

B.B.C. CRYSTAL SET AND ONE-VALVER

HOW TO MAKE RECORDS OF BROADCASTING

Every
Thursday 3^d

Amateur Wireless

and
Radiovision

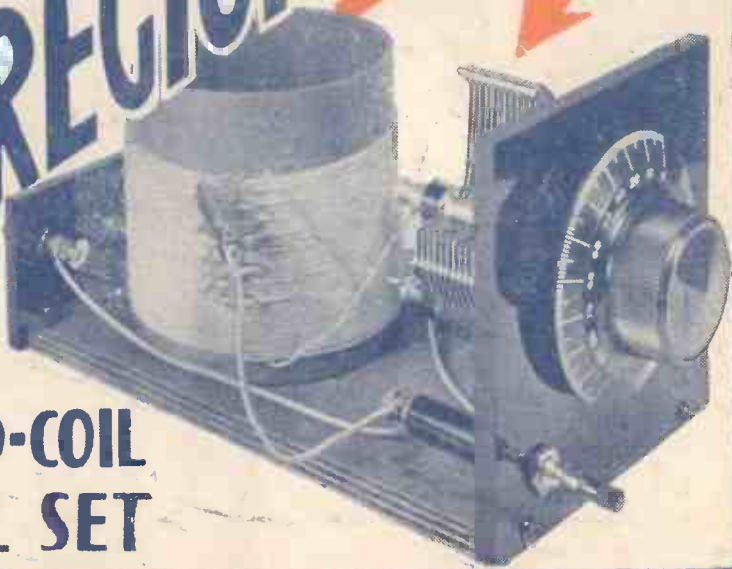
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Saturday, March 28, 1931



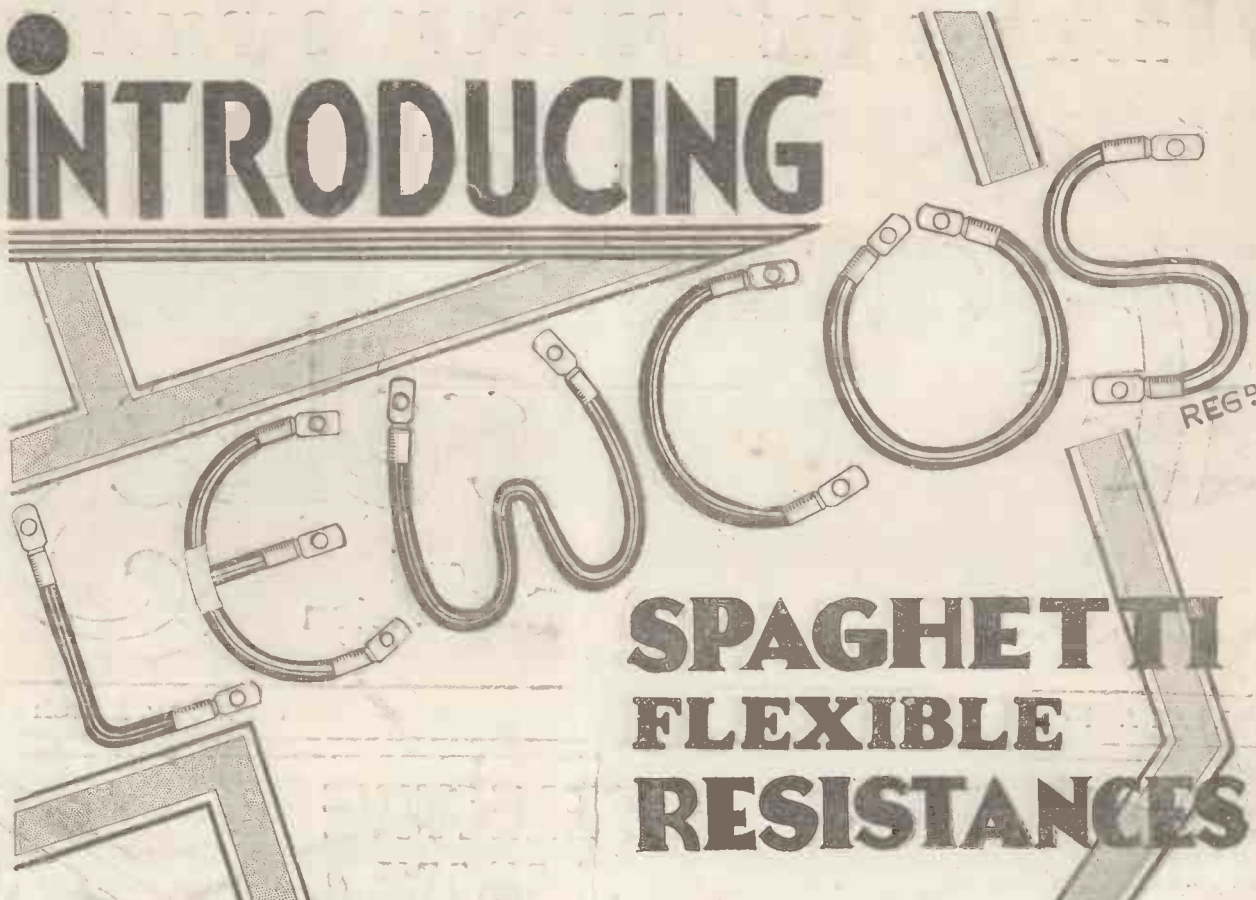
**A SELECTIVE
ONE-VALVER**

TWO BBC. REGIONAL SETS



**A
TAPPED-COIL
CRYSTAL SET**

INTRODUCING



SPAGHETTI FLEXIBLE RESISTANCES

Like all other "LEWCOS" products the Spaghetti Resistances maintain a high standard of quality—the result of over fifty years' experience in Wire Manufacture.

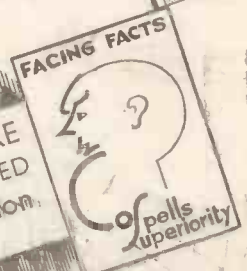
The terminals of this new product are constructed to prevent loose connections, and the black sleeving is made of a special material which eliminates the possibility of cracking.

The values of the nineteen different resistances, which are suitable for use in all circuits, are printed below.

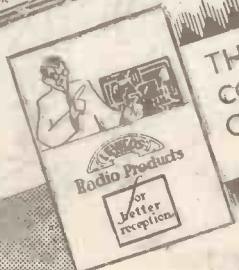
"If it's 'LEWCOS' it must be good!"

Resistance Ohms.	Capacity M/amps.	Resistance Ohms.	Capacity M/amps.
300	50	10,000	2 1/2
600	50	15,000	2 1/2
750	50	20,000	2 1/2
1,000	50	25,000	2 1/2
2,000	15	30,000	3
3,000	15	40,000	3
4,000	15	50,000	3
5,000	15	60,000	3
7,500	15	75,000	3
		100,000	3

(The value of the resistance is shown on the sleeve.)



THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED
Church Road, Leyton, London, E.10



Advertisers Appreciate Mention of "A.W." with Your Order

WHAT THE MIKE TELLS TO TELSEN-TELSEN TELLS TO YOU



Telsen Four-Pin Valve Holders
Price 1/- each.

