Amateur Wireless November

NEW CENTURY SUPER—MO

EXTRA SUPPLEMENT-GUIDE TO

Amateur Wireless

and Radiovision

Thursday

3d

Vol. XXI. No. 543

Saturday, November 5, 1932

The NEW CENTURY SUPER

FULL DETAILS

BRINGS IN A RING OF STATIONS

Registered at the G.P.O. as a Newspaper

5,000,000 WIRELESS ...IS NEED BATTERIES!

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The Demand for Wireless Batteries is increasing by LEAPS AND BOUNDS! According to the latest statistics only one in every three houses is equipped with electricity and so it is easy to see what an enormous demand there must be for High Tension Batteries. If you are a Wireless Enthusiast you know also that you and millions of others are constantly on the look-out for BETTER Batteries.

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Here is a way in which YOU can meet the demand for BETTER Batteries, and Profit Financially—make **them yourself in your Spare Time by means of our Patented Method and Formula!** By making your own batteries you can SAVE money—by supplying your friends and others you can MAKE money; and you can make up to £300 a year per Licence!

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You may know nothing about Wireless or Electricity—**it doesn't matter in the slightest!** We will tell you how to do it—FREE. **After receiving our instructions you can start right away to manufacture!** And the work is intensely interesting, as well as easy; more fascinating than making your own Wireless Set! The saving is huge—**an average worker can complete a 60-volt H.T. Battery in 2 hours, at a cost of 2s. 3d. approximately!** Compare this with Shop Prices!

Many People *LIKE YOU* Have Doubled Their Incomes!

MAKE YOUR FRIENDS WIRELESS BATTERIES AND MAKE MONEY!

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One Man Earned £960 in Spare Time

your friends know of them they will want some, too! Thus, you can begin to build up a Profitable Spare-Time Business and reap a Golden Harvest from the Wireless and Electrical Market. Many men are already making comfortable EXTRA incomes in this Pleasant, Easy Way.

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The dull, long winter evenings are here. How better can you employ them than in making money in this Fascinating, Interesting way? Enter this profitable employment NOW and earn £££'s before Xmas.

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THE ENGLAND-RICHARDS CO., LTD.
1223 King's Lynn, Norfolk.

Sir,—Please send me at once, and FREE, full details as to how I can Make Money at home in my spare time. I enclose 2d. stamp for postage.

Print your name and address boldly in capital letters on a plain sheet of paper and pin this Coupon to it.

"*Amateur Wireless*," 5/11/32.

● SEND FOR THIS BOOKLET—USE THE COUPON BELOW

The Famous WEARITE OT2 INTERMEDIATES specified for the NEW CENTURY SUPER

The very heart of a super-het. is in its intermediates—upon them the set's efficiency depends—and the designers have specified Wearite.

Prompted by the experience of past triumphs, including the original "Century Super"—with a knowledge of the careful and exclusive tests which every OT2 undergoes before release—the designers pinned their faith in the perfect functioning of their set to these coils. To ensure results as the authors intended you *must* use the Wearite OT2's.

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THE WEARITE STICK-ON SELECTIVITY CONTROL AND AERIAL LEAD-IN fits any window—no holes—no tools. For use with any receiver.

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With aerial anchoring block 1/6

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One 50,000-ohm Potentiometer (Q.V.C.) combined with switch (G.40). Price complete, 6/6
Eight Four-pin and One Five-pin Valve Holders (S.1). Price ... ... 1/- each
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One 20,000-ohm Resistance (2 watt) (R.D.). Price 2/-
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THE WEARITE INTERMEDIATE COILS

PRICE 10/6 each

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Please send me a copy of your latest illustrated Booklet (A.1) dealing with the full range of your components.

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at a *fraction* of the cost

Perhaps your radio reception is on the downward path. Fewer stations; less volume; worse tone. Your set is not to blame. Your set is as up-to-date to-day as it was a year ago. It's your valves; they are not pulling their weight. Renew your set throughout with Tungsram Valves. Make it as good, or even better than when you bought it, or built it. More stations; increased volume; perfect tone. But it must be Tungsram! For this reason; Tungsram Valves are the most efficient that modern science has so far produced. Tungsram Valves are used by 61 British set manufacturers. But they cost very much less than the price you're used to paying. You cannot get Tungsram quality in any other valve, even by paying twice the Tungsram price!
Insist on Tungsram. Don't be put off. Go to a Tungsram dealer; take nothing but Tungsram!

RENEW YOUR SET WITH

TUNGSRAM

BARIUM VALVES

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FOR EVERY SET — *there's a*
PILOT AUTHOR KIT
CASH — C.O.D — or H.P.

EVERYTHING RADIO
CASH, C.O.D. or H.P.

CARRIAGE PAID TO YOUR DOOR

COSSOR MELODY MAKER MODEL 334 with Metallised Variable-mu S.G. and Detector Valves, Power Valve and Cabinet. Cash Price, £6/7/6. Balance in 11 monthly payments of 11/10. — Send 10/- only

LISSEN "SKYSCRAPER 3." Chassis model with (Lissen) S.G., Detector and Pentode valves. Cash Price £4/9/6. Carriage paid. — Send **8/3** only

Balance in 11 monthly payments of 8/3.

LISSEN "SKYSCRAPER 3" KIT with Lissen Valves, Walnut Cabinet and special Balanced Armature Loudspeaker. Cash Price £6/5/0. Carriage Paid. Balance in 11 monthly payments of 11/6. — Send **11/6** only

READY RADIO "METEOR" S.G.3. Three-valve screened-grid receiver, with valves, cabinet, and permanent-magnet moving-coil speaker. Covers short, medium, and long waves without coil changing. Cash Price £8/17/6. Balance in 11 monthly payments of 16/3. — Send **16/3** only

READY RADIO KENDALL-PRICE S.G.4. S.G., Detector, L.F. and Power. Complete kit less valves and cabinet. Cash Price £4/6/6. Carriage Paid. Balance in 11 monthly payments of 8/-. — Send **8/-** only

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ATLAS ELIMINATOR. Type A.C.244. Three tappings. S.G., detector and power. Output: 120 volts at 20 m/a. Cash Price £2/19/6. Carriage Paid. Balance in 11 monthly payments of 5/6. — Send **5/6** only

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GARRARD INDUCTION GRAMOPHONE MOTOR. For A.C. mains. Model 202. Mounted on 12-inch nickel motor plate with fully automatic electric starting and stopping switch. Cash Price £2/10/0. Carriage Paid. Balance in 11 monthly payments of 4/7. — Send **4/7** only

GARRARD JUNIOR "B" SPRING MOTOR. Complete with turntable. Cash Price £1/13/-. Carriage Paid. Balance in 5 monthly payments of 6/1. — Send **6/1** only

UNIVOLT ELECTRIC UNIT. Standard unit with Univolt pick-up, automatic start-and-stop, for A.C. mains, 110/250 v. Cash Price £5/15/6. Carriage Paid. Balance in 11 monthly payments of 10/6. — Send **10/6** only

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IMPORTANT *Parts, Kits, Miscellaneous Components, Finished Receivers or Accessories for Cash, C.O.D. or H.P. on our own system of Easy Payments. Send us a list of your wants. We will quote you by return C.O.D. orders value over 10/- sent carriage and post charges paid.*

NEW CENTURY SUPER

As described in last week's issue of AMATEUR WIRELESS

KIT A
DELIVERED CARRIAGE PAID
ON FIRST PAYMENT OF **12/9**
Balance in 11 monthly payments of **12/9**

These are the Parts the Author used

	£	s.	d.
1 J.B. Unitune 2 twin-gang .0005 variable condenser		18	6
1 J.B. Nugang semi-screened single .0005 condenser		9	6
1 Bulgin 50,000-ohm potentiometer and switch, type V836		5	6
3 Wearite intermediates, type OT2, with pigtails	1	11	6
1 Lissen ganged oscillator and band-pass coils with switch	1	10	0
8 Telsen four-pin and one five-pin rigid type valve holders		7	0
2 Dubilier 1-mfd. and one .02-mfd., type 9200, fixed condensers		7	6
3 Lissen fixed condensers, .0001, .0002, and .001 mfd.		1	6
1 Graham Farish 1-meg. and one 2-meg. grid-leak		2	0
1 Telsen coupling unit, 10-1 ratio		12	6
9 Clix marked wander plugs		1	1½
2 Belling & Lee marked spade terminals			4
1 Ready Radio fuse and holder		1	0
2 Graham Farish Ohmite 20,000-ohm and 50,000-ohm resistances		3	0
1 Peto Scott aluminium bracket			6
Connecting wire, screws, sleeving, etc.		1	6
KIT "A" CASH or C.O.D.	**£7.0.0**		
Peto-Scott 16 in. by 8 in. oak-faced ply panel ready drilled		2	0
Peto-Scott 16 in. by 10 in. foil-covered ply baseboard		2	6

COMPLETE PILOT AUTHOR KIT PRICES

KIT "A" Cash or C.O.D. Carriage paid. **£7.0.0**
Complete kit of Author's first specified components as listed, excluding panel and foil-covered baseboard. *or 12 monthly payments of* 12/9

KIT "B" Cash or C.O.D. Carriage Paid. **£11 5 6**
As Kit "A" WITH oak-faced ready-drilled panel, foil-covered baseboard and valves. *or 12 monthly payments of* 20/9

KIT "C" Cash or C.O.D. Carriage paid. **£12 0 6**
As Kit "A" WITH oak-faced ready-drilled panel, foil-covered baseboard, valves and Peto-Scott New Century table model cabinet. *or 12 monthly payments of* 22/3

ANY PARTS SUPPLIED SEPARATELY
Cash or C.O.D. orders over 10/- sent Carriage and C.O.D. Post Charges Paid.

KIT BITS
Selected C.O.D. Lines. You simply pay the postman — we pay all post charges.

	£	s.	d.
Set of 6 specified Mullard valves		4	1	0
Peto-Scott 16 in. by 8 in. ebonite panel, ready drilled			4	6
Table cabinet specified with ply panel and baseboard		1	1	0
Camco "Windsor" cabinet ready drilled for panel controls		2	3	0
1 Rola F5 P.M.P. moving-coil speaker		1	12	6
J.B. Unitune 2 .0005 twin-gang condenser			13	6
J.B. Nugang semi-screened .0005 condenser			9	6
Set of 3 Wearite OT2 intermediates		1	11	6
Lissen ganged oscillator and band-pass coils		1	10	0

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West End Showrooms: 62 High Holborn, London, W.C.2. Telephone: Holborn 3248

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ADDRESS .....
..... A.W. 5/11/32.

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Amateur Wireless & Radiovision

BRITAIN'S LEADING RADIO WEEKLY
FOR CONSTRUCTOR, LISTENER & EXPERIMENTER

EDITOR: BERNARD E. JONES. TECHNICAL EDITOR: J. H. REYNER, B.Sc., A.M.I.E.E. RESEARCH CONSULTANT: W. JAMES. ASSISTANT EDITOR: H. CORBISHLEY.

NEWS & GOSSIP OF THE WEEK

ART SUPPLEMENT NEXT WEEK!

IN presenting free with next week's issue a Special Art Supplement beautifully printed by the gravure process, we shall be breaking new ground, for, to the best of our belief, gravure—more properly rotary-gravure—has not up to the present been used in the production or embellishment of any wireless periodical in this country. Our supplement in many ways is an achievement. Please turn to page 979 for the Editor's own announcement of Next Week's Free Gift, and please see that you get in your order at once for your copy. A word to your friends would not come amiss, and we should be grateful for it. Further, note the important foot-line to this page.

THE "CENTURY"

And an Extra Supplement

THIS issue contains further interesting details of our new set which is out to beat all records—the "New Century Super." This set is such a station-getter that we claim it will get any station you want. The Supplement Guide to 100 Best Stations, included this week, will help you to log the foreigners; in addition, there is a further eight-page supplement for beginners.

DEFINITE EMPIRE SERVICE PLANS

Details of the Five Entertainment Periods

AS we have already mentioned, the new Daventry Empire short-wave stations will make their bow to Empire listeners on Monday, December 19. For the present the aim is to serve each of the five zones with a two-hour programme. This will be given at 9.30 and 11.30 a.m. for Australia, 2.30 to 4.30 for India, 6 to 8 p.m. for Africa, 8.30 to 10.30 p.m. for West Africa, and 1 to 3 a.m., next morning, for Canada.

A directional "mike" designed by the National Broadcasting Co. engineers in America. The bowl-shaped reflector is here being used in an opera broadcast

FEATURES YOU SHOULD NOT MISS

Building the "New Century Super."

Using Your Set on the Short Waves.

Are Dual Speakers Worth While?

ALSO—

Station-logging Guide, "100 BEST STATIONS," and Eight-page Special Supplement for Beginners.

MORE NEWS BULLETINS

FOR the new Empire service from the Daventry stations there will be five news bulletins in the twenty-four hours, the nature of the news changing from time to time as fresh news "happens." In addition, there will be a weekly "news letter," containing all the important news of the week, broadcast each Sunday.

INSTALLING THE ORGAN

ALREADY we see that walls are being knocked down to take the new giant organ at Broadcasting House. It will have no less than 2,362 pipes, divided into thirty-one racks. There will be 150 draw stops—which need not be drawn, only lightly touched. Lights will show when the stops are in action. It will be ready some time next year.

DANCE MUSIC FROM ALL STATIONS

AFTER December 19 all the relays will broadcast the late dance music programme every night until midnight. This is another move in the general policy of filling up the gaps that now exist in various parts of the B.B.C. programmes. No extra staff will be needed, but the engineers will have to work an hour longer.

NEXT WEEK: HOME SET BUILDING ART SUPPLEMENT

NEWS & GOSSIP OF THE WEEK—*Continued*

THOSE RECORDED PROGRAMMES

IN readiness for the B.B.C.'s representative who is to start on a tour of the Empire on November 11, a number of programmes have been recorded at Broadcasting House for him to take in his luggage as examples of the kind of material which will be available in connection with the Empire broadcasting scheme. These disc records are intended for use by outlying stations where the provision of original programmes is impossible.

SOME "HIGH SPOTS"

THE recorded programmes now ready which will be submitted to local stations overseas, are mostly of an hour's duration and are as follows: (1) "Ellen Vannin Through the Ages"—a Manx National Programme, with music based on traditional airs; (2) "Cakes and Ale"—old English songs and choruses; (3)—"My Adventure at Chislehurst"—A. J. Alan; (4) Topical Half-hour—a selection of items of topical interest linked by music; (5) Vaudeville programme—Lily Morris, Bransby Williams, Charles Coborn and others, with Henry Hall conducting the B.B.C. Dance Orchestra; (6) Scottish programme—Saturday evening at the Manse, traditional music, pipes, etc.; (7) A Pageant of English Life, 1812-1933 (as yet untitled)—industrial conditions, the Diamond Jubilee, the Great War, etc.; (8) "Songs from the Shows"—British musical comedy successes, old and new; (9) "Postman's Knock"—British musical comedy specially written for broadcasting; (10) "Christopher Wren"—biographical play by Whitaker-Wilson; (11) Children's Hour programme—"Robin Hood and the Sorrowful Knight," traditional songs and choruses, written round the Robin Hood legend.

ANOTHER NON-STOP

ANOTHER hour of "non-stop" variety will be broadcast on November 7. It will include Harold Scott ("the man with a wink in his voice"), Ray Wallace, Cammeyer's Zither Banjo Society, Richard Matthews, Clarice Mayne, the Maestro Singers, and John Charlton. S. Kneale Kelley will conduct the B.B.C. Theatre Orchestra.

NEGATIVE PICTURES!

DURING one of the recent half-hour television broadcasts from Broadcasting House all the vision signals were sent out the wrong way round. Amateurs equipped with televisors got negative instead of positive pictures. The amusing part is that the B.B.C. check receiver did not record anything amiss, and it was not until six "lookers" wrote in that the B.B.C. knew anything about their negative broadcast. Apparently the cause of this curious effect was traced to the crossing of two wires in the control room.

SUNSHINE SUSIE IS COMING!

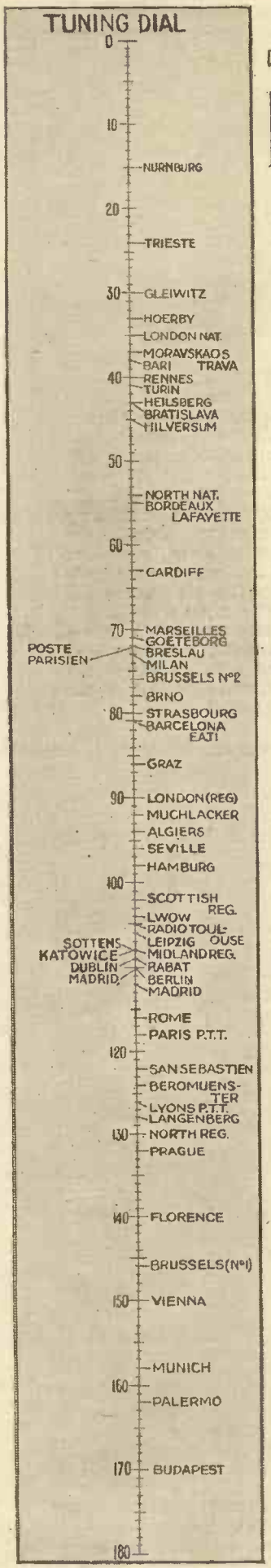
GOOD news! John Watt is arranging to broadcast a microphone version of that very popular film *Sunshine Susie*. And if he can get Renate Muller, the girl who took the name part and made famous the song "To-day I Feel So Happy," he will do the broadcasts on December 1 and 2.

B.B.C.'S BIRTHDAY PARTIES

TWO happy functions have been arranged for the B.B.C. staff to celebrate the occasion of its tenth birthday. There will be a night given over to dancing and cabaret, and another night for a dinner. These bright affairs will enable the staff to meet the Director-General and the Governors.

Miss Phyllis Monkman and Laddie Cliff take a keen interest in the Marconiphone portable which appears with them in "Rhyme and Rythm" in a popular London show

Putting 'phones through their paces! The baffle speaker idea is used by the Post Office engineers in testing 'phones for frequency response. The padded box acts in just the same way as a sound-lagged speaker baffle



How I Toured Europe on The New Century Super

By J. GODCHAUX ABRAHAMS

IT was my privilege in May, 1931, to test the original 'Century Super," the receiver which did so much towards popularising the super-het in the British Isles.

You may recall that an improved version of this type of set was later brought out by AMATEUR WIRELESS and again achieved great success. When, some weeks ago, the "A.W" Engineering Staff told me that they had gone, not one, but at least two better than their previous effort, and added: "Would you?" I said I would—and I did, but I was only given one evening to carry out my tests. You will say that this was far too short a period of time to ascertain what a new receiver can do. I agree with you, but apparently the constructors were fully satisfied that a run around the dials would convince me that the "New Century Super" is all that they claim for it.

It is, as you may see from the dial readings of the medium-wave stations and the log of the long-wave stations. Each station in every instance has been actually identified, and I have no doubt that had I been permitted to try out the receiver for a longer period, many more transmissions would have been heard.

At different times, wireless receivers offered to the public have been labelled "the forty-, the fifty-, or the sixty-station set," a qualification which in many instances is a misleading one. With many receivers of repute, and consequently constructed on sound principles, it is an easy matter to work up a more or less sensational log, but it should be borne in mind that there is every chance that such a collection of transmissions cannot be picked up *nightly*. If, therefore, on a preliminary test, a *reasonable number* of broadcasts can be satisfactorily received, quite clearly and at a strength which would permit the listener to enjoy a programme, you may take it from me that you have not exhausted by a long way the possibilities of a set. And this undoubtedly is the case with the "New Century Super."

When you wish to try out a car you take it up a test hill, and note results; a short spin along a straight arterial road will not display all its qualities.

Much the same applies to a new receiver; you may hear a number of stations but can you capture those which do not appear frequently in the average log?

This will be the subject of my second test report on the "New Century Super" next week.

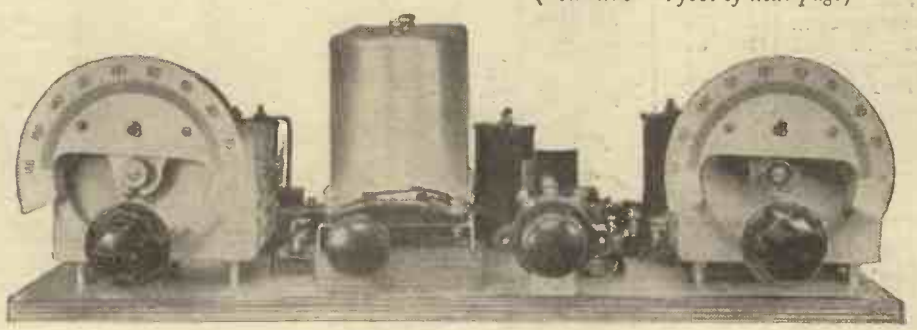
J. GODCHAUX ABRAHAMS.

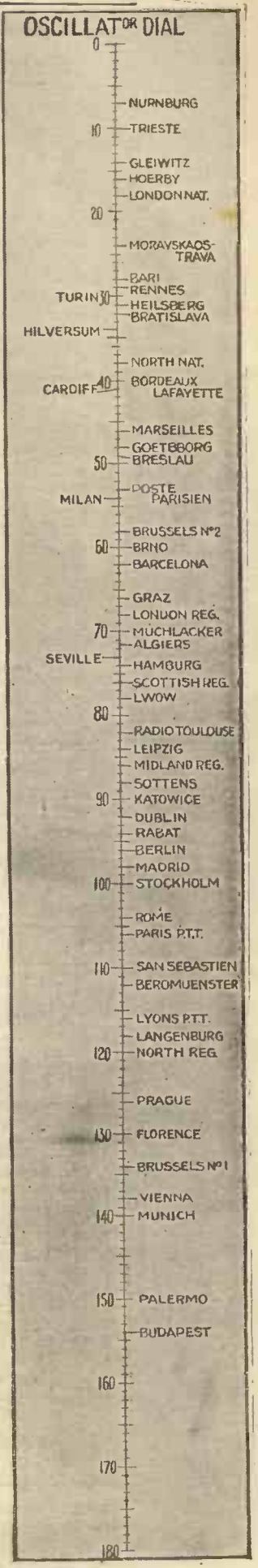
Operating the receiver is not a difficult matter, although there are four controls, all of which possess important duties. The aerial tuning is fairly flat, and to search for a station much more attention must be paid to the oscillator dial. You will here find that the tuning is of knife-edge sharpness. Keep the dials so far as you can in step; the condenser readings will not correspond but the differences in degrees will remain about the same except at the lower and top ends of the coils.

Adjust the aerial dial and then bring the trimmer into play. This will so sharpen tuning that cutting out interfering transmissions by this means becomes a pleasure. With the volume control you can pull up the transmission from a whisper to full volume.

I found the set exceedingly stable and

(*Continued at foot of next page*)





HOW IT IS DONE:

THE SILENCE CABINETS

AS you walk through the passages of Broadcasting House you can often hear what is going on in the studios, not because any of the sound-proof doors are left open, but because every main studio has a listening and silence cabinet. You have only to walk into one of the silence cabinets or listening rooms, touch a switch and immediately hear what is going on in the studio next door through a pilot speaker.

These silence cabinets and listening rooms are in frequent use as the announcer can carry out his administrative work outside the studio itself, and can give instructions to waiting artistes while still being in touch, through the pilot speaker, with what is going on in the studio itself.

There is the usual double thickness glass window between the studio and the listening cabinet or silence room. The announcer or control engineer can see what is happening in the studio, but, until he touches the speaker switch he cannot hear the artistes broadcasting. The silence cabinet is absolutely "silent." Each silence cabinet has a mains-driven moving-coil speaker working off an A.C. two-valve power amplifier. This amplifier is not connected direct to the microphone in the studio next door, but is connected to the main amplifier rack in the control room. There are two sets of lines running throughout the building, one carrying the National programme and the other the Regional. The power amplifier in the silence cabinet can be switched on to either of the lines or the announcer can phone through from the listening room to have his speaker equipment connected to a special amplifier. This is done if the studio is being used for a rehearsal or for some item which is not actually being broadcast and which therefore cannot be picked up on the National or Regional lines.

This is the listening room adjoining the Military Band Studio in London. The pilot speaker is on the left, and the control desk on the right

The listening rooms are untreated acoustically, but the silence cabinets have packing on the walls, behind the decoration, and there is a condenser microphone over the announcer's desk in each of the silence cabinets so that he can broadcast without going into the main studio. He has a special silent volume control for his "mike" and when he is giving his introductory or concluding remarks through the silence cabinet microphone, a control engineer in the listening room signals to him when he has his microphone input control at the right setting.

The silence cabinets and listening rooms are often used in wireless plays. The narrators can broadcast from the silence cabinet while watching the artistes in the main studio.

"HOW I TOURED EUROPE ON THE 'NEW CENTURY SUPER'"

(*Continued from page* 971)

was not inconvenienced by heterodyne whistles; moreover, harmonics, of such stations as London National and Regional (the test was made in north-west London) were particularly conspicuous *by their absence* (I found only one towards the top end of the medium-wave coil). High-tension voltage, especially on the second detector valve, is critical, but this is merely a matter of a few minutes' test.

As already stated, in the short time at my disposal, I could not by any means exhaust the possibilities of this new version of the "Century Super." To the man who wants a sensitive, selective and all-round efficient receiver, and whose ambition it is to scour the ether, the "A.W." Technical Staff offers one of the most fascinating radio instruments it has been my pleasure to handle.

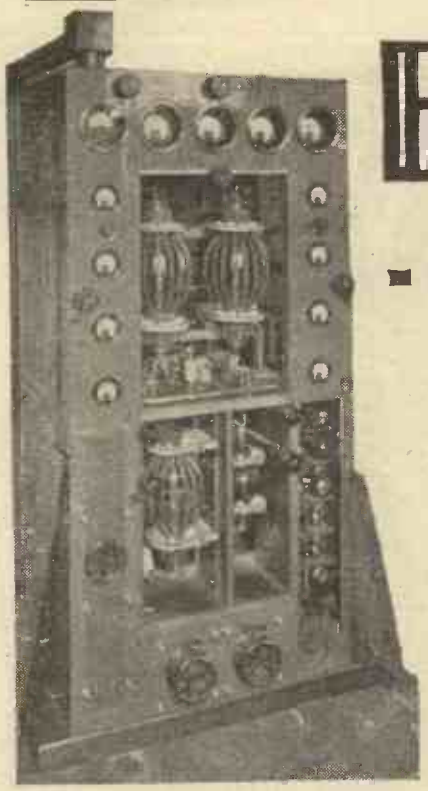
Notwithstanding its great selectivity, quality has not been unduly impaired and the "New Century Super," although combining so many advantages, will take its place without any doubt as a thoroughly reliable household set.

RECEPTION LOG ON THE LONG WAVES

Wave-length Metres	*Stations*	*Dials Aerial*	*Dials Oscillator*
833	Heston Airport ...	30	19
848.7	Moscow (*Tests*) ...	33	21
900	Croydon Airport ...	35	22
1,000	Leningrad	38	24
1,034	Kiev (*Faint*)	42	25
1,083	Oslo	45	30
1,153	Kalundborg	65	41
1,200	Reykjavik	68	41½
1,229.5	Boden	70	42
1,237	Vienna Experimental (?)	71	42
1,304	Moscow (T.U.) ...	73	43
1,348	Motala	75	52
1,411	Warsaw (Slight interference from F.L.) ...	80	54
1,445.7	Eiffel Tower (F.L.) Paris	95	60
1,554.4	Daventry National ...	115	68
1,635	Konigswusterhausen ...	116	70
1,725	Radio Paris	118	80
1,796	Lahti (*Interference by Paris and Huizen*) ...	123	82
1,875	Huizen	128	85
1,935	Kaunas (*Faint*)	132	87

Tested on October 18, 1932

A busy scene in a police radio van during a deputation of unemployed from all over London outside the County Hall. The transmitter in this van kept the police in touch with Scotland Yard



B.B.C. PROGRESS ... ON 7 METRES

In this brief summary of the B.B.C.'s work with its experimental seven-metre transmitter, ALAN HUNTER explains why progress must of necessity be slow and how in the near future it may be possible for amateurs to participate in the ultra-short-wave tests

IN the early part of the summer of this year, a start was made by the B.B.C. with an experimental short-wave transmitter erected on the roof of Broadcasting House in Portland Place. Before we can estimate the value of the work that has since been done we must briefly go over the facts.

Strictly speaking we ought to refer to the new transmitter as an ultra-short-waver, since the wavelengths covered by the tuning apparatus are between 6 and 8 metres, far shorter wavelengths than those normally used for so-called short-wave broadcasting.

The transmitting apparatus is fitted up in a small room near the back of the clock at Broadcasting House, on the seventh floor. The aerial is on the roof just above. It is known as a Franklin half-wave aerial, consisting of vertical wires supported by horizontal wires held up by two 35-foot lattice masts, which you can see as you pass by Broadcasting House.

The 7-metre Aerial

The Franklin-type aerial is, at the moment, tuned to the ultra-short wavelength of 7.75 metres. It is on this wavelength that all the tests have been made since the start several months ago.

The purpose of the B.B.C.'s tests, which have been of a "secret" nature in that amateur help has been actively discouraged, has been firstly to discover what service range, if any, could be expected from such short waves from a transmitter erected in the heart of a big city like London.

You may wonder why, when all the new regional stations are carefully erected many miles from the cities they are designed to serve, the B.B.C. should erect the ultra-short-waver in the middle of London. The reason is that, following experiments in other countries, notably in Germany and in America, it was already known that the range would be limited to a few miles.

It would therefore be useless to put up one of these transmitters in the country, because long before the signals reached to the nearest populated town they would have become absorbed. This is a point that has been overlooked by many amateurs.

To find out just what the range of the transmitter might be, the B.B.C. has fitted up a number of mobile vans with special short-wave sets, made and calibrated at the new research branch at Nightingale Lane, Clapham. These vans have, for the past month or so, been moving around in the "optical range" of Broadcasting House, that is, within a radius of about 12 miles.

This series of experiments has taken the engineers beyond Hampstead to the north, beyond the Crystal Palace to the south, beyond Kensington to the west and beyond the Tower of London to the east.

As a result of these extensive tests, which have of course been conducted with the aid of field-strength measuring apparatus in addition to the usual aural tests, valuable data has now been collected—sufficient to enable the scientific experts to make a first analysis.

It has been proved, and this is the point of greatest interest to the amateur in the London area, that up to about 10 miles it is quite possible to pick up the Broadcasting House ultra-short-wave signals with ordinary apparatus, that is with a simple adaptor working on the super-het. principle, with a broadcast set tuned to the medium waves as an intermediate amplifier.

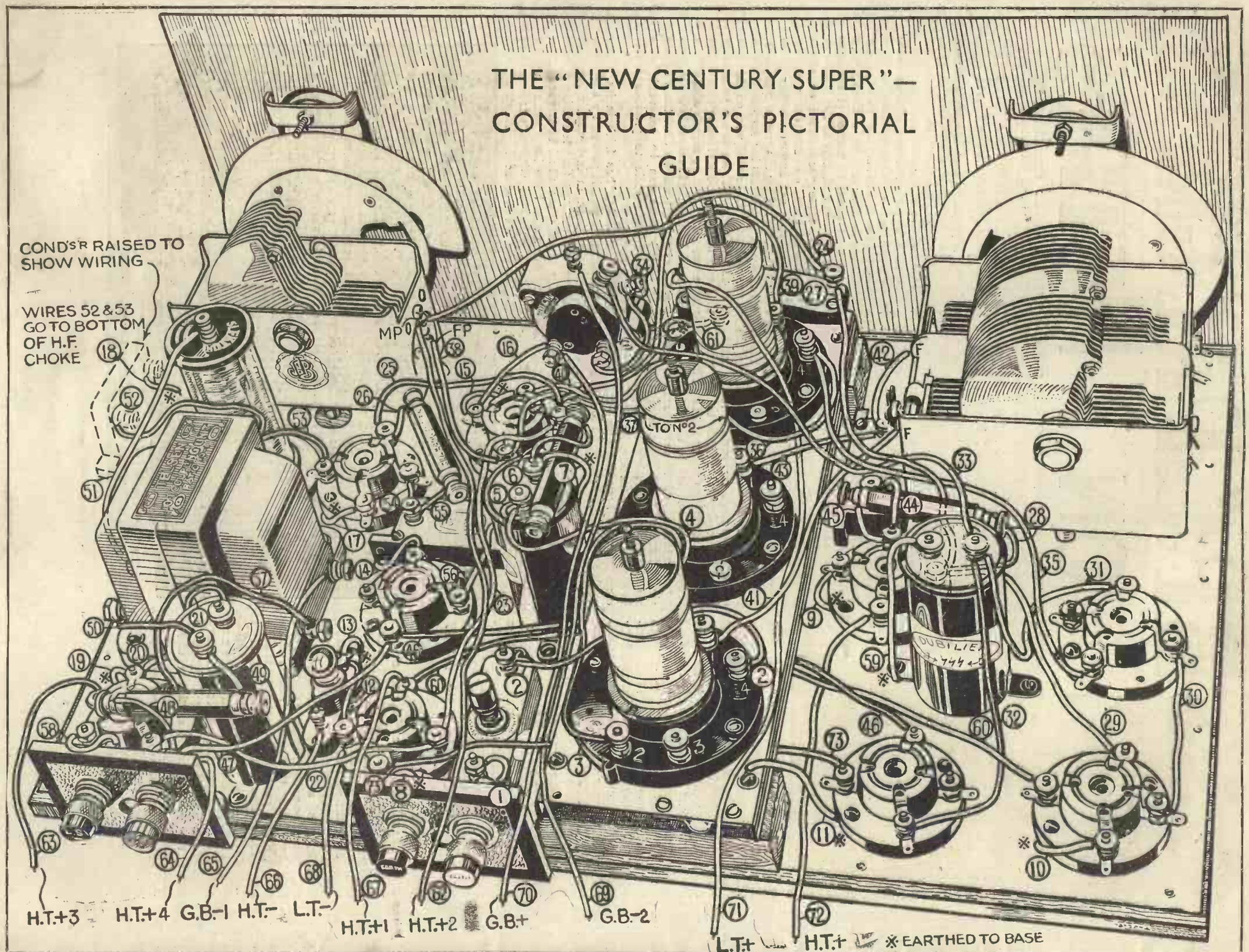
The next important series of tests, now in progress, is to determine how far the ultra-short-wave signals are affected by intervening buildings. It is known that the screening effect of masses of steel, as found in modern buildings in the Metropolis, is much more pronounced on ultra-short waves than on any other waves. At present it is not known whether these effects entirely nullify chances of reception.

