happen to be somewhat expensive.

Sideband Cut-off

Perhaps an important aspect of this last question is the sideband cut-off, for it is difficult, if not impossible, to make long-wave intermediate transformers have a resonance curve which will preserve the 10-kilocycle band of frequency required for satisfactory quality, and will still give really sharp tuning, so that the required order of selectivity is obtained.

(Continued on page 440)

ARE YOU ON D.C. ?



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By far the biggest output. Gave 50% increased reception when used with a 7-valve set taking over 50 m/a. Absolutely steady output without any trace of mains hum. 18 different H.T. voltages. Gives 130 m/a at 100 volts. Trickle charger for 2, 4 or 6 volts.

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ONE-VALVE SETS

All these 1s. each, post free.

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Music Marshal (D, 2 Trans) .. WM190
Gramo-Radio D.C. Three (SG, D, Trans) .. WM196

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Five-Point Three (SG, D, Trans) .. WM212
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All-purpose Short-wave Three (D, RC, Trans) .. AW147
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Binowave Three (D, RC, Trans) .. AW172
Clarion Three (SG, D, Trans) .. AW175
Local and Continental Three (HF, D, Trans and D, RC, Trans) .. AW189
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Music Player (HF, D, RC, Trans) .. WM144
Arrow Four (SG, HF, D, Trans) .. WM154
1930 Monodial (zSG, D, Trans) .. WM158
All-electric Four (SG, D, RC, Trans) .. WM162
Outpost Four (SG, D, 2 Trans) .. WM165
Brookman's Four (zSG, D, Trans) .. WM174
Transportable Four (SG, D, 2RC) .. WM180
Super Q (SG, D, 2 Trans) .. WM189
Lodestone Four (HF, D, RC, Trans) .. WM193
Searcher's Four (SG, D, RC, Trans) .. WM194
Invitation Four (SG, D, RC, Trans) .. WM200
Reginal Band Pass Four (SG, D, RC, Trans) .. WM211
★ Five-Point Four (SG, D, RC Trans) .. WM216
Facility Four (HF, D, 2RC—Q-coil) .. AW154
Broadcast Picture Four (HF, D, 2RC) .. AW163
The Orchestra Four (D, RC, Push-pull) .. AW167
All Europe Four (zHF, D, Trans) .. AW173
Stability Four (HF, D, RC, Trans) .. AW182
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All-wave Lodestone Five (HF, D, Push-pull) .. WM146
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"A.W." Improved Linen Diaphragm Speaker .. AW248 1/-

Each blueprint shows the position of each component and every wire and makes construction a simple matter. Copies of "Wireless Magazine" and of "Amateur Wireless" containing descriptions of all these sets can be obtained at 1s. 3d. and 4d. respectively, post free. Index letters "A.W." refer to "Amateur Wireless" sets and "W.M." to "Wireless Magazine" sets.

Send, preferably, a postal order (stamps over sixpence in value unacceptable) to

Wireless Magazine

BLUEPRINT DEPT.
58/61 FETTER LANE,
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QUERY RULES

How to Make the Best Use of the "Wireless Magazine" Information Bureau When You Are in Difficulty

Those readers who send queries to the WIRELESS MAGAZINE must observe the simple rules connected with the service; otherwise replies are delayed and trouble is caused all round. Their proper observance greatly facilitates the work of the staff at the WIRELESS MAGAZINE offices and delays are obviated.

In the first place, no questions can be answered personally or by telephone. Were we to answer all the inquirers who call at the "W.M." offices personally the whole time of the staff of the Information Bureau would be taken up by visitors. The same applies to telephone calls.

All inquiries must be made by letter, therefore, so that every reader gets exactly the same treatment.

Each inquiry, which must consist of not more than two questions, must be accompanied by the coupon always to be found on the inside back cover and a postal order for 1s.

A stamped addressed envelope should also be included and the whole sent to: Information Bureau, WIRELESS MAGAZINE, 58-61 Fetter Lane, London, E.C.4.

It greatly facilitates the answering of the large number of questions on all radio subjects received every day if correspondents write on only one side of the paper and are as concise as possible.