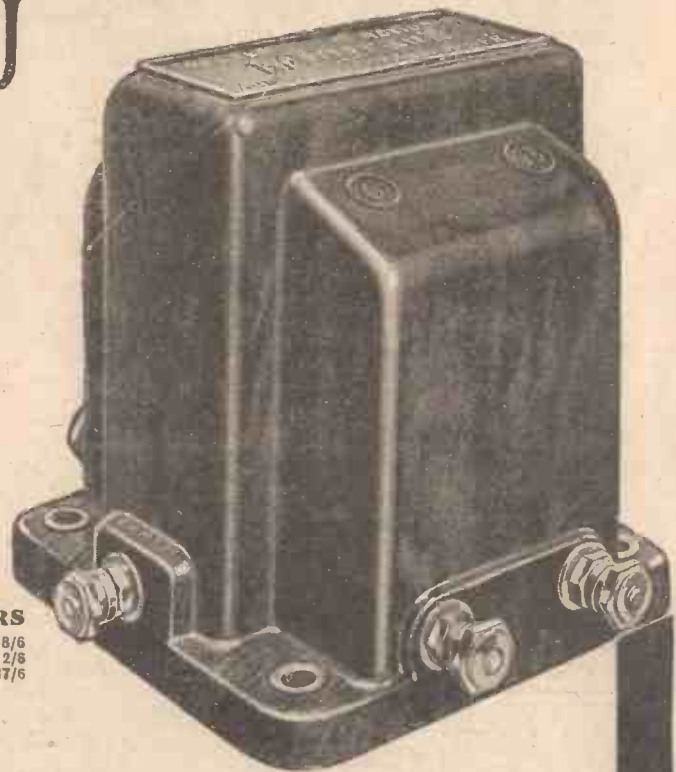


Telsen Five-Pin Valve Holders. Price 1/3 each.

Telsen Valve Holders.
Pro. Pat. No. 20286/30. An entirely new design in Valve Holders, embodying patent metal spring contacts, which are designed to provide the most efficient contact with the valve legs, whether split or non-split. Low capacity, self locating, supplied with patent soldering tags and hexagon terminal nuts.

TELSEN L.F. TRANSFORMERS

"ACE" - Ratios 3-1 & 5-1 8/6
"RADIOGRAND" - 3-1 & 5-1 12/8
"RADIOGRAND" - Super Ratio, 7-1 17/6



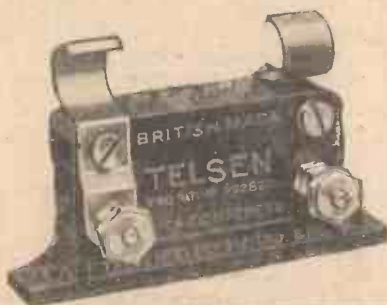
Telsen H.F. Chokes. Designed to cover the whole waveband range from 18 to 4,000 metres, extremely low self capacity, shrouded in genuine bakelite. Inductance, 150,000 microhenries; resistance, 400 ohms. Price 2/6 each.



Telsen Grid Leaks. Absolutely silent and non-microphonic, practically unbreakable, cannot be burnt out, and are unaffected by atmospheric changes. Not being wire wound, there are no capacity effects. Made in capacities: 1/4, 1/2, 1, 2, 3, 4, and 5 megohms. Price 1/- each.



Telsen Fixed (Mica) Condensers. Shrouded in genuine bakelite, made in capacities up to .002 mfd. Pro. Pat. No. 20287/30. .0003 supplied complete with patent grid-leak clips, to facilitate series or parallel connection. Can be mounted upright or flat. Tested on 500 volts. Price 1/- each.



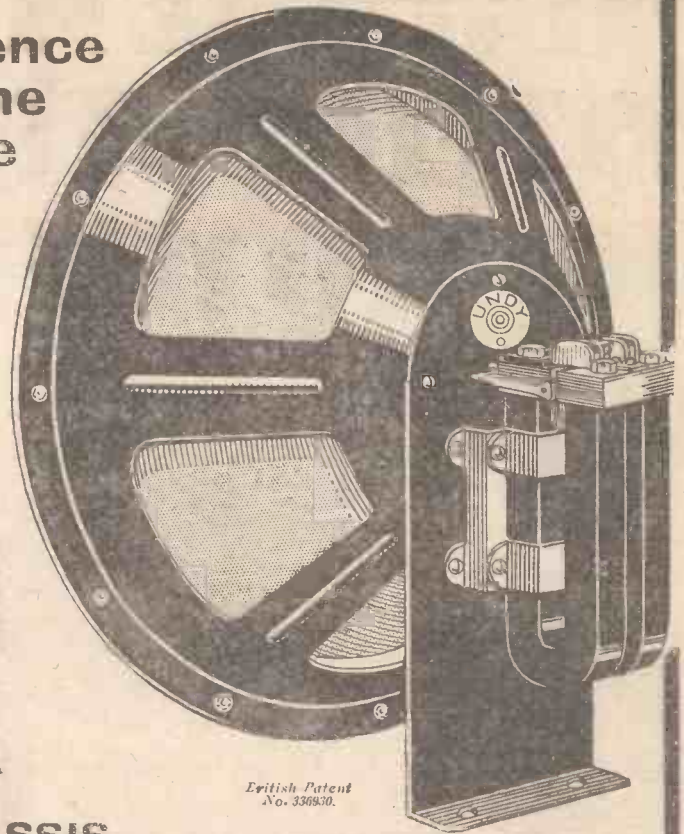
TELSEN Components pass on to you the full perfection of the original—no need to test them—you can rely on the guarantee which is in the name TELSEN . . . As you construct your set you know of at least six points of possible weakness which are safeguarded by TELSEN . . . As you switch on the receiver for the first thrilling test of the completed instrument there is no need to strain forward and 'listen'—you lean back and 'hear' . . . Fit TELSEN Components and safeguard the Key positions of your new set . . .

TELSEN COMPONENTS

**The greater excellence
in volume and tone
which an 8 pole
unit alone can give**

The "Undy" 8 pole Dynamic Unit and Chassis is so marvellously sensitive that it gives the maximum result from every receiver large or small. At the same time the "Undy" works on a minimum of power, rendering unnecessary expensive high power final stage valves. Hear the "Undy" and KNOW that none other can give such perfect result.

50/-
UNDY
8 POLE Dynamic UNIT AND CHASSIS



English Patent No. 336930.

EXTRACT FROM
"DAILY EXPRESS"
REPORT
MARCH
10TH.

The "Super 60," as Mr. James calls this new set, employs six valves—oscillator, first detector (anode-bend), two stages of screened-grid intermediate amplification, second detector (leaky grid) and power valve. "If the set is revolutionary in design, it is no less so in selectivity and power. At four miles from Brookman's Park the London stations have a spread of only one degree on the tuning dial. "All the components for this set can be purchased from any wireless dealer for £12 inclusive of cabinet, frame aerial, and valves. "Under actual test during two evenings the 'Super 60' brought in fifty-six stations on the medium wave and nine on the long-wave band, and even this wonderful record does not exhaust its possibilities. "It seems almost incredible that a super-het of such uncanny selectivity and sensitivity can be constructed for so small a sum, but the specification of parts shows that it can be done without difficulty. "Mr. James is to be congratulated on an extremely noteworthy achievement."