It may be found that in "screened" areas the use of a vertical aerial wire on the roof will do the trick. There is the possibility that one main ultra-short-wave roof aerial may serve many sets by means of multiple feeders. All this is at present in the experimental stage. It will be Christmas before any further data can be collected on a sufficiently wide scale to produce trustworthy results.

That the B.B.C. has faith in its ultra-short-wave station, is proved by the news, exclusively given in last week's issue of AMATEUR WIRELESS, that television signals by the Baird process had been put out on 7.75 metres and have been picked up by engineers equipped with a televisor and short-wave receiver at Nightingale Lane.

Filming a television transmission!
A scene in the studios during the filming by Gaumont-British of a Baird television broadcast. Mr. Baird is just in front of the left-hand camera

THE "NEW CENTURY SUPER"— CONSTRUCTOR'S PICTORIAL GUIDE



TELSEN L.F. TRANSFORMERS COUPLING UNITS and OUTPUT CHOKES

TELSEN "RADIOGRAND" L.F. TRANSFORMERS

Typical of all that is finest in British Radio craftsmanship. Designed in accordance with recent research, constructed on the soundest engineering principles and tested rigorously for immaculate performance and enduring efficiency.

Ratio 3-1
Ratio 5-1 **7/6**

TELSEN "RADIOGRAND" (Ratio 1.75-1) TRANSFORMER

For use in high-class receivers employing two stages of L.F. amplification. When used following an L.F. stage employing choke or resistance coupling, it gives ample volume with remarkable reproduction. **10/6**

TELSEN "RADIOGRAND" (Ratio 7-1) TRANSFORMER

Gives extra high amplification on receivers employing only one stage of L.F. amplification. Not recommended for use with two L.F. stages, as overloading is likely to occur. **10/6**

TELSEN POWER PENTODE OUTPUT CHOKE

For mains operated pentodes taking an anode current of up to 40 m.a. Serves both to prevent direct current passing through the speaker and to match the speaker to the pentode valve, with the choice of three ratios—1-1, 1.3-1, 1.7-1. Used with a 1-mfd. condenser it gives a great increase in both quality and volume. **10/6**

TELSEN TAPPED PENTODE OUTPUT CHOKE

For mains and battery operated pentodes taking an anode current of up to 20 m.a. The single tapping provides (by reversing) ratios of 1-1, 1.6-1, 2.5-1, ensuring perfect matching under widely varying conditions. Also suitable for matching a low-impedance speaker with an ordinary power valve, a 1-mfd. coupling condenser being recommended for this purpose. **7/6**

TELSEN INTERVALVE L.F. COUPLING CHOKES

Primarily designed for use as coupling chokes but may be used in any circuit carrying not more than the stipulated maximum current. The 100H type is for H. or H.L. type valves and the 40H for L. types.

	Normal Current.	Max. Current.
40 H.	5 m.a.	10 m.a.
100 H.	3 m.a.	8 m.a.

5/-

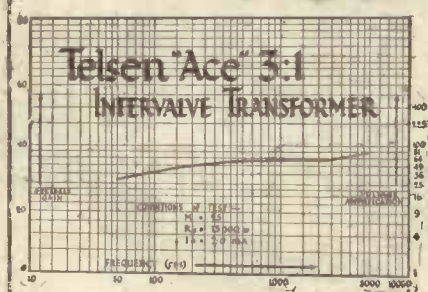
TELSEN OUTPUT CHOKE

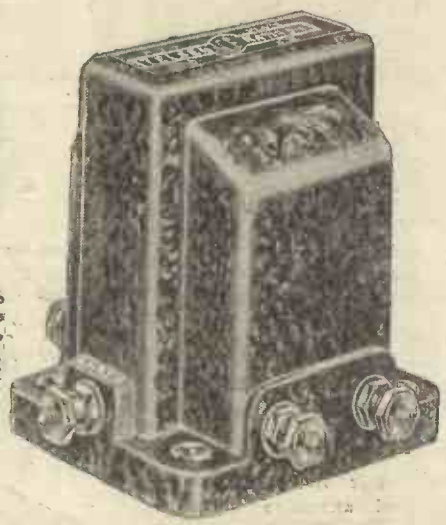
Designed for use with power or super-power valves taking an anode current of up to 40 m.a., this output filter provides an ideal response curve under all conditions. For use with a condenser of not less than 1 mfd. capacity. **7/-**

THE TELSEN "ACE"

The Telsen "Ace" is eminently suitable for Receivers where highest efficiency is required at low cost and where space is limited. As its characteristic curve will show, it gives a performance equal to that of the most costly transformers. **5/6**

Ratio 3-1
Ratio 5-1





TELSEN MULTI-RATIO OUTPUT TRANSFORMER

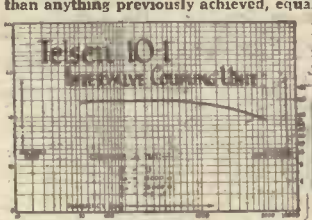
For use with moving-coil speakers, having a low-impedance speech coil winding, and suitable for anode currents of up to 40 m.a. Three ratios—9-1, 15-1, 22.5-1—allow for correct matching of speakers of widely varying characteristics. **10/6**

TELSEN OUTPUT TRANSFORMER (Ratio 1-1)

For connecting the speaker to the output stage, using a triode valve. Avoids saturation by isolating the D.C. from the speaker windings. Also keeps H.T. voltage from the speaker and its lead, which is especially important where a D.C. eliminator is being used. Suitable for anode currents of up to 40 m.a. **10/6**

TELSEN 10-1 INTERVALVE COUPLING UNIT

A filter-fed transformer using a high permeability nickel alloy core, securing a 10-1 voltage step-up while preserving an exceptionally good frequency characteristic. The response is compensated in the higher frequencies for use with a pentode valve giving an amplification greater than anything previously achieved, equal to two ordinary L.F. stages but with better quality of reproduction.



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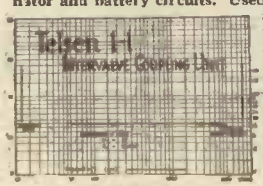
TELSEN 1-1 INTERVALVE COUPLING UNIT

A modern development of the deservedly popular R.C. unit incorporating a low pass filter feed in its anode circuit, thus preventing "motor-boating," "threshold howl" and other instability due to common couplings in eliminator and battery circuits. Used with an H.L. type valve it gives an amplification of about 20 and a perfect frequency response on a negligible consumption of H.T. current.



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Extraordinary high inductance combined with low self-capacity make this choke ideal for the latest super-heterodyne Circuits.

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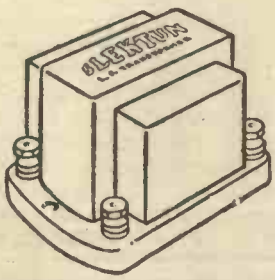
SLEKTUN SUPER TRANSFORMER



A general purpose L.F. Transformer of exceptionally high primary inductance, with self-capacity and primary voltage drop reduced to an absolute minimum. A definite advance on other transformers at twice the price. Guaranteed for three years.
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On Your Wavelength!

KILO . . . WHATS ?

WIRELESS is, happily, full of joys and little incidents. One of these came my way a few nights ago when several people were admiring the performances of a new set—a mains four-valver—that had just been installed in a friend's house. "Extraordinary how economical these sets are to run," remarked one chappie. "Now, I've a seven-valve super-heterodyne and all it takes from the mains is ninety amperes." "Ninety whats?" I queried. "Ninety watts? Why, I've just told you amperes." It took a moment or two to straighten out the whats and watts business, and then I congratulated the man on owning a receiving set with a rating higher than that of Budapest or Brussels. At 230 volts, 90 amperes would work out at a bit over 20 kilowatts and, on the whole, the set would not be exactly economical to run. A 90-watt consumption is a very different business!

"CESSPOOL"

I WONDER if you have tuned in the new big station that is now to be heard on 210 metres. If you haven't, you should do so without delay. Actually, it is Budapest No. 2, but in some lists which aim at minute accuracy it appears as Csepel. British tongues are not built to twist round words like that, and I am not surprised to find that several of my friends have jokingly christened it "Cesspool." Myself, I shall go on talking about Budapest No. 2, but that is merely a matter of personal preference. The station is shown as using a power of 3 kilowatts, but I suspect that its real rating is considerably more, for, despite its great distance from this country, it comes in very strongly. This may, of course, be due partly to its low wavelength, for experience of the Swedish relays and other small stations down near the bottom of the medium wave-band shows that immense range can be achieved after dark with quite small power on wavelengths between 200 and 250 metres. Nuremberg is another instance. This is genuinely only a 2-kilowatt station, though signal strength is frequently terrific.

THE WIRELESS POLE

THIS is not a note on aerials; it concerns an unfortunate inhabitant of Lodz, in Poland, who appears to be a human receiving set. It is reported on high authority that as soon as the local station switches on, he is able to hear the programmes without the use of any kind of wireless apparatus. Though it has certain advantages, such a physical condition has also certain drawbacks. I have, for instance, always maintained that one of the most valuable features of the wireless set is that you can always switch off when you don't want to hear an item. The human receiver is apparently not provided with an on-and-off switch; he has to take everything that's going.

Whether the unfortunate man will be prosecuted for indulging in reception without a licence I don't know. It is stated that his case is attracting particular attention in medical circles and that he is being sent to Paris for observation and possible treatment. Paris strikes me as a rather unfortunate place, since it possesses at least five broadcasting stations, and unless the unfortunate Pole possesses a certain natural selectivity, he may be in for an unhappy time.

A HOPEFUL SIGN

I HEAR that at the Madrid Radio Conference, the British delegates did put forward the suggestion that there should be a wholesale reduction in the power used by European broadcasting stations. Little support was apparrently forthcoming, but it is good to see that some of those in authority have at length realised that the shouting-down competition in Europe cannot go on indefinitely. It is distinctly interesting that the proposal to reduce power should have come from us, for the B.B.C. is mainly responsible for having created the present position by its own regional scheme.

Old readers will remember that, from the time when the scheme was first mooted, I have always maintained that it could lead eventually to nothing but confusion. In a matter of months from now almost every channel between 330 and 550 metres will be occupied by a super-power super-shouter. Experience has already shown that even if two such stations are separated by hundreds of miles from one another, a 9-kilocycle difference in their carrier frequencies is not sufficient. But it will have to suffice because, owing to the crowded state of the band, they cannot be given more elbow room. The net result will unquestionably be that, as regards the reception of both home and foreign stations, we shall be far worse off than we were when moderate power was in general use.

WHAT OF THE FUTURE ?

MUCH as I would like to see it, I am afraid that there is very little hope of a general reduction in the power rating of European stations—at any rate, in the next year or two. What is going to be the result of a continuance of the present policy? We shall have to make our receiving sets more and more selective and some kind of whistle filter to get rid of steady heterodyne beat notes may have to become a standard fitting. There is no question that high power has already rendered the reception of broadcasting a much more difficult and complicated business than it used to be, instead of making it easier, as those who first thought of high-power imagined would be the case.

When the old 2LO was my local station, a very simple set sufficed for beautiful reception of its 2-kilowatt broadcasts at a range of rather less than thirty miles. Now I find the 50-kilowatt London Regional and the 50-kilowatt London National at fifteen or sixteen miles amongst the most difficult of all stations to receive properly. In order to obtain really good quality, I have to use four valves, whereas I used to use three—a rather surprising state of affairs. It isn't, of course, that I need more amplification. A high-frequency valve becomes desirable to provide sufficient selectivity to separate the two stations easily, whilst a special kind of detector and push-pull output are required to deal faithfully with deeply modulated high-power transmissions at short range. A queer business, isn't it?

THE COMING SET

I AM delighted to see that AMATEUR WIRELESS is carrying on its good work in the development of the super-heterodyne. This, to my mind, is the set of the future, and "A.W."

On Your Wavelength! (continued)

can justly claim to have been the first to realise the fact and to have brought the up-to-date super-het into the scope of the home constructor. A little more than two years ago there were many who said that the super-het could never come back. The original models had been tried and found wanting; hardly a super-het remained in use, and most people were convinced that it had unavoidable defects which rendered it quite unsuitable for use as a broadcast receiver.

The old super-hets consumed unconscionable amounts of both H.T. and L.T. current; they were noisy, they were difficult to tune, and the quality from them was definitely bad. Worse still, when numbers of high-powered stations came into being, the second-channel problem became acute. The super-het, as then known, received every station upon two different channels and in the case of big stations at short range, there were often no less than four settings at which the transmission came through. Second-channel interference—and sometimes third and fourth channel—was often bad enough to outweigh all the super-het's natural advantages in the matter of selectivity.

A VERY DIFFERENT AFFAIR

THE modern super-het as developed by "A.W." is a very different piece of apparatus. The current consumption can be kept down to surprisingly small limits; the background is devoid of offensive noisiness; the degree of selectivity obtainable is unapproached by any other kind of receiving set; ganged tuning makes genuine one-knob operation possible and renders the super-het the easiest of all receivers to work. In well-designed super-hets of to-day the second channel problem has practically ceased to exist. There is a no more delightful set to use, and if you are thinking of building a new receiver, I can very strongly recommend you to turn your attention to the "New Century Super."

THAT ECHO!

I WAS very interested during my last visit to Berlin to inspect the big Rundfunkhaus at Witzleben and to hear the sound effects produced in some of the studios. For instance, they have one asbestos-lined room so devoid of anything approaching an echo that the report from a heavy Colt revolver is throttled down to a thin, feeble "crack." On the other hand, there is another studio where a feeble hand-clap is magnified up to a reverberating roar. Not that the B.B.C. are behind in such matters; in fact, I rather think we lead the way. For instance, the special "echo" studio was used very effectively in the recent *Christopher Wren* broadcast — specially in the epilogue. Although this particular part of the play may not have been to everyone's taste, the intoning was certainly most impressive; better, in fact, than anything I have ever heard before.

THAT BATTERY PROBLEM

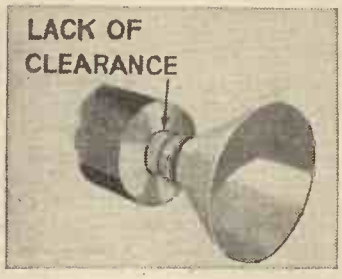
IN spite of all the mains-driven sets on the market, the battery problem is still a vexed question with most of us, seeing that only 40 per cent. of British householders are lucky enough to be on an electric supply system. I suppose it isn't possible to find the perfect solution—though quite a lot of grey matter has been spent in devising more or less ingenious makeshifts. For instance, a friend of mine who lives in the country takes his L.T. accumulator by car to the nearest garage—some miles away—every now and then. He uses a wet-cell H.T. battery and charges this occasionally from his L.T. accumulator by switching the H.T. cells into parallel during the charging operation. All very nice and handy. One Sunday, however, after leaving the H.T. on charge for some time, he found that he had run down the L.T. accumulator and, to save himself trouble, freshened it up from his car accumulator. He certainly got his Sunday programmes, but found next morning there was no juice left to run the starter. It was cold weather, and the car was a bit of a brute at its best, but he called it more than that before he finally managed to "swing" it into life.

A CURIOUS VALVE DEFECT

THE other day I came across another curious valve fault which rather puzzled me for some time. I had a set in which the quality was not at all nice. After playing round for a bit, I came to the conclusion that it was the output valve which was at fault. I changed the valve and everything was all right. As a matter of interest, I thought I would like to find what was actually wrong with the defective valve. I could not see any radical fault at first, and a test with a continuity meter showed no short circuit between grid and filament or anything of that sort. Yet replacing this valve in the set brought back the same poor quality, and I was very puzzled to know what the explanation was, because the valve was a comparatively new one.

A MOVING-COIL HINT

A moving-coil speaker which chatters and seems to overload has generally a lack of clearance between the moving coil and the magnet. The spot where the trouble is likely to arise can be seen from



the sketch. If no centering device is provided on the speaker, then the cone should be bent slightly until the speech coil clears the magnet system. This tip applies equally to permanent-magnet and energised speakers

THE REASON FOR THE BAD QUALITY

QUITE by accident I happened to shield the valve with my hand and noticed that only one-half of the filament seemed to be alight. The filament, of course, was of the customary double "V" type, and when I looked into it I saw that only one of the "V's" was glowing its customary dull red. The other section of the filament was not glowing at all. From this I concluded that there must have been some high-resistance short circuit across the second part of the filament which was shunting some of the current, so that the second "V" was either receiving practically no current or, at any rate, not enough to cause it to warm up sufficiently to emit electrons. The short circuit must have been of fairly high resistance, or the remaining section of the filament would have received the full 2 volts and would have glowed much too brightly, which it did not.

At any rate, the effect was that only half the filament was active; so that the emission was nothing like sufficient for the purposes of the valve. Hence, the internal resistance was somewhere about double what it should have been, while the grid bias, which was quite normal when the valve was working properly, was much too much for this greatly reduced emission. Consequently, the valve gave all symptoms of an over-biased L.F. valve instead of an ordinary power output valve, and this was the explanation of the bad quality.

FOR BEGINNERS

IT'S not often that I mention lectures in these columns, but I have just heard from a Northern listener friend of a lecture that was really more of a friendly chat, when, last week, some eight hundred Liverpool boys and girls listened to a popular talk by Mr. Percy W. Harris on "Wireless for the Beginner." The talk, which was given in conjunction with the Ranelagh Hobbies Club and Messrs. Lewis's, the famous store, followed the autumn prize presentation to successful competition winners. Among the prize-winning entries were two ingeniously constructed wireless sets. The chair was taken by Mr. Marquis, managing director of Messrs. Lewis's. My friend tells me that Mr. Harris, who illustrated his talk by simple sketches on the blackboard, explained in popular language what happened between the studio and the listener. After his talk, he invited questions and took the opportunity of giving a simple explanation of how a variable condenser works. It's a difficult job, "making wireless easy," but the hearty applause which concluded the talk showed that the young audience appreciated the explanations, and I understand that Mr. Harris was kept busy for some time autographing copies of "A.W."!

THERMION.

VOLUME CONTROL IN SIMPLE SETS

IT is, when we come to think of it, rather strange that although a volume-controlling device is fitted to most screen-grid sets, very little attention has been given to the problem of such a control in simple sets consisting of a detector and two low-frequency stages. Even in factory-built receivers of this type—and they are many—the control marked "volume" is in most cases just the knob of the reaction condenser. True enough, this can be made to control the volume on a distant station or one which without reaction is insufficiently loud to be of any programme utility, but as the majority of receivers are used in the service area of powerful

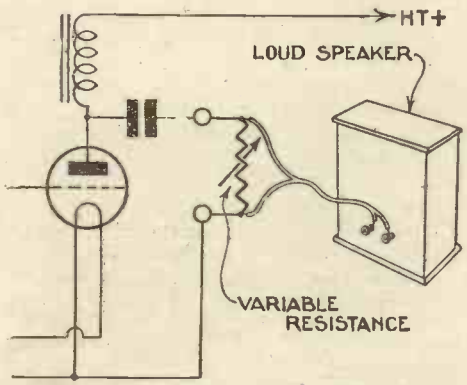


Fig. 1. The output valve stage of a simple "det. and two L.F." circuit

stations it often happens that programmes are much too loud even with this "volume control" set at zero.

Of course many people control the volume of such a set by de-tuning, for there is only one tuning condenser in many of these sets—that which controls the first grid circuit connected to the tuning coil. At one time this was a reasonable enough scheme, as not so very long ago there was a wide separation between the only stations that could be heard on such sets, but it was always open to criticism on the grounds of quality, which was never quite so good "off tune" as directly "on tune." Nowadays, in many conditions, particularly with simple sets in which the tuning is none too sharp, any appreciable de-tuning from one station will bring you into the programme of the other, so we must look elsewhere for a proper means of controlling volume on such receivers.

When you take a set such as the "Mascot," which has all the advantages of the detector and two low-frequency stages, coupled with very sharp tuning, the de-tuning method is not always convenient, particularly when it is desired that the set should be used by members of the household all of whom have different views on desirable strength! What is wanted in such receivers is some real volume control which does not upset *any other adjustment*, so that once the receiver is properly tuned to a particular station any unskilled person can vary the volume

Percy W. Harris deals with a topic of importance to owners of straightforward receivers in which control of volume is to be provided.

at will without requiring a skilled user to get the set back again to a proper tuning position when desired.

A Novel Scheme

I have recently been experimenting with a scheme which achieves this result and has certain very distinct advantages. To appreciate them I should like you to consider one or two other methods which have been suggested and used for achieving a similar result, and to show you why they have failed badly in certain circumstances. Take, for example, Fig. 1, which shows the output valve of a simple detector and two low-frequency stage receiver. A variable resistance is connected across the loud-speaker, and as it is controlled by a knob it is possible to vary the strength from a whisper up to full volume.

The Matter of Quality

The main disadvantage of this scheme is that it gives very poor quality in the great majority of cases, for it cannot reduce distortion already occurring due to overloading the valves. The reduction of volume in this case is only achieved by

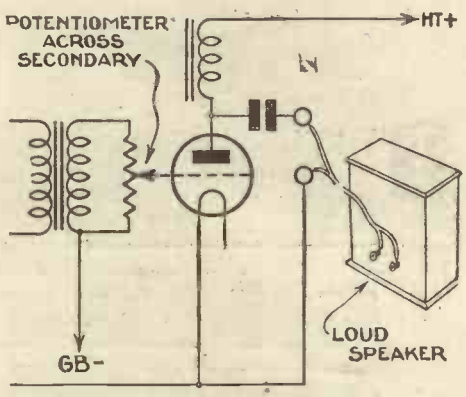


Fig. 2. A volume control consisting of a potentiometer across the transformer secondary

reducing the efficiency of the loud-speaker, the distortion still remaining throughout the receiver. It also has another technical disadvantage in that it gives you a varying load on the output valve, according to the different settings.

Fig. 2 shows another scheme, free from some of the disadvantages of the first. Here we have a volume control scheme consisting of a potentiometer across the secondary of the transformer. If the resistance of the potentiometer is made reasonably high it may even improve the quality slightly by giving a flatter response curve. Here, when the slider of the potentiometer is at the top, we get only slightly less volume than would be the case if the potentiometer were absent, the shunting value of the potentiometer resistance being quite high. As the slider comes down so we tap off less and less voltage, so that at the

(*Continued on page* 1025)

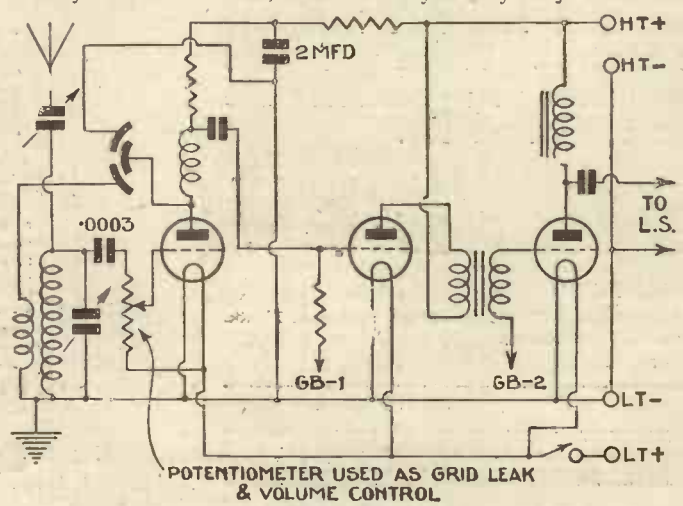


Fig. 3. A potentiometer as the grid-leak in a detector circuit

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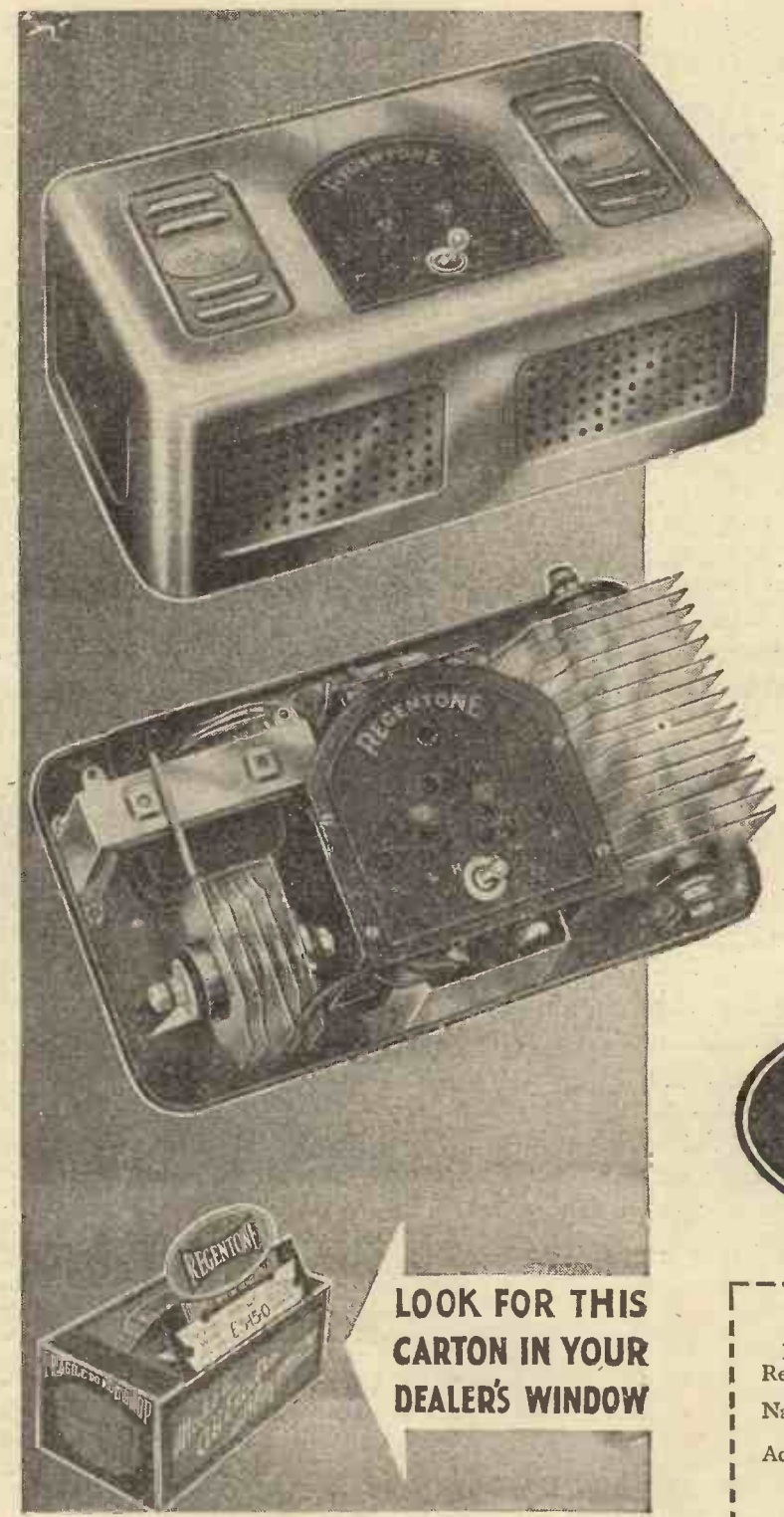

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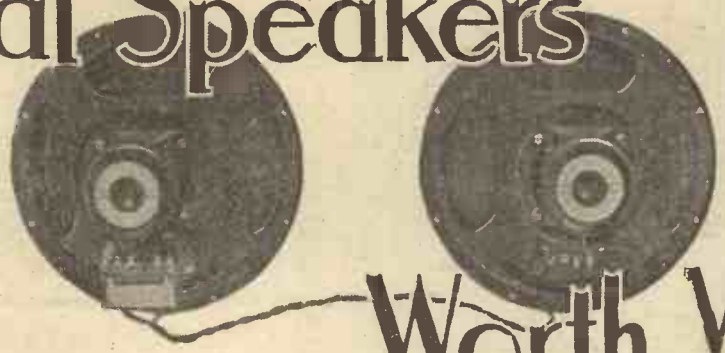
Are Dual Speakers Worth While?



J. H. REYNER, B.Sc., A.M.I.E.E., shows why better reproduction is possible with balanced dual speakers in place of the conventional single speaker

"... by the use of dual speakers we are enabled to radiate more power without shattering our ear-drums . . . the transients are much better reproduced with two loud-speakers."

SEVERAL loud-speaker firms, notably the Magnavox and Rola companies, have recently introduced dual speakers. These are two specially matched loud-speakers which are both connected to the receiver at once.

The average reader may perhaps wonder whether this is not just a means of selling two loud-speakers where one would suffice. This is not the case, for several manufacturers in this country are fitting dual speakers as standard to their more expensive models, while the system has been popular in America for some time. There is, of course, an added expense, but for those who require really good quality this is justified by the results.

What then, are the advantages? First and foremost comes an improvement in the response obtained from the whole system, but this is not the whole story. By the use of dual speakers we are enabled to radiate more power without shattering our ear-drums. One can stand quite close to an orchestra without sensation of pain, yet any attempt to reproduce the same volume of sound from a single loud-speaker is accompanied by very considerable unpleasantness. Finally, the transients are much better reproduced with two loud-speakers.

Those Resonances

Let us analyse these points individually. We will consider first of all the question of response, although this is only half the story. The average loud-speaker contains two resonance points, one in the bass and the other in the treble. Now in order to obtain uniform reproduction it is necessary to accentuate the bass because the human ear becomes progressively less sensitive as we go down the frequency scale.

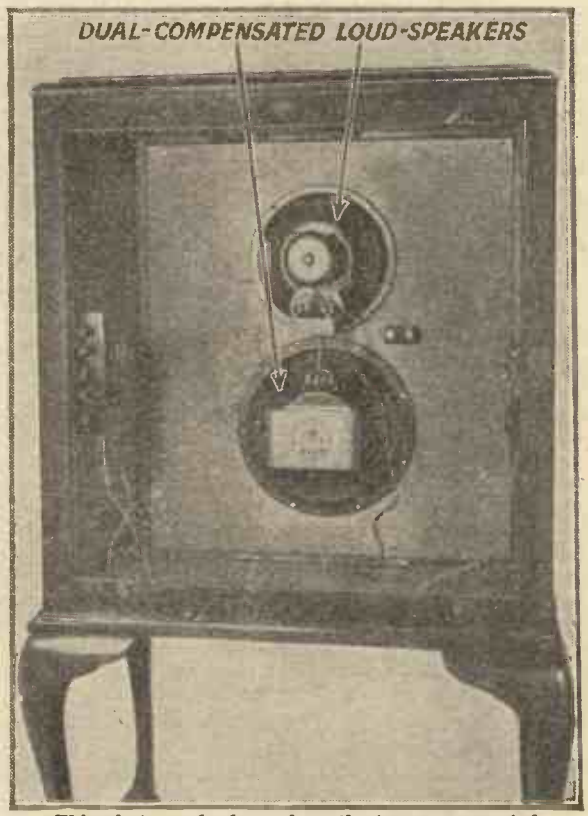
We can obtain the necessary increase in the bass by adjusting the resonance of the diaphragm to occur between 80 and 100 cycles, but we are prevented from making full use of this by the fact that when this resonance occurs the impedance of the loud-speaker increases enormously. Therefore we are unable to force the power through it, and we defeat our own ends. The dual-speaker system overcomes this difficulty by arranging that the resonances of the two loud-speakers are slightly different.

Normally, the two loud-speakers share the power between them. As we reduce the frequency we reach the point where one speaker resonates. The impedance of the speaker rises so that the current falls off. The other speaker, however, still carries its normal current so that the system continues to radiate sound.

Down in the Bass

As we continue to reduce the frequency we reach the resonance point of the second loud-speaker when the radiation from this speaker commences to drop away very rapidly. By this time, however, we have passed the resonance of the first speaker so that this is now taking its share of the work and handles the bass quite satisfactorily.

The net result is a marked increase in the bass response over an appreciable register. This may only extend from perhaps 50 to 100 cycles, but you must remember that this covers a whole octave so that the improvement in the result is very marked.



This photograph shows how the two compensated speakers are fixed on the one baffle

In the upper frequencies the effect is slightly different. Here there is another resonance, not so marked as in the bass, but nevertheless present just before the speaker begins to cut off. At first sight it would seem that the best design of any single loud-speaker is one having a resonance at 6,000 or 7,000 cycles, but this can only be obtained by sacrificing the efficiency in the middle register and the results are not pleasant. With the dual-speaker system it is possible to use such an instrument in conjunction with a speaker of normal characteristics having a resonance at 4,000 to 5,000 cycles with quite a good middle register. Therefore we get here a blending of the two desirable characteristics and the effect of adequate radiation right up to 7,000 or 8,000 cycles per second.

So much for the response. Now for the question of power output. It is found that radiation from a loud-speaker is strongly directional and is more or less confined within an invisible tube coming from the mouth of the speaker. Under such conditions the power which the speaker will handle is strictly limited because beyond a certain point the sound pressure produced is so large as to produce a sensation of physical pain in the ear. With the dual-speaker system, on the other hand, we have two tubes like this which interfere with each other and break each other up.

Not a Chunk!

The result is that the radiation is distributed around the source of sound and does not hurl itself at us in a solid chunk, but permeates through the room much in the same manner as the sound would from an actual orchestra. Consequently, for the same power input to the two speakers, we appear to obtain less volume and we have to supply more power in order to bring the volume up. On the other hand we can continue to supply more power and bring the strength up to a value comparable with the real thing without producing physical pain.

If this process is carried to the limit, several loud-speakers may be used and the results get increasingly better, but even with two loud-speakers the difference is sufficiently marked to make the extra expense justifiable.

(*Continued on page* 1002)

Interesting facts about how quartz crystal is utilised for radio purposes are told in this

article, compiled from information given by W. A. Marrison in the Bell Laboratories Record

ABOUT QUARTZ CRYSTAL RESONATORS

THE properties of quartz crystals which make them useful in many electrical circuits are due largely to the piezo-electric effect. If a piece of crystalline quartz is strained mechanically it sets up an electric field in its neighbourhood, inducing charges or electric potentials on conductors in the field. Hence the derivation of the term piezo-electric from the Greek expression *piezin* which means "to press."