Practical queries should contain all the relevant information that may help to solve the problem. It is often important, for instance, to know exactly what valves are in use and what is the high-tension supply.

In short, give every piece of information you can in the most concise way. Then we can help you without delay.

DO NOT FORGET THE COUPON!

THE HYPERDYNE RECEIVER — *Continued*

It occurred to me, some time ago, that if one could use an intermediate frequency *higher* than the ordinary broadcast frequency instead of lower, some of these difficulties might be overcome. Experiments were therefore made to convert normal superheterodyne practice into high-frequency working, and after some of the initial difficulties had been overcome the results were extraordinarily promising.

Points About the New System

Briefly the system finally adopted is as follows:—

1.—A frequency of the order of 1,950 kilocycles is adopted for the intermediate stages, corresponding to a wavelength of between 150 and 160 metres.

2.—The intermediate-frequency transformers at this wavelength are exceedingly simple to construct, and are cheap to produce.

3.—With the arrangement adopted there is *no second channel*. There is only one possible tuning point to each station.

4.—This being so there is no need for additional high-frequency amplification, and the arrangement is a simple two-dial control, only one of which is really critical.

5.—The arrangement works on a normal aerial system. A frame aerial is not necessary.

6.—The arrangement receives long, medium, and ultra-short waves with equal facility.

7.—The intermediate stages are capable of being tuned while the receiver is in operation, so that the set can always develop its maximum efficiency.

This brief review will serve to show the possibilities of this new system. It has been well tested, and a receiver embodying the new principle will be described next month.

**LOOK OUT FOR
DETAILS OF THE
NEW HYPERDYNE
RECEIVER IN THE
DECEMBER
ISSUE,
PUBLISHED ON
THURSDAY,
NOVEMBER 20**

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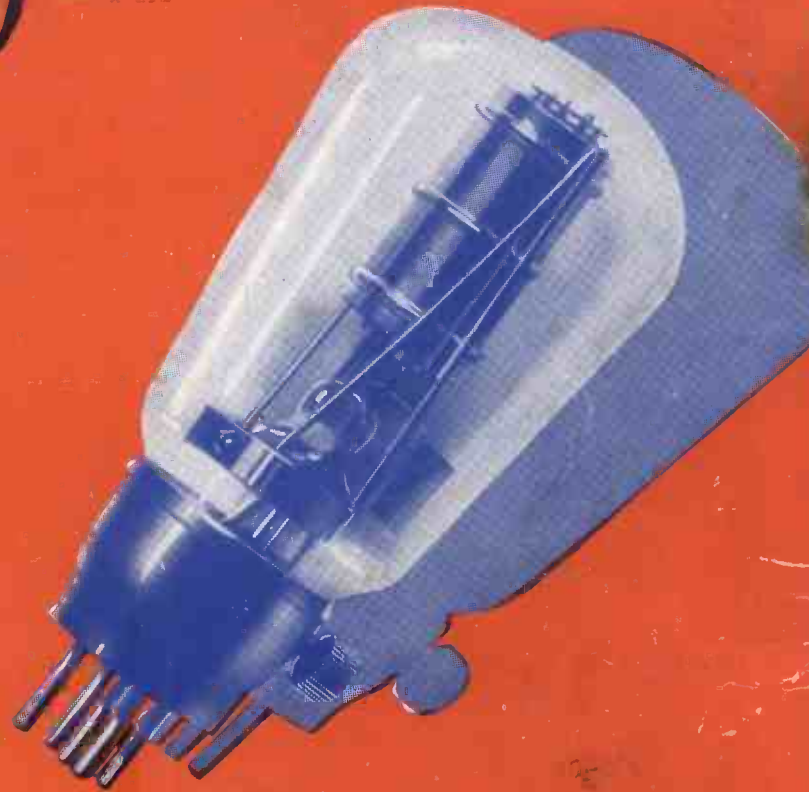
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H.T. Volts . . .	200	200	200	200	250
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Magnification	1,200	35	10	5	—
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Mutual Conductance	3	2.6	3.75	2.5	2.2
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