GET
YOUR COPY
OF THE APRIL
ISSUE NOW

The **DAILY EXPRESS**
praises the W. James'
"SUPER 60"

The difficulties of separating stations have now been overcome by a new set of revolutionary design—the "Super 60," by W. James.

Read what the "Daily Express" says about this amazing new receiver. Then read the April issue of WIRELESS MAGAZINE, now on sale, which contains further extensive details of the "Super 60"—the set that has set a new fashion in radio.

OTHER FEATURES OF THE APRIL ISSUE INCLUDE:—

16-pp. LOUD-SPEAKER SUPPLEMENT— Loud-speaker Choosing, Using and Building.

ARE YOU A LISTENER OR A KNOB TWISTER—by Whitaker Wilson.

POWER NOISES THAT SPOIL RECEPTION —by Alan Hunter.

LATEST L.F. CIRCUITS—by W. James.
RADIO MEDLEY—by BM/Press.

WIRELESS MAGAZINE

APRIL ISSUE NOW ON SALE. PRICE 1/-. OF ALL BOOKSTALLS AND NEWSAGENTS

H & B

GUARANTEED KITS

KIT FOR THE B.B.C. ONE

	s.	d.
1 Ebonite panel, 9 by 6 in.	3	0
1 .0005 variable condenser (J.B., Cyldon)	11	6
1 Filament switch (Junit)	1	3
1 Valve holder (Telsen)	1	0
1 Two-way coil holder	3	6
1 Fixed condenser, .0003 (Telsen)	1	0
2 Fixed condensers, .0001 (Telsen)	2	0
1 Grid-leak holder	6	6
Wire and Sistoflex	6	
4 Terminals, fitted to blocks (Belling Lee)	2	3
1 Baseboard	6	

Cash Price £1 7 0

"COMPANION"

FIVE-VALVE PORTABLE

1—.0005-mfd. variable condenser with drum drive (Cyldon and J.B.)	11	6
1—.0001-mfd. variable reaction condenser (Polar)	3	0
Wave-change and filament switch combined (Benjamin)	1	9
5—Four-pin valve holders (Telsen)	5	0
2—H. & B. Specified high-frequency Coupling units	15	0
3—1-mfd. fixed condensers (Dubilier)	7	6
1—Low-frequency transformer (Telsen "Ace")	8	6
2—Grid-leak holders (Lissen)	1	0
1—2-megohm grid leak (Telsen)	1	0
1—100,000-ohm resistance (Lissen)	1	0
3—Fixed condensers, 1 .002-mfd., 1 .005-mfd., and 1 .0005-mfd. (T.C.C., type "M")	4	1
4—Spaghetti resistances, 1 100,000-ohm, 1 20,000-ohm, and 2 2,000-ohm respectively (H. & B.)	5	3
Connecting wire and sleeving (H. & B.)	1	6
6—Wander plugs, marked: G.B.+1, G.B.—1, G.B.—2, H.T.—, H.T.+1, H.T.+2 (Belling-Lee)	1	0
2—Spade terminals, marked: L.T.+1, L.T.— (Belling-Lee)	8	
3—Yards of thin single flex (Lewcoflex)	4	
Safety fuseholder and fuse (Bulgin No. F4)	1	3
4—Ounces No. 28 D.S.C. wire (Lewcos)	1	11
Loud-speaker unit (Ormond)	12	6
10-in. built cone with Tonax adaptor complete	2	0

CASH PRICE £4 5 9

"COMPANION" ACCESSORIES

100-volt H.T. battery (Siemens)	15	0
9-volt grid-bias battery (Siemens)	1	6
2-volt non-spillable accumulator (C.A.V., type 2NS21)	18	0
5—Specified Mullard valves	2	4
Portable Cabinet (Camco "Riverside")	2	5

H & B High-Frequency COUPLING UNITS.



Designed by H & B at request of "AW" and exclusively specified for THE "COMPANION."

H & B SPECIFIED COUPLING UNITS 15/- The Pair

KIT FOR THE B.B.C. CRYSTAL SET

	s.	d.
1 Ebonite panel, 4½ by 4½ in. (Trelleborg)	10	
1 .0005 variable condenser (Formo)	4	6
1 Crystal detector for panel mounting	2	6
2 Terminal blocks (Belling Lee)	1	4
4 Terminals, marked: A, E, Phones (2) (Belling Lee)	1	6
1 .0003-mfd. fixed condenser (Telsen)	1	0
Connecting wire	3	
Crocodile clip (Bulgin)	3	
Coil ready wound	2	6

Cash Price 14 8

Super 60

60

Stations Anywhere

Have you read "Wireless Magazine" this month?

H & B GUARANTEED KIT contains all you require to construct this Marvellous Receiver.

Full Kit. .£6:3:0

Frame Aerial £1:7:6

Oak Cabinet 17:6

Six specified

Valves . .£3:16:0

BUILD IT NOW!

KINGSTON HOME RECORDER

For the 1931 Ether Searcher. Enjoy the pleasure of making your own records. It's simple with the Kingston recorder. Make permanent records of your favourite Broadcast items with Kingston Recorder and the 1931 Ether Searcher.

Broadcast Model

This consists of—(1) A wire gauge. (2) A tracking device. (3) A specially tuned pick-up. (4) Track arm. (5) Recorder sound box. (6) Needles. The fixing of the track arm to the gramophone (any type is suitable) is only a matter of a few moments. To record broadcast items attach the leads from the special cutter pick-up to the loud speaker terminals of radio set, and set gramophone motor in motion.

PRICE £3:16:6 Complete with 3 recording discs.

Acoustic Model

This model is very similar to the Broadcast model, except that the equipment does not include the special cutter pick-up. It has been designed for those possessing a gramophone and records speech only. A small horn is fixed to the special sound box, and it is into this that the message is spoken. The resultant recordings are not only of crystal-like clarity, but are exact reproductions of the voice tone.

PRICE £2:5:0 Complete with 3 recording discs

Full Instructions, clear and simple, are contained in every box.

Delivery from Stock. Trade supplied.

NOTE.—Any parts sold separately.

Carriage paid on all Cash Orders. C.O.D. charges paid on all orders over £1.

H & B RADIO CO.

34, 36, 38 BEAK STREET, REGENT STREET, LONDON, W.1

Telephone: Gerrard 2834

Advertisers Appreciate Mention of "A.W." with Your Order

Designed for more efficient H. F. Amplification

Greater all-round efficiency, increased sensitivity and wider range are readily available to all users of non-screened Grid Receivers in the new Cossor 210 H.L. Incorporating the famous Cossor seven point system of filament suspension this new valve is completely non-microphonic. Owing to the favourable grid current characteristics no grid bias is necessary resulting in an exceptional degree of H.F. Amplification. The use of the Cossor 210 H.L. will ensure a considerable increase in the efficiency of any non-screened Grid Receiver.