Conversely, when a piece of crystal is placed in an electric field, it changes its shape slightly. The deformation thus produced is very minute ; it is, in extreme

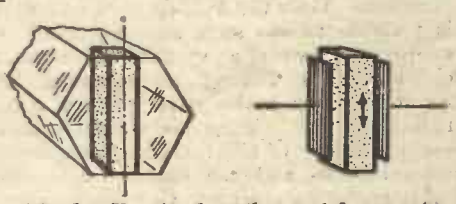


Fig. 1. Showing how the crystals are cut from the slab of quartz

cases, only a few thousandths of a millimetre for a rod one centimetre long.

Quartz, however, has other desirable properties in addition to piezo-electric effects, chiefly due to its low internal friction, and consequent low damping, and due to its hardness and chemical stability.

It is the low damping in quartz that makes this material especially suitable for resonators. The damping is so low that an oscillation, when once started, may continue through 6,000 vibrations before it is reduced to half of the original amplitude.

The familiar conch shell is a poor resonator in comparison with quartz, but it illustrates one point they have in common. The air in the shell resonates at certain audible frequencies from the great variety of sounds always present under natural conditions, and gives that characteristic sound reminiscent of the sea. A quartz crystal will select certain vibrations in a much higher frequency range and give a corresponding response under suitable conditions.

Stability

The hardness of quartz is important in the use of resonators, as it prevents wear and consequent change of dimensions, which would change the frequency of response. Because it is harder than most metals and alloys, quartz cannot be scratched by the metal electrodes or clamping devices. It can be scratched by topaz, ruby or diamond, which are all still harder. It is usually cut or ground to desired shapes by diamond dust or powdered carborundum used as abrasives.

The chemical stability of quartz is also of great importance. It cannot oxidise because it is already silicon dioxide (SiO_2). The only chemical substances that affect it to any extent at ordinary temperatures are hydrofluoric acid and a few related minerals which do not occur free in nature.

Quartz is not appreciably soluble in water except at very high temperatures and pressures. The fact that clear crystals of quartz are often found among rocks that are disintegrating with age is a fair guarantee of the permanence of this material.

The Electrode Arrangement

If electrodes are arranged about a suitable piece of quartz crystal, so that an electric field between them will cause a deformation (i.e., a change in shape) the combination will behave in many respects like an electrical network containing a highly resonant circuit element.

This is due to the piezo-electric influence, which effectively couples some of the mechanical properties of the quartz crystal into the electrical circuit of which the electrodes of the crystal are the terminals. The piezo-electric resonator thus formed can be used in many ways for the measurement, control, or separation of frequencies over a considerable frequency range.

Perhaps the best known use of quartz crystals is for the control of frequency in radio transmitters. The high constancy of crystal control also makes it especially adaptable for use as a frequency standard. A standard of frequency employing quartz crystal oscillators is now in use in the Bell Laboratories and gives an accuracy of approximately one part in ten million.

Crystals for the broadcast and high-frequency range are obtained from slabs cut parallel to one of the six natural faces of the original quartz crystal. Resonators of the desired shape, either round or square, as is most convenient for cutting and mounting, are cut from these slabs. The most important dimension from the standpoint of frequency is the *thickness*, as the principal response depends most on this dimension.

The frequency of such crystals may be determined approximately by dividing the constant 2,100,000 by the thickness in millimetres. Crystals cut in the manner illustrated in Fig. 1 are mounted between pairs of parallel plate conductors, often, though not necessarily, in contact with them. The direction of the applied electrical field is perpendicular to one of the three electrical axes of the crystal.

The different axes of a quartz crystal are referred to as the optical, electrical and mechanical axes. The optical axis is the axis of symmetry of the hexagonal quartz prism and may be defined as a direction parallel to the length. The electrical axis is parallel to opposite faces of the prism and perpendicular to the optical axis. The mechanical axis is also perpendicular to the optical axis, but is perpendicular instead of parallel to opposite faces of the prism.

Crystals for operating at relatively low frequencies are usually cut so that the long dimension is parallel to a mechanical axis, that is, perpendicular to the electric and optical axes. The electric field is applied by electrodes which are in the plane of the mechanical and optical axes, as indicated in Figure 2.

The frequency of an oscillator controlled directly by a crystal is usually above the audible range and may have any value, depending on the size of the crystal and the circuit conditions, up to *several million cycles*. The frequency of the primary standard now in use in the Bell System in America is 100,000 cycles per second.

When it is desired to obtain a low frequency controlled by a quartz crystal it is usually done by the use of a sub-multiple

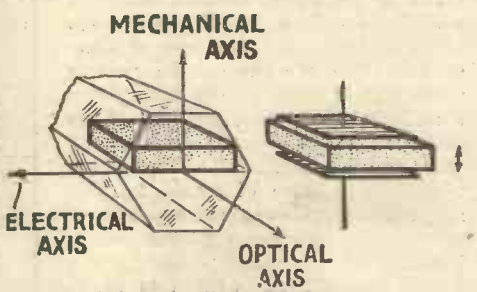


Fig. 2. The arrangement of the piezo crystal in the holder

generator. This is a circuit that will control a current at a frequency that is an exact sub-multiple of the input or controlling frequency. Any simple reduction from a half to a tenth can be obtained readily by this means in a single stage.

A good frequency standard, with the addition of a phoniwheel motor and a few gears, may be made into a clock capable of keeping accurate time and of accurately controlling time impulses. A clock of this sort, controlled by a quartz resonator, has an accuracy comparable to that of the highest precision pendulum clocks.

The use of quartz resonators in electrical circuits is of increasing importance and the above applications are not by any means all that could be stated. Some functions are performed by the use of crystals that could be achieved only with great difficulty or perhaps not at all by any other means.

The fact that a small piece of rock can be substituted for a highly resonant electric circuit element, and in many cases give an improved performance, makes the use of quartz unique in the electrical art.—A. S. H.

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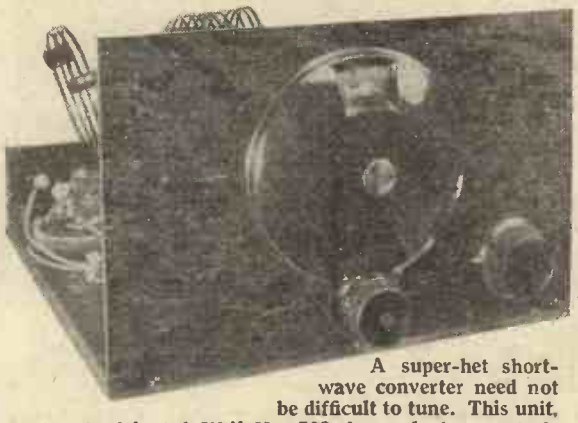
KENNETH ULLYETT gives practical advice for those who do not want to go to the trouble of building a set specially for reception below 100 metres.

USING YOUR SET ON THE SHORT WAVES

The 7 and 14-megacycle equipment of Mr. H. B. Crowe, a London short-wave experimenter

THERE are many ways in which you can sample the fun of short-wave reception without building a special set for the job.

Simple adaptors can be used which enable you to tune down to below 100 metres with a standard broadcast-band set. One type consists of a single detector stage with short-wave coils in the tuning circuit which entirely replace the tuning arrangement of the broadcast set. This type of adaptor can be added in various ways, but it is of chief interest to the man who has a set without any high-frequency amplification. If the set has a high-frequency stage then it will be necessary to alter the high-frequency coils, and in ganged sets this is practically a structural impossibility.



A super-het short-wave converter need not be difficult to tune. This unit, described in "A.W." No. 502, has only two controls

The Super-het Adaptor

Then there is the super-het type of short-wave adaptor which consists, in the ordinary way, of one or more valves (generally a detector and an oscillator) which form the first stages of a short-wave super-het. The high-frequency stage or stages of the broadcast-band receiver form the intermediates of the short-wave super-het, and the detector of the broadcast receiver is the second detector of the super-het layout. This is a much more efficient method of converting a standard set, and which, if it is properly set up, is hard to beat for DX results.

A modification of this type of super-het short-wave adaptor is the autodyne. In this, a screen-grid valve is used as the oscillator detector of the super-het, and the high-frequency stage of the existing set acts as the intermediate-frequency of the super-het. It is essential, therefore, that an autodyne unit be used with a broadcast receiver which has at least one high-frequency stage, and preferably a screen-grid stage at that.

Cutting-out Strays

Without exception, a unit to enable a broadcast-band set to tune on the short-waves should be connected up to the set without long wires. It is vital to cut down the stray high-frequency currents.

Fig. 1 shows the theoretical circuit of an adaptor which can be made up to replace the detector stage of a standard set. The output leads of this unit can be taken to a valve-holder type of plug, as shown, so that it is necessary only to take out the detector valve, put it in the unit and put the plug into the detector socket of the receiver.

This will cut out the detector wiring of the set, and the special short-wave coils and condensers of the unit come into play. There is, naturally, no need for separate batteries, for this added detector stage gets its high-tension through the usual high-tension tap to the detector.

Values are important. Short-wave low-loss coils must be used. They can be plug-in jobs, or you can use one of the special tapped short-wave coils such as the triple-range Lissen coil.

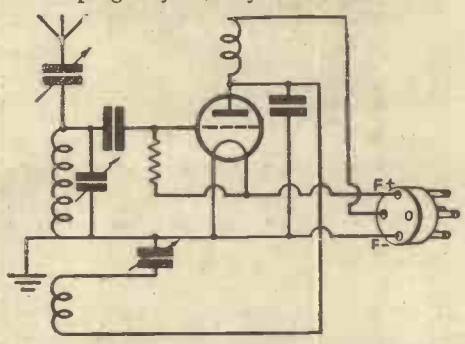


Fig. 1. The theoretical circuit of a simple one-valve adaptor to add to a broadcast-band receiver

A short-wave condenser of about .0002 microfarad maximum capacity must be connected across the grid-winding terminals and the reaction condenser should be of the same size. A short-wave type .00015 microfarad condenser will do in either position. You will see that there is a neutralising condenser in series with the grid winding. It is a good tip to ensure smooth reaction over the entire wave-range, no matter what coils are used.

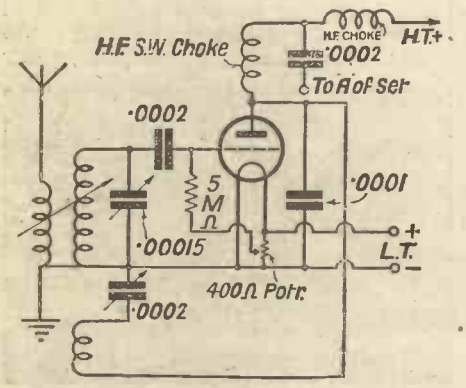


Fig. 2. The circuit diagram of a short-wave super-het converter, showing the short- and long-wave high-frequency chokes in series in the anode circuit. Note the coupling condenser joining unit to set

Use a Small Aerial

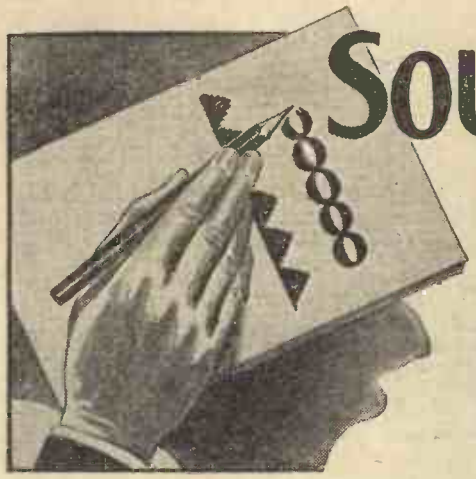
Never use a big aerial for short-wave reception, and no matter what type of aerial is tried, vary the neutralising condenser and find the best setting for each waveband. This advice applies to any add-on unit.

A short-wave choke must be used in the anode lead of a unit of this type, the by-pass condenser can have the usual value of about .0001 microfarad, and a .0002 microfarad and 3 megohm or 4 megohm leak should be used.

The super-het adaptor, a circuit of which is shown by Fig. 2, this being a typical arrangement, is just as simple to build as the add-on unit.

The valve in this unit acts as the first detector of the super-het arrangement. Therefore you will need an extra valve, for all the valves of the broadcast set are needed. The broadcast set must also have one good high-frequency stage, if not more.

(*Continued on page* 1002)



SOUND FROM DRAWINGS!

Dr. Alfred Gradenwitz describes a new scheme for producing harmonies from geometrical patterns through the medium of photo-cell apparatus

BRITISH talking picture engineers have already "manufactured" a human voice by drawing with Indian ink the sound track of a talkie film.

Now German scientists are experimenting with the production of harmonies from geometric patterns and a well-known Berlin film song writer has succeeded in turning regular geometrical patterns into musical harmonies. This composer, Oscar

Fig. 1 (top).—Three C's of different octaves. Fig. 2 (centre). Three different notes of three octaves. Fig. 3 (bottom)—Three notes, F sharp, C sharp and A sharp, sounding simultaneously

Fischinger, finds that after sitting down at the drawing table and patterning simple geometrical outlines, angles and curves, he can by photo-cell apparatus translate these into sound.

There are, indeed, as ascertained by Fischinger, strange correlations between geometric figures—strict mathematical forms and patterns—on the one hand, and musical works on the other. Sounds are patterns and patterns can be made to sound by talkie projectors. In fact, when transferred to a talkie film, patterns will assert their inherent tonal qualities, as sounds and tunes. The immediate acoustic relations between any given geometric systems, their instrumental *timbre*, can be ascertained experimentally.

Some examples will give an idea of the effects of various wavelengths :—

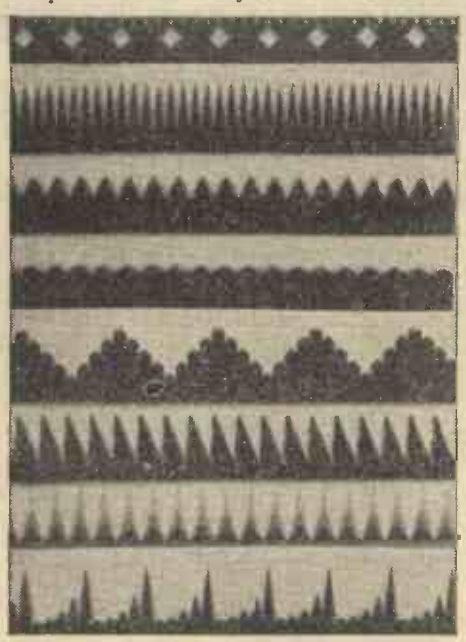
Fig. 1 is a wave picture of the note *C* in three different octaves. Fig 2 shows three different notes from three octaves, Fig. 3 the three notes *F Sharp, C Sharp, D Sharp*, and Fig. 4 illustrates five different *C's*, inserted into one another.

Flat waves will give soft notes, sounding as though from a distance, whereas those drawn at right angles correspond to sounds of normal strength and steep waves to sounds of excessive intensity. Fig. 5 strikingly illustrates these differences in behaviour. Fig. 6 next shows how the quality of sounds can be further changed by varying the wave form as desired, how soft and floating as well as heavy and massive sounds, how loud and abrupt sounds, on the one hand, and soft evanescent sounds, on the other, can be produced.

The characteristic *timbre* of given instruments is rendered with surprising faithfulness by given geometric figures. Some concentric rings, e.g., as in Fig. 7, will result in the sounds of an electric bell, of which their very ornamental arrangement is reminding.

Another geometric figure, which in the talkie projector corresponds to the sounds of a flute, bears a striking resemblance to the conventional picture of a serpent, and a third ornament, characterised by bassoon-like sounds, even in its shape shows a certain connection with that instrument.

The various grey shadings of (drawn) musical ornaments are of considerable importance. The contrasts of a wave characteristic of prevalent effects, certain waves, i.e., certain sounds, can be made to predominate, while other waves, in various grey shadings, are superposed upon them. This is how very complicated tonal systems are obtained, which even as ornaments are productive of very attractive effects.



In order downwards : Fig. 4. Three C's in a tone pattern. Fig. 5. One note played at various intensities. A sound pattern showing variation of timbre. Fig. 8. The sound pattern of the voice of a German singer

Any tonal systems desired can be combined : Possibilities in this respect are quite unlimited, even personal or national characteristics being represented by ornaments. German singers, for instance, have a preference for an abrupt, rather violent formation of voice, in accordance with the

Fig. 7 (in order downwards). Showing the timbre of different sounds : xylophone, electric bell, two-note bell, bassoon, flute, an instrument rich in upper harmonics, bassoon and various high pitched sounds

curve shown in Fig. 8, whereas Frenchmen and Italians prefer a soft, melodious formation, as corresponding to their nature and as expressed outwardly in the characteristic patterns !

All these pictures are enlargements of talkie film bands of standard width (3 millimetres). While several ornaments can be traced beside one another even on these narrow bands, incomparably greater possibilities will result from a uti isation of the full width of the film, and musical composers are likely to avail themselves of these possibilities. In fact, they will be able on such firms not only to hit any pitch with the utmost accuracy but to represent, beside one another, the characteristic *timbres* of all the instruments of which an orchestra is made up. The composer's work is by this new draughtsmanship, recorded in far greater detail than by the usual system of note writing—all personal, individual characteristics, usually left to the conductor's interpretation, thus being faithfully registered.

OUR BROADCAST CRITIC on "HIGHBROWS"

HARRY TATE
the popular comedian who broadcast last week

I SUPPOSE most of you heard Mr. J. B. Priestley's talk after all the fuss about his losing his manuscript? I imagine he must have aroused some amount of controversy. He certainly took trouble to define what he thought a highbrow was. Personally I think the term an inexpressive one, but it is so common now that it is as well that someone like Mr. Priestley should define it.

On the other hand, I personally cannot agree with a great deal of what he said. He talked to this un-named listener in no uncertain fashion, but I came to the conclusion that if a highbrow was what Mr. Priestley said he was, then I have never come across one. I know nobody who even remotely resembles the type of person Mr. Priestley so vividly described.

The "person" undoubtedly *was* a highbrow, but surely he was rather exaggerated? Honestly, do you know anyone who fitted that description? Surely the term, as we have come to understand it—that is, if we really *do* understand it—means someone who appreciates the highest in art, music, literature, science, etc.

In the wireless sense the un-named listener whom Mr. Priestley trounced so unmercifully is merely the sort of person to whom a symphony concert or a chamber music broadcast appeals more than a Vaudeville broadcast.

It is unfair to suggest that such a person is objectionable. After all, it is quite often that our work makes us high or low brows. A great violinist, an opera singer, a writer on history cannot very well help being highbrow. His work makes him so. That does not necessarily mean that a vaudeville artiste need be a lowbrow. Probably he *will* be, because his work takes him away from the higher arts "Highbrow" may be a slang term, but personally I think highbrowism must be a virtue. What is wrong with deep study, anyhow? No, Mr. Priestley, you did not *quite* convince me! All the same, your talk was interesting as a broadcast.

◆ ◆ ◆

There was another poor vaudeville during the week. I wonder if you were as disappointed in Harry Tate as I was? I remember him years ago when he did that scene called "Motoring." You will remember the soppy youth he had with him, presumably his son, who wore an Eton collar and had one tooth blacked out. He used to convulse the audience with his inane remarks. Was he not responsible for "Good-byee, Papa?" Then there was the fun with the motor horn which, being attached to two more or less invisible strings, always managed to be just where Harry Tate was. He used to tread on it and kick it into the wings. But it was there again a few minutes later.

Since those days Mr. Tate has become famous in these various scenes. Well now, here we had him in "Golfing." His voice was there all right, his queer intonation being just as attractive as ever. We were given to understand that he brought the famous moustache with him to Broadcasting House, for where Harry Tate is, there the moustache is also. So everything was complete—apparently. When we came to his item something seemed to be missing. Mr. Tate had forgotten to bring any humour with him. Nothing but the feeblest lines. I am not relying entirely on my own judgment. There was little applause and practically no laughter. Mr. Tate must revise his lines for broadcasting. Unless the line will bear writing down and being subjected to the most thorough scrutiny it must be counted valueless. I abjure Mr. Tate to make his next "scene" a "scream" from start to finish, and I say that with grateful rememberances of him in the past, when he was *really* funny.

Vivienne Chatterton, in her character songs, did not quite convince me, I regret to say. There again, it is the lines that count. Characterisation on the wireless is not easy to bring off.

◆ ◆ ◆

Betty Warren began well enough. She prefaced her turn by telling a little story which "set" her impersonations. Then I thought she let us down. The impersonations were not so good as I have heard her give.

◆ ◆ ◆

Morton and Ridley gave us syncopated songs at the piano, and Terence McGoveran did something with a piano-accordian, but the turn of that vaudeville that was really up to standard, was the humour of John Tilley. His supposed report of his company's balance-sheet at a shareholder's meeting contained some very amusing lines.

◆ ◆ ◆

How did you like the Yorkshire Mummers? I thought some of the singing quite good but it did not strike me as an outstanding show. However, I should like to hear them again some time.

◆ ◆ ◆

I should like to congratulate Dr. Boult and the Strings of the Symphony Orchestra upon their playing of the rather hackneyed Brandenburg Concerto (Bach) on Wednesday night. That concerto had, I thought, been played to death, but they made it live. Never have I heard finer tone or finer rhythm. Bach would have been thrilled by it, I am sure.

◆ ◆ ◆

Well, did you "Consider your Verdict?" I thought the case for the prosecution broke down from the beginning. There was no question of murder. Neither could I agree with the defence which made for an acquittal. Long before the learned judge summed up the case I had decided it was manslaughter. No one has any right to drive a car with such an end in view. I wonder if you agree?

◆ ◆ ◆

Ninety Day's Leave proved to be a very amusing show. Leonard Henry kept it together, of course, but I imagine he was expected to do so. I thought the descriptive parts lacked production. The various characters who described scenery were much too formal. There were some cases of real bad inflection. Also another thing struck me: surely it might have been possible to introduce the songs better? They seemed very much dragged in. Leonard Henry was best in the scene describing how to eat spaghetti in a Naples café.

WHITAKER-WILSON.

PROGRAMME POINTERS

The two main uses of wireless are to entertain and to instruct. When instruction is given in an entertaining form broadcasting reaches its height of excellence. The series called "Consider Your Verdict" entertains and instructs at the same time. It provokes discussion; it certainly simplifies law for the layman; it attracts those who like listening to good English. The point I want to raise is that it is a weakness—regarding the series as a whole—if a ruling be not given. The case this week suggested one of three verdicts—murder, manslaughter, or not guilty. My own opinion, early in the proceedings, was that it should be given that the prisoner was guilty of manslaughter, though I should have recommended a light sentence. I think the judge held that view also. I should like to know, however, how that case went. I suggest, therefore, that some legal person or persons be asked to give an opinion and that, each week, before the new case is tried, the verdict of the previous case shall be announced. It would be satisfactory to know if one's own view was right or wrong.

BUILDIN NEW CENTU

Helpful constructional hir nection with this fine se were given in la

Three ganged coils with switch

Twin-gang .0005 condensers

Oscillator condenser

Fixed condenser and potentiometer

Preset condenser and fixed condenser

THE "New Century Super" is easily constructed. The illustrations given last week show various stages in the assembly and wiring.

The baseboard, it should be noted, has a covering of aluminium foil. This metal covering is used as the earthing point for numerous connections and helps to simplify matters considerably.

It is, therefore, necessary to do two things. The first is to see that where a connection has to be made the surface of the foil is cleaned. The second point is to be sure to cut away the foil where the oscillator (single) condenser is fitted. It is essential that there be no connection between the fixing feet and the foil as if there were the condenser would be put out of action.

Cut the Foil

Note also that the foil is removed from the baseboard where the volume control bracket is fitted. The foil should be cut away so that there is a good clearance between it and the bracket of the volume control as well as the supports of the oscillator condenser.

Valve Holders

Do not cut away the foil where the fixing bushes of the two-gang condenser are placed for the very good reason that the fixing bushes make electrical contact with the foil. Fit first the valve holders, noting the exact positions and the direction in which the grid and plate contacts point.

There are three for the intermediate frequency transformers and six for the valves. Note these remarks particularly as sometimes a fault has occurred due to the grid and plate contacts being reversed.

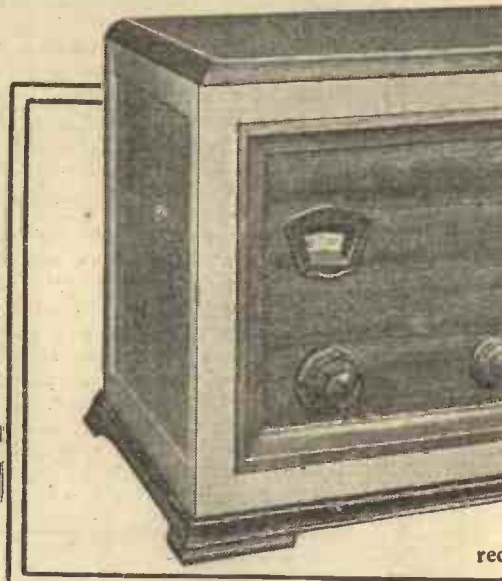
After fixing the valve holders place the two variable condensers in position. These are fastened by screws which pass through the baseboard, the heads being underneath.

Screwing them Down

These are fastened by screws which pass through the baseboard, the heads being underneath. Therefore countersink the holes on the *bottom* side of the baseboard.

DESIGNED BY W. HARRIS AND RUTH —YOU CAN BE SUR CENTURY

When tightening the screws *do not* use a lot of force, but just make the fixing screws firm so as to ensure a good contact between the foil and the fixing pieces. If you screw with too much force you are likely to get the head of the screw through the baseboard and to do other damage. You must then place the condensers in the right position and fit them carefully. Shut



rec

EVERY STATION YOU WANT IS TO BE H

...G THE ...URY SUPER

...nts by W. James in con-...et, first details of which ...st week's issue

the vanes before handling the condensers in order to avoid bending and possible short circuits.

It is easy enough to fit the three coil units. Note that the unit is not screwed down to the base itself but is raised a little by the use of two pieces of wood 3⅛ in. long and ¾ in. square. Be careful that the unit is placed in the correct position, as we want the control knob to be in the right place.

...JAMES, PERCY W. ...IERFORD WILKINS ...RE OF THE "NEW SUPER"

The Coupling Unit

There are now various other parts to be fitted, such as the condensers and coupling unit. The right positions are given in the large drawing. Note particularly the earthing points and clean them well as this will save time afterwards. When all the parts have been assembled place the valves in the holders and also the intermediate-frequency coil units in order to make sure that all parts are in the right positions.

Then you can consider the wiring. Examine the diagram in last week's issue very carefully. No. 20 gauge tinned copper wire can be used with systoflex for covering the connections.

Wiring

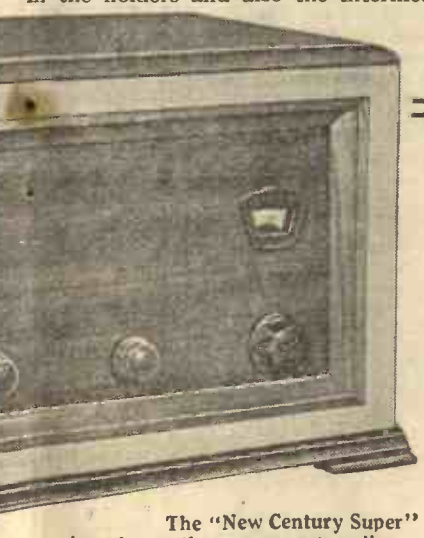
This is probably the most interesting part of the work and should be carried out slowly. Many people rush the wiring and make an untidy job. Start according to the numbers to be found on the large diagram and be particularly careful of the earthing wires.

Make a good contact with the foil by seeing that it is clean before fixing the wire. The battery wires are flexible. As each wire is connected to the set fit the plug connector so as to definitely mark the lead. Afterwards you can neatly twist sets of leads and bring them out.

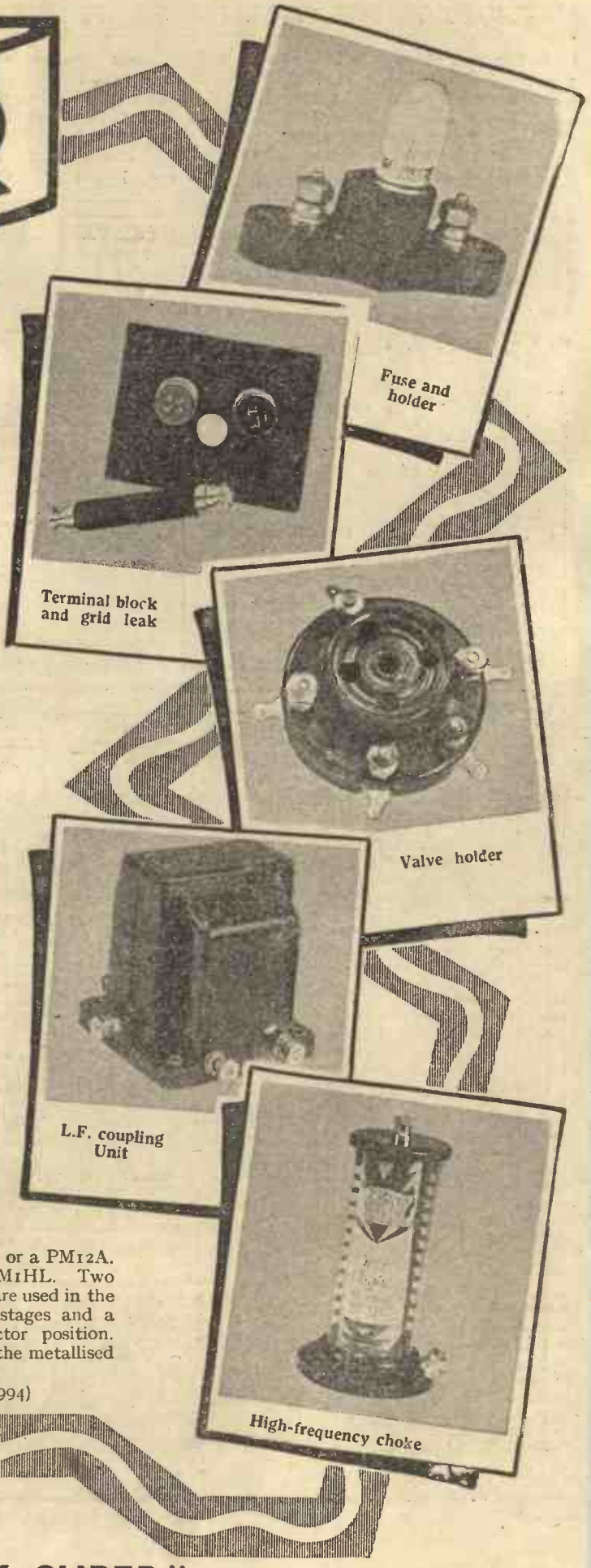
It is easy to make a mistake here. That is why it is better to fit the wander plugs as each lead is joined to the set, and not waiting until all leads are joined before fixing them. You can easily test the set before fitting it to the cabinet. A 120-volt battery is needed for high tension, a 16-volt grid-bias battery, and, of course, the filament accumulator.

In the first stage fit a PM12 or a PM12A. The oscillator valve is a PM1HL. Two PM12V valves (variable-mu) are used in the two intermediate-frequency stages and a PMHL in the second detector position. All these valves should be of the metallised type.

(*Continued on page 994*)



The "New Century Super" is no larger than an average ordinary ...ceiver and it is just as simple to operate



...HAD WITH THE "NEW CENTURY SUPER"

A SET THAT WILL BRING IN EVERY STATION YOU WANT (Continued)

The output valve is a PM22A, a small pentode. Connect the low-tension first, then the grid bias. Take the grid bias plug GB—1 to 4½ volts to start with and the G.B.—2 to the full 16 volts.

There are five high-tension positive wires. The one marked H.T.+ goes to 60 volts; H.T.+1 goes to 70 volts for the screens of the variable-mu valves; H.T.+2 goes to 90 volts for the oscillator; H.T.+3 connects with 108 volts for the auxilliary grid of the pentode; H.T.+4 is taken to the full 120 volts for the power valve and the plates of the two variable-mu valves. These voltages are approximate only, but will do to commence with. Switch the set on and tune to the local station.

Try the volume control and see that it works. Then alter, if necessary,

(*Continued on page* 996)

These parts which you will need to build the "New Century Super" are shown pictorially on the preceding pages

VARIABLE CONDENSERS
1—Twin gang .0005 (J.B., Unitune 2 type D, or British Radiophone, Polar, Utility).
1—Single .0005 (J.B., Nugang type A1, semi-screened, or Polar, Utility).

COILS
3—Super-het intermediates (Wearite, type OT2).
1—Ganged oscillator and band-pass coils with on-off switch Lissen).

TRANSFORMER
1—L.F. coupling unit (Telsen 10-1 or Lissen, Slektun, Bulgin, Igranic, Varley, Ferranti, Lotus, Goltone, Tunewell, Formo).

H.F. CHOKE
1—H.F. choke (Slektun Super-het or Ready Radio, Climax, Graham-Farish, Tunewell, Wearite, Telsen, Goltone, Lissen).

PRE-SET CONDENSER
1—.0003 max. Sovereign or Lissen, Formo, Telsen, Varley, Igranic).

FIXED CONDENSERS
2—1-mfd. (Dubilier, type 9200).
1—.02-mfd. (Dubilier, type 9200).
3—One .0001, one .0002, and one .001 (Lissen or Dubilier, T.C.C., Telsen, Goltone, Sovereign, Graham-Farish, Franklin).

RESISTANCES
2—One 1-meg. and one 2-meg. grid leak (Graham-Farish "Ohmite," Lissen, Erie, Telsen, Goltone. Dubilier, Tunewell).
2—One 20,000-ohm and one 50,000-ohm resistance (Graham-Farish, "Ohmite," or Lissen, Erie, Telsen, Goltone, Dubilier, Tunewell).

VOLUME CONTROL
1—50,000 potentiometer and combined switch (Bulgin V.S.36).

VALVE HOLDERS
9—Eight four-pin and one five-pin (Telsen, Lissen, W.B., Goltone, Bulgin, Ready Radio, Lotus.)

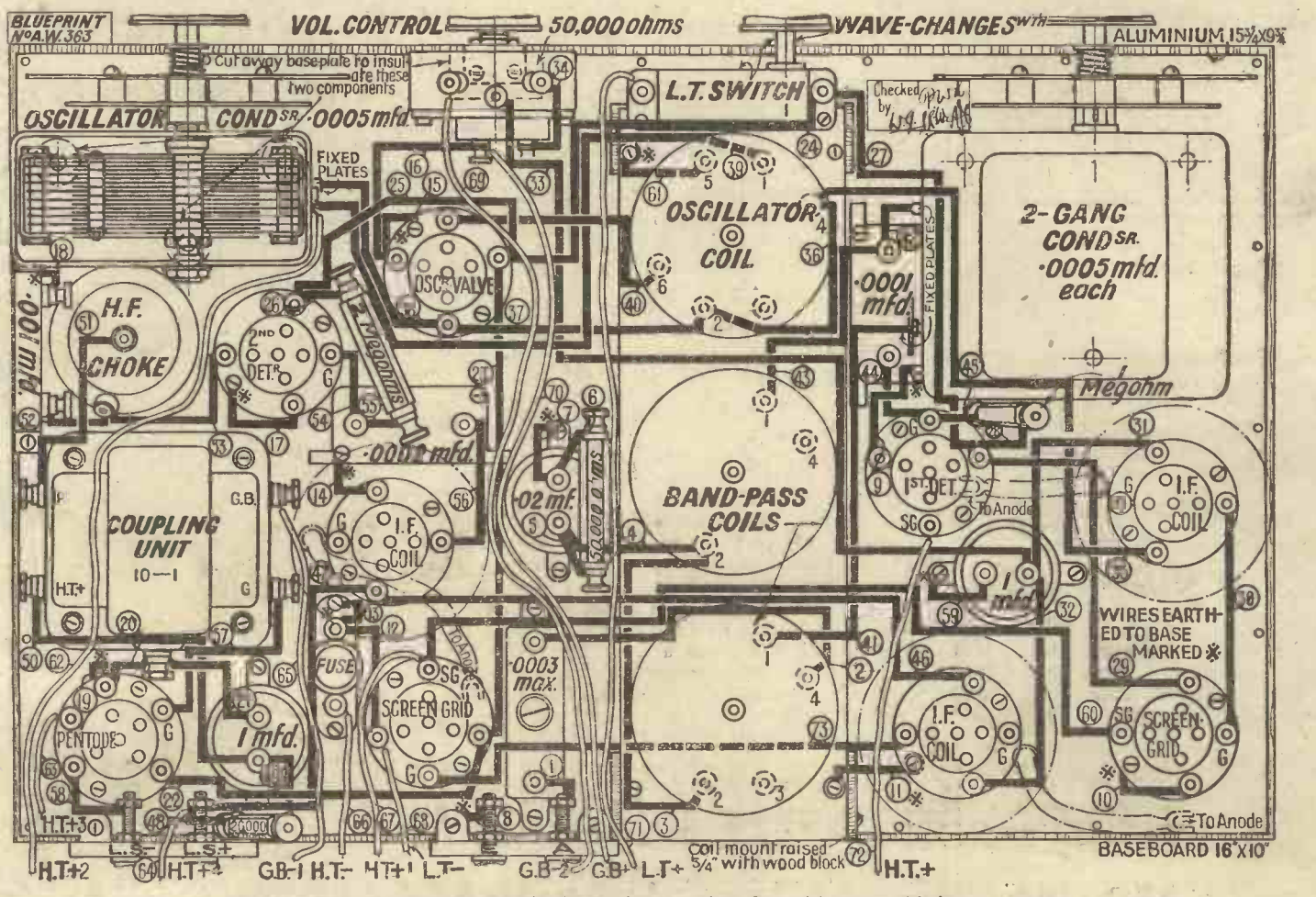
TERMINAL BLOCKS
2—Sovereign or Lissen, Goltone, Telsen.

TERMINALS
4—Marked Aerial, Earth, L.S.+, L.S.—, (Clix, or Belling Lee, Eelex).
9—Wander plugs marked G.B.+, G.B.—1, G.B.—2, H.T.—, H.T.+, H.T.+1, H.T.+2, H.T.+3, H.T.+4 (Clix, Belling Lee, Eelex).
2—Spade terminals marked L.T.—, L.T.+ (Clix, Belling Lee, Eelex).

SUNDRIES
6 yds. connecting wire and sleeving (Lewcos or Jiffilinx).
One piece of aluminium foil 16 ins. by 10 ins. (Peto-Scott).
Six yards thin flex (Lewcoflex).
Fuse and holder (Ready Radio, Lissen, Bulgin, Belling Lee).
One aluminium bracket. (Peto-Scott)

RECOMMENDED ACCESSORIES FOR TABLE MODEL
Cabinet with baseboard, 16 ins. by 10 ins. and panel drilled to specification (Direct Radio).
Cabinet Loud-speaker (W.B. Mansfield or Blue Spot, Lissen, Epoch, R. & A., Celestion).
120-volt H.T. battery (Lissen Power type, or Drydex, Oldham, Ever Ready).
16-volt G.B. battery (Lissen or Drydex, Pertrix, Ever Ready).
2-volt accumulator (Lissen, Exide, Oldham, Pertrix, Ever Ready).
H.T. unit (Atlas A.K.260 or Ekco, Regentone Lissen, Climax, Heayberd).
One coil aerial wire (Electron).
Earthing device (Graham-Farish "Filt").

RECOMMENDED ACCESSORIES FOR CONSOLE MODEL
Cabinet (Cameo "Windsor").
Chassis loud-speaker (Rola F5PMB or W.B., Sonochorde, R. & A., Epoch, Lissen, Blue Spot, Ormond, Igranic).
Batteries, accumulator, H.T. unit, and aerial and earth equipment as for Table Model.



A reduced reproduction of the blueprint. A full-size blackprint was given free with last week's issue. A blueprint, full size, can be obtained from these offices for 1/6 post free

LISSEN provide the foundation stone of the "New Century Super"

Wonderful NEW TUNING UNIT evolved by Lissen simplifies Super-het construction !

This new Lissen Super-het Coupling Unit makes Super-heterodyne construction as simple as the building of a straight circuit—makes the operation of a Super-het as easy as that of a simple receiver. In this one unit are incorporated ganged band-pass and oscillator tuned circuits, exactly matched for single dial operation, and with switch incorporated for changing the wavelength band and also to operate the filament circuits of the receiver. The unit can also be used as an H.F. amplifying unit in receivers where the design calls for high amplification before the first detector.

"Amateur Wireless" have based the design of their star set—the NEW CENTURY SUPER—on this Lissen Band-pass Super-het Coupling Unit, and it is responsible for the simplicity of both design and operation of this receiver and for the phenomenal sensitivity.

The ONLY COILS you CAN use for this "Amateur Wireless" Set !

PRICE **30/-**

LISSEN BAND PASS **SUPER HET** COUPLING **UNIT**

COMPLETE WITH INBUILT SWITCH.

LISSEN LIMITED, WORPLE ROAD, ISLEWORTH, MIDDLESEX

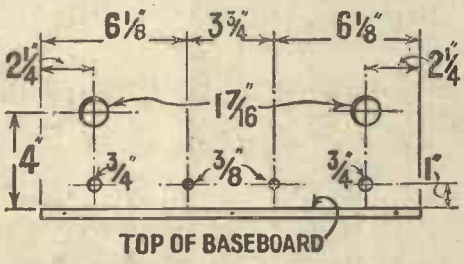
Please Mention "A.W." When Corresponding with Advertisers

THE SET DESIGNED BY THREE LEADING EXPERTS (*Continued from page 994*)

the pre-set condenser. The trimmer should be unscrewed as it is not used for ganging.

A Useful Pre-set

The pre-set condenser is useful in that if you have a large aerial the input to the set can be reduced as found necessary by trial. You had better test on distant stations, and once it has been adjusted to the best all-round value it can be left.



The panel-drilling dimensions are given in this drawing; note that the condensers are actually supported on the baseboard

Tuning is easy, the oscillator circuit in particular being sharp.

It should be remembered that the three plug-in coil units of the intermediate-frequency amplifier tune to a definite narrow band of frequencies. When tuning, you therefore adjust the aerial circuit to the frequency of the station and the oscillator is adjusted to that frequency, which results in a new signal having the frequency of the amplifier.

The signal is heard over a degree or so of the oscillator tuning condenser and then falls off rapidly on each side of this narrow section. From this it follows that, while the tuning is sharp, it is not critical. A station comes in suddenly as the oscillator condenser is turned, is held for a degree or so and then goes.

With a critical set the station is heard at one particular setting only, to the detriment of quality and ease of handling. A super-heterodyne set tunes very sharply and with the least possible interference.

These points should be noted. I know that some people look upon the oscillator condenser as a form of reaction control. This is quite wrong, of course, and the best results are likely to be obtained only when the principles of the circuit are grasped.

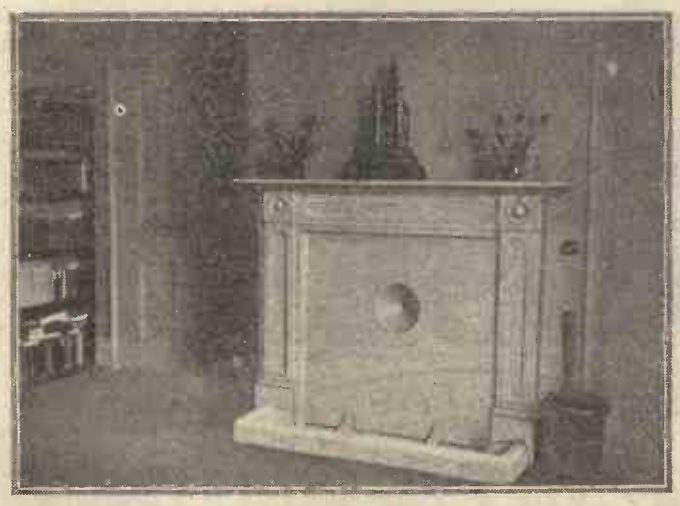
Easy Tuning

The circuit is best tuned by first setting the two tuning condensers to bring in a station, making sure they are accurately set by adjusting them with the volume control turned well down. Then the two condenser dials can be adjusted together, a fraction at a time, increasing or decreasing the volume control as necessary.

The set tunes beautifully, the stations being brought in and tuned out in a manner that will be surprising to those who have not had experience with good supre-heterodynes. A large outdoor aerial can be used, too, if desired, as the selectivity of the set is ample. On the other hand, the performance is excellent even when the aerial is a poor one.

You must use the volume control, and not attempt to alter the volume by de-tuning either condenser. If you do the selectivity may be affected. The tone will be found very satisfactory, and a large number of stations will be within the range of the "Super."

Here is the back-of-panel view of the "New Century Super" from which the compact and simple construction is apparent



A NEW PLACE *for the* LOUD-SPEAKER

A LOUD-SPEAKER, if it is mounted on a big baffle, is not only unsightly, but also cumbersome. The accompanying illustration shows how, if you have central heating, and therefore do not use your fireplace, you can employ a large baffle without it being in the way of anything in the room.

Fire-places are usually set back from the mantelpiece. But even if yours is only set back a few inches, there will be sufficient space for the baffle, in front of the grate. The fire-place remains exactly as it is. Simply cut the baffle to fit accurately into the opening in the mantel-piece and stand it on two feet that should, if possible, be sunk into the baffle (see illustration). The loud-speaker itself should be mounted sufficiently high on the baffle so that it avoids contact with the bars of the grate. In this illustration the baffle is sunk back several inches, and yet there is room for a large speaker with a big permanent magnet.

Quite apart from the convenience of this position for the speaker, it is also excellent for quality of reproduction: for the entire wall surface is made to act as a baffle. Moreover the speaker is not totally enclosed, since the chimney behind the baffle remains open. If the baffle is painted to match the mantel-piece it looks quite natural in its setting, and far less ugly than many old-fashioned fire grates. To complete the colour scheme of a room and obtain an effect of uniformity of paintwork throughout, it is a good plan to paint both the hearth and fender to match the baffle.

Results !!! Stations never England logged by Home-every part of the country !

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THE PICK OF THE MONTH'S RECORDS

A GUIDE TO THE BEST OF THE LATEST RELEASES.

The records reviewed below are a careful selection of the best of the recent issues. It will be noted that criticism is chiefly devoted to the treatment of the music and quality of recording rather than the actual composition

ORCHESTRAL

Forest Idyll (Erslinger) and **The Hermit,** 4s. **H.M.V. C2451**
Two of the descriptive school admirably done by Marek Weber and orchestra. The trilling of birds in the first is most lifelike; the second has a suggestion of "Monastery Garden." A very entertaining record.

Golden Rain and "Faust" Waltz, 2s. 6d. **H.M.V. B3894**
Bound to be popular. Marek Weber's Orchestra play these in their inimitable style.

Blue Devils' March and **Through Night to Light,** 2s. 6d. **H.M.V. B4235**
Entirely first rate. Clean, brilliant playing of two very attractive tunes. The London Palladium Orchestra are really great at this sort of thing.

The Doll and the Showman and **The Merry Teddy,** 2s. 6d. **H.M.V. B4233**
Two jolly numbers (simply *ideal* for the nursery) played by Ferdy Kauffman and Orchestra. Buy this for the party season.

Tea Party of the Cockchafers and **The Nightingale in the Lilac Bush,** 1s. 6d. **WIN 5504**
Tea-time music by the excellent Commodore Orchestra and organ. The best nightingale ever heard in Hammersmith!

The Daughter of the Regiment, 3s. 6d. **DECCA POLYDOR LY6031**
Donizetti's overture is by no means great music, but if anybody wants this piece to awaken old memories the playing of the Berlin Philharmonic Orchestra is beautifully full and satisfying.

Der Rosenkavalier Suite, 8s. **H.M.V. C2294-5**
All the pieces included in this suite are well known and are finely played by the Vienna Philharmonic Orchestra. Four out of five will like these records.

Roman Carnival Overture, 6s. **COL LX172**
A splendid orchestral record by the Hallé Orchestra. This is real, full-blooded Berlioz and I recommend those who know, perhaps, only his Hungarian March to hear it without delay.

Arsinoë Intermezzo and **Song of the Volga Boatmen,** 1s. 6d. **ZONO 6196**
By Ray A. Goddere and the Grosvenor House String Orchestra. Eminently suitable tea-time music.

BAND

Pilgrim's Chorus and **Grand March,** 1s. 6d. **WIN 5509**
The band of H.M. Scots Guards tackle Tannhauser quite well.

The Warrior and **Post Horn Polka,** 1s. 6d. **ZONO 6198**
Harry Mortimer gives a very fine cornet performance here with Foden's Band. The first is really excellent.

DANCE

Let's Have Another Cup of Coffee and **Cabin in the Cotton,** 2s. 6d. **H.M.V. B6225**
Excellently played fox-trots by Waring's Pennsylvanians and Johnny Hamp's Orchestra respectively. Both are "straight."

Drink Up! and **Have Another One** and **One Hour with You,** 1s. 3d. **IMP 2746**
A bucolic and a sentimental fox-trot are here vigorously played by Jack Payne's Band. The first is mostly vocal.

Sharing and **Tell Me Why You Smile** 2s. 6d. **H.M.V. B6224**
Fox-trots both. I like the first (by Jack Denny and his Waldorf-Astoria Orchestra). The other is by Waring's Pennsylvanians.

I'll Keep You in My Heart Always and **Julian,** 1s. 6d. **BRDCST 3239**
Two tangoes with the musical saw effectively used.

For You, Just You, My Baby and **Little Romany,** 1s. 6d. **STERNO 1021**
An excellent tango and waltz admirably played by Mantovani's Orchestra. And there are no vocals.

Midnight Waltz and **Monsieur Tricotrin,** 1s. 6d. **STERNO 1005**
Two more good numbers by the same band.

Samum, 1s. 6d. **ZONO 6188**
"A classical fox-trot." If it *is* a fox-trot (and it seems a perfectly good one), no one who had heard it could tolerate the ordinary rubbish again. It is a masterpiece, by Bertini and his Band: hear it. Of course, it may be an Eastern rhapsody in disguise, but it is very delightful.

INSTRUMENTAL

Softly Unawares and **Les Sylphides,** 1s. 6d. **WIN 5512**
One of the best cinema organ performances Ive heard for some time, especially the first. They are by Harry Davidson and are admirably recorded.

Extase (Ganne) and **Popular Song and Tale,** 3s. 6d. **DEC POLYDOR LY6033**
By the Paul Godwin Quintet (with harp). Here are three restful pieces very pleasantly played. An enjoyable record.

Campanella, Op. 7 Bis (Pagani) and **Tzar's Bride** (Rimsky-Korsakov), 6s. **H.M.V. DB1638**
Two remarkable violin solos by Yehudi Menuhin. This boy's playing in the first piece must be heard to be believed. Very brilliant all through.

VOCAL

The Yeoman of the Guard—Vocal Selection, 2s. **IMP Z132**
A stronger chorus would have helped this. The solo parts are fair. Anyway, the record is certainly good value.

Deep In Your Eyes and **The Voice in the Old Village Choir,** 2s. 6d. **H.M.V. B4226**
The singer here (Donald Noirs, tenor) is new to me. The record is worth while for the first, which is an attractive light song well sung.

O Star of Eve and **Toreador's Song,** 1s. 6d. **BRDCST 3231**
By Roy Henderson. The first is *really* good, but there is something wrong with the recording of the Carmen piece.

Stormalong and **Highland Laddie** and **Billy Boy** and **Hob-a-Derry-Dando,** 1s. 6d. **BRDCST 3219**
A "terrific" performance by Tom Burke and his Human Voice Orchestra. A useful record to lead a sing-song.

Come to the Ball and **The Shade of the Palm,** 1s. 6d. **BRDCST 3232**
Two delightful old friends splendidly sung by Arthur Vivian (baritone). He has a most commendable enunciation.

The Linden Tree and **By the Sea,** 3s. 6d. **DEC-POLYDOR LY6032**
By Leo Slezak (tenor), in German. I think these two songs of Schubert may best be described as "sympathetically" sung.

Parted and **I Love Life,** 2s. 6d. **DEC M423**
Sydney Rayner, a tenor of some note, crashes through these. His voice is undeniably good.

Ah! Fairest Sun and **Flower Song** (Carmen), 2s. 6d. **DEC K677**
Now here is the real Sydney Rayner in splendid voice within his legitimate sphere—opera. Brilliantly sung in French

Waiata Poi and **To a Miniature,** 1s. 6d. **ZONO 6194**
Two very attractive songs in their respective spheres. The first (a Maori song) is especially good.

MISCELLANEOUS

Tilly Took a Tramp in the Wood and **Laugh and Let the Clouds Roll By,** 1s. 3d. **IMP 2752**
Randolph Sutton, breezy as ever, quite ably supported by somebody's "boys."

There's a Ghost in Our House and **Watch the Navy,** 1s. 3d. **IMP 2751**
Leslie Holmes this time. Out of the same stable as the last, and as effectively done.

The Big Drum-Major and **The People Upstairs,** 1s. 6d. **BRDCST 3225**
A most entertaining pair by the Western Brothers. Mention should be made of the noises in the first.

Old Friends With New Faces, 1s. **BRDCST 878**
In other words, "Just Like the Ivy" and such like tapped, banged, and twanged on modern dance-band instruments. Rather enjoyable, really.

H. T. Current for less than 1/2 D. per week

FROM THE FOUR TYPES OF LISSEN ELIMINATORS MENTIONED ON THIS PAGE YOU CAN CHOOSE ONE WHICH EXACTLY SUITS YOUR SET.

Low first cost is practically your only outlay because the cost of running a Lissen Eliminator is so small that your meter will hardly register the current it takes. No current from any eliminator is smoother or more silent than the current of a Lissen Eliminator. No eliminator output is more constant, none is so free from hum. Every Lissen Eliminator will deliver—

Yours for 5/- DOWN

20 mA Output in perpetuity—

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Large smoothing chokes—big condensers—no chance of motor-boating. Decoupling arrangements incorporated in every eliminator—you connect the Lissen Eliminator almost as you would an H.T. battery. Everything has been thought out for you—you simply put the eliminator in. Lissen have made eliminators safe by totally enclosing all the current-carrying parts in high-grade insulating material—see also the thickly insulated "cab-tyre" flex.

EASY TO CHOOSE

The type you want is easy to choose. Your dealer will help you, or write direct to factory.

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Every Lissen Eliminator is available for a small initial payment and easy gradual purchase terms.

D.C. MODEL "A"
100/110, or 200/250 volts. Cash price 27/6. Or 5/- down and 5 monthly payments of 5/6.

D.C. MODEL "B"
100/110, or 200/250 volts. Cash price 39/6. Or 5/- down and 8 monthly payments of 5/-.

A.C. MODEL "A"
100/110, or 200/250 volts. Cash price 60/-. Or 5/- down and 10 monthly payments of 6/6.

A.C. MODEL "B"
100/110 or 200/250 volts. Cash price 75/-. Or 5/- down and 10 monthly payments of 8/-.

LISSEN A.C. OR D.C. ELIMINATORS

"USING YOUR SET ON THE SHORT WAVES"

(*Continued from page* 989)

You will see that there are two high-frequency chokes. The one connected direct to the valve anode is a short-wave choke. The other is a standard type. The values of the parts are as those previously mentioned, and the main additional component is a potentiometer across the low-tension supply for finding the correct bias of the detector grid.

This type of unit has its output connected to the aerial and earth terminals of the set, and the aerial and earth are taken to the input. The set is tuned to the long waves; anywhere between 1,600 and 2,000 metres. It must be accurately tuned. If the set is not ganged, it is wise to tune in one of the long-wavers before the unit is added. This ensures that you get the most intermediate-frequency amplification.

The unit is adjusted so that it is gently oscillating, and the effect of it, when it is tuned to the short-wave station, is to convert the incoming short-wave signal to a long-wave signal which is amplified by the high-frequency stage or stages of the broadcast set.

You must remember, though, that although the unit brings in the short-wave stations, it is actually never adjusted to the point of exact tune. It has to be slightly mistuned in order to produce a beat note in the anode circuit. The amount of the mistuning determines the frequency of the beat.

The autodyne type of unit works in the same way, but a screen-grid valve is used as the combined detector and oscillator. Therefore the choice of the valve needs care. Not all valves will work well.

There should be a 50,000-ohm potentiometer for critical adjustment of the screening-grid voltage, and the grid of the screen-grid valve will need about 3 volts bias. This can be obtained by a separate battery in series with the slider of the "pot." usually put across the low-tension wiring.

An autodyne unit, as with any super-het unit, must be adjusted to oscillate all the time the stations are being received. You will have to spend about half an hour varying the grid and screening-grid bias until the screen-grid valve oscillates smoothly.

TEST IT FIRST

It pays to try a set out in the "hook-up" stage before it is finally fitted into the cabinet. This applies particularly to band-

pass sets where it is difficult to get at the trimmers on the top of the condensers, once the set is in its box

"ARE DUAL SPEAKERS WORTH WHILE?"

(*Continued from page* 985)

We now come to the final point—that of the transients. This is a matter which can be discussed at great length. Briefly, a transient term is a sudden vibration which is not regularly recurring. If one whistles a note the vibrations are regular and continuous. When we beat a drum, however, we produce a sudden sharp vibration which does not continue. Some instruments, such as the oboe, produce notes which, although apparently continuous, are really made up of a more-or-less regular succession of these transient effects.

It seems that the ordinary loud-speaker diaphragm is incapable of following out these vibrations sufficiently faithfully to give a good reproduction of transient terms. Some experiments were conducted recently at Cambridge with sand figures, by using a specially prepared plate carrying fine sand on which the sound vibrations were allowed to fall. When they did so they caused the sand to form certain patterns on the plate and different instruments gave different forms of figure.

By playing first the actual instrument and then the reproduction of the instrument through a loud-speaker, it is possible to compare the real with the artificial. These experiments showed quite conclusively that with an instrument such as the oboe containing a large proportion of transient terms the single loud-speaker was quite unable to give satisfactory reproduction.

SETS OF THE SEASON

LISSEN —BATTERY THREE

HERE is a set that does a great deal to remove a long-standing reproach about the lack of battery sets. The Lissen Battery Three is a straightforward attempt to meet present-day requirements in range and selectivity at a moderate cost.

My tests prove that the set copes adequately with existing conditions, and, with easy control, brings in a very goodly number of foreign stations at full loud-speaker strength—at a strength that makes them really worth hearing as alternatives to the locals.

In its general layout the Lissen set under review has many points of distinction.

BRIEF SPECIFICATION OF THE LISSEN SET

Makers.—Lissen Ltd., Isleworth, Middlesex.

Price.—£8 17s. 6d.

Valve Combination.—Screen-grid (Lissen SG215) metallised detector (Lissen HL2X) and pentode output (Lissen PT225).

Power Supply.—Self-contained batteries.

Power Consumption.—Due to use of "economy" pentode, total anode current was only 9 milliamperes.

Controls.—Single knob for main tuning, with super-imposed trimmer. Combined wavelength and battery switch knob. Combined reaction and volume control, giving progressive increase in volume from zero to maximum.

Type.—Table-cabinet set with self-contained loud-speaker of moving-iron type.

Remarks.—A good "straight" three-valver giving a large number of foreign stations at fine strength.

The cabinet, for example, is fashioned on the new "cathedral" lines. The figured-walnut wood is in good taste, and is remarkably superior for such an inexpensive set.

Looking into the set from the opening at the back—there is no cabinet back—we find a neat metal-chassis set. On top of this chassis are mounted the two Lissen screened tuning coils, and in suitable positions around the coils are the three valves All the remaining components are mounted below the chassis.

In the top part of the cabinet is a large moving-iron loud-speaker. The large size of the diaphragm is more than justified by the good reproduction. The absence of a back to the cabinet still further enhances the clean-cut effect that is so notable a feature of the loud-speaker's output.

The circuit is, rather inevitably, a screen-grid, detector and pentode combination. The aerial is coupled to the grid tuning of the screen-grid through fixed condensers. For volume control there is a variable resistance across the input tuning.

A choke-fed coupling comes between the screen-grid and the detector valve, which has reaction applied in the usual way through a coil, coupled to the grid coil, in series with a variable condenser. The reaction is controlled by the same knob as the variable resistance, giving a progressive increase in volume, the reaction coming into action at the maximum setting of the volume.

The detector is coupled by a transformer to the pentode output valve, with a tone-compensating grid-stopper in the pentode circuit. Such is the circuit, which certainly works with good effect in the set I tested.

I was soon listening to all the usual foreigners on the medium waves. The tuning dial is marked in wavelengths, which in the model tested, were all on the low side. This small fault could easily be remedied.

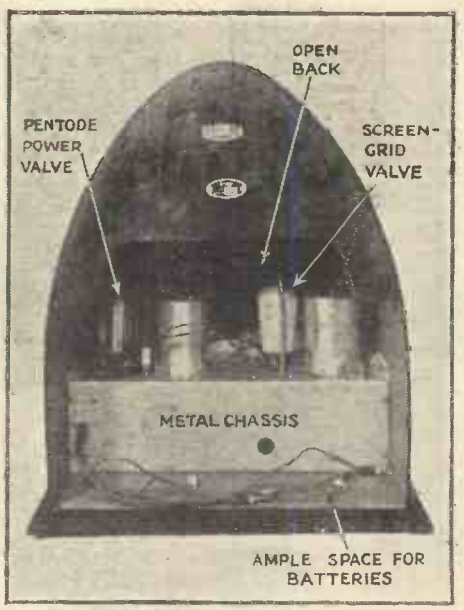
The strength of the foreigners was really good. I found Budapest at the top of the dial came in at full strength, which I consider is good for a three-valver. The long waves were above the average. I got Oslo better on this set than I can remember getting it for a long time. Radio Paris was clear of Daventry.

Medium-wave selectivity is rather deceptive. As you know, there are now three powerful medium-wave nationals —London 261, Scottish 288.5 and North 301 metres, and if you are not careful you think London National is spreading all over the place, whereas really you are getting three distinct stations.

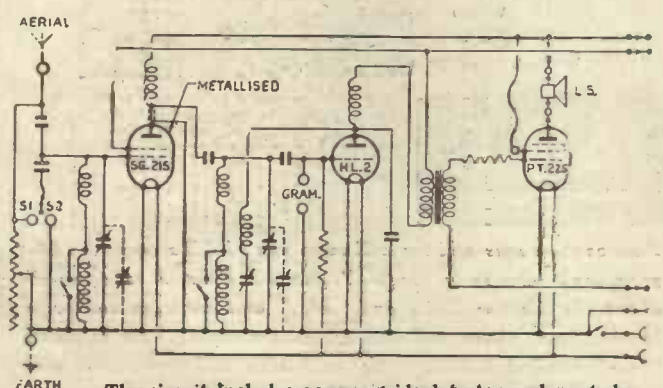
I got Hilversum clear of North National, and Midland Regional clear of London Regional. Above Midland Regional, the set behaves very well indeed, bringing in all the worth-while stations without any difficulty. Langenberg was clear of North Regional, as was Prague.

I liked the tone balance. Speech is very clear. Music has quite a pleasing timbre and enough volume can be obtained for normal requirements without overrunning the stout little Lissen pentode to its point of distortion. Cutting down the volume does not interfere with the quality.

SET TESTER.



The Lissen Battery Three is metal-chassis built and as this rear view shows accessibility is a feature



The circuit includes screen-grid, detector and pentode with a variable resistance volume control across the input tuning

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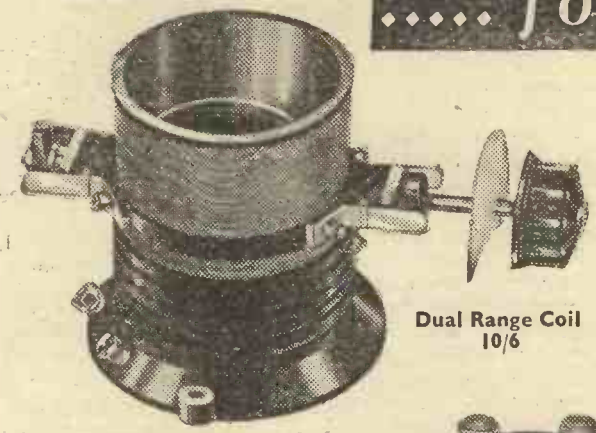
The fourth act of Verdi's opera, *Il Trovatore*, will be relayed from the Empire Theatre, Newcastle-upon-Tyne, on November 12. It will be given by the Carl Rosa Opera Company.

Karl Ulrich Schnabel, the son of the famous Artur Schnabel, will play the Mendelssohn Concerto in G minor in a concert to be relayed from the Ulster Hall, Belfast, on November 19.

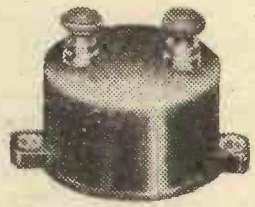
MAKE YOUR OLD SET BETTER THAN IT WAS WHEN NEW

..... *for a few shillings*

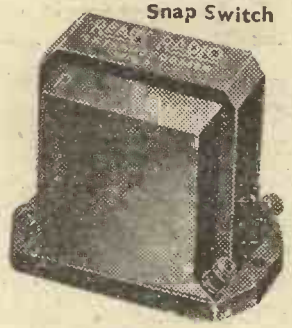


Dual Range Coil 10/6

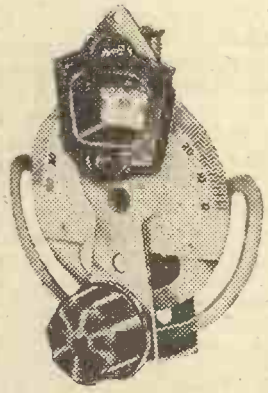
Snap Switch 2/9



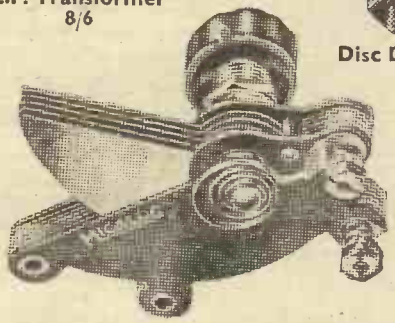
Standard H.F. Choke 1/6



L.F. Transformer 8/6



Disc Drive 25 to 1 4/-



'Micalog' Condenser 3/6

Is your radio set behind the times ? Is it failing to give you modern efficiency ? Do you realise how easily and cheaply you can make it even better than it was when new ?

Take advantage of the many improvements in design and efficiency which have been discovered since your set was built and bring it right up-to-date with Ready Radio Components. Every Ready Radio Component is the outcome of extensive laboratory research of the famous designer, Mr. G. P. Kendall, B.Sc., and possesses special features which will give you greater efficiency and reliability. As soon as you put Ready Radio Components into your set you will be impressed by the improvement.

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A minimum of forty or fifty stations on the speaker with ease and great volume. Short-wave stations from all parts of the World.

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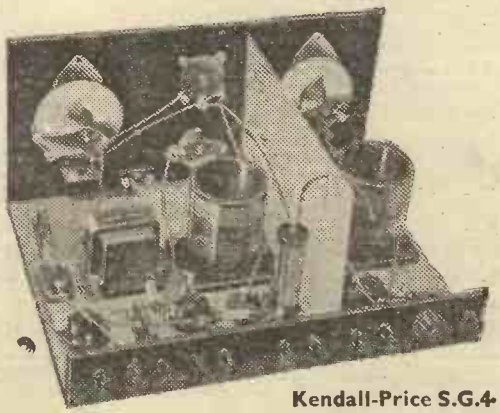

Kendall-Price S.G.4

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Please send me free copy of the Kendall-Price Book of Ten Circuits. I enclose 1½d. stamp to cover postage.

Name.....