A. C. Cossor, Ltd., Highbury Grove, London, N.5

THE NEW
COSSOR
210 H.L.

The new Cossor 210 H.L. 2 volts, 1 amp. Impedance 22,000. Amplification Factor 24, Mutual Conductance, 1.1 m.a./v. Anode voltage 75-150
PRICE 8/6

COSSOR
Valve
NEW PROCESS
ST VALVE
BRITAIN'S FINEST VALVE

7 POINT SUSPENSION

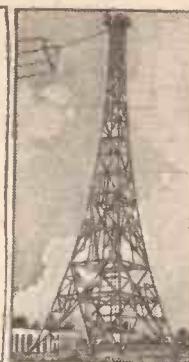
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Amateur Wireless

and
Radiovision



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THE LEADING RADIO WEEKLY FOR THE
CONSTRUCTOR, LISTENER & EXPERIMENTER.

NEWS · & · GOSSIP · OF THE · WEEK

SPRING IS HERE!

WHAT do you intend doing about radio for the summer? Are you going to make up a set for out-of-door work, or are you making any arrangements for a loud-speaker extension from your present set into the garden? Weather experts promise a fine summer; radio is even more interesting this year than last, and the B.B.C. is out to give a greater proportion of light music. What about it?

DON'T BE ANNOYED

DON'T let the new Slaithwaite station upset your reception. AMATEUR WIRELESS is out to help you in wipe-out and selectivity troubles. Constructional details are given in this issue of simple one-valve

RADIO-GRAM CHURCH BELLS!



Here is the amplifier which, by means of a loud-speaker in the belfry, gives church bell "broadcasts" at Totteridge church, Hertfordshire. These artificial bells are such a success that a larger amplifier is to be fitted

and crystal arrangements (B.B.C. officially approved) which will help users of these simplest sets to get interference-free reception.

NORTH REGIONAL TESTING

AT last we have definite times for the public-participation tests of North Regional. The first official test will be given on Monday night, March 23, after Midland and North Regional stations have closed down. The wavelength to which sets must be tuned to receive these test signals is 479 metres. A regular schedule has been drawn up for morning and evening test transmissions as from March 23. Every Monday, Wednesday and Friday North Regional will radiate on normal power and modulation from 11.15 to midnight. Then every day as from March 24, except Sunday, transmissions will be given in the mornings from 11.5 a.m. to 11.45 a.m. We understand that a late series of tests has been arranged for Tuesdays, Thursdays and Saturdays, starting at 12.15 and continuing until 1 a.m.

NEWCASTLE'S FUTURE

LISTENERS to the Newcastle station will be glad to hear that the B.B.C. has definitely decided to retain the Newcastle station. The reason given is that Newcastle is just about 100 miles from Slaithwaite and listeners in the Newcastle district are therefore just outside the service range of North Regional. Many of the other relays will be closed down soon.

BILLY BENNETT'S SURPRISE

DURING the week listeners were surprised to learn that "Alexander and Mose," the B.B.C. vaudeville stars, are in reality Mr. James Carew and Mr. Billy Bennett respectively. Discussing this *denouement* with a B.B.C. official, we learn that Billy Bennett will be heard again with his partner on April 6.

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After only two broadcasts "Alexander and Mose" were stars. Surely a record in entertainment history. The broadcast turn is different every time and is the result of strict rehearsals and attention by Billy Bennett to the special needs of radio entertainment. As the B.B.C. state: "It is an extraordinary commentary on the power of radio that 'Alexander and Mose' are already better known than Billy Bennett, in spite of the fact that as Billy Bennett he has achieved great success at variety theatres."

MAKE A NOTE

WHAT should prove to be an extremely humorous broadcast is a series of talks arranged between Jack and Claude Hulbert. Starting on April 28 and continuing once a week for three weeks through the National stations, Jack and Claude will discuss their holiday, which was spent collecting fossils!

STILL MORE LICENCES

LATEST licence figures issued by the B.B.C. show that the increase for February, 1931, is just double that for February, 1930. The number of licences actually taken out during February of this year was 35,000. We are surely safe in saying that no other undertaking in this

∴ NEXT WEEK :—A FINE SUPER-SELECTIVE THREE-VALVER ∴

NEWS & GOSSIP OF THE WEEK —Continued

country can boast of such a steady and remarkable progress in times of general depression. No doubt the reduction in the price of receiving equipment has something to do with the spreading of the listening habit. "During the past winter the movement has been towards a 10 per cent. reduction in the prices of reputable sets," recently stated Mr. D. Grant-Strachan, honorary secretary of the Radio Manufacturers' Association.

SEMMEERING TESTS BEGIN

THE international wavelength tests among high-power stations, as arranged at the recent Semmering Conference, are now in process. One night recently the London Regional and National stations both continued to broadcast until midnight. It was the turn of these stations to have their field strength measured at the fifteen European points referred to in previous notes. The whole tests are to be done in two periods of sixteen days and will end in the first week of April. There is every likelihood that recommendations will then be made that certain stations should change wavelengths in order to reduce interference.

OPERA BY TELEVISION

HEARING by radio has not made America opera-minded. Seeing by radio, simultaneously with sound reproduction, will bring opera into far greater favour." Such is the view of William Gustafson, leading basso of the Metropolitan Opera Company of New York. "We'll eventually evolve a new technique for opera itself when television arrives," he states. "We'll have to speed up the acting. There will be more life in the production." There seems to be a lot more optimism about the future of television in America than in this country, judging by the

numerous statements that come to hand on the lines of the above.

NEW YORK'S "RADIO CITY"

THE architect's plans for the proposed "Radio City" to be erected on Fifth Avenue in New York have now been revealed to a group of journalists. The actual construction is to begin in June and the first buildings will be ready for occupation by the autumn of 1932. In this, the most ambitious private development ever conceived in America, the main building is to be that of the National Broadcasting Company, containing sixty-eight stories and 2,000,000 feet of floor space. There will be thirty studios for broadcasting and television, designed in the belief that television will be a practicable means of entertainment by the time Radio City is completed.

NEW TIMING OF SUNDAY PROGRAMMES

AN alternative to the Bach Cantata will be introduced into the Sunday afternoon programmes as from Easter Day. This alternative will be given from the London and Midland Regional transmitters which have hitherto been silent until 3.30 p.m. The effect will be that as from April 5 the Regional transmitters will start at 3 p.m., that is, half an hour earlier than at present, providing an appropriate contrast to the programme broadcast from the National transmitters. A good idea, we think.

RECORDS FOR SPONSORED PROGRAMMES

AMERICAN listeners in certain districts are finding that several advertisers are giving fewer original broadcasts during sponsored programme hours, and are specialising in gramophone records.

Although there is a preponderance to "canned" music, even when the programmes are not sponsored, this development is not altogether regarded in an unfavourable light, for the quality of the transmissions is very good and the very best records are chosen. A large motor-car company has just placed with one of the record-producing studios a contract for its broadcasting requirements for ten weeks, the cost being £200,000. The

B.B.C. should be able to put over some splendid gramophone record programmes if paid £20,000 a week for its trouble!

A NEW SLOT MACHINE

PENNY-IN-THE-SLOT wireless is yet to be heard in this country, but Londoners were probably surprised to see that last week a shilling-in-the-slot machine for selling gramophone records and needles

TESTING H.T.!

Some amateurs short-circuit their high-tension batteries with a piece of flex, and if there is a big flash then they judge that there must be a fair amount of "juice" still left in the battery. Actually this is one of the quickest



ways of running down a battery, and two or three of these so-called tests will ruin the average high-tension battery. If you want to test the voltage, then use a high-resistance voltmeter.

was installed outside a West End theatre. The records automatically sold by the machine are the new flexible variety, and as each machine holds two hundred records, radio-gram enthusiasts have plenty from which to choose!

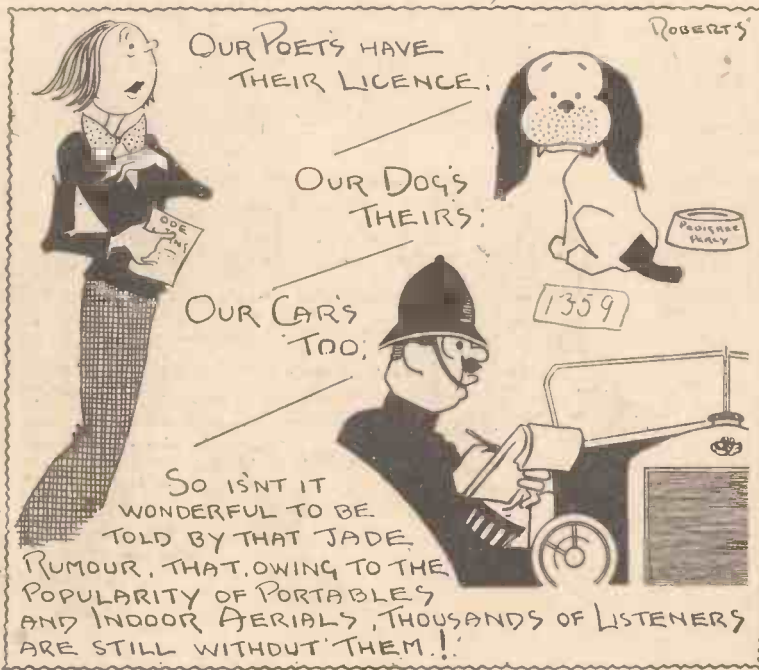
A BRISTOL RADIO SHOW

PLANS are in hand for a radio show to be held in Bristol. It is hoped that this show will coincide with the Bristol Radio Week. This is the first Radio Exhibition of its kind to be held in the west of England and readers should make a note of trying to get to the Colston Hall to see the Exhibition, which will run from September 21 to 30, inclusive.

WARE SHOCKS

QUITE a nasty shock can be given by the large-capacity condensers used for smoothing the output from a high-tension eliminator. Also they are quite capable of holding their charge for some hours after the set has been switched off, unless there is a conducting path through which they can discharge. Accordingly, if it is intended to investigate the interior of the set, it is advisable to switch off the high-tension before the low-tension. Any residual voltage left on the smoothing-condensers is then discharged as plate current through the valve, because the latter acts as a conductor so long as the filament is lit.

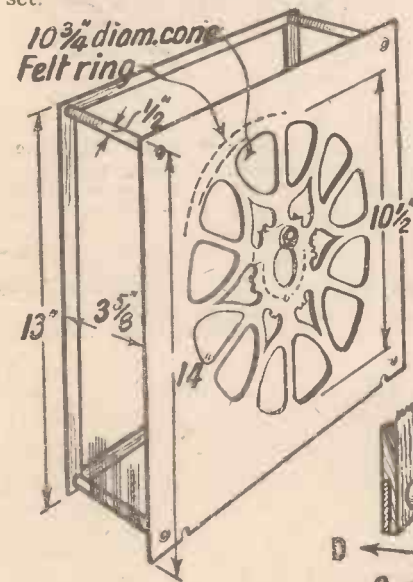
A POET'S LICENCE!





WINDING THE FRAME AERIAL : MAKING THE SPEAKER VALVES TO USE : OPERATION

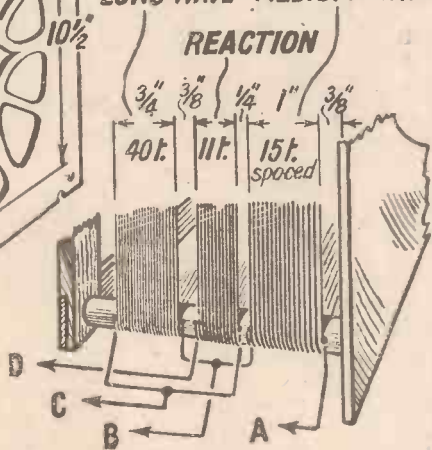
ONE of the great features about "A.W.'s" new portable for 1931, the "Companion," is that it is easy to build. First details of this new set were given in last week's issue, and constructors will be interested in the following additional notes dealing with the frame aerial box, loud-speaker, and general assembly of the set.



blueprint. It should be noted, incidentally, that a full-size blueprint of the receiver unit on which details of the cabinet and speaker are also given, can be obtained, price 1s. 6d., from the Blueprint Department of AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4.

The frame aerial is wound on a frame, the front portion of which is made up by the

Aerial wound with No 28 d.s.c. wire. All windings in same direction.
LONG-WAVE MEDIUM-WAVE



Constructional and winding details of the frame aerial

A small reproduction has already been given of the layout and wiring diagram for the receiver unit, which is made up, as can be seen from the photographs, in a three-stage manner, the panel, valve support, and the vertical riser, all being of wood.

This unit fits into the front part of the cabinet, leaving space for batteries at the back. The frame aerial is made up on a skeleton frame which fits inside the lid of the cabinet and the loudspeaker is in the centre of this in the conventional manner.

The Frame Aerial

Details of the construction of the speaker and frame aerial unit can be clearly seen from the accompanying reproduction of the

medium-wave winding, centre for reaction on both wavelength bands and the third winding for long-wave working. All windings are in the same direction and are of No. 28 d.s.c. wire.