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If you wish to have, with your free book, ten full-sized blue-prints, enclose 1/- in stamps with this coupon. A.W.12

What Our Readers Think

The Editor does not necessarily agree with the views expressed by readers and does not accept responsibility for the letters published. Letters cannot be published which do not bear the sender's full name and address

Collecting the Volts

SIR,—L.H.L.'s account of a shock being received by persons making contact between a 'bus rail and a metal pit cover interested me, because I had several reports of passengers receiving quite heavy shocks either on alighting or boarding. After several tests we discovered it to be due entirely to static. We ran various 'buses for a few miles then stopped and by retaining our hold of the back rail we got a severe shock. In one case the man was thrown heavily to the ground. I think you will quite see how it is possible. Hot weather, dry asphalt roads, rubber tyres, machinery in motion, and the bus becomes a generator of static electricity which the first person to alight or board discharges. Of course, the point at which one happens to get the shock is a factor in the case. The metal pit cover in L.H.L.'s case was particularly suitable.—J. W. J. (Kensington).

Battery Charging

SIR,—I agree with H. K. A. G. (Battle) in his remarks re some battery charging stations. The job is *not* done when the battery gasses, as so many seem to imagine, yet there are customers who, if one of these so-called charging people offered to do them a penny cheaper, would take their custom there.

I saw the following in a catalogue which might equally apply here:

"There is hardly anything in the world that some man cannot make a little worse and sell a little cheaper, and the people who consider price only are that man's lawful prey."—D. G. T. (Ilminster).

SIR,—Like H. K. A. G., I am pleased to see your articles advising listeners on their low-tension and high-tension accumulators, but may I say a word in defence of the charging station attendant, who seems to be blamed for all the discrepancies of low-tension batteries.

Re corrosion on terminals, he's a poor listener, I won't call him a "fan," who can't attend to this matter at home, thereby making sure himself of good contact and at the same time good results, and I venture to say that most charging station assistants advise their customers to keep their terminals clean. I would advise all listeners to change their charging station if they receive their batteries back awash with acid. This certainly can be avoided at the station. As for "topping up," I for one would doubt my battery being fully charged unless the plates were covered.

The Editor invites letters from readers on all interesting radio subjects. For the most interesting letter published each week a general-purpose valve or other component to the same value will be given.

May I address a word to accumulator manufacturers? Why the difference in the specific gravity of the different makes? I looked over my board to-night, and I found four different makes and four different S.G.'s, from 1.215 to 1.250. Why not a standard S.G.? I know it is easy enough making S.G. 1.215 from 1.250, but manufacturers would be sure of their batteries being treated properly if they would standardise the S.G. It's a messy job at the best of times filling an accumulator, and it's only human nature if one gets careless and fills up with S.G. 1.240 instead of 1.215, especially near closing time.—G. G. (Dundee).

Another Impression of the Show

SIR,—I am little more than a newcomer to wireless, and for the first time visited the Radio Exhibition this year. I came away somewhat disappointed, but did not quite know why.

I have just read W.H.'s letter in this week's issue, and believe I now understand why the Show did not reach my expectations.

As it was my first visit I cannot, of course, compare the Show with its predecessors, but surely we should be shown a little of the construction of components. Everybody has some desire to know how a thing is made or works, and seeing a thing taking shape creates interest.

I saw a pageboy playing with a Yo-Yo, and he had a large crowd watching him, which goes to prove that visitors were sorely in need of something to look at.—G. W. (London, S.E.).

Tone Compensation

SIR,—I have tried out your tone compensator given in your issue of October 1 between two speakers with satisfactory results. In fact, I might say more than satisfactory, as one speaker, being very sensitive, would give a heterodyne whistle, also produce a background of an interfering station when switched on alone, whereas the old speaker, not quite so sensitive, would not do this. Since fitting this potentiometer I can work these speakers separately or simultaneously without this background.

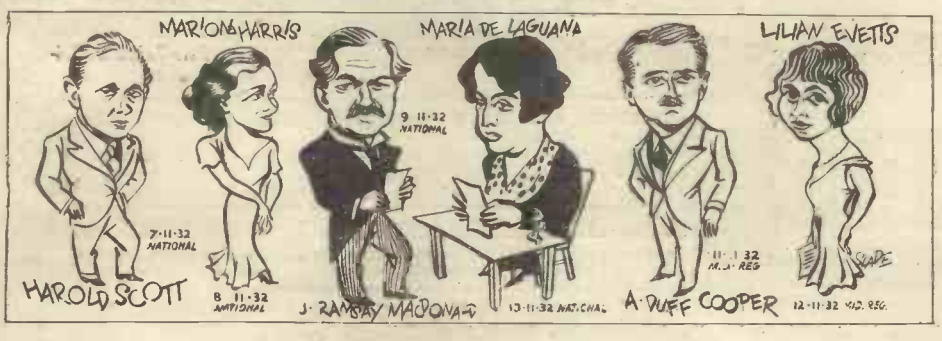
Also an idea that might be of interest. Most people know how to metallise their valves by using aluminium paint and a small piece of wire. The best way of applying this paint to the valve is to obtain a spray used for spraying "Flit" (the fly killer), fill the container with the paint and proceed to spray it on. This gives an even coating over the valve.—F. A. (Caterham).

The Crystal Set To-day

SIR,—I wonder how many of your readers who possess a humble crystal set think to try it out in these days of high-powered stations.

This week I roughly built a variometer-tuned crystal set and of course tried it out before fixing it in the room. Imagine my surprise when I was able to tune in 5GB, North National, and much louder and clearer than either of these came a dance band from Poste Parisien. I also heard two other stations on the medium waveband, but I was unable to identify them. Judging from the dial readings they could have been Radio Roma and North Regional. After plugging in a loading coil 5XX came in good with Radio Paris in the background. I think you will agree with me that the foregoing is not a bad log for a crystal set situated right in the heart of the "Black Country" near Birmingham.—J. H. G. (Dudley).

PERSONALITIES OF THE WEEK'S PROGRAMMES



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OFFICIAL DEMONSTRATION : 159 BORO' HIGH STREET

"Amateur Wireless" in co-operation with Direct Radio invite you to a demonstration of the "Century Super" constructed from Direct Radio guaranteed kits. Even the designers are astounded. Before you definitely decide on any new receiver come to 159 Borough High Street and test the remarkable "Century Super" yourself.

CASH

	£	s	d.
1 J.B. Unitune twin-gang .0005 variable condenser, fully screened		18	6
1 J.B. Unitune single .0005 variable condenser, fully screened		9	6
1 Bulgin 50,000-ohm potentiometer and combined switch type VS36		5	6
3 Wearite super-het intermediates with pigtails	1	11	6
1 Set Lissen ganged oscillator and bandpass coils and combined on-off switch	1	10	0
8 Four-pin and 1 five-pin valve holders		4	8
2 Dubilier 1-mfd. condensers, type 9200		5	6
1 Dubilier .02-mfd. fixed condenser, type 9200		2	0
1 T.C.C. .0001-mfd. fixed condenser		1	3
1 T.C.C. .0002-mfd. fixed condenser		1	3
1 T.C.C. .001-mfd. fixed condenser		1	6
1 Erie 1-megohm grid leak		1	0
1 Erie 2-megohm grid leak		1	0
1 R.I. Parafeed low-frequency coupling unit		11	9
1 Sovereign .0003-mfd. pre-set condenser		1	3
1 Ready Radio high-frequency choke		5	6
2 Sovereign terminal blocks		1	0
4 Belling-Lee terminals, marked: Aerial, Earth, L.S.—, L.S.+			10
9 Belling-Lee wander plugs, marked: G.B.+, GB.—1, G.B.—2, H.T.—, H.T.+, H.T.+1, H.T.+2, H.T.+3, H.T.+4		1	2
2 Belling-Lee spade terminals, marked L.T.—, L.T.+			8
1 Sheet aluminium foil, 16 in. by 10 in.		1	6
1 Ready Radio fuse and holder		1	0
1 Erie 20,000-ohm fixed resistance		1	0
1 Erie 50,000-ohm fixed resistance		1	0
1 Aluminium bracket			3
6 Yards flex			4
1 Special Direct Radio "159" cabinet, with Easyfix baseboard and panel drilled to specification	1	1	0
6 Mullard valves: PM12 Met., 2 PM12V Met., 2 PM1HL Met., 1 PM22A	4	1	0
1 Calibrator Easy Station Finder (no charge)			
	£12	2	0

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Or twelve monthly payments of 13/-.

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KIT MODEL 4 (Complete kit as specified with "159" Consolette Cabinet, Valves, and Epoch Twentieth Century Moving Coil Speaker) **£15:0:0**
Or twelve equal monthly payments of £1/7/6

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ACCESSORIES

1 Siemens H.T. battery	*13*	*6*	
1 Oldham L.T. accumulator, type 0.50	*9*	*0*	
1 Atlas H.T. unit, type A.K.260	*4*	*10*	*0*
1 Epoch Twentieth Century moving-coil loud-speaker	*1*	*15*	*0*
1 Selectanet indoor aerial	*2*	*6*	
1 Selectanet earth	*1*	*6*	
1 "Cop" lightning arrestor and lead-in tube	*2*	*6*	

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for which (a) I enclose (b) I will pay on delivery (c) I enclose first deposit of {cross out line not applicable} £.....

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IN MY WIRELESS DEN

WEEKLY HINTS — CONSTRUCTIONAL & THEORETICAL

BY W. JAMES

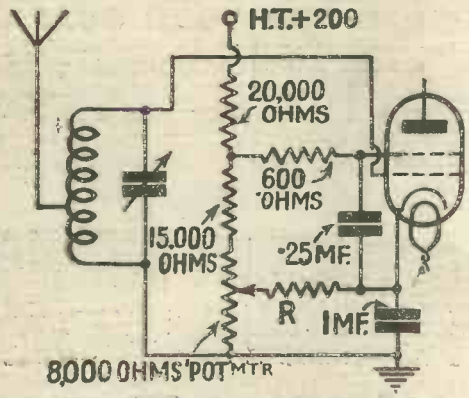
MULTI-MU ADVANTAGE

ONE of the chief advantages of the multi-mu screen-grid valve is the fact that a grid-bias control is satisfactory for adjusting the amplification.

When the bias is small the maximum magnification is obtained, and as the bias is increased so the amplification is cut down. The circuit shows a convenient method of dealing with a screen-grid valve of this type. Bias and screen voltage are considered together, because the action of the valve might be very different from the ideal if the voltage of the screen were not controlled as well as the bias.

De-coupling is also included, the values being for an Osram valve. Rather different values may be required for valves of other makes. The 600-ohm resistance is for de-coupling and works with the .25-microfarad condenser. Resistance R should have a value of about 75 ohms, but this may be increased if the stage is unstable when the potentiometer is set to give maximum volume.

A graded-type potentiometer is recommended and it must be capable of carrying a fair current, such as 12 to 15 milliamperes. The current falls off as the bias is increased, but when the bias is about the minimum the current is the maximum. The control must be a good job from the mechanical point of view.



A good multi-mu circuit: details are given in the accompanying paragraph

DEALING WITH THE LOCALS

I OFTEN wonder how people having a popular type of three-valve set manage to deal with the local stations.

The set referred to is of the screen-grid, detector, pentode type. No doubt, a volume control is fitted, but the chances are that it is really suitable for varying the volume but slightly. The local stations are picked up at such great strength that the amplification before the detector must be greatly reduced in order to avoid overloading.

The usual high-frequency control distorts the signals when used near the minimum. When a screen-grid potentiometer is adjusted to reduce the amplification to near the minimum point the valve is working in such a way that correct amplification is not obtained.

With a multi-mu type screen-grid valve having a control the results are much better, but the majority of sets are not fitted with this type of valve. A solution of the problem of how best to deal with local stations is perhaps to cut out the screen-grid valve altogether.

Join the aerial through a pre-set conpenser to the grid end of the tuning condenser in the detector circuit. If the strength is enough, then arrange the alternative aerial tapping. The screen-grid valve can be made practically inoperative by turning its control to minimum.

MOVING-COIL RESONANCE

THE moving-coil speaker is looked upon as being the best type, but it is well to remember that these speakers have, as a rule, two pronounced resonance points.

The first is the resonance which usually has the mean frequency of 70 or 80 cycles.

(*Continued on page* 1010)

"IN MY WIRELESS DEN"

(*Continued from page* 1008)

This may be well defined, or the makers may have smoothed it out a bit and expanded it over a band of the lower frequencies. Naturally if the resonance happened to be at 100 cycles and the speaker were used with an A.C. set having rectified 50 cycles, there might be trouble from hum.

Therefore the makers of the loud-speakers take care to have the lower resonance point where it does least harm. This resonance does boost up the bass and is considered useful, provided the effect is not too pronounced.

At the other end of the frequency scale we have, as a rule, a further resonance, followed by a marked falling off at the higher frequencies.

The point is that if the quality of the one you happen to have is not satisfactory, the makers might be able to put it right at little cost. Do not feel that the whole of the makers outfit of that type is likely to be faulty because your one is, but give them a chance to put it right. By the way loose screws and other parts must be avoided or strange noises may be heard. The back of the cabinet must be a tight fit, as it has been noticed that a loosely fitting back may vibrate.

MAKING THE DETECTOR SENSITIVE

WHEN you are trying to get the utmost from a set, it is advisable to adjust the detector very carefully.

The size of the grid condenser does not matter very much as a rule, but there is no harm in trying values of from .0001 to .0003 microfarad. Quality will be altered a little if the capacity of the condenser used is changed, but the sensitivity will hardly be varied.

The grid leak is usually much more important; a value of 3 megohms may be tried and other values down to about .5 megohm. This leak should be joined between the grid of the valve and a contact on a potentiometer which is connected across the filament battery. You will notice a fair difference in the results when testing with the leak connected between the grid and low-tension positive and the grid and low-tension negative.

With the leak having one end joined to a tap on a potentiometer the results may be best of all. Smooth reaction and good sensitivity may be obtained more easily when the potentiometer is used. This may be a resistance of two or three hundred ohms having four taps.

Next try various values of by-pass condensers between the anode of the valve and negative low tension. The effect of working on the detector circuit may easily be to double the results and a fair amount of time can be spent in testing. Potentiometers for the filament circuit are manufactured and are quite cheap.

Sometimes it is advisable to connect a condenser of, say, 1 microfarad between the negative low tension and the tap having the grid leak joined to it. It is interesting to note that the values found best for the particular valve used as the detector may not be the best when a different valve is fitted. Naturally, there are slight differences between valves, which may not be noticed unless the circuit is as efficient as possible.

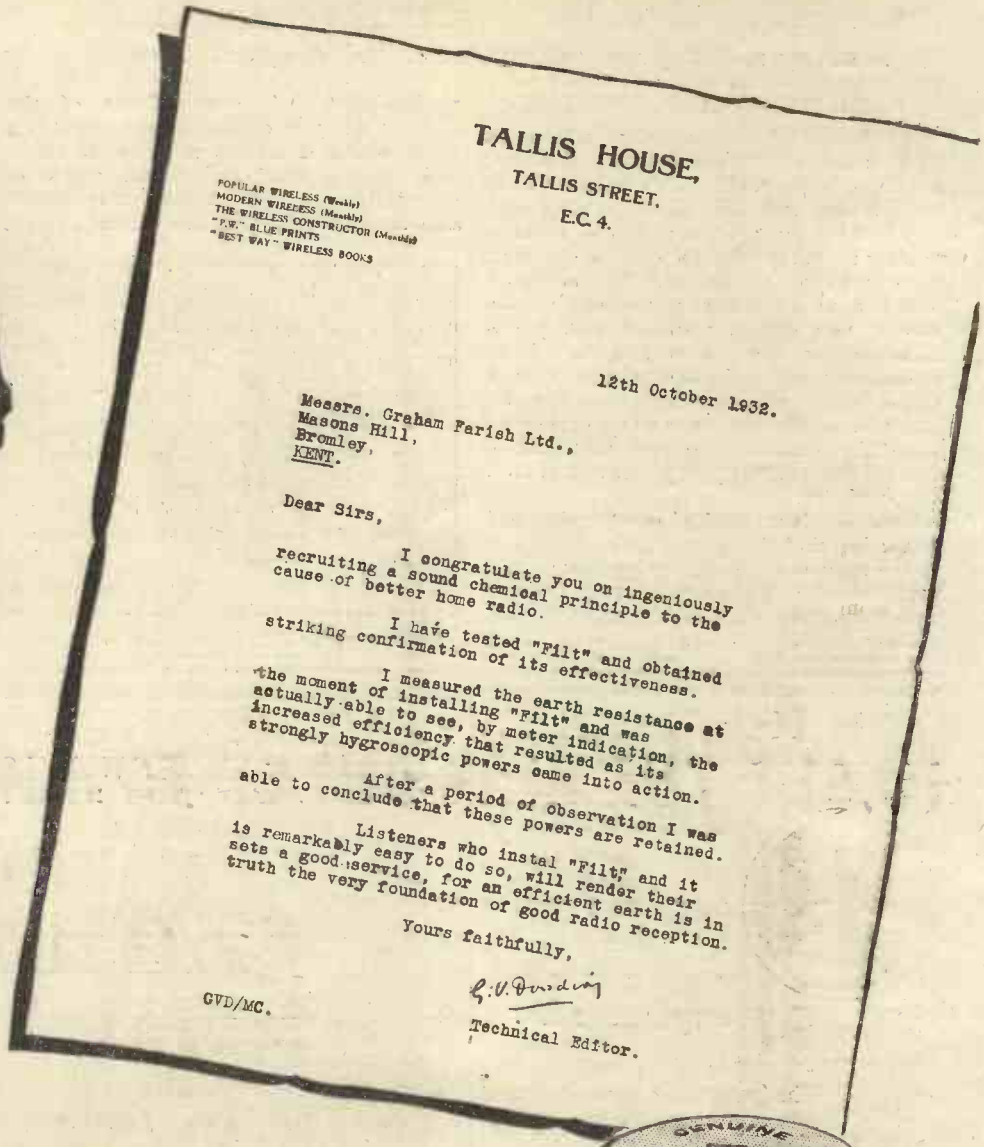
The well-known 1933 model Brown moving-coil speaker, the list price of which is £3 19s. 6d., is being offered at 39s. 6d. by E. J. Heraud, Ltd., Dept. A.W.14, Number One, Edmonton, N.18. These speakers are complete in cabinet, and are of the permanent-magnet moving-coil type. A deferred-payment system is available, and a speaker can be obtained for seven days' free trial for a deposit of only 2s. 6d.

"Music Seller" Reference Book, 1932-1933.—Members of the music selling trade, which includes some proportion of the wireless trade, will find extremely useful the "Music Seller" Reference Book, 1932-1933, issued as a free gift to subscribers to the "Music Seller," the monthly trade paper published by Evans Bros., Ltd., Montague House, Russell Square, London, W.C.1. The Reference Book is a bound volume of 272 pages and contains a complete alphabetical list of all the gramophone records issued by all the recording companies during the past twelve months, and, in addition, much other valuable information, such as addresses of gramophone and accessories makers, a radio directory, sheet music of the year arranged alphabetically, etc.

A Beethoven and a Brahms sonata for violin and pianoforte will be broadcast from Manchester on the North Regional wavelength on November 9, by Reginald Stead and Maurice Arnold.

Another Expert who praises FILT

Mr. G. V. Dowding, Associate I.E.E., Technical Editor of several well-known wireless publications



TALLIS HOUSE,
TALLIS STREET,
E.C.4.

POPULAR WIRELESS (Weekly)
MODERN WIRELESS (Monthly)
THE WIRELESS CONSTRUCTOR (Monthly)
"P.W." BLUE PRINTS
"BEST WAY" WIRELESS BOOKS

12th October 1932.

Messrs. Graham Farish Ltd.,
Masons Hill,
Bromley,
KENT.

Dear Sirs,

I congratulate you on ingeniously recruiting a sound chemical principle to the cause of better home radio.

I have tested "Filt" and obtained striking confirmation of its effectiveness.

I measured the earth resistance at the moment of installing "Filt" and was actually able to see, by meter indication, the increased efficiency that resulted as its strongly hygroscopic powers came into action.

After a period of observation I was able to conclude that these powers are retained.

Listeners who instal "Filt" and it is remarkably easy to do so, will render their sets a good service, for an efficient earth is in truth the very foundation of good radio reception.

Yours faithfully,

G.V. Dowding

GVD/MC. Technical Editor.

Why YOU should fit a FILT

Efficient earthing is vital to good reception. Without it you cannot obtain the power, purity or volume of which your set is capable.

FILT is the most efficient scientific earthing system ever invented. As soon as the copper receptacle is buried, the wonderful chemical it contains begins to spread through the soil, making a permanent highly conductive area to a depth of several feet, ensuring perfect earthing in any climate.

Get a FILT to-day. It may put right faults that you thought could only be remedied by expensive new valves or parts.

PRICE 2/6 COMPLETE

GRAHAM FARISH

FILT

PERCOLATIVE EARTH

Obtainable from your radio dealer or post free from the sole manufacturers,

Graham Farish Ltd.
Masons Hill - - Bromley, Kent

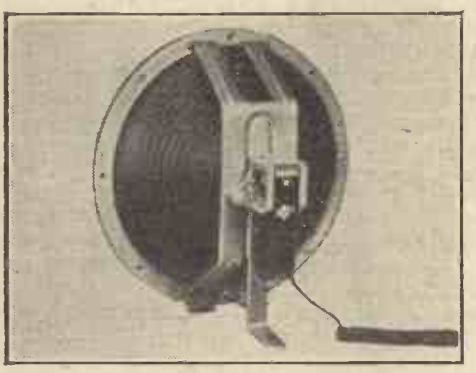
WE TEST FOR YOU

A weekly review of new components and tests of apparatus conducted by J. H. Reyner, B.Sc., A.M.I.E.E.

BLUE SPOT 100U SPEAKER

WE have been interested to receive for test one of the new season's Blue Spot speakers, type 100U. This speaker is in chassis form and includes in the very rigid spot-welded framework a special concentrically ribbed diaphragm which is operated from an inductor-type unit. This unit consists of a large U-shaped permanent magnet having two specially shaped pole pieces mounted on the extreme ends. The armature itself is located centrally with respect to the small gap formed by the two pole pieces. The operating coil is suspended from the framework of the unit and is located between the pole pieces and around the armature.

Due to this method of construction and to the fact that the operating rod is soldered to the apex of the cone, the speaker cannot rattle even on the largest input. On test the speaker gave very well-balanced results, neither end of the frequency scale being predominant. The impedance of the speaker at 500 cycles is approximately 3,200 ohms, so that it may be used satisfactorily with all normal types of power valve. It is claimed that it can also be used with pentode valves without the addition of a matching transformer.



A very popular Blue Spot speaker—the 100U

The speaker is priced at 32s. 6d. in chassis form, or it may be obtained complete in an oak cabinet for 52s. 6d.

RADIO COMBINATION TOOL

A VERY handy little gadget which we have received for review is the radio combination tool marketed by Messrs. C. Gilbert & Co., Ltd. The whole tool is about the size of a fountain pen and consists essentially of a tubular spanner, one end of which fits 2B.A. size nuts and the other 4 B.A. Into the smaller of these ends there is fitted a small ⅛ in. blade screwdriver, the end of which is formed the same size and shape as a standard 4 B.A. nut, so that the screwdriver can be pushed inside the tubular body of the tool when it is not in use. At the other end is carried in the same way a ¼ in. recessed screwdriver. The reverse end of this screwdriver is also

(*Continued on page 1014*)

"WE TEST FOR YOU"

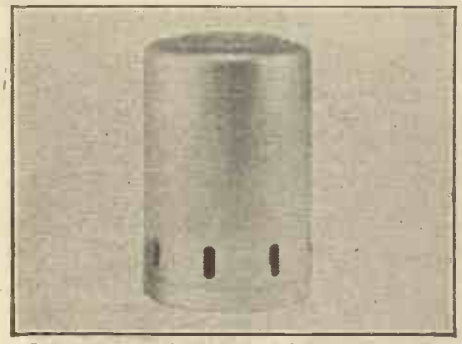
(*Continued from page* 1012)

recessed to fit 6 B.A. nuts, but we found the application of this slightly limited by the fact that the recession was not deep enough.

The whole tool is nickel-plated and is provided with a fountain-pen clip to enable it to be carried conveniently in the pocket. It is a very useful accessory, which will commend itself to experimenters, both amateur and professional. The retail price is 2s. 6d.

GOLTONE TERMINAL BLOCK

WE have received from Messrs. Ward and Goldstone, Ltd., two samples of their "Goltone" terminal block. These blocks are made from moulded bakelite finished a pleasing shade of brown. They



Complete with its screen—the Telsen dual-range coil

are arranged for screwing on to the baseboard of the receiver and are supplied complete with the necessary screws, but without terminals.

It is a point which is very often overlooked that the external connections to the receiver should be made just as carefully and efficiently as the internal connections. The use of the terminal blocks under review will greatly facilitate this and they can be recommended to all intending constructors.

The blocks are retailed at 9d. per pair.

TELSEN DUAL-RANGE COIL

WE have been much interested in the new Telsen Screened Dual-Range coil recently received for test, since in many respects it conforms with our own ideas. In the first place the coil is arranged as an H.F. transformer, an arrangement which is not only flexible, but definitely the best from a technical point of view, as was pointed out in an article in "A.W." only a week or two ago.

Secondly it is provided with a screen of generous dimensions relative to the size of the coil itself, while a self-contained switch is incorporated, this being of such a type that several coils may be linked together in various ways as is explained in the data supplied with the coil.

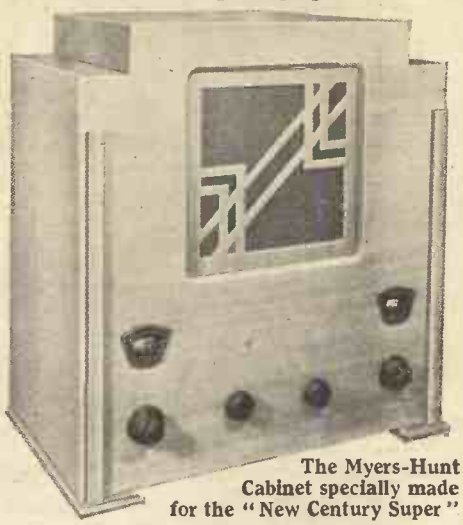
The coil is wound on a bakelite former having six ribs, the overall diameter being 1½ inches. The short-wave section is a simple solenoid winding, while the long-wave windings and the primaries are housed in suitable slots. The terminals are arranged around the base of the coil and slots are provided in the bottom of the screening cover to enable the connections to be brought out easily. Incidentally the reaction coil is brought out to two separate terminals and the primary windings are also separate, so that the coil is really universal in its application.

Since the same winding is used both as a primary and an aerial winding it is essential to use a series aerial condenser, otherwise the coupling will be too strong and the results will be unselective. We found a .0003 variable condenser useful in this position and by its use we were able to separate the two London transmissions satisfactorily. On the long waves, a number of stations were receivable at good strength once we had connected up a .002 condenser across the aerial winding to cut out break-through as recommended in the literature.

Incidentally the instruction book with the coil is particularly complete. It gives details of numerous circuits, and discusses various methods whereby the coils may be linked together. Altogether the coil is a neat production which can be considered a worthy addition to the Telsen range.

A NEW "CENTURY SUPER" CABINET

BUILDERS of the "New Century Super" should note that a special cabinet for this fine set has been produced by the Myers-Hunt Cabinet Co. This cabinet, known as the "Whitehall de Luxe," is of very modern design, as can be seen from the accompanying photograph, and it is



The Myers-Hunt Cabinet specially made for the "New Century Super"

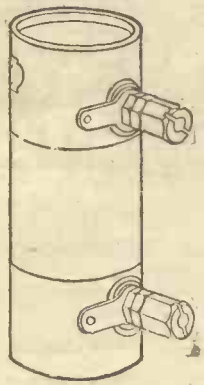
obtainable in three finishes—natural, golden and Jacobean. It is made of guaranteed solid figured oak, plywood being used only for the speaker fret. The cabinet in any one of the three finishes costs only 30s., and full details can be obtained from the Myers-Hunt Cabinet Co., 7 Austin Street, Shoreditch, London, E.2, free on mention of "A.W."

IGRANIC QUALITY COMPONENTS

NOV. 11
REMEMBRANCE DAY
Give generously for your poppy

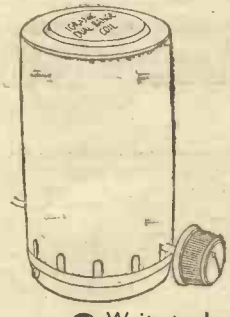
Igranic Components—built of first-class materials—are raising the standard of radio. Take, for example, the Igranic Binocular type high frequency choke. Due to the binocular construction the external field is extremely small — enabling it to be placed in close proximity to other coils with negligible interaction. It is exceptionally efficient over the entire wavelength range of 150 to 2,500 metres. It has D C. resistance of 830 ohms and an inductance value of 158 millihenries. Price **3/9**

"An excellent piece of work . . . in the first class and can beused with confidence even under the most severe conditions." "*Amateur Wireless*," Oct. 29, 1932.



SHORT WAVE H.F. CHOKE

Specially developed for efficient operation on wavelengths of the order of 10 to 80 metres. Useful for a number of purposes where the presence of H.F. currents would give rise to troublesome hand-capacity effects, unsatisfactory reaction control, and instability of the low-frequency amplifier. Price **2/-**



SCREENED DUAL-WAVE COIL

with self-contained wave-change switch. Designed to give maximum efficiency on the medium and long wave bands, covering a range of 200-550 metres and 1,000-2,000 metres when tuned with a .0005-mfd. variable condenser. Price **12/6**

Write to-day for fully-illustrated Catalogue No. D.172 of complete new range of Igranic Quality Components.

Igranic Electric Co., Ltd., 149 Queen Victoria Street, London, E.C.4.

SEND FOR THE 1932 CATALOGUE

IGRANIC COMPONENTS WILL BE THE MAKING OF YOUR SET.

RADIO IGRANIC DEVICES

CVS33

OUR LISTENING POST

By JAY COOTE

JUST at present a number of changes are taking place in both Leningrad and Moscow—at least, as regards the transmitters—and I have not yet elucidated the mystery of the new station heard and reported upon by other listeners on 848.7 metres. Whether it is Moscow or Leningrad is not clear, as both calls have been picked up on that wavelength. At the same time, one fact appears to be certain, namely, that Moscow Komintern has left the 1,481-metre channel clear for the new Noghinsk 500-kilowatter and has taken up its position on 1,000 metres. Leningrad has also reduced its wavelength and may be heard nightly just below 900 metres.

Two New Russians

There are two super-power transmitters nearing completion in the Soviet Union: Noghinsk on 500 kilowatts and Leningrad (2) on 250 kilowatts. No doubt, we shall be logging them regularly in the near future. Moscow Stalin (100 kilowatts) is again merrily working on 424 metres and may be picked up on any evening before 8 p.m.; it completely blots out Madrid (EAJ7), which you will find on that wavelength when the Russian has closed down.

Conditions during the past week have been exceptional for the reception of North and South American broadcasts; on one night with the "New Century Super" I logged four "Yanks," and on another, at a later hour (2.30 a.m.), three of the Buenos Aires transmissions.

Have you noticed the peculiar announcement put out by the N.B.C. studios? Contrary to European custom, they do not say "This is the So-and-so calling," but "Your station is (say) WGY, Schenectady," and so on, as if it were a reply to a question put by you. In the same way you are told the name of the man responsible for the announcements.

From Radio Paris

You may have been puzzled by a broadcast which is now carried out regularly every Saturday morning between 9 and 10 a.m. by Radio Paris. Although advertised as a concert it is, as a matter of fact, a general rehearsal relayed from the Paris Conservatoire, and now and again you will hear interruptions by the conductor and, if you understand French, his pithy observations to the members of the symphony orchestra. Moreover, a passage may be played over several times, as is the case in rehearsals.

Reports are being received in respect of experimental broadcasts on 431 metres by a Portuguese station calling "*Radio Parede*"; although I have made careful search in up-to-date maps, I cannot trace the locality; but, without doubt, announcements are in the Portuguese language.

By the way, if Budapest is within your grasp (it is on most modern receivers) you may be interested to learn that during the winter season (October 15 to May 1) the studio has arranged to relay fifty performances from the Royal Hungarian Opera House. Many of these broadcasts, I understand, will also be taken by transmitters in neighbouring countries. Also, Hungary, at the Madrid conference, is claiming an extra wavelength, which she may or may not get. In the meantime, however, Budapest (2) will work on 840 metres and the kilowatt relay at Magyarovar will take over the channel on 210 metres.

The Leipzig Station

No doubt you will have heard by now the new Leipzig station, Germany's super-power transmitter, testing on the Frankfurt-am-Main wavelength when the other studios have closed down. If so, you may now stand by for the initial tests of the new Munich 60-kilowatter. In the meantime, Palermo (Italy), in its search for a new position in the waveband, has settled down temporarily on 538.6 metres. I doubt whether it will be able to stay there.

Two stations which I have logged this week on several nights have been coming through at good volume; they are Riga and Bucharest. Although the latter is sandwiched between Frankfurt-am-Main and Midland Regional, I was able to get it clear of both, *but only with a super-het.*

UTEX TIME SWITCHES

TWO ingenious switches have recently been marketed by the Utex Manufacturing Co., Ltd., of 39 High Holborn, E.C.1. Both are of the on-off type and are controlled by the winding key at the back of an alarm clock.

The switch is fixed to the back of an alarm clock by two screws and the alarm is set for any desired time. When the alarm bell rings, the winding key which, of course, rotates, pushes the switch arm and makes or breaks the contact as desired.

Two models, one for battery sets and the other for mains, are available. The battery model costs 2s. 6d. and the mains type 5s. 6d. The latter switch is rated at 250 volts, 3 amps.

"Forty Stations?"

"Yes . . . each as loud as London"

"Listen . . . National. Now . . . London Regional. And here's Madrid. . . ."

"Why, it's as clear and loud as London. . . ."

"I told you. Now Berlin . . . and here's Hilversum."

"But how do you get each station as clear as a whistle like that?"

"The screened grid and modern selective circuit cuts out all stations, even the near-by ones. Blanks them all out, so you only hear the one you want."

"But what a wonderful depth of volume!!"

"That's the moving-coil loud-speaker. Can fill a ballroom—or you can turn it down to a whisper, like this."

"What a beautiful set. THAT must have cost you some money. Twenty guineas?"

"Well, it's worth that, but the price of this Aerodyne Screened Grid Three is only £9 9s. Or, if anyone wants to buy it on hire purchase terms, 17s. 11d. down and eleven more payments of the same amount. Yes, you can buy it at your local radio shop."

9 GNS COMPLETE

SPECIFICATION

Single Knob Tuning.
B.V.A. Valves.
Moving-coil Speaker.
All-metal Chassis.
Alternative Aerial Sockets.
Gram Pick-up Sockets.
Figured Walnut Cabinet.
H.T., 120 volts; G.B., 9 volts.
Accumulator, 2 volts 40 amp. hours.

Make sure you see the name

"AERODYNE"

SCREENED GRID 3

(VARIABLE MU.)

BATTERY OPERATED MOVING COIL SPEAKER

HUSTLER, SIMPSON & WEBB, LTD.,
AERODYNE WORKS, HOE ST., WALTHAMSTOW, E.17

Post (½d. stamp on an unsealed envelope will do) to—
HUSTLER, SIMPSON & WEBB, LTD., "AERODYNE" WORKS, HOE STREET, WALTHAMSTOW, E.17.

Dear Sirs,

Please send me your illustrated descriptive literature of your "AERODYNE" Radio Sets. Also full particulars of your Easy Payment Terms.

NAME.....

ADDRESS.....

.....A.W.

OUR QUERY DEPARTMENT

The attention of readers is directed to the rules printed below. Replies are sent by post, only a selection of queries of general interest are printed here.

Electrical Gramophones

SIR,—Having an ordinary pedestal gramophone with an electric motor, I should like to know whether it would be possible to play the records electrically without having a wireless receiver. I have been told that I cannot use one of the new electrical "sound-boxes" without I have a wireless receiver and loud-speaker.

K. R. (Middlesex).

There is definitely no need for you to possess a receiver to work your gramophone electrically so far as playing the records is concerned but it is essential that you have a valve amplifier and a loud-speaker. If you obtain a good two-valve amplifier and a suitable speaker, you may employ a gramophone pick-up—electrical sound-box—by connecting it to the input terminals of the amplifier. The working of a gramophone electrically in this way does not call for your possessing a post-office wireless licence, but if you decide to make your amplifier into a wireless receiver at a later date you must get a post-office licence.

Outdoor-Aerial Super-hets

SIR,—I have the "Century Super" in use and it is giving extremely satisfactory results. I would like to use the set with an outdoor aerial. Will you explain what alterations should be made?

M. M. (London, E.10)

The receiver cannot be used with an outdoor aerial without making drastic alterations, which would affect the general efficiency of the receiver. It would be necessary to use either a bi-grid, or a screen-grid valve as the first detector valve and also to change the present frame aerial for a band-pass arrangement. We would refer you to the design of the "New Century Super" described this week.—ED.

Grid-bias

SIR,—A friend tells me that if I apply too much grid-bias voltage to the valves in my set I cause the H.T. battery to run down very speedily. I have always been under the impression that with too little bias the H.T. battery runs down.

K. O. B. (Harrow).

By increasing the negative bias voltage you automatically reduce the current consumption of your valves and thus reduce the drain on the H.T. battery. If one of your valves has positive bias, and you increase the positive bias, the current consumption of the valve will certainly increase and this will cause a greater drain on the H.T. battery.—ED.

Using a Pentode

SIR,—What is the wiring needed to fit a pentode?

L. K. (Hertford).

First of all, arrange a 1- or 2-microfarad condenser directly between the auxiliary-grid terminal of the valve holder and the negative L.T. terminal. Then connect a 10,000- or 15,000-ohm resistance between the auxiliary-grid terminal of the valve holder and the power positive H.T. supply terminal. If the pentode valve to be used is one of the low anode-current consumption type, an output filter or transformer will not be essential for its use. It will, however, be advisable for you to add a tone-control device to subdue some of the high-note response.

WHEN SUBMITTING QUERIES

Please write concisely, giving essential particulars. **A Fee of One Shilling** (postal order), a stamped addressed envelope, and the coupon on the last page must accompany all letters. The following points should be noted.

Not more than two questions should be sent with any one letter.

The designing of apparatus or receivers cannot be undertaken.

Modifications of a straightforward nature can be made to blueprints, but we reserve to ourselves the right to determine the extent of an alteration to come within the scope of a query. Modifications to proprietary receivers and designs published by contemporary journals cannot be undertaken.

Readers' sets and components cannot be tested at this office. Readers desiring specific information upon any problem should not ask for it to be published in a forthcoming issue, as only queries of general interest are published and these only at our discretion. Queries cannot be answered by telephone or personally.

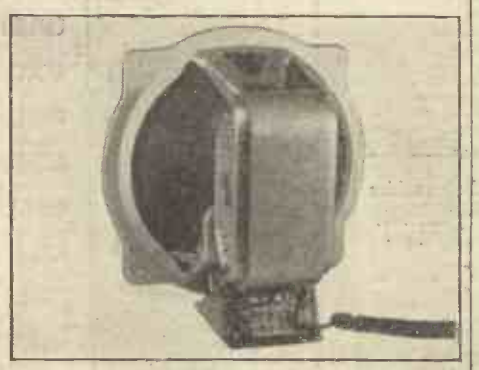
Readers ordering blueprints and requiring technical information in addition, should address a separate letter to the Query Department and conform with the rules.

A POPULAR BLUE SPOT SPEAKER

ONE of the leading speakers of the Blue Spot range is the permanent-magnet speaker 99PM. This is a high-power speaker in which the very best of materials are employed. The heavy magnet is forged from highest grade magnet steel, containing a large percentage of cobalt. The magnetic energy in the air gap of the speaker is of the exceptionally high order of 1,320,000 ergs. Owing to the high grade of metal employed, the magnet system of the 99PM has a high degree of permanency.

The magnet system is fitted with Milam side pieces which exclude dust and the pole pieces are cadmium-plated to prevent rusting.

A transformer to match the speaker up with pentode or triode output valves is included in the base. The speaker will handle an output of 3½ watts without distortion and will take a maximum D.C. current of 50 milliamperes. The 99PM is



The Blue Spot 99PM speaker—a fine permanent-magnet moving-coil chassis

a compact speaker, having an overall diameter of 9 in., and owing to the special material used for the cone, the response obtained over a wide frequency range is practically perfect. The 99PM costs 59s. 6d. in chassis form, and details can be obtained free on mention of "A.W." from The British Blue Spot Company, Ltd., Blue Spot House, 94-6 Rosoman Street, Rosebery Avenue, London, E.C.1.

Sir Hamilton Harty will conduct the Hallé Orchestra in a Mozart Symphony and a performance of Berlioz' "Symphonie Fantasque" on November 10, when the concert is to be relayed from the Free Trade Hall, Manchester.

TELSEN

H.F. CHOKES, PUSH-PULL SWITCHES & VALVE HOLDERS

TELSEN PUSH-PULL SWITCH

(2 point)

For use as battery switch, or as wave-change switch with the dual-range S.W. Coil Unit. Employs a "knife" type self-cleaning contact and a positive snap action, a series gap reducing self capacity to a minimum.

1/-

TELSEN WAVE-CHANGE SWITCH

(3 point)

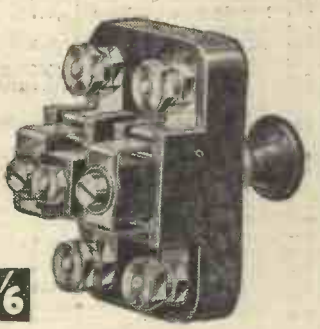
The perfect Wave-change Switch, for use with a dual-range aerial coil or for breaking L.T. and H.T. currents simultaneously.

1/3

TELSEN "TWO-POLE" PUSH-PULL SWITCH

(4 point)

Highly suitable for use in wave changing on two coils or an H.F. transformer, or for switching pick-up leads or an additional speaker.

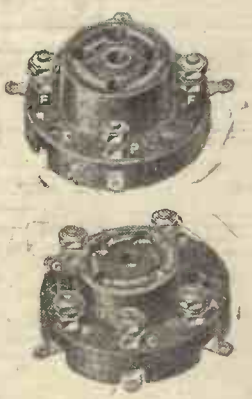


1/6

TELSEN VALVE HOLDERS

An improved range of Valve Holders in both solid and anti-microphonic types. Employ special contact sockets of one-piece design, with neat soldering tag ends and terminals. Extremely low self capacity.

Solid type, 4 pin 9d.
Solid type, 5 pin 1/-
Anti-microphonic, 4 pin 1/-
Anti-microphonic, 5 pin 1/3



TELSEN STANDARD H.F. CHOKE

Covering the entire broadcast band and occupying only the minimum of baseboard space, the Telsen Standard H.F. Choke has proved deservedly popular ever since its introduction. With an inductance of 150,000 microhenries, a resistance of 400 ohms, and an extremely low self capacity, it is highly suitable for use in reaction circuits, and is constantly being specified in this respect by the leading set designers.

2/-

TELSEN BINOCULAR H.F. CHOKE

In H.F. amplification the performance of a choke is of supreme importance. Where the very highest efficiency is the primary requisite, the Telsen Binocular H.F. Choke is the inevitable choice. It has a high inductance of 250,000 microhenries, with a very low self capacity and a practically negligible external field (due to its binocular formation). It is from every point of view the *ideal* choke and, where high-class circuits are concerned, definitely the *essential* choke.

5/-

TELSEN
RADIO COMPONENTS

TELSEN RADIO COMPONENTS ARE 100% BRITISH

ANNOUNCEMENT OF THE TELSEN ELECTRIC CO., LTD., ASTON, BIRMINGHAM

BROADCASTING STATIONS

Broadcasting Stations classified in order of wavelengths. For the purpose of better comparison, the power indicated is that of the carrier wave.

Metres	Kilo-cycles	Station and Call Sign	Power (Kw.)
19.737	*15,200*	Zeesen (DJB) ...	8.0
20.64	*14,530*	Radio Nations ...	20.0
25.4	*11,810*	Rome (2RO)	15.0
25.53	*11,751*	Chelmsford (G5SW)	16.0
31.25	*9,598*	Lisbon (CTIAA)	2.0
31.51	*9,520*	Skamlebaek	0.5
31.38	*9,560*	Zeesen (DJA)...	8.0
32.26	*9,300*	Rabat	0.5
40.3	*7,464*	Radio Nations...	20.0
43.75	*6,865*	Vitus/Paris	0.3
50.0	*6,000*	Moscow	20.0
58	*5,172*	Prague	0.5
198.5	*1,510*	Riga (test).....	16.0
207.6	*1,445*	Seraing	0.2
210	*1,430*	Magyarovar	1.5
211.3	*1,420*	Newcastle	1.0
212	*1,415*	Antwerp	0.4
214.3	*1,400*	Aberdeen	1.0
214.3	*1,400*	Warsaw (2)	1.9
215.4	*1,392.5*	Brussels (Conf.)	0.25
217.1	*1,382*	Königsberg	0.9
218	*1,373*	Salzburg	0.5
220.1	*1,362.9*	Béziers	0.5
222.9	*1,344.6*	Cork (6CK)	1.2
225.2	*1,332*	Fécamp.....	10.0
227.4	*1,319*	Flensburg	0.5
230.6	*1,301*	Malmö	1.2
231.1	*1,298*	R. Wallonia	0.3
232.2	*1,292*	Kiel	0.25
233.4	*1,285*	Lodz	2.2
236	*1,271.9*	Kristianssand ...	0.5
237.9	*1,261*	Bordeaux-Sud-Ouest	2.0
237.2	*1,265*	Nimes	0.6
238.9	*1,256*	Nürnberg	2.0
239	*1,255*	Binche	0.3
240.1	*1,249.1*	Stavanger	0.5
241.3	*1,243*	Liege (Exp.).....	0.2
242	*1,238*	Belfast	1.0
244.1	*1,229*	Basle	0.5
245.9	*1,220*	Berne.....	0.5
245.9	*1,220*	Cassel	0.25
245.9	*1,220*	Linz	0.5
247.7	*1,211*	Trieste	10.0
249	*1,205*	Prague (Strasnice)	5.0
249.8	*1,200.3*	Juan-les-Pins ...	1.0
250	*1,200*	Radio Schaerbeek	0.3
252.3	*1,189*	Barcelona (EAJ15)	6.0
253.4	*1,184*	Gleiwitz.....	5.0
255	*1,175*	Toulouse (PTT)	1.0
256.7	*1,168*	Hörby	10.0
259.3	*1,157*	Leipzig	2.0
261.6	*1,147*	London National	50.0
263.8	*1,137*	Moravska-Ostrava	11.0
265.8	*1,128.5*	Lille (PTT)	1.3
266.8	*1,124.5*	Valencia	8.0
268.1	*1,118.6*	Bremen	0.3
269.4	*1,112*	Bari	20.0
270.9	*1,107.6*	Rennes	1.3
271.9	*1,103*	Cointe-Liege.....	0.3
273.7	*1,096*	Turin (Torino)...	7.0
276.5	*1,085*	Heilsberg	60.0
279.5	*1,073.2*	Bratislava.....	14.0
281	*1,067*	Copenhagen	0.75
282.2	*1,063*	Lisbon (CTIAA)	2.0
283	*1,058*	Innsbruck.....	0.5
283.6	*1,058*	Berlin (E).....	0.5
283.6	*1,058*	Magdeburg	0.5
283.6	*1,058*	Stettin	0.5
286	*1,049*	Montpellier	0.8
287.1	*1,045*	Radio Lyons.....	10.0
288.5	*1,040*	Bournemouth ...	1.0
288.5	*1,040*	Plymouth	0.12
288.5	*1,040*	Scottish National	50.0
288.5	*1,040*	Swansea	0.12
291	*1,031*	Tampere	1.0
291	*1,031*	Viipuri	13.0
293	*1,022*	Kosice	2.5
293.7	*1,021.5*	Limoges (PTT)...	1.0
296.1	*1,013*	Hilversum.....	20.0
299.1	*1,003*	Tallinn	11.0
301.5	*995*	North National	50.0
304.9	*984*	Bordeaux (PTT)	13.0
306.8	*978*	Zagreb (Agram)	0.75
307.1	*976.6*	Falun.....	0.5
308.6	*971.6*	Vitus-Paris	1.0
309.9	*968*	Cardiff	1.0
312.8	*959*	Cracow	1.5
313.9	*955.6*	Genoa (Genova)	10.0
315	*952.5*	Marseilles	1.6
318.8	*941*	Naples (Napoli)	1.5
318.8	*941*	Sofia (Rodno Radio)	1.0
319.7	*936*	Dresden.....	0.25
321.9	*932*	Göteborg	10.0
325	*923*	Breslau	60.0
328.2	*914*	Poste Parisien ...	60.0
331.4	*906*	Milan.....	50.0
335	*896*	Poznan	1.9
337.8	*888*	Brussels (No. 2)	15.0
342.1	*877*	Brunn (Brno)...	35.0
345.2	*869*	Strasbourg (PTT)	11.5
348.8	*860*	Barcelona (EAJ1)	8.0
351	*855.5*	Leningrad (RV70)	20.0
352.1	*852*	Graz	7.0
355.8	*843*	London Regional	50.0
360.5	*832*	Mühlacker.....	60.0
363.4	*825.5*	Algiers (PTT) ...	16.0
365.4	*820.8*	Fredriksstad.....	0.7
365.5	*820.7*	Bergen	1.0
366.2	*819.4*	Seville (EAJ5) ...	1.5
368.1	*815*	Bolzano.....	1.0
368.5	*814*	Helsinki	13.2
370.4	*810*	Radio LL (Paris)	1.0
372.2	*806*	Hamburg	1.5
376.4	*797*	Scottish Regional	50.0
380.7	*788*	Lvov	16.0
385	*779*	Radio Toulouse	60.0
385	*779*	Stalino (RV26)...	10.0
388.5	*772*	Archangel	10.0
389.6	*770*	Frankfurt-a-m.	1.5
389.6	*770*	Leipzig (tests) ..	120.0
394	*761*	Bucharest.....	12.0
398.9	*752*	Midland Regional	25.0
403	*743*	Söttens	25.0
408	*734*	Katowice	12.0
413.8	*725*	Athlone (tests)...	60.0
413.8	*725*	Dublin	1.2
416.4	*720.5*	Radio Maroc (Rabat)	6.0
419	*716*	Berlin	1.5
423.4	*707*	Madrid (Espana)	2.0
424.3	*707*	Madrid (EAJ7)...	2.0
429.8	*698*	Belgrade	2.8
431	*696*	Parede (tests) ...	1.5
435.4	*689*	Stockholm	55.0
441.2	*680*	Rome (Roma) ...	60.0
447.1	*671*	Paris (PTT)	7.0
453.2	*662*	Danzig	0.5
453.2	*662*	Klagenfurt	0.5
455	*659*	Radio Agen	0.5
459.4	*653*	Beromuenster ...	60.0
460.6	*557*	San Sebastian (EAJ8)	0.6
465.8	*644*	Lyons (PTT) ...	1.6
469.3	*640*	Tartu.....	0.5
472.4	*635*	Langenberg	60.0
480	*625*	North Regional	50.0
488.6	*614*	Prague 120.0	
496.2	*604.5*	Trondheim	1.2
500.8	*599*	Florence (Firenze)	20.0
508.5	*590*	Astrakhan (RV35)	10.0
509.3	*589*	Brussels (No. 1)	15.0
518.5	*578.6*	Vienna	15.0
also testing on 1,258 m. from 7 p.m. (Mon., Wed., Sat.).			
525.4	*571*	Riga	15.0
532.9	*563*	Munich (tests) ...	60.0
538.6	*556.9*	Palermo	3.0
541.5	*554*	Sundsvall .....m.	10.0
550	*545*	Budapest (1).....	18.5
559.7	*536*	Kaiserslautern ...	1.5
559.7	*536*	Augsburg	0.3
564.4	*531.5*	Wilnot	16.0
564.9	*531*	Hanover	0.3
569.1	*527.1*	Grenoble (PTT)	2.0
569.3	*527*	Freiburg	0.25
574.7	*522*	Ljubljana	5.2
675	*444*	Oufa (RV22).....	10.0
678.7	*442*	Lausanne	0.6
719.4	*417*	Moscow (RV2) ...	20.0
748	*401*	Ostersund.....	0.6
759.5	*395*	Geneva	1.25
840	*357.1*	Budapest (2).....	3.0
848.7	*353.4*	Leningrad.....200.0	
882	*340*	Saratov	20.0
937.5	*320*	Kharkov (RV4)	20.0
967.7	*310*	Alma Ata	10.0
1,000	*300*	Moscow (OldKom)	100.0
1,034.5	*290*	Kiev 100.0	
1,048.2	*286.1*	Tiflis (RV7) 100.0	
1,071.4	*280*	Scheveningen-Haven	10.0
1,083	*277*	Oslo	60.0
1,107	*271*	Minsk (RV10) ...	35.0
1,117.4	*268.5*	Moscow Popoff)...	40.0
1,153.8	*260*	Kalundborg	7.5
1,170	*256*	Taschkent.....	25.0
1,190.5	*252*	Luxemburg 100.0	
1,200	*250*	Istanbul	5.0
1,200	*250*	Reykjavik.....	21.0
1,229.5	*244*	Boden	0.6
1,258	*238.5*	Vienna Exp.....	8.0
1,260	*238*	Bakou	35.0
1,304	*230*	Moscow (Trades Unions)	165.0
1,348	*222.5*	Motala	30.0
1,380	*217.4*	Novosibirsk (RV6)	100.0
1,411.8	*212.5*	Warsaw.....120.0	
1,445.7	*207.5*	Eiffel Tower	13.5
1,481.5	*202.5*	Moscow RV1.....500.0	
1,538	*195*	Ankara	7.0
1,554.4	*193*	Daventry (Nat.)	30.0
1,600	*187.5*	Irkutsk (RV14)	10.0
1,620	*185*	Norddeich KVA	10.0
1,634.9	*183.5*	Zeesen	60.0
1,725	*174*	Radio Paris	75.0
1,796	*167*	Lahti.....	54.0
1,875	*160*	Huizen	8.5
1,935	*155*	Kaunas	7.0
2,625	*119*	Königswuster-Hausen (press)	20.0
2,650	*113*	Eiffel Tower ...	15.0
2,900	*103.5*	Königswuster-Hausen (press)	15.0
4,000	*75*	Königswuster-Hausen (press)	15.0

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Two New Blue Spot Sets

HERE is something I can recommend to all enthusiasts on the lookout for a new receiver ; an illustrated folder of two new Blue Spot receivers. The sets dealt with are the R336 pedestal model and the K252 table model. The folder gives full details and copies can be had free. **872**

New Lively-O List

A handy list which gives sizes, weights and capacities of Oldham Lively-O batteries has just come to hand. In the unspillable range there are suitcase, transportable, and jelly-acid types. **873**

Why Not a New Cabinet ?

Cabinets for radiograms, console sets, transportables, and speakers are shown in a fine catalogue issued by W. & T. Lock, Ltd. This gives the chief dimensions, so that you will know just how to fit your existing set into any one of these cabinets. **874**

The "Mansfield"

Have you had details yet of the W.B. "Mansfield" moving-coil speaker which, incidentally, is specified in connection with the "New Century Super"? If not, then take my tip and get the new W.B. literature. There is also a Mansfield kit, claimed to be the only set kit on the market which includes a moving-coil speaker. **875**

A Kenwell "Three"

Kenwell, the power pack people, have a new three-valver using variable-mu and power pentode valves. It has a gramo-radio switch, tone control, pre-detector volume control, and a mains energised moving-coil speaker. Other details in the new Kenwell catalogue. **876**

OBSERVER.

Some Notes on Present-day Short-wave Conditions

Around the Short-wave Dial

By SHORT-WAVER

'HULLÔ, Hullo, Radio Nations from Geneva." This is the call of Prangins, the recently opened League of Nations station at Geneva. The wavelengths at the moment are 38.47 and 31.31 metres used simultaneously.

These broadcasts take place on Sunday evenings between 10 and 10.15 in English, and in French or Spanish between 11 and 11.15. Before each broadcast an announcement is made giving details of the following Sunday's transmissions.

Reception during the last week has been rather disappointing. Readers seem to have had considerable trouble in obtaining any long-distance reception at all, due probably to the American stations having gone over to their winter schedule.

W2XAD now broadcasts between 6 and 8 p.m., instead of between 9 p.m. and 12 midnight, as during the summer months. Reception of this station after about 7 o'clock is very unreliable indeed and on some evenings is unobtainable. On Sunday afternoons at 5 p.m. it can be heard at fair speaker strength, but lately could only be held for about half an hour. The 30- and 50-metre American stations now come over approximately one hour earlier: W2XAF and W3XAL can be heard quite well after 10 p.m.

Heredia (Costa Rica), using a power of only 150 watts, was received on phones on Sunday evening week about 11 o'clock. The wavelength used was 31 metres, and considering the low power used, this reception was particularly good.

Using a super-het I picked up LR4, Radio Splendide, Buenos Aires, on 203 metres. This was heard only weakly on the speaker, but when I reverted to LSX on 28.98 metres, the same programme was heard at R7/8. Madrid EA9 is now working quite regularly on a wavelength of 30.4 metres. The times are irregular but it can often be heard testing with LSX or one of the other Buenos Aires stations.

Coltano IAC has been allotted various wavelengths, but usually it can be heard at R7/8 on 47 metres.

One of the most interesting stations has been Moscow on 50 metres. The reproduction has been considerably improved and the programmes are now not purely propaganda, but include an excellent mandoline orchestra with some good vocalists. Since the opening of Zeesen DJB, little has been heard of the two German short-wavers. Zeesen DJA used to be one of the most reliable short-wave stations, but at the present time can only be heard at irregular intervals. While DJA has been so unreliable, W8XK on 19.72 metres has, for the last few days, been coming in at R6.

Radio Coloniale on 25.6 metres is " on the air " every evening after 10 p.m. giving news in French and sometimes in English. The strength usually is about R8/9.

Six-to-seven metre work seems to be of little interest in this country, although the B.B.C. is still carrying on their experimental work. Television transmissions are being tested on these wavelengths.

Berlin commenced broadcasting a regular service on 7.5 metres on October 2, but so far no reports have been received in this country.

A HANDY PILOT LIGHT

A HANDY tuning knob pilot light has been introduced by Messrs. Wright and Weaire. This device switches on a pilot light for a condenser or tuning scale immediately the knob is touched. This control is supplied unassembled ready for fitting to any set and all that is necessary for assembling is to drill two small holes through the panel so that wires can pass through from the knob control to the pilot light. This automatic switch, which brings the pilot light into circuit only when required, should be very popular with owners of battery-driven receivers.

"VOLUME CONTROL IN SIMPLE SETS"

(*Continued from page 981*)

bottom no voltage at all is applied to the grid of the output valve. This scheme saves output valve overloading and as there is no change of load in the speaker circuit the quality does not suffer from this cause. It is still faulty, however, because of the fact that both detector and first low-frequency stages can easily be overloaded on a powerful "local." It has an advantage in that it does not in any way upset any reaction setting or tuning arrangements. The value of the potentiometer can here be 1 megohm and a good type should be chosen, otherwise it may be noisy in operating.

My own scheme is to use a potentiometer as a grid leak in the detector circuit in the manner shown in Fig. 3, so that when the slider is at the top the circuit (provided the value of the potentiometer is the same as a normal leak) is exactly the same as is generally adopted. For example, the grid condenser can be .0003 microfarad and the potentiometer 2 megohms. As the slider comes down the potentiometer the value of the leak is progressively reduced while we tap a lower and lower voltage off the tuned circuit.

Reducing the voltage, of course, reduces the signals, while reducing the value of the grid leak slightly alters the operating point on the detector characteristics and the combined effect of these two is to give a very smooth control. The scheme has the great advantage that even when fully tuned to the powerful local station, no detector overloading and consequent distortion can occur when the volume is turned down to a low value, whereas in the previous two schemes this fault cannot be avoided.

Like many arrangements in wireless, this particular scheme requires careful layout, as the slider is attached to the very critical detector grid.

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Amateur Wireless FEE 1/-

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See also advertisement on page 1020.

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BRINGING IN THE FOREIGN STATIONS

Ether-Searching Hints for Beginners

BEFORE you can bring in the foreigners you must know when is the most suitable time for their reception. Many distant stations that are quite inaudible during daylight can be heard at full strength on quite a small set when it is dark.

The long-distance range of a set depends more on the condition of the ether than on the power of the set. This is an important point.

THE UPPER LAYER

The reason for the difference in the strength of foreign stations during daylight and after dark is found in the upper layer of the earth's atmosphere.

At night the upward rays from the transmitter are "bent back" to earth by the upper layers of the atmosphere. During the daytime this bending-back process does not occur, because the sun's rays diffuse the layer and the upward rays simply vanish into outer space.

We are then left with only the energy of the rays that follow the curvature of the earth from transmitter to receiver. On the way, much of this energy is lost through absorption by the earth, and if the signal is initially rather weak, or the distance is many hundreds of miles, the energy may be completely absorbed before it gets to the receiver.

There are two main things that set the limit to distance reception. One is what we call the background ratio. Let us explain this now

You will find that the greater you press a set to the limit of its amplifying abilities the more noisy will be the background when tuning in a distant station.

This is because you are not only amplifying the weak signal, but also dozens of other weak disturbances of the ether—little vibrations that with moderate amplification are not brought up to the audible level.

If, then, a foreign station is so weak that it needs very great amplification to enable it to be heard on the loud-speaker, it is not worth logging for entertainment

You will soon discover that there is a critical ratio of signal to background noise. The way to get worth-while foreign stations is to reject those that need great amplification. Then the stations you have left will come in with only a moderate background.

The second limiting factor in foreign-station reception is your locality Some spots are proverbially 'blind" to the presence of foreign stations' signals.

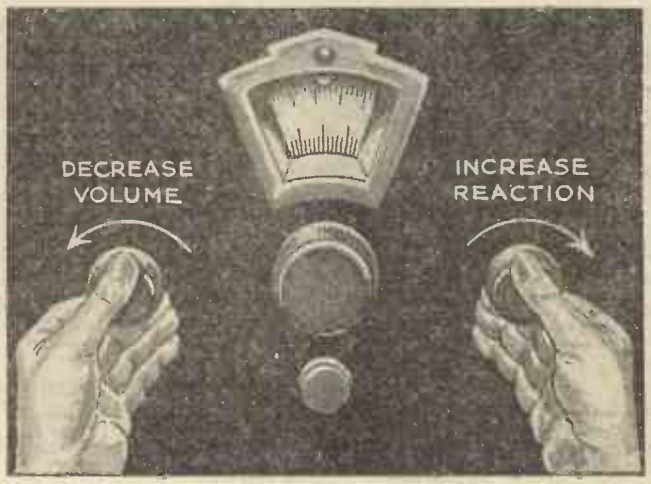
Intervening hills and metal ore deposits, for example, have a great effect on wireless waves, often completely screening the receiver from the transmitter's energy.

Large towns and cities where there are large masses of steel in the buildings are also bad for long-distance reception. As a rule, too, the many electrical devices in towns tend to increase the background noises.

Foreign stations adjacent in wavelength to the locals may not be receivable owing to the swamp effect of the powerful stations at home

A very selective set is needed to separate adjacent foreigners from regionals situated up to twenty miles from the receiver

If you will bear these facts in mind you will be saved much time and disappointment in your search for the foreigners. There are plenty of distant stations that can now be tuned in at full strength after dark on very simple sets.



Here is a useful tip for increasing the selectivity of a three-valver fitted with volume and reaction controls. Decrease the overall volume and make up the strength of the wanted station by increasing reaction. Always work volume and reaction together

HOW MANY STATIONS?

A two-valver with a good aerial and earth will often bring in a dozen or so stations, while a three-valver with a stage of high-frequency amplification can log upwards of twenty stations

If you are making a start with foreign-station reception you cannot do better than to "sign-post" the ether with the logging points of the B.B.C regional and national transmissions. After dark these signals should be heard in all but the most remote parts of the country As they are fairly evenly spread around the dial they will serve as an excellent guide as to your wavelength whereabouts.

Starting at the bottom of the scale there is London National Near the top end of the scale you will find North Regional At intervening log points you will find, working upwards from London National, the following in this order .—

Scottish National, North National, London Regional, Scottish Regional, and Midland Regional As all these stations will announce in English you cannot help recognising them if you wait long enough.

On looking up a list of stations you will discover which foreign

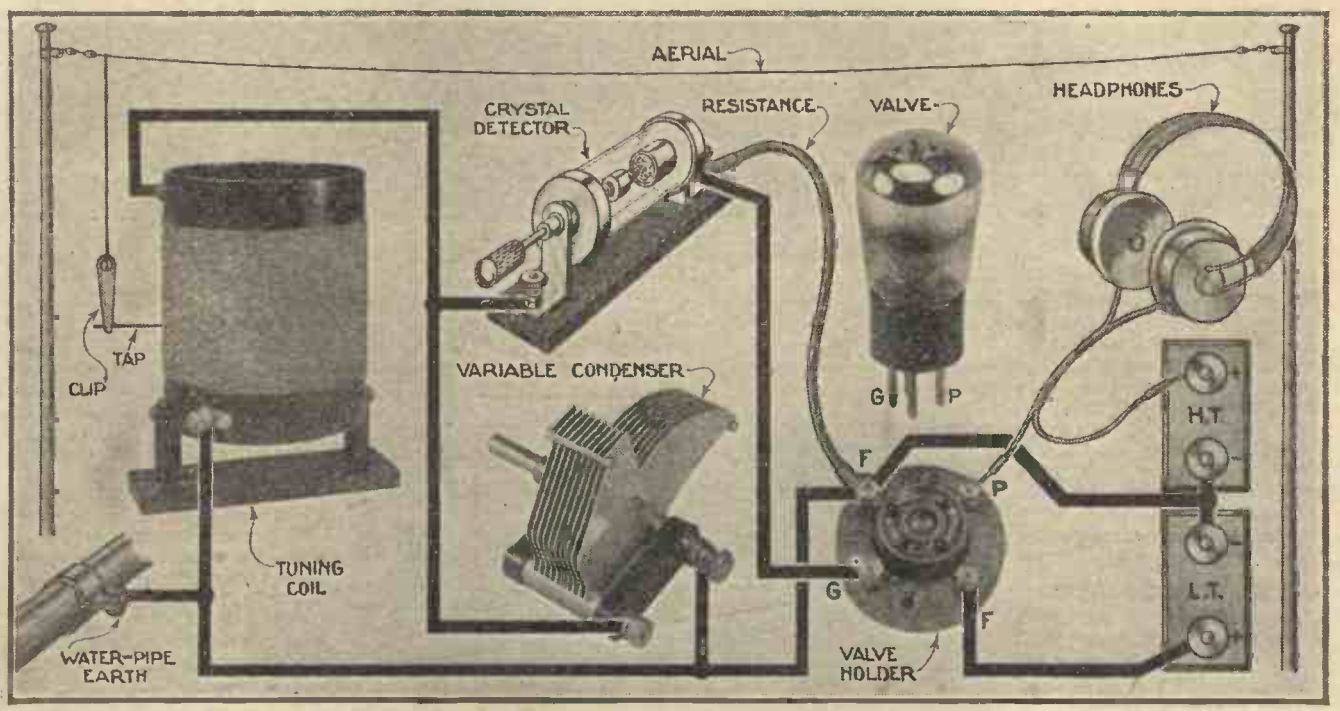
(*Continued on page six*)

"HIGH-SPOTS" OF THIS SUPPLEMENT

ELEMENTARY WIRELESS COURSE FOR BEGINNERS

BY J. H. REYNER AND THE "A.W." STAFF

THIS WEEK: HOW THE VALVE WORKS



Every beginner will find this clear pictorial diagram of great interest. It shows how a valve is coupled to a crystal set in order to obtain greater strength from the headphones through the amplifying properties of the valve. Note the high resistance taking the place of the headphones in the crystal circuit. Here the valve is working as a low-frequency amplifier

How do you use a valve?

IT will take many talks to answer your question because the applications of the valve are so numerous. We shall have to start with quite simple uses. Let us first consider why we should use a valve with the crystal set we built a fortnight ago.

To make the music louder?

Yes. Last week I showed you that if we apply a voltage to the grid of the valve we can cause the current through the valve to vary. All we have to do is to use the voltage which is normally applied across the telephones, to control the valves.

What do you mean by voltage? I thought you had a current in the telephones.

The two effects are linked up. Voltage is another name for electromotive force because we usually measure the e.m.f. in volts and so we often speak of the voltage in a circuit

It will be as well if we consider the relation between current and voltage before we can go further. You know I told you that an e.m.f. in a circuit will set the electrons in motion and cause a current to flow. Obviously there must be some limit to the actual current.