Frame Windings

It is advisable to make accurate measurements for the positions of these windings. On one of the round spacers, pre-

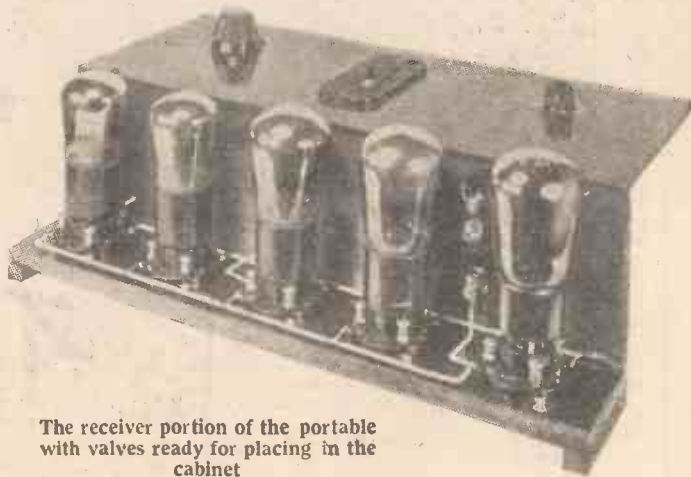
ferably that at the bottom left-hand corner, mark off six points, one being 3/8 in. from the start, the next 1 in. along, the next approximately 1/2 in. away, the next 3/8 in. away, and the last 3/4 in. away. Start winding from the first point and put on fifteen turns of the 28 d.s.c. wire.

It is important that these turns should be spaced slightly, each wire being placed a little away from the next by about the same thickness. In this way the fifteen turns should occupy the 1 in. space and should finish at the second point where a small hole should be drilled so that the end of the wire can be secured. Make a loop of the wire so that the tapping point B (see blueprint) can be soldered here and then carry on to the last but one point where another hole should be drilled for the start of the long-wave winding.

Long-wave Winding

The long-wave section has forty turns, wound in the same direction as the short-wave winding, and this takes up the approximately 3/4 in. space provided. The wire is then twisted through a small hole drilled at the finish. Loop the wire again so that the tapping point C may be soldered and then carry the wire back to the vacant point near the start (that is, 1/4 in. away from the medium-wave winding), and start the reaction winding here.

Wind in the same direction and put on



The receiver portion of the portable with valves ready for placing in the cabinet

eleven turns, finishing at the last marked-off point where the wire should be twisted through a small hole in the spacer and carried off to the tapping point, D.

The loud-speaker is quite easy to assemble. The unit, Ormond, Blue Spot, Triotron, Hegra, and Sheffield Magnet being suitable, is fixed to the back of the fret so that the adjusting knob is conveniently accessible from the front of the set when the lid is open. The cone can, of course, be purchased ready made, or can be made out of a sheet of paper to make a 10 in. diameter cone, as supplied by Six-Sixty or Kone Dope.

Making the Cone

If the cone is made up at home, then remember to make a neat job of glueing the edges, and of attaching the open edge to the resilient felt or cardboard ring, which, of course, abuts against the back of the loud-speaker fret. Incidentally, care should be taken to mount the unit very firmly to the fret, for any vibration will affect the working of the speaker. The cone is simply inverted over the end of the speaker driving rod and then the chuck is tightened on the rod, so that the cone is held quite firmly, but without undue pressure against the wooden front. The method of assembly is obvious from the illustrations.

Constructors may not have finished all the necessary work on the receiver unit and

a few hints on the wiring and mounting may be helpful. On the blueprint the valve holders are shown dotted because they are, of course, mounted on the reverse side so that the valves project upwards when the receiver unit is in its box. Beneath the valve platform are the coupling condensers, which are held simply by the rigid wire making connection to them, no other support being needed.

On the vertical riser between the valve platform and the panel are the bigger parts, such as the low-frequency transformer, bypass condenser and one of the H.F. coupling condensers. The other H.F. coupling unit is on the underside of the panel, together with a 1-microfarad fixed condenser which is similarly mounted. On the blueprint the heavy wires indicate rigid connections, while the open wires represent flexible connections or spaghetti resistances. Where any wire is shown dotted this implies that it is on the reverse side of the mounting board shown.

Take care over the connections to the wavechange switch, which also does duty for turning the set on and off. The low-tension positive and negative wires are soldered to this switch and, when spade tags have been attached to their ends, may be twisted for neatness. Take the greatest care over the whole job of wiring up the set, because one wrong connection will entirely spoil the results.

When the frame aerial unit and receiver are complete, the whole assembly may then be placed in the cabinet and the connections from the frame aerial and loud-speaker should be completed.

Suitable Valves

So far as valves are concerned, the first and second valves should be chosen from the following: Marconi or Osram H2, Mullard PM1HF, Cossor 210HF, or Mazda HL210. The detector should be a valve such as Mazda H210, Cossor 210RC, Mullard PM1A, Marconi or Osram H210 or Eta BY2023.

The first low-frequency valve should be of medium impedance, such as the Marconi or Osram L210, Cossor 210L, Mullard PM1LF, or Mazda L210.

The power valve should not be of the "super" type, for too big a drain will be taken from the high-tension battery, and it is recommended that one of the following valves be used: Mullard PM2A, Cossor 215P, Marconi or Osram LP2, or Mazda P220.

Operating

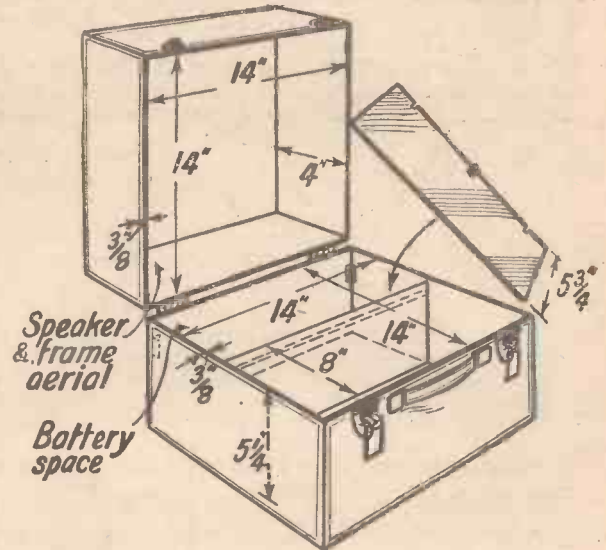
For a first test place the valves in their holders, connect up to a 100-volt H.T. battery (Fuller special portable size, Pertrix, Ever Ready or Drydex) and to a 9-volt grid-bias battery. $1\frac{1}{2}$ or 3 volts should be put on the first grid tapping and $4\frac{1}{2}$ to 6 volts on the second tapping. The high-tension positive 1 tapping should be

placed somewhere between 60 and 80 volts, and the full 100 volts should be applied to the H.T.+2 tapping. Make sure that the small fuse bulb is well screwed home in its holder.

Tuning

Tune slowly at first, keeping reaction near the oscillation point during the initial tests and keep the frame aerial approximately in line with the station which it is desired to receive. The directional properties of the aerial will be found very handy in cutting out interference.

Don't forget that the "Companion"



Readers desirous of making the cabinet will find all the essential details given in this drawing

Portable can be seen in the Radio Department windows of Messrs. Selfridge & Co., Ltd., of Oxford Street, London, W.1.

THE NEW MAGNETISM

THE magnetisation of a body is considered to be due to electrons in rotation about each atom or nucleus. The latest theory is that each electron not only rotates bodily about an orbit, but also simultaneously spins about its own axis, in much the same way as the earth moves around the sun. This point of view is interesting because it gives the electron a permanent magnetic character in addition to being the fundamental unit of negative electricity. It also goes to show that magnetism is a definite part of the make-up of every atom, therefore of all matter.