Why? What limits the current?

The electrical resistance of the circuit. As you will remember, the electrons do not have an absolutely free path. Every now and then they collide with one another. In a low-resistance material, such as copper, the collisions are not very frequent, but if we use iron or tungsten, the electrons are more cramped and collisions are quite frequent.

We need an electromotive force to overcome the effect of these collisions. If there were no collisions, the current, once started, would continue to flow indefinitely, whereas in practice we know that the electrons gradually knock each other out. If we want to keep a steady stream of electrons in motion we have to apply an e.m.f. to maintain the supply.

You will also appreciate that the more the resistance, *i.e.*, the greater the liability to collisions, the greater the e.m.f. must be in order to maintain a given current. In fact, these collisions produce an electromotive force of their own, which opposes the flow of the current and tries to stop it The strength of this opposing force, or *back e.m.f.* as we call it, depends entirely on the number of collisions.

You mean on the resistance?

Not entirely. Resistance is the index of the *liability* to collision; whereas the *number* of collisions is dependent also upon the *number* of electrons in motion If you increase the current then, if the resistance is the same, the number of collisions must increase. Similarly if you have two materials both carrying the same current, but one having a much higher resistance than the other, the number of collisions in the second case will be much greater.

Then the collisions are dependent on both the current and the resistance?

Yes, and the back e.m.f produced is equal to the product of these two, so that if we double the current we double the back e.m.f.

What does this back e.m.f. do ?

It tries to stop the current, and if we

NEXT WEEK: THE BEGINNERS' COURSE WILL EXPLAIN

HOW THE VALVE WORKS

wish to keep the current flowing we have to apply a driving voltage from a battery or some other suitable source which is exactly equal to the back e.m.f. If our applied voltage is too small, the current will automatically reduce itself until the back e.m.f. is equal to the applied voltage.

I gather that the voltage and current are dependent on each other?

And on the resistance. In fact the three quantities are related by the simple expression :—

Current multiplied by resistance equals voltage.

This is called Ohm's Law—after the scientist who discovered it, and is a very valuable expression to remember.

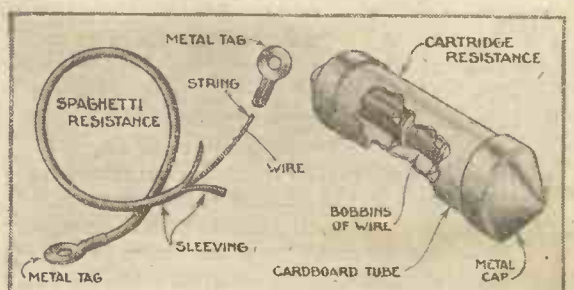
Now from what I have said you will understand that any current flowing through a circuit or part of a circuit which possesses resistance (as every circuit does) will develop a voltage. This is not "something for nothing" because somewhere else in the circuit there must be a source of e.m.f. to keep the current flowing, but we often find it convenient not to bother about this, but merely to consider the voltage developed across one particular part of the circuit.

To revert to the crystal set, you will see that if we have current flowing through the telephones there must be a voltage across them, and this is the voltage which we use to operate the grid of the valve.

But do we not want the telephones in the valve circuit?

We do, of course, and so we replace the telephones in the crystal circuit by some electrical equivalent. We can use, for example, what we call a high resistance. This is a component specially designed to have a high electrical resistance in a confined space, and we adjust the value of this resistance to be equivalent to that of the telephones.

Thus if we insert this high resistance in place of the telephones we shall get a voltage developed across it by the speech currents in just the same way as we should if the telephones were present. This is the voltage we use to operate our valve.

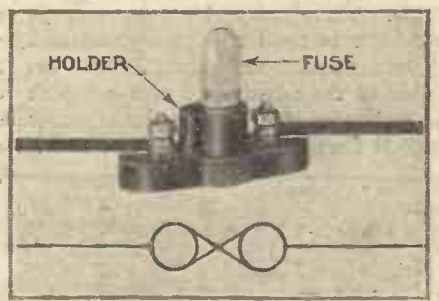


Two typical high resistances. On the left is the construction of a spaghetti resistance and on the right is a cartridge-type resistance

Do you connect it to the grid?

Yes: Let us draw a pictorial diagram. The crystal set itself is the same as before, consisting of a tuning circuit with a crystal detector, but with a resistance in place of the telephones. One side of the resistance we connect to the grid of the valve and the other to the filament.

The voltage on the grid of the valve is thus continually varying in conformity with the sound vibrations in the wireless wave. As you saw last week, this causes the anode current through the valve to vary in the same manner.



Here is a typical fuse and below it you will find the conventional symbol as used in circuit diagrams

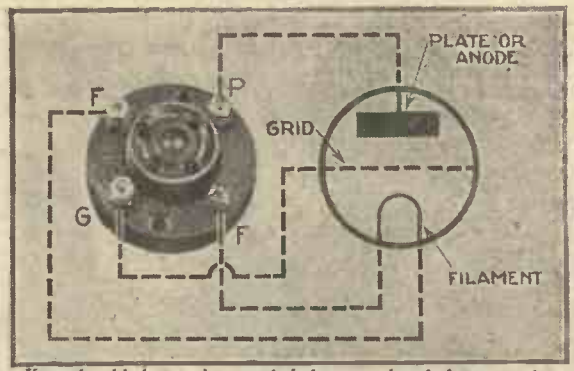
We place our telephones in the anode circuit between the high-tension battery and the valve so that the varying currents have to flow through the telephones and consequently the diaphragm vibrates and sounds are reproduced.

Much stronger than before, I suppose?

Yes, because of the amplifying properties of the valve. The grid is much closer to the filament than the anode is and consequently quite a small variation in grid voltage causes a large change in anode current, and we get considerably increased sound from the telephones.

How do you actually make the connection to the valve?

By fitting it into a special socket. The valve is provided with four pins, and these fit into special sockets so that the valve can be removed and replaced with alteration to the circuit.



You should learn the symbol for a valve before you try to read theoretical circuit diagrams. Here you see the symbol, on the right, corresponding to the valve holder terminals on the left

Why are the pins unevenly spaced?

So that the valve can only be inserted in the correct way. For instance, if the valve were wrongly inserted so that the high-tension battery became connected across the filament, the valve would be burnt out.

What do you mean by "burnt out"?

The resistance of the filament is so proportioned that with a 2-volt battery the current is just sufficient to heat the filament to the temperature required. If we apply more than 2 volts the current will be too great and will produce more heating than is necessary, and if the voltage is excessive, the filament will get so hot that it will actually melt. If this happens, of course, the valve is useless, and to avoid such troubles the sockets are spaced unevenly so that the valve can only be inserted the correct way.

Does that entirely overcome the difficulty?

It does under normal conditions, but where one is experimenting there is always a danger of a wrong connection, and many people use fuses to protect their circuit.

What is a fuse?

A device that will carry the normal current safely but will melt if this current is exceeded. We can choose a fuse that will carry the anode current of the valve quite easily, but that will melt at once if the current approaches the value required to heat the filament. Thus, under normal conditions, when the high-tension battery is only supplying the anode current, the fuse does nothing, but if the high-tension is inadvertently connected across the filament, the fuse at once blows up before the current has become large enough to damage the filament.

(Continued on page six)

NEXT WEEK: COILS!

PERCY W. HARRIS'S "BUILD AS YOU LEARN"

IMPROVING THE QUALITY

THERE are two components I have not mentioned—the 50,000 ohms spaghetti resistance and the 2-micro-farads condenser. The reason for their inclusion is so important that I want to devote most of this lesson to discussing it.

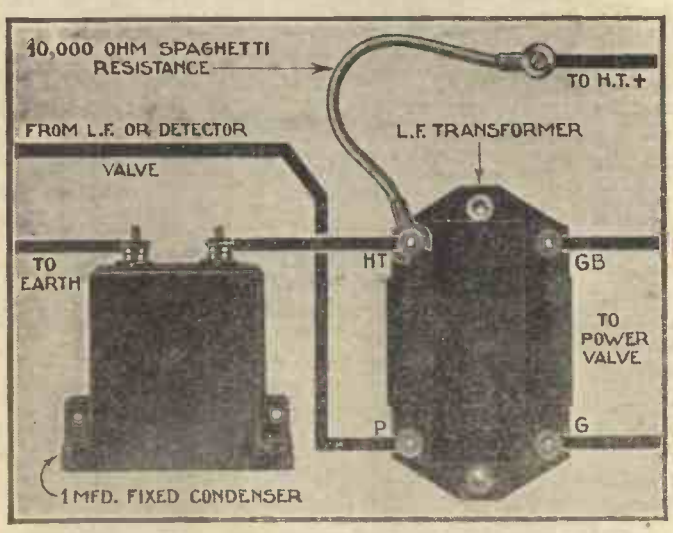
Whenever you have a set with several valves, each of which magnifies, you must always guard against certain "reaction" troubles. We have seen in an earlier lesson how we can take some of the magnified energy, hand it back and re-magnify it so as to make the set more sensitive and efficient. We have also seen how, if we overdo this feed-back, the set will oscillate and be useless for reception.

Most people think of reaction only as a high-frequency effect—as something that happens before the detector, but just the same thing can happen in the low-frequency end when we magnify our audible signals after detection.

"But," you will say, "how can we get any reaction effect in the low-frequency end when we have no low-frequency reaction coil?" You have no idea how many ways it can happen or in what unexpected places it can turn up! You certainly need not have a special coil to feed back energy from one low-frequency circuit to another—the magnetic field of the low-frequency transformer can do it, particularly in sets where there are two low-frequency transformers whose fields can easily interlink.

It is really a difficult job to design a good receiver with two low-frequency transformers unless you have very carefully designed the screening. Just because a set does not actually howl or "motor-boat" it is not necessarily stable. There may be just enough feed-back to spoil the quality without provoking actual oscillation.

One of the advantages of a set with one resistance stage and one transformer stage is that we have no risk of transformer fields interacting, but we still have one common sort of trouble—the coupling which occurs either in the high-tension battery or its equivalent, the mains unit, or "eliminator" as it is sometimes called.



De-coupling is really quite a simple idea, as you can see from this pictorial diagram. In series with the primary winding of the transformer is connected a high resistance. Where these two points are joined you then connect one side of a fixed condenser, the other side of which goes to earth or low-tension negative

It may not be easy at first to grasp why at such a place you can get feed-back, but it must be remembered that the high-tension currents from *each* valve circuit all pass through it. I explained earlier in this series that if an electric current is flowing through a particular circuit or part of a circuit there must be a voltage across this part and if the current varies so the voltage must vary. Think now what happens when the current from one particular valve circuit is fluctuating through a high-tension battery, giving voltage changes across this battery. If at the same time a current from another valve circuit which normally would be steady is passing through the battery, this current is bound to be affected by the voltage change in the battery.

Put more simply, you can only have a steady current through a circuit if the voltage remains steady and so any fluctuations in the voltage of the high-tension source of a wireless receiver are bound to affect every circuit connected to it.

The biggest current changes in a receiver obviously occur in the last or loud-speaker valve circuit. If now you examine what we have done in our present receiver you will know that large current changes occur in the circuit consisting of the plate to filament path of the last valve, the loud-speaker windings, and the high-tension battery.

These changes of current bring about changes of voltage and these changes of voltage readily communicate themselves back to the detector valve circuit where they are re-magnified, passed on again and so come back once more in intensified form to the detector circuit. This goes on until we get either acute distortion or actual low-frequency oscillation, which, if sufficiently violent, will

MAKING A DUAL-RANGE COIL—

PERCY W. HARRIS IMPROVES THE QUALITY

periodically "clog up" the detector valve, bringing silence till the charge leaks off, when a further clogging takes place. This gives the regular "plop-plop-plop" sound which so closely resembles the noise of an outboard motor-boat engine that it is called "motor-boating."

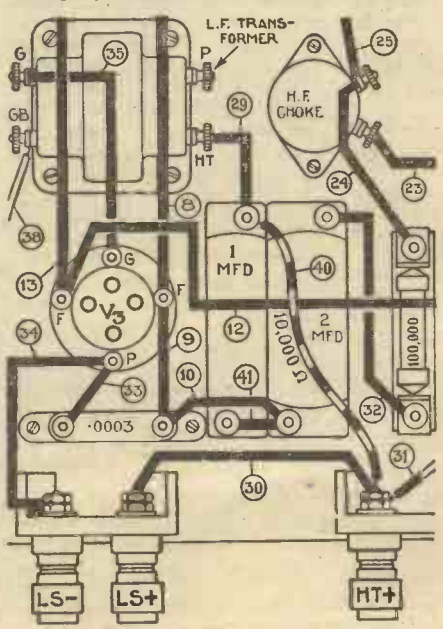
HOW "FEED-BACK" VARIES

The amount of feed-back that occurs depends on the high-tension battery and its resistance. The lower its resistance, the smaller voltage change set up, and as new batteries are of low resistance the effect may not be noticeable for a few weeks or even for a month or two. High-tension mains units usually have a high or fairly high internal resistance and are much more prone to give motor-boating or feed-back troubles.

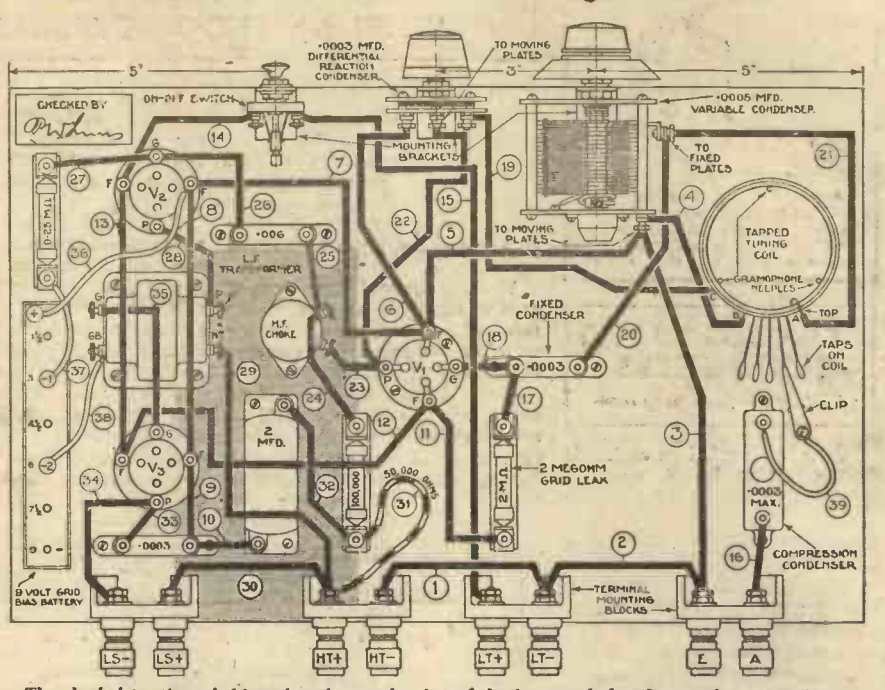
How can we cure this trouble in a set? The best way is to isolate the battery from the possibility of voltage changes and to keep it solely as a supply of steady current. This is the ideal but it is not always essential, so let us see what we have done in the present set.

If you look at the connections you will find that the high resistance in the detector plate circuit which is used for coupling two valves, instead of going straight to the high-tension battery, goes to a further 50,000 ohms resistance and at the point of junction with this it is connected to a 2-microfarads condenser which goes down to earth, or in other words to the negative side of the high-tension battery.

This condenser offers a complete barrier to direct current but it allows



A "close-up" view of the portion of the set affected by this week's de-coupling



The shaded portion of this reduced reproduction of the layout of the three-valve set indicates the part of the baseboard where component alterations have to be made to fit the extra de-coupling

rapid changes of current through it. Being connected to a high-tension battery through this 50,000 ohms resistance it is always kept charged and any rapid changes of voltage in the detector plate circuit finds a very easy path back to earth or filament this way than through the 50,000 ohms resistance and the high-tension battery. It is, so to speak, a reservoir that can take control of certain changes and be steadily fed as required from the high-tension source.

Voltage changes in the high-tension battery set up by the loud-speaker current will not communicate themselves back to the detector—or at least not sufficiently to upset the working of the set.

MORE DE-COUPLING

The best remedy for all this kind of trouble is not only to decouple the detector as we have done in this set, but to isolate the current changes in the output valve circuit and prevent them going back to the battery. This is done with what is called a choke-output circuit, which I cannot describe here this week. It will not be necessary with this set, but we still have a possibility of feed-back to the first low-frequency valve from the output valve, giving instability, and actually with the set as it stands it is not so stable as I want it to be. We need more decoupling.

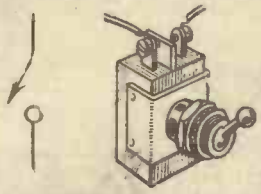
Indeed, I hope it shows its instability to you, as it is, even with the detector decoupling, for unless you have these effects in your experimental set, you will neither appreciate the benefit of curing them nor know what to do in future. This week I want you to obtain one 1-microfarad condenser and a 10,000 ohms spaghetti resistance. Both of these are quite cheap and you may be able to obtain the two for half a crown. In any case it will cost very little more than this.

NEW CONNECTIONS

What I want you to do is to disconnect the lead going from the high-tension positive terminal of the low-frequency transformer to the high-tension positive and insert in it the 10,000 ohms resistance, connecting the 1-microfarad condenser from the junction point of the transformer and the resistance to low-tension negative as shown in the "close up" diagram. The effect of this resistance and condenser is to isolate the first low-frequency valve from the high-tension battery just as we have isolated the detector valve from this source.

This slight change should bring about a very appreciable improvement in the quality owing to the increase in stability. Whether or not you have so far had instability with this set will depend to some extent on the components you have used, but if you have had "motor-boating" or distortion you will find the addition of the parts mentioned this week will cure it. Next week I hope to talk about dual-range coils.

—PERCY W. HARRIS'S SPECIAL SUBJECT NEXT WEEK



SWITCH

A simple two-point switch, as used for the filament on-off control, is shown in symbol on the left and as a tumbler-type switch on the right

BRINGING IN THE FOREIGNERS

(*Continued from page one*)

stations are located on each side of the known B.B.C. stations. You will then, by turning the tuning dial a degree or so each way, be able to add at once to your list of certainties.

After this it is fairly easy, by listening to the different languages, to identify the remaining intervening foreigners.

Take your time, and within two or three evenings you will have compiled an authoritative log of foreigners, even though you start without any knowledge of their wavelengths or dial positions.

FAST AND SLOW

Take the question of the speed of turning the knobs. Tuning should be done by *slowly* turning the knob when travelling from station to station. When settling down on a station a *quick* backwards and forwards movement is correct, as you can then more accurately define the exact point.

Reaction should be treated with great respect. Usually it does not pay to over-do reaction, but if you are having trouble in separating two foreign stations the best plan is to decrease the high-frequency amplification, as by turning down the volume control or aerial-coupling condenser knob, and then increase the reaction to its maximum.

Reaction amplifies the station to which the set is tuned to a greater extent than it amplifies all other stations. This is an important asset.

It means that you can, in effect, increase the ratio of strength of a wanted station to the strength of the unwanted station, simply by increasing the reaction.

When there is an unduly annoying background noise it is a good idea to bring into action the tone control, assuming your set is fitted with one. A low-pitched tone, obtained by cutting out high notes, will usually decrease background noises, which are themselves of fairly high frequency.

HOW TO GET GOOD RESULTS WITH AN INDOOR AERIAL

SO powerful are stations now, and so sensitive are modern sets, that quite a small aerial will usually be enough to give you full loud-speaker strength. Even if you have an outdoor aerial there is no reason why you should not try a wire fitted up indoors.

You will probably be surprised at the strength of stations so received. A well-erected indoor aerial is not much less efficient than many outdoor aerials.

When fitting up the indoor aerial you should be careful to insulate the wire from earthed objects, such as the walls and the ceiling. It is not possible to isolate the wire from the capacity effects of the room, but you can at least reduce this cause of inefficiency by hanging the wire a foot or so from the walls.

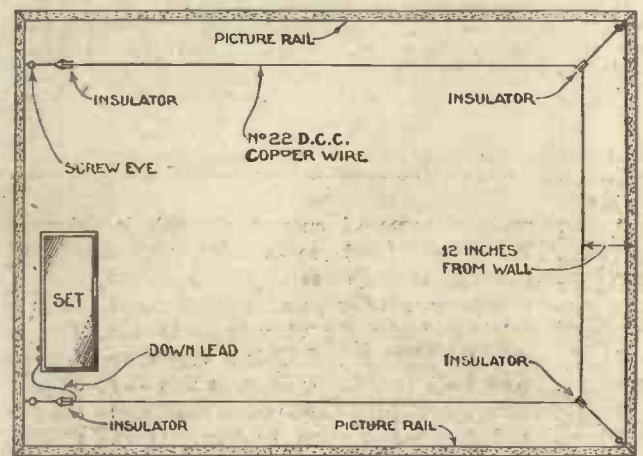
It is preferable to erect an indoor aerial in a top floor, though quite fair results can be obtained on the ground floor if that is more convenient. Or you may find it possible to fit up a vertical wire from a landing to the living room. This is usually quite efficient.

The wire to use for an indoor aerial is chosen to be as efficient as possible without being conspicuous. Obviously the thick stranded copper wire of outdoor aerials would be out of place in a living room.

Cotton covered wire of about 22 gauge is ideal. It is thick enough to ensure a fairly low resistance and its white covering makes it almost invisible against the ceiling.

As a rule it will not be possible to obtain a very long straight run with an indoor aerial wire. Never mind—you can use three sides of an ordinary sized room for the run of the wire, thus using a total length of between 40 and 50 feet of wire.

It is a mistake to erect very *long* indoor aerials in the hope that they will pick up more energy than a short wire. What happens is that the extra length causes losses by increasing the resistance.



When erecting an indoor aerial do not make the mistake of using too long a wire. About 50 ft. is the maximum that is normally required. Erect this around three sides of the room, as shown above, keeping the wire at least a foot from the walls and ceiling

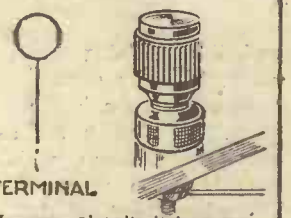
Remember also that as every indoor aerial has large capacity losses, due to the proximity of walls and ceilings, the longer the wire the greater are these losses.

For normal use a 50-foot indoor aerial is just about right, though very good results can often be obtained especially with large sets, on as little as 30 feet.

An indoor aerial makes a useful standby for the outdoor aerial, and will enable you to carry on with your experiments while the family is listening in. For short-wave work the indoor aerial is extremely useful, especially if kept short.

GOT THE SEVEN OTHER SUPPLEMENTS?

This is the eighth successive "Wireless Made Easy" Supplement we have presented with "Amateur Wireless." Have you got the other seven? If not, you can obtain them through all newsagents or direct from the publishers, Bernard Jones Publications, Ltd., of 58 to 61 Fetter Lane, E.C.4, price 4d. each, post free.



In some circuits it is necessary to show a terminal connection, as is done on the left for the terminal shown on the right

ELEMENTARY WIRELESS COURSE

(*Continued from page three*)

Thus, under normal conditions, when the high-tension battery is only supplying the anode current, the fuse does nothing, but if the high-tension is inadvertently connected across the filament, the fuse at once blows up before the current has become large enough to damage the filament.

How are fuses made?

For wireless work, where the currents are rather small, we use a very thin wire, often enclosed in a glass bulb like a flash-lamp bulb. There is also a special form of fuse, which is quick acting, made of a thin film of gold deposited on a strip of glass. Is there anything else you would like to ask?

I should like to know more about this high resistance.

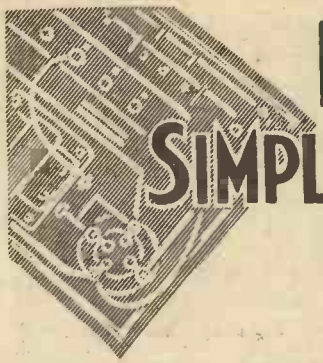
There are various forms which this component can take. One way of obtaining a high resistance is to use wire made of a special alloy of copper and tin, known as Eureka, which has a resistance nearly fifty times as great as copper. We can use a long length of this Eureka wire wound round a bobbin or otherwise suitably accommodated.

For instance, the spaghetti resistances so popular to-day use very fine wire wound round asbestos cord, an arrangement giving a flexible resistance that can easily be connected between the points required.

Other forms use a short rod, either of carbon or some composition. These resistances are semi-conductors and have a resistance of many thousands of ohms to the inch. By suitable choice of the material and its dimensions we can obtain the necessary high resistance in the form of a short rod with terminals at each end.

Study the diagram at the bottom of page three in this Supplement.

Next week I will tell you how we can combine a crystal and valve by using the valve both as a detector and amplifier.



HOW A FULL-SIZE PRINT SIMPLIFIES THE HOME CONSTRUCTOR'S JOB

A year ago the beginner might have looked askance at the assembly of a super-het. Now with the aid of our simple "blackprint" (given free with last issue) anybody can tackle with confidence the building of the "New Century Super." Step by step this full-size print, as with all "Amateur Wireless" prints, takes you through the construction from start to finish. As the article explains, the full-size print is the home constructor's certain aid to success.

OUR blueprints and the blackprint given away in last week's issue, provide the constructor with a very simple yet foolproof aid to the job of assembling the components and wiring them together

What, firstly, is an "A W" blueprint or blackprint? They are *full-size plan views* of the completed set. You start, then, with a large picture before you of the finished job.

As you will soon see if you examine one of these prints, the *exact* positions on the baseboard of all the components are clearly indicated. The relative positions of the components, the space each takes up on the baseboard, their distance apart—all these invaluable constructional details are given.

We would stress the point, often overlooked by the beginner that as the prints are full size they do away with a great deal of tedious measurements You do not have to make laborious measurements with a ruler We have done all that for you. *Our expert draughtsmen have conveyed to the original blueprint every detail needed to build the set.*

We provide you with the complete wiring. From a print you can see just how the wires go from one terminal to another. See those numbers inside little circles attached by short lines to each wire length? They show you the order in which the wires of the original set were made.

They form a foolproof check of the wires you make in your set. Cross off each as you make it and you cannot go wrong or leave out a wire.

A full-size print, therefore, helps you in two ways. It enables you, firstly, to place your components on your baseboard in exactly the same relative positions that our components were placed on our baseboard. Secondly, it enables you to follow the complete wiring sequence, with a check as you go along from No. 1 wire to the last wire.

Let us take, as a good example, the blackprint given with last week's issue of AMATEUR WIRELESS. With this print the building of the "New Century Super" can be undertaken with every confidence even by those who have never before built a wireless set.

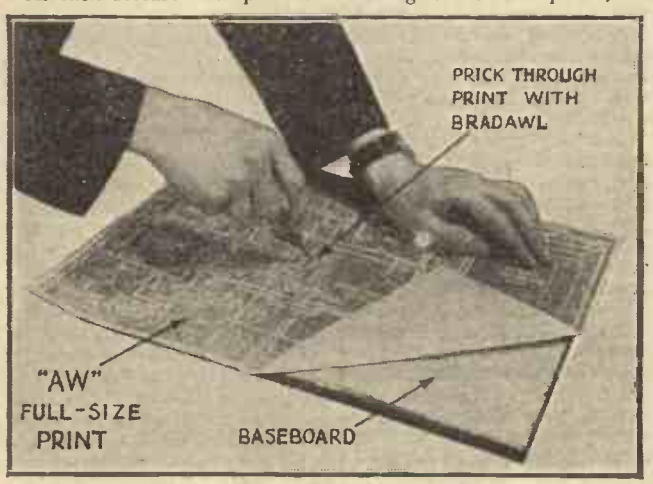
You start with your baseboard, already cut to size After this has been covered with metal foil you are ready to make use of the print Place the print over the prepared baseboard, making sure that the edges of the print coincide with the edges of the baseboard

On each pictured component you will find two or more holes marked to indicate the exact positions of the fixing screws. These are small circles with a line across them—representing the "plan view" of a screw head

Prick through all the circles meant to take screws. This pricking can be done with a small bradawl Do not be afraid to make a good impression on the wood It will then be all the easier to screw home the fixing screws later

The pricking process gets over the beginners' difficulty, which is to know how to start on the job of transferring the print details to the actual baseboard.

When all the screw holes have been marked out by using the print as the template, you can remove the print and then, referring to it as required, fix down all the baseboard components Round-headed wood screws of ½ in. or ¾ in. are used.



All our full-size blueprints can be used as baseboard and panel templates. Here you see a constructor marking out the positions of the baseboard components by pricking through the "screw-head" circles on the print with a bradawl or other sharp-pointed instrument

Just a word here about the panel In the "New Century Super" there is no panel, the controls being mounted on the front edge of the baseboard, as shown by the print When a panel is used we show in the print the end elevation. The baseboard and the panel, at right angles in the set itself, are shown in the print as being in the same plane.

You can, of course, use the print as a panel drilling template, just as you use it to locate the baseboard component positions.

We would specially like to draw your attention to the wiring shown by the print. Each wire length, you will see, is numbered.

We make a standard practice of enclosing wire length numbers in small circles, attached to the actual connection by means of short, straight lines. This avoids confusion with numbers of components, such as the coils in the "New Century Super" This circling idea also enables clear numbering to be done for wires that run close together

Let us assume you have mounted all the parts and want to make a start with wiring Seek out No. 1 wire on the print. This you should always find somewhere around the aerial circuit, because we number our leads in sequence from the aerial or input side of the set to the loud-speaker or output

You will see that in the print for the "New Century Super," for example, the No. 1 lead is the short length of wire between the aerial terminal at the back of the baseboard and the aerial compression condenser

The wire used is No. 20 gauge round tinned copper, and the thickness you see on the print is made up by the covering of insulating sleeving put on each bare wire length.

You will find that sometimes a wire runs from component A to component B and thence on, from the same terminal, to component C. Here there is no need to use separate lengths of wire, although you will, of course, have to break up the sleeving between each component.

Example: Wire No. 54 from the grid of the second detector in the "New Century Super" goes to the grid condenser and thence on, by wire No. 53, to the grid leak You can make *one* length of wire, twisted round the intermediate terminal, which is the grid-condenser terminal, serve instead of two separate wires

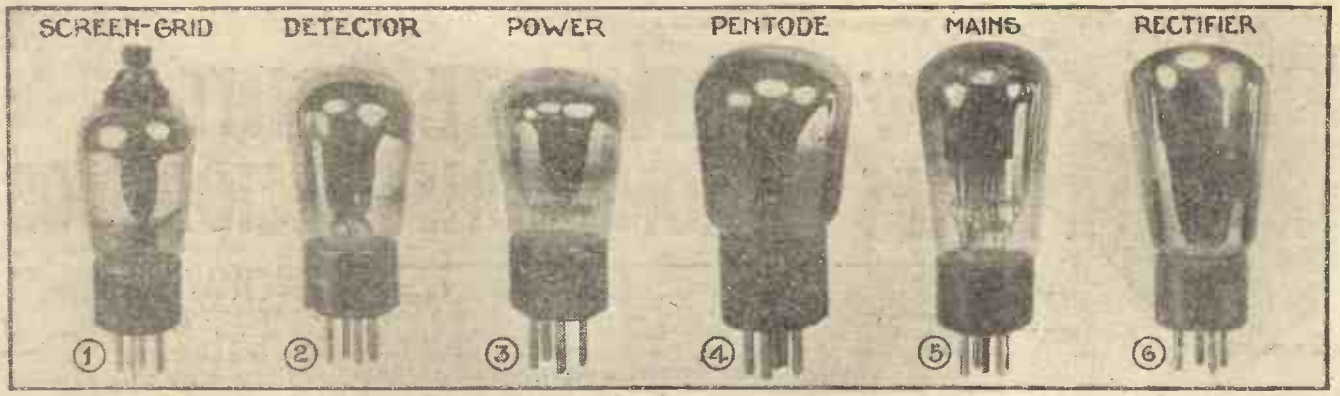
A great point is to cross off on the blueprint each wire as you complete it in the actual set. Next week we will give some practical hints on the wiring.

NEXT WEEK'S

SPECIAL ARTICLES

HOW TO READ THE CIRCUIT DIAGRAM — THE KEY TO THE LAYOUT PLAN — JUST HOW THE JOB OF WIRING SHOULD BE DONE.

These two articles have been specially written to appeal to beginners: They deal with important points in the theory and practice of wireless reception.



BEGINNERS' GUIDE TO DIFFERENT TYPES OF VALVES

FROM the two hundred odd valves on the market we can find five or six distinct types. The first, and most common type, is the three-electrode valve. This valve has an anode, a filament, and a grid in between. It is used mostly for the detector and power stages in the set. The filament can be 2, 4 and 6 volts, although to-day there is no need to worry over the 4 and 6 volt filaments, as the 2-volt filament is very efficient.

THE IMPEDANCE

The important point to consider in a valve is the impedance, which is the resistance offered by the filament-to-plate path of the valve to the passage of the wireless signal. The three-electrode valve is made in various impedances, from about 60 000 ohms down to 1,000 ohms.

We might sub-divide the three-electrode valve type into two groups, one containing high and moderate impedance valves, and the other the low-impedance valves. The first group can be used not only for the detector position but for a low-frequency amplifying valve after the detector.

The second group, containing three-electrode valves with impedances below 5,000 ohms, are used for the power output stage.

There is a very good reason for the various valve impedances. The higher the amplification factor the higher is the impedance, and, as a rule, the lower is the anode current.

We usually choose a fairly high impedance valve for the detector stage, because we want a sensitive valve giving a good degree of amplification. Sometimes though, it is more satisfactory to use a lower impedance valve, as when the coupling between the detector and the next valve has a low impedance.

In the power valve group of the three-electrode range we are more concerned with the power output of the valve than with its amplification factor. As a rule the greater the power output the greater is the anode current.

Most of us would like a great deal of power at the output, but we are usually limited in our ambitions by the necessity for keeping down the anode current, so that the high-tension battery supplying this current will not be too quickly exhausted.

It is once again a question of compromising. The high-impedance power valves take a smaller anode current than the low-impedance power valves.

We have now to consider the pentode power valve, which is another distinct type. It has the usual filament and anode and grid, but in addition there are two more grids, one internally connected to the filament and the other, coming between the normal grid and the anode, needing an external connection to the high-tension battery.