M. B.

Station CFCE, in Montreal, owned and operated by the Canadian Marconi Company, has been added to the seventy-three stations associated with the National Broadcasting Company in America.

During the year of 1930 the Columbia Broadcasting System in America received 1,027,046 letters from listeners. The previous year, 416,069 were received.

Carrier pigeons are still used for communication purposes by the U.S. army to supplement wire and wireless systems. The navy, however, has virtually abandoned them.

COMPONENTS FOR THE "COMPANION PORTABLE"

- Portable cabinet (Camco "Riverside").
- .0005-mfd. condenser, with drum drive (Cyldon, J.B., Formo, Lotus, Polar, Lissen, Utility, Burton).
- .0001-mfd. variable reaction condenser (Readi-Rad, Bulgin, Peto-Scott, Formo, Polar, Lotus, Burton, Lissen).
- Wave-change and filament switch combined (Benjamin).
- Five 4-pin valve holders (W.B. "Rigid," Telsen, Lotus, Clix, Benjamin, Lissen, Junit, Trix).
- Two high-frequency coupling units (H. & B., Peto-Scott).
- Three 1-mfd. fixed condensers (Lissen, T.C.C., Formo, Dubilier).
- Low-frequency transformer (Telsen "Ace," Lissen, Burton, Varley, Ferranti, Voltron, Lotus, R.I.).
- Two grid-leak holders (Lissen, Bulgin).
- 2-megohm grid leak (Lissen, Telsen, Readi-Rad, Graham-Farish, Dubilier, Watmel).
- 100,000-ohm resistance (Lissen, Graham-Farish, Telsen).
- Three fixed condensers, one .002 mfd., one .005 mfd., and one .0005 mfd. (T.C.C. type "M," Graham-Farish, Lissen, Telsen, Ormond).
- Four spaghetti resistances, 100,000-ohm, 20,000-ohm, and two 2,000-ohm respectively (Graham-Farish, Bulgin, Lewcos, Sovereign).
- Connecting wire (Glazite).
- Six wander plugs, marked: G.B.+ , G.B.—1, G.B.—2, H.T.—, H.T.+1, H.T.+2 (Bellings-Lee, Clix, Eelex, Burton).
- Two spade terminals, marked: L.T.+ , L.T.— (Bellings-Lee, Clix, Eelex, Burton).
- Three yards of thin single flex (Lewcoflex, Peto-Scott).
- Safety fuseholder and fuse (Bulgin, No. F.4 : Readi-Rad).
- 4 oz. No. 28 d.s.c. wire (Lewcos).
- Loud-speaker unit (Ormond, Blue Spot, Triotron, Hegra, Sheffield Magnet).
- Cone paper to make a 10 in. diameter cone (Six-Sixty, Kone-Dope).
- One loud-speaker chuck (Tonax, Weedon).
- 100-volt high-tension battery (Fuller special portable size, Pertrix, Ever Ready, Drydex).
- 9-volt grid-bias battery (Fuller, Pertrix, Drydex, Ever Ready).
- 2-volt non-spillable accumulator (C.A.V. type 2NS21, Exide, Fuller).



"EFFECTS"

In this article "Savoy Hiller" describes how the "Effects" for radio plays are produced

HAVE you ever been in the Effects Studio at Savoy Hill? If you haven't, then it's well worth a visit, although the privilege of an uninterrupted survey, such as I had, is a difficult one to obtain.

However, I was lucky, so here is an account of my experiences.

The studio is in the basement. I don't think this is an intentional location, at any rate from the point of view of noise, because, next to the studio is another—used for speech in plays, chiefly, and almost opposite is the echo room.

However, there are many either intentional or unintentional advantages about this situation; one of them being that there is a fine floor. When I say stone, the floor is in reality a very fine example of mosaic inlay, a legacy from the time when the building was a block of super flats. You can imagine how the effects men revel in this floor. Think of the excellent "crashes" they can obtain by dropping things upon it, and so on.

The Properties

When I entered the double doors leading from the passage, the first thing that struck me was the general appearance of the room.

It was the exact antithesis of what I expected, and really looked more like the store room of a West End theatre than anything else.

The ceiling was hung with all manner of flotsam. Old swords, cymbals, odd pieces of iron, a great sheet of metal—used, as I found afterwards, as a thunder effect—chains, drums, rattles, springs, and a hundred and one different things, all of which were—my guide assured me—carefully chosen for the job.

One of my earliest surprises—and my visit was destined to become one long series of them—was the disclosure of the fact that very few noises were reproduced by using what would appear to the average man to be the obvious method.

The sound of waves breaking upon the sea shore, for example, is not made with the aid of the water tank which I saw in the middle of the room. This effect is obtained by rolling ordinary lead shot in a one-sided bass-drum.

Again, an old sword which I saw is used

apparently to give the sound made by the rattling of equipment when a regiment presents arms, and not as I surmised to reproduce a rapier duel. This latter is made by clashing together two old door hinges, which were accidentally found to possess just the right "timbre."

You can imagine that the O.C. effects often comes up against it when he is called upon to reproduce a sound hitherto unexplored.

The first time a telephone bell was required, he did his bit at rehearsal, and was promptly "told off" by the producer, who said that from his position at the loud-speaker on the Dramatic Control panel, the noise sounded like a fire engine!

The poor effects man explained that he had actually rung a *real* telephone bell, borrowed from the exchange. It was some hours before the right effect was produced, and then it was found that an ordinary clockwork bicycle bell did the trick.

The Use of Gramophone Records

One of the biggest problems the effects people ever came up against was that of the reproduction of the ordinary common or garden sea-gull.

After numerous experiments, all of them failures, it was decided that one of the big gramophone companies should be called in and an actual record made of this bird's peculiar call. I must explain here that quite a few effects are made with the use of gramophone records worked through electric "pick-ups."

Well, in due course a complete recording apparatus, several expert engineers, and various officials were conveyed to the lake in St. James's Park. The apparatus having been set up, the officials armed with a goodly assortment of fish, proceeded to try to lure the birds to the microphone.

In this they were entirely successful, but they had reckoned without the ducks.

These latter, locating a free feed, also turned up in force, with the result that when the record was "developed," the sea-gulls were drowned by a loud and persistent quacking which entirely ruined the whole effect.

Several other attempts were made, but each time the ducks joined in, and when on

the last occasion they brought along about half a dozen pelicans as well, the engineers thought it was just about time to turn it down.

So the effects section had to try again, and just as they were giving up hope, one of them remembered that as a small boy he had often picked a piece of strong grass and by placing it between the balls of his thumbs and blowing upon it, produced a peculiar wailing sound, very nearly approximating to the cry of the sea-gull.

Experiments were conducted along these lines and now the most perfect reproduction is obtained with the aid of two small pieces of firewood, and three elastic bands.

Records are, however, used successfully on a large scale. On one occasion the B.B.C. engineers spent a whole day at Oxford Circus tube station making records of lifts and trains for a production which, when transmitted, only lasted about half an hour.