INCREASING VOLUME

The object of the pentode power valve is to increase what is known as the sensitivity ratio. The most sensitive power valve is the one that gives the most power output for a given power expenditure and for a given input voltage.

The pentode power valve, either for battery or mains operation, provides us with a larger power output for a given anode current than an ordinary power valve. The greatest use of the pentode valve in small battery sets is in giving sufficient power to work the loud-speaker with the minimum amount of anode current, and therefore with the least possible drain on the high-tension battery.

The larger pentodes as used in mains sets, are often intended to give a greater power output than can be obtained with a three-electrode power valve.

THE SCREEN-GRID

We have now dealt with the valves used for detection and for the power output. For the valve stage before the detector it is now usual to use what is called a screen-grid valve. This is similar in general construction to a high impedance three-electrode valve, with the addition of a grid, called the screening grid, between the filament and the anode. This grid has to be externally connected to a point on the high-tension battery.

There are now two groups of screen-grid valves for battery operation. The ordinary screen-grid has a very great amplification and therefore a very high impedance. It can be used most successfully in sets with only one stage of high-frequency amplification. Its drawback is that when its amplification is reduced, as by reducing the screen volts, it tends to bring in distortion in reproduction.

The variable-mu type of screen-grid valve is designed to overcome this trouble. It has a lower amplification than the ordinary screen-grid, but will not distort even when its amplification is reduced to minimum. This is done, by the way, by altering the grid bias and not by altering the screen-grid volts.

Quite distinct in construction from any of the preceding valves is the mains valve. This is available for all stages of the set, but has a special type of filament. There is a heater filament, which is connected to the A.C. or D.C. mains from which its heat is derived.

This heat is passed on to the cathode surrounding the heater wire but insulated from it. The heated cathode then emits the electrons but does not pass on the fluctuations in the mains heating, so there is no "mains hum" developed.

The mains valve has five connections, two for the heater, one each for the cathode, grid, and anode. This would correspond to a three-electrode valve for battery operation. The screen-grid and pentode valves naturally have additional connections.

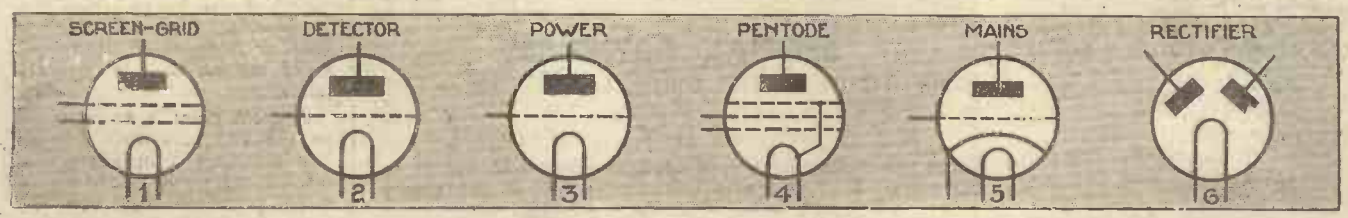
MAINS RECTIFIER

Among mains valves there is the mains rectifier, again a distinct type. This valve is really two separate valves assembled in one bulb. There is a central filament and two anodes. In effect there are two two-electrode valves, which convert A.C. mains input into direct current at the output.

The full- or double-wave rectifier, as it is called, has four connections, two for the filament and two for the two anodes.

SIX VALVE TYPES YOU SHOULD KNOW

At the top of this page you will see pictures of the six most important types of valves, and at the bottom of the page are given the corresponding symbols as used in circuit diagrams. No. 1 is the screen grid used for high-frequency amplification. No. 2 is the detector valve, of the three-electrode type. No. 3 is the three-electrode power valve. No. 4 is the pentode power valve. No. 5 is the mains valve with indirectly heated filament. No. 6 is the mains full-wave rectifier valve.



STILL ANOTHER SUPPLEMENT NEXT WEEK

"Amateur Wireless" Guide to the 100 BEST STATIONS

218 Metres

PORI (Finland)

(Bjorneborg)

Approximate distance from London, 1,130 miles.

Frequency : 1,373 kilocycles.

Power : 0.7 kilowatt.

Relays the main Helsinki programme. Announcements in Finnish and Swedish.

Dial Readings .....

218 Metres

SALZBURG (Austria)

Approximate distance from London, 770 miles.

Frequency : 1,373 kilocycles.

Power : 0.5 kilowatt.

Relays the Vienna programme, together with Linz, Graz, Klagenfurt, and others. Metronome interval signal.

Dial Readings .....

223 Metres

FÉCAMP (France)

Approximate distance from London, 114 miles.

Frequency : 1,345 kilocycles.

Power : 10 kilowatts.

Interval call : Ici Radio Normandie. Carillon.

Frequent late night and early-morning gramophone concerts, in addition to sponsored programme.

Dial Readings .....

232.2 Metres

KIEL (Germany)

Approximate distance from London, 470 miles.

Frequency : 1,292 kilocycles.

Power : .25 kilowatt.

Relays the Hamburg programme, together with Bremen, Flensburg, and Hanover. Transmits at intervals from 5 a.m. Main news bulletin at 9 p.m.

Dial Readings .....

239 Metres

NURNBERG (Germany)

Approximate distance from London, 580 miles

Frequency : 1,256 kilocycles.

Power : 2 kilowatts.

Relays the Munich programme, together with Augsburg and Kaiserslauten, which are both on 560 metres.

Dial Readings .....

244.1 Metres

BASLE (Switzerland)

Approximate distance from London, 460 miles

Frequency : 1,229 kilocycles.

Power : .5 kilowatt.

Dial Readings .....

246 Metres

BERNE (Switzerland)

Approximate distance from London, 464 miles.

Frequency : 1,220 kilocycles.

Power : 0.5 kilowatt.

Relays the Beromuenster programme.

Dial Readings .....

246 Metres

CASSEL (Germany)

Approximate distance from London, 400 miles.

Frequency : 1,220 kilocycles.

Power : 0.25 kilowatt.

Call : See Frankfurt.

Relays the Frankfurt programme broadcast on 390 metres.

Transmits at intervals from 5 a.m.

Dial Readings .....

246 Metres

LINZ (Austria)

Approximate distance from London, 780 miles.

Frequency : 1,220 kilocycles.

Power : 0.5 kilowatt.

Relays the Vienna programme broadcast on 517 metres, together with Salzburg, Innsbruck, Klagenfurt, and Graz.

Dial Readings .....

253 Metres

GLEIWITZ (Germany)

Approximate distance from London, 740 miles.

Frequency : 1,184 kilocycles.

Power : 5 kilowatts.

Relays the Breslau programme broadcast on 325 metres.

Transmits at intervals from 5.15 a.m.

Dial Readings .....

255 Metres

TOULOUSE (France)

(PTT)

Approximate distance from London, 550 miles

Frequency : 1,175 kilocycles.

Power : 0.7 kilowatt.

Call : Ici Toulouse P.T.T.

Dial Readings .....

257 Metres

HORBY (Sweden)

Approximate distance from London, 650 miles.

Frequency : 1,166 kilocycles.

Power : 10 kilowatts.

Call : See Stockholm or Motala.

Relays the Stockholm programme, together with Boden, Motala, Goteborg, and others. Transmits at intervals from 6.20 a.m.

Dial Readings .....

259 Metres (Wavelength shortly to be exchanged with Frankfurt-am-Main.)

LEIPZIG (Germany)

Approximate distance from London, 530 miles.

Frequency : 1,157 kilocycles.

Power : 2 kilowatts.

Relayed by Dresden on 319 metres. Transmits at intervals from 5.15 a.m. Main programme starts at 7 p.m. Often relayed from Hamburg. News bulletin at 9.30 p.m.

Dial Readings .....

263.8 Metres

MORAVSKA-OSTRAVA (Czechoslovakia)

Approximate distance from London, 820 miles.

Frequency : 1,137 kilocycles.

Power : 11 kilowatts.

Transmits at intervals from 5.15 a.m. Relays programmes of Prague, Kosice, and Bratislava.

Dial Readings .....

269.4 Metres

BARI (Italy)

Frequency : 1,112 kilocycles.

Power : 20 kilowatts.

Transmits at intervals from 12 noon. News bulletin and agricultural report at 7.30 p.m.

Main concert starts at 8 p.m. Final news bulletin at 10 p.m.

Dial Readings .....

272 Metres

RENNES (PTT) (France)

Approximate distance from London, 248 miles

Frequency : 1,103 kilocycles.

Power : 1.3 kilowatts.

Relays Paris. Interval call : "Allo ! Ici P.T.T. Rennes !"

Dial Readings .....

273.7 Metres

TRIESTE (Italy)

Approximate distance from London, 600 miles

Frequency : 1,096 kilocycles.

Power : 7 kilowatts.

Relayed by Milan, Genoa, and Florence. Transmits at intervals from 7.15 a.m. News bulletin at 7 p.m.

Dial Readings .....

276.5 Metres

HEILSBERG (Germany)

Approximate distance from London, 460 miles

Frequency : 1,085 kilocycles.

Power : 60 kilowatts.

Relayed by Danzig on 453.2 metres. Transmits at intervals from 5 a.m. Interval signal, two-note gong, D flat and A flat.

Dial Readings .....

279 Metres

BRATISLAVA (Czechoslovakia)

Approximate distance from London, 800 miles

Frequency : 1,076 kilocycles.

Power : 14 kilowatts.

Interval call : Allo ! Bratislava (if own transmission). Frequently relays Prague (Praha), Praha. Interval signal : Musical note (A).

Dial Readings .....

281 Metres

COPENHAGEN (Denmark)

Approximate distance from London, 590 miles

Frequency : 1,067 kilocycles.

Power : 0.75 kilowatt.

Call : Kalundborg København.

Relayed by Kalundborg on 1,153 metres. Transmits at intervals from 6.30 a.m. Time signal and chimes from Copenhagen Town Hall at 11 p.m.

Dial Readings .....

283 Metres

INNSBRUCK (Austria)

Approximate distance from London, 760 miles

Frequency : 1,058 kilocycles.

Power : 0.5 kilowatt.

Call : See Vienna.

Relays the Vienna programme, together with Linz, Salzburg, Klagenfurt, and others. Transmits at intervals from 8.20 a.m. Main orchestral concert starts at 9.30 p.m.

Dial Readings .....

283 Metres

STETTIN (Germany)

Approximate distance from London, 570 miles

Frequency : 1,058 kilocycles.

Power : 0.5 kilowatt.

Relays the Witzleben programme (Berlin).

Dial Readings .....

293 Metres

KOSICE (Czechoslovakia)

Approximate distance from London, 640 miles

Frequency : 1,022 kilocycles.

Power : 2.5 kilowatts.

Chiefly relays the Prague and Moravska-Ostrava programmes.

Dial Readings .....

296.1 Metres

HILVERSUM (Holland)

Approximate distance from London, 230 miles

Frequency : 1,013 kilocycles.

Power : 20 kilowatts; (7 kilowatts up to end of afternoon programme).

Announcements in Dutch.

Interval call : "Hier Hilversum."

Dial Readings .....

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304 Metres
BORDEAUX-LAFAYETTE (France)

Approximate distance from London, 550 miles.
Frequency : 986 kilocycles.
Power : 13 kilowatts.
Transmits at intervals from 12.45 p.m. News bulletin at 6.30 p.m. Main evening concert starts at 8 p.m.

Dial Readings .....

306 Metres
PITTSBURG (U.S.A.)

Approximate distance from London, 3,300 miles.
Frequency : 980 kilocycles.
Power : 25 kilowatts.
Relayed by W8XK on 48.86 metres and 25.27 metres. Transmits at intervals from 11.45 a.m. Main evening programme starts at 7 p.m.

Dial Readings .....

307 Metres
ZAGREB (Yugoslavia)

Approximate distance from London, 830 miles.
Frequency : 977 kilocycles.
Power : 0.75 kilowatts.
Metronome interval signal. Interval call : "Radio Zagreb." Occasional French and German announcements. Relays Belgrade.

Dial Readings .....

312.8 Metres
CRACOW (Poland)

Approximate distance from London, 880 miles.
Frequency : 959 kilocycles.
Power : 1.5 kilowatts.
Call : Hallo! Polski Radjo Cracow.
Frequently relays Warsaw programme broadcast on 1,411 metres. Bugle call from the famous St. Mary's Church is frequently broadcast.

Dial Readings .....

312.8 Metres
GENOA (Italy)

Approximate distance from London, 640 metres.
Frequency : 959 kilocycles.
Power : 10 kilowatts.
Relays the Turin programme, together with Milan and Florence. Transmits at intervals from 7.15 a.m.

Dial Readings .....

319 Metres
DRESDEN (Germany)

Approximate distance from London, 540 miles.
Frequency : 941 kilocycles.
Power : 0.25 kilowatts.
Relays the Leipzig programme broadcast on 259 metres. Transmits at intervals from 5.15 a.m.

Dial Readings .....

319 Metres
NAPLES (Italy)

Approximate distance from London, 1,000 miles.
Frequency : 941 kilocycles.
Power : 1.5 kilowatts.
Interval call : "Radio-Roma-Napoli!" Relays the Rome programme broadcast on 441 metres. Transmits at intervals from 7.15 a.m.

Dial Readings .....

322 Metres
GOTEBORG (Sweden)

Approximate distance from London, 675 miles.
Frequency : 932 kilocycles.
Power : 10 kilowatts.
Relays the Stockholm programme, together with other relays, including Motala, Boden, and Horby. Transmits at intervals from 6.20 a.m.

Dial Readings .....

325 Metres
BRESLAU (Germany)

Approximate distance from London, 743 miles.
Frequency : 923 kilocycles.
Power : 60 kilowatts.
Relayed by Gleiwitz on 253 metres. Metronome as interval signal.

Dial Readings .....

328.2 Metres
PARIS (France)

(Poste Parisien)
Approximate distance from London, 214 miles.
Frequency : 914 kilocycles.
Power : 60 kilowatts.
Transmits at intervals from 12 noon. News bulletin and press review at 7 p.m. Dance music starts 10.30-11 p.m.

Dial Readings .....

331.5 Metres
MILAN (Italy)

Approximate distance from London, 530 miles
Frequency : 905 kilocycles.
Power : 50 kilowatts.
Takes the Turin programme, together with Genoa and Florence. Transmits at intervals from 7.15 a.m.

Dial Readings .....

335 Metres
POZNAN (Poland)

Approximate distance from London, 728 miles
Frequency : 896 kilocycles.
Power : 1.9 kilowatts.
Opening signal : Chimes from St. Mary's Church, Cracow. Frequently relays the Warsaw programme.

Dial Readings .....

338.2 Metres
BRUSSELS (Belgium) (No. 2)

Approximate distance from London, 200 miles
Frequency : 887 kilocycles.
Power : 15 kilowatts.
Call : Ici Bruxelles I.N.R.
Programme in Flemish. Main concert starts at 8 p.m.

Dial Readings .....

242 Metres
BRNO (Czechoslovakia)

Approximate distance from London, 750 miles
Frequency : 878 kilocycles.
Power : 35 kilowatts.
Interval call : "Hallo, hallo! Brno" (pronounced "Brr-no").
Relays the Prague programme.

Dial Readings .....

British Broadcasting Stations
(classified in order of wavelength)

Newcastle, 211.3 metres. 1 Kw.
Aberdeen, 214.3 metres. 1 Kw.
Belfast, 242 metres. 1 Kw.
London National, 261.6 metres. 50 Kw.
Bournemouth, 288.5 metres. 1 Kw.
Plymouth, 288.5 metres. .12 Kw.
Scottish National, 288.5 metres. 50 Kw.
Swansea, 288.5 metres. .12 Kw.
Northern National, 301.5 metres. 50 Kw.
Cardiff, 309.9 metres. 1 Kw.
London Regional, 355.8 metres. 50 Kw.
Scottish Regional, 373.4 metres. 50 Kw.
Midland Regional, 398.9 metres. 25 Kw.
North Regional, 480 metres. 50 Kw.
Daventry National, 1,554.4 metres 30 Kw.

345 Metres
STRASBOURG (France)

Approximate distance from London, 400 miles.
Frequency : 830 kilocycles.
Power : 11.5 kilowatts.
Programme starts at 11.30 a.m. Evening programme at 8 p.m. Dance music at 10.30 p.m. Deep toned bell as interval signal.

Dial Readings .....

343.6 Metres
BARCELONA (Spain)

Approximate distance from London, 720 miles
Frequency : 860 kilocycles.
Power : 8 kilowatts.
Opening call : "Aqui estacion EAJ 1 Union Radio Barcelona."

Dial Readings .....

352.1 Metres
GRAZ (Austria)

Approximate distance from London, 760 miles.
Frequency : 852 kilocycles.
Power : 7 kilowatts.
Relays the Vienna programme, (for call see Vienna together with Innsbruck, Linz, Salzburg, and Klagenfurt. Transmits at intervals from 8.20 a.m. News and weather forecast at 9.15 p.m.

Dial Readings .....

360.5 Metres
STUTTGART (MÜHLACKER) (Germany)

Approximate distance from London, 450 miles.
Frequency : 832 kilocycles.
Power : 60 kilowatts.
Call : Hier Suedfunk.
Relayed by Freiburg on 570 metres. Transmits at intervals from 5 a.m. Interval signal, three notes, G-D-G.

Dial Readings .....

363.3 Metres
ALGIERS (N. Africa)

Approximate distance from London, 1,040 miles.
Frequency : 825.3 kilocycles.
Power : 13 kilowatts.
Transmits at intervals from 12 noon. News and time signal at 7 p.m. Main evening concert starts at 8 p.m.
Opening call : "Ici Radio PTT Alger."

Dial Readings .....

394 Metres
BERGEN (Switzerland)

Approximate distance from London, 617 miles
Frequency : 824 kilocycles.
Power : 1 Kilowatt.
Interval call : "Bergen Her!"

Dial Readings .....

368.1 Metres
HELSINKI (Finland)

Approximate distance from London, 1,130 miles.
Frequency : 815 kilocycles.
Power : 13.2 kilowatts.
Relayed by Lahti on 1,796 metres. All announcements made in Finnish and Swedish.
Call : Hiomio! Helsinki-Lahti.

Dial Readings .....

372 Metres
HAMBURG (Germany)

Approximate distance from London, 440 miles
Frequency : 803 kilocycles.
Power : 1.5 kilowatts.
Call : Hier Norddeutsche Sader . . . .
Call : HA (. . . . .) in Morse. Relayed by Bremen, Flensburg, Hanover, and Kiel. Transmits at intervals from 6 a.m. News bulletin at 9 p.m. Frequent variety programmes starting at 10 p.m.

Dial Readings .....

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379.5 Metres

SCHENECTADY (U.S.A.)

Approximate distance from London, 3,000 miles.
Frequency: 790 kilocycles.
Power: 50 kilowatts.
Relayed at intervals by the short-wave stations, W2XAF and W2XAD. Transmits at intervals from 11.45 a.m.

Dial Readings..............................

381 Metres

LWOW (Poland)

Approximate distance from London, 900 miles.
Frequency: 788 kilocycles.
Power: 16 kilowatts.
Occasionally relays the Warsaw programme but also gives its own studio programmes.

Dial Readings..............................

385 Metres

TOULOUSE (France)

Approximate distance from London, 550 miles.
Frequency: 779 kilocycles.
Power: 8 kilowatts.
Transmits at intervals from 12.15 a.m. Abbreviated call "Ici Radio Toulouse." Gong as interval signal. Closes down with the tune, "La Toulousaine."

Dial Readings..............................

390 Metres

ARCHANGEL (Russia)

Approximate distance from London, 1,200 miles.
Frequency: 770 kilocycles.
Power: 10 kilowatts.

Dial Readings..............................

390 Metres

FRANKFURT-AM-MAIN (Germany)

Approximate distance from London, 330 miles.
Frequency: 770 kilocycles.
Power: 1.5 kilowatts.
Call: Hier Suedivestfunk.
Relayed by Cassel on 246 metres. Transmits at intervals from 5 a.m. Time signal and news bulletin at 6.15 p.m.

Dial Readings..............................

394 Metres

BUCHAREST (Rumania)

Approximate distance from London, 1,200 miles.
Frequency: 761 kilocycles.
Power: 12 kilowatts.
Call: Phon. Attent-zee-von-aye ah-eet-chee Radio Look-oo-recht-ee.
Metronome interval signal. Transmits at intervals from 11 a.m. News bulletin at 9 p.m. Closes down with Rumanian National Anthem.

Dial Readings..............................

403 Metres

SUISSE ROMANDE (Switzerland)

(Sottens)
Approximate distance from London, 450 miles.
Frequency: 743 kilocycles.
Power: 25 kilowatts.
Relayed by Lausanne (680 metres) and Geneva (760 metres). Transmits at intervals from 11.28 a.m. News bulletin at 7.30 p.m.

Dial Readings..............................

408 Metres

KATOWICE (Poland)

Approximate distance from London, 835 miles.
Frequency: 734 kilocycles.
Power: 16 kilowatts.
Transmits at intervals from 11 a.m. Acts mainly as a relay of the Warsaw programmes.

Dial Readings..............................

413 Metres

DUBLIN (Ireland)

Approximate distance from London, 288 miles.
Frequency: 725 kilocycles.
Power: 1.2 kilowatts.
New high-power transmitting testing.

Dial Readings..............................

416 Metres

RABAT (Morocco)

Approximate distance from London, 1,080 miles.
Frequency: 721.1 kilocycles.
Power: 6 kilowatts.
Interval call: "Ici Radio-Maroc!" Metronome. Closes down with "La Marseillaise."

Dial Readings..............................

424.3 Metres

MOSCOW-STALIN (Russia)

Approximate distance from London, 1,550 miles.
Frequency: 707 kilocycles.
Power: 100 kilowatts.
Announcements in Russian.

Dial Readings..............................

430.4 Metres

BELGRADE (Yugoslavia)

Approximate distance from London, 1,055 miles.
Frequency: 697 kilocycles.
Power: 2.5 kilowatts.
Call: "Ovde Radio Beograd."

Dial Readings..............................

436 Metres

STOCKHOLM (Sweden)

Approximate distance from London, 890 miles.
Frequency: 689 kilocycles.
Power: 55 kilowatts.
Relayed by Boden, Horby, Motala, and others.
Interval call: "Stockholm-Motala."
Transmits at intervals from 6.20 a.m. Main evening programme starts at 7.30 p.m.

Dial Readings..............................

419.5 Metres

BERLIN (Germany)

(Witzleben)
Approximate distance from London, 570 miles.
Frequency: 715 kilocycles.
Power: 1.5 kilowatts.
Transmits at intervals from 5.15 a.m.
Interval-call: "Achtung! Hier Berlin." Metronome.

Dial Readings..............................

424.3 Metres

MADRID (Spain)

Approximate distance from London, 700 miles.
Frequency: 707 kilocycles.
Power: 2 kilowatts.
Transmits at intervals from 8 a.m. News at 8.15 p.m.

Dial Readings..............................

441 Metres

ROME (Italy)

Approximate distance from London, 890 miles.
Frequency: 680 kilocycles.
Power: 50 kilowatts.
Relayed by Naples on 310 metres and by 2RO, the short-wave Rome station, on 25.4 metres. News bulletin at 7 p.m.

Dial Readings..............................

453.2 Metres

SAN SEBASTIAN (Spain)

(EAJ8)
Approximate distance from London, 570 miles.
Frequency: 662 kilocycles.
Power: 0.6 kilowatts.
Main programme starts at 7 p.m. Interval call: "San Sebastian Union Radio EAJ8."

Dial Readings..............................

453.2 Metres

DANZIG (Free City)

Approximate distance from London, 880 miles.
Frequency: 662 kilocycles.
Power: 0.5 kilowatts.
Relayed by Heilsberg on 276.5 metres.

Dial Readings..............................

453.2 Metres

KLAGENFURT (Austria)

Approximate distance from London, 760 miles.
Frequency: 662 kilocycles.
Power: 0.5 kilowatts.
Relays the Vienna programme broadcast on 517 metres.
Transmits at intervals from 8.20 a.m.

Dial Readings..............................

453.2 Metres

PORSGRUND (Norway)

Approximate distance from London, 720 miles.
Frequency: 662 kilocycles.
Power: 0.7 kilowatts.
Relays the Oslo programme broadcast on 1,083 metres.
Transmits at intervals from 10.10 a.m.

Dial Readings..............................

459 Metres

SCHWEIZERISCHER LANDESSENDER (BEROMUENSTER) (Switzerland)

Approximate distance from London, 470 miles.
Frequency: 653 kilocycles.
Power: 60 kilowatts.
Relays Basle, Berne and Zurich.

Dial Readings..............................

465.8 Metres

LYONS PTT (France)

Approximate distance from London, 400 miles
Frequency: 644 kilocycles.
Power: 1.5 kilowatts.
Interval call: "Ici Radio Lyon PTT." Announcements only in French. Transmits at intervals from 8 a.m. Main evening programme starts at 8 p.m. Frequently relays Paris PTT.

Dial Readings..............................

473 Metres

LANGENBERG (Germany)

Frequency: 635 kilocycles.
Power: 60 kilowatts.
Interval Signal: Chimes. Call: Hier Westdeutscher Rundfunk.
Transmits at intervals from 5.45 a.m. Mid-day concert at 12 noon. Time signal and news at 5.45 p.m. Main evening programme starts at 7.30 p.m.

Dial Readings..............................

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488.6 Metres

PRAGUE (Czechoslovakia)

Approximate distance from London, 640 miles.
Frequency : 6.4 kilocycles.
Power : 120 kilowatts.
Call : Allo Praha.
Transmits at intervals from 5.15 a.m. Time signal at 8 p.m. Occasionally takes programmes from Bratislava and Moravska-Ostrava.

Dial Readings .....

500.8 Metres

FLORENCE (Italy)

Approximate distance from London, 760 miles.
Frequency : 599 kilocycles.
Power : 20 kilowatts.
Relays the Turin, Milan, Trieste and Genoa programmes.

Dial Readings .....

509 Metres

BRUSSELS (Belgium)

(No. 1)
Approximate distance from London, 200 miles
Frequency : 590 kilocycles.
Power : 15 kilowatts.
Call : Ici Bruxelles I.N.R.
Transmits at intervals from 12 noon. Main evening programme starts at 8 p.m. Announcements are made only in French.

Dial Readings .....

517 Metres

VIENNA (Austria)

Approximate distance from London, 767 miles.
Frequency : 581 kilocycles.
Power : 15 kilowatts.
Relayed by Graz, Innsbruck, Klagenfurt, Linz, and Salzburg. Metronome interval signal. Interval call : "Radio Wien."

Dial Readings .....

533 Metres

MUNICH (Germany)

Approximate distance from London, 570 miles.
Frequency : 563 kilocycles.
Power : 50 kilowatts.
Relayed by Augsburg, Kaiserslautern, and Nurnberg. Transmits at intervals from 5.45 a.m Occasionally relays Stuttgart.

Dial Readings .....

538.6 Metres

PALERMO (Italy)

Approximate distance from London, 1,000 miles.
Frequency : 556.9 kilocycles.
Power : 3 kilowatts.
Announcements in Italian by a woman announcer. Transmits at intervals from 11.45 a.m. Main programme starts 7.45 p.m.

Dial Readings .....

542 Metres

SUNDSVALL (Sweden)

Approximate distance from London, 886 miles.
Frequency : 554 kilocycles.
Power : 10 kilowatts.
Takes the Stockholm programme on 436 metres, relayed by Boden, Motala, Horby, and others.

Dial Readings .....

550 Metres

BUDAPEST (Hungary)

Approximate distance from London, 900 miles
Frequency : 545 kilocycles.
Power : 18.5 kilowatts.
Programme also relayed on 210 and 840 metres rom 6.30 p.m. to close down of main programme Special feature of "Answers to Correspondents," at 5 p.m. News bulletin at 9 p.m. Musical box interval signal.

Dial Readings .....

560 Metres

AUGSBERG (Germany)

Approximate distance from London, 570 miles.
Frequency : 536 kilocycles.
Power : 0.25 kilowatt.
Transmits at intervals from 5.45 a.m. Relays the Munich programme.

Dial Readings .....

563 Metres

WILNO (Poland)

Approximate distance from London, 1,070 miles.
Frequency : 533 kilocycles.
Power : 16 kilowatts.
Frequently relays Warsaw, but also independent transmissions are given in Lithuanian.

Dial Readings .....

566 Metres

HANOVER (Germany)

Approximate distance from London, 450 miles.
Frequency : 530 kilocycles.
Power : 0.25 kilowatt.
Relays Hamburg, which see.

Dial Readings .....

574.7 Metres

LJUBLJANA (Yugoslavia)

Approximate distance from London, 760 miles.
Frequency : 522 kilocycles.
Power : 2.5 kilowatts.
Gramophone record of cuckoo as interval signal. Exchanges programmes with Belgrade and Zagreb.

Dial Readings .....

680 Metres

LAUSANNE (Switzerland)

Approximate distance from London, 462 miles.
Frequency : 442 kilocycles.
Power : 0.6 kilowatt.
Announcements in French.
Relayed by Sottens (403 metres).

Dial Readings .....

760 Metres

GENEVA (Switzerland)

Approximate distance from London, 468 miles.
Frequency : 395 kilocycles.
Power : 1.5 kilowatts.
Call : "Allo ! Ici Radio Genève." Announcements in French.
Relayed by Sottens on 403 metres.

Dial Readings .....

937.5 Metres

KHARKOV (Russia)

Approximate distance from London, 1,600 miles.
Frequency : 320 kilocycles.
Power : 20 kilowatts.
Announcements in Russian and Ukrainian. Interval call : "Allo ! Radio Kharkov !"

Dial Readings .....

1,000 Metres

LENINGRAD (Russia)

Approximate distance from London, 1,300 miles.
Frequency : 300 kilocycles.
Power : 100 kilowatts.

Dial Readings .....

1,034 Metres

KIEV (Russia)

Approximate distance from London, 1,500 miles.
Frequency : 290-kilocycles.
Power : 20 kilowatts.
Announcements in Russian.

Dial Readings .....

1,083 Metres

OSLO (Norway)

Approximate distance from London, 730 miles.
Frequency : 277 kilocycles.
Power : 60 kilowatts.
Relayed by Fredriksstad, Notodden, Porsgrund, Kjukanr, etc. Transmits at intervals from 10.10 a.m. Weather and news at 8.40 p.m. Dance music starts at 9.50 p.m.

Dial Readings .....

1,153 Metres

KALUNDBORG (Denmark)

Approximate distance from London, 540 miles.
Frequency : 260 kilocycles.
Power : 7.5 kilowatts.
Relays the Copenhagen programme. Transmits at intervals from 6.30 a.m.

Dial Readings .....

1,200 Metres

ISTANBUL (Turkey)

Approximate distance from London is 1,550 miles.
Frequency : 250 kilocycles.
Power : 5 kilowatts.
Call : Telsig Telefinou Istanbul.
Announcements in Turkish and French. Interval signal, gong.

Dial Readings .....

1,200 Metres

REYKJAVIK (Iceland)

Frequency : 250 kilocycles.
Power : 21 kilowatts.
Transmits at intervals from 10 a.m. Weather bulletin, 7.30 p.m. Main evening concert at 7.30 p.m.

Dial Readings .....

1,304 Metres

MOSCOW (Russia)

(Trades Union)
Approximate distance from London, 1,550 miles.
Frequency : 230.1 kilocycles.
Power : 100 kilowatts.
Transmits at intervals from 9 a.m. Occasional talks in every leading European language. Closes down at approximately 10 p.m.

Dial Readings .....

1,348 Metres

MOTALA (Sweden)

Approximate distance from London, 885 miles
Frequency : 222.5 kilocycles.
Power : 30 kilowatts.
Relays the Stockholm programme broadcast on 438 metres. Transmits at intervals from 6.20 a.m. Weather and news at 8.45 p.m.

Dial Readings .....

1,411 Metres

WARSAW (Poland)

Approximate distance from London, 900 miles
Frequency : 212.5 kilocycles.
Power : 120 kilowatts.
Opening signal, letter "W" in Morse (. - -). Musical box interval signal. Frequently gives bugle call from tower of St. Mary's, Cracow.

Dial Readings .....

1,445.7 Metres

PARIS (France)

(Eiffel Tower—FLE)
Approximate distance from London, 214 miles.
Frequency : 207.5 kilocycles.
Power : 13 kilowatts.
Time signals broadcast on 2,650 metres, at 9.26 a.m. and 10.26 p.m. Main programme starts at 12.30 p.m. Evening programme at 8 p.m.

Dial Readings .....

1,481 Metres

MOSCOW (Russia)

(Old Komintern)
Approximate distance from London, 1,550 miles.
Frequency : 22.60 kilocycles.
Power : 100 kilowatts.
Announcements in Russian with occasional English programmes.

Dial Readings .....

1,635 Metres

BERLIN (Germany)

(Konigs Wusterhausen)
Approximate distance from London, 580 miles.
Frequency : 183.5 kilocycles.
Power : 60 kilowatts.
Transmits at intervals from 5.15 a.m.

Dial Readings .....

1,725 Metres

PARIS (France)

(Radio-Paris—CFR)
Approximate distance from London, 214 miles.
Frequency : 174 kilocycles.
Power : 75 kilowatts.
Transmits at intervals from 7.45 a.m. Children's programme at 3 p.m., except on Sundays.

Dial Readings .....

1,796 Metres

LAHTI (Finland)

Approximate distance from London, 1,130 miles.
Frequency : 167 kilocycles.
Power : 54 kilowatts.
Interval call : "Huomio ! Lahti-Helsinki!" Announcements in Finnish and Swedish.

Dial Readings .....

1,875 Metres

HUIZEN (Holland)

Approximate distance from London, 235 miles.
Frequency : 160 kilocycles.
Power : 8.5 kilowatts.
Gives the programme of the Catholic Radio Society, K.R.O., etc. Transmits at intervals from 7.30 a.m.

Dial Readings .....

1,935 Metres

KAUNAS (Lithuania)

Approximate distance from London, 1,000 miles.
Frequency : 155 kilocycles.
Power : 7 kilowatts.
Announcements in Lithuanian. Interval call : "Allo ! Allo ! Lictuvos Radio Kaunas !"

Dial Readings .....