Two Novel Devices

But of course a record once made is a definite asset and may come in useful upon many hundreds of occasions afterwards. The B.B.C. have something like four thousand records of effects, collected from all parts of the world, and now there are very few noises which cannot be produced at a moment's notice.

A great many effects are worked by electricity, notably the "aeroplane."

This noise is produced by a small electric motor (controlled by a rheostat) upon the business end of which is a wheel consisting of spokes only. To each of these spokes is attached a strip of soft leather about 3 in. by 1 in.

When the motor is set in motion the wheel revolves and the strips of leather beat against the vellum of a large bass drum, thus causing the deep-throated roar of a powerful aero engine.

Just one more interesting fact about effects at Savoy Hill.

For a very long time the B.B.C. effects people had tremendous difficulty in reproducing the sound of a pistol shot. They tried revolvers, automatics, pop-guns, rifles, and, in fact, every known instrument of percussion which they could think of, and yet not one of them was in any degree realistic.

At last, after months of experiment the solution to the problem was obtained. When you hear a shot fired in the course of a radio play, to-day, it is made by slapping an ordinary piece of cane on a leather-covered cushion, and I'm sure you will agree with me that the result isn't so bad.

THE HOW AND WHY OF RADIO

XXIX—WHY SIGNALS SOMETIMES FADE

If you are a beginner in wireless, now is your chance to gain a clear conception of its theory and practice. In this series of articles, specially prepared for the beginner, no previous knowledge of wireless is assumed. It is intended to deal with every aspect of the subject and the whole series will endow the beginner with sufficient knowledge to enable him to derive the greatest possible interest from the fascinating hobby of wireless

EVERY listener who has picked up a foreign station must have experienced the phenomenon of fading. What happens is this: the distant station is tuned in and the set adjusted to give satisfactory volume; then after a minute or so the volume noticeably diminishes, in spite of the fact that neither the transmitting power nor the receiver's sensitivity has been altered. Something must have varied; that something is known as the Heaviside layer; it consists of a layer of ionised atmosphere, between 40 and 60 miles above the surface of the earth.

Two Waves

Before we can understand why this mysterious canopy affects the strength of foreign stations, we must see how wireless waves are transmitted. In passing, may I say that at the present time this article has a more than academic interest, for the opening of North Regional will shortly serve to show that transmitting power is not the only factor in range of reception.

Whatever the power or wavelength of the station, its waves are radiated in all directions: more important still, at all angles with respect to the horizontal. Although it is the station designer's aim to broadcast as much of the total energy along the ground, thus following the curvature of the earth, a considerable amount of energy is unavoidably radiated upwards.

Firstly, let us follow the ground ray. If the station is transmitting between 200 and 600 metres (medium band), this is the only ray that ever gets to the distant set during daytime. On its way from the transmitting aerial to the receiving aerial the signal gradually loses energy, through the absorption effect of the earth, and of hills, buildings, and other conductors or semi-conductors. For a given power the shorter the wavelength the more marked is this loss of energy, or attenuation, as it is called. That is why London Regional on 356 metres has a greater service range than London National on 261 metres.

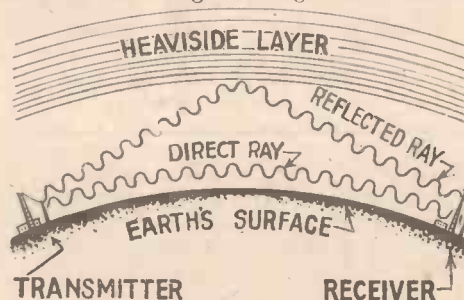
Strength and Distance

Any station on the medium band, no matter how great its power, loses way, so to speak, as the receiving point is extended. The strength varies inversely as the distance. If we double the distance we halve the strength. During the daytime we hear very little of the foreign stations, for the direct ray is practically all absorbed in the intervening distance.

That long-wave stations, such as Hil-

versum and Radio Paris, can be received during the day is proof of the superiority of long waves over the medium waves in the matter of attenuation. The long waves are not so easily absorbed as the shorter waves. The direct ray arrives from the distant transmitter with something like its original glory.

When the B.B.C. estimates the service area of a station, such as Brookmans Park or Moorside Edge, it does so on the assumption that the direct ray is to be received. Only by the direct ray, at least on the medium waves, can non-fading day and night reception be obtained. Those who have picked up a medium-wave distant station during the daytime will have noticed that, although the strength is below par, there is no fading. At night the distant



TRANSMITTER RECEIVER
How wireless waves travel: note how one ray travels upwards and is reflected from the Heaviside layer

station, on the same adjustment of the set, will be many times louder, but its strength will vary from time to time. Clearly, there is some connection between the increase of strength gained by the distant station at night and its noticeable variation in strength. The same medium is responsible for the night-time increase in strength as for the variation in strength that then occurs. That medium is the Heaviside layer.

I have already said that, in spite of the designer's aim to keep the radiations as much as possible to the ground (direct ray), some of the energy is sent upwards at all angles. During the day this energy simply dissipates itself in space. It goes up but contrary to the proverb does not come down again. At night this upward ray pursues its journey upwards some 40 to 50 miles only, for it then comes up against the Heaviside layer. During the day this ionised strata of the atmosphere is diffused by the sun's rays, but at night it acts just like a dull mirror to wireless waves, reflecting them back to earth. The picture shows how this

happens. Note that, in addition to the direct ray, following the earth's surface, there are reflected waves arriving at the receiving point.

The speed of waves being constant, it follows that the direct ray will reach the set before the reflected ray. Moreover, it must be noted that sometimes more than one reflected ray arrives at the receiving point, for the Heaviside layer is varying all the time both in height and opaqueness to wireless waves. It is easy to see how at one moment the reflected ray or rays may be adding to the direct ray, providing an exceptionally strong signal, while a few moments later the reflected ray may be subtracting from the direct ray, thus causing a variation in the strength of the received signal.

Fading Distance

It follows that there is a critical distance at which fading is most pronounced. This condition occurs when the reflected and direct rays are about the same strength. We have already seen that the direct ray is more quickly absorbed at the short wavelengths than at the long. So the critical fading distance also depends upon the station's wavelength and thus varies for each station received.

Readers may have heard it said of a station that it is not far enough away to give non-fading reception. This seems a little paradoxical until one appreciates the fact that, as the distances increase, the direct ray becomes negligible and only the reflected ray is received. It might be asked why the reflected ray does not become attenuated like the direct ray; the answer is that since this ray is travelling in space it does not become absorbed by the earth-bound objects that absorb the direct ray.

The North Regional

Some distant stations do not suffer appreciably from fading. Examples are Rome and Stockholm as received in London. The reason these stations do not fade is that the direct ray is almost entirely absorbed over the long intervening distance and probably only one reflected ray is being received. In this way something like constancy in reception is achieved, over several hundred miles more than the guaranteed service area.

An important bearing of the reflected ray on the service range of a station is not often realised. The new North Regional will serve as an admirable example. During the daytime I have heard this station at

(Continued at foot of next page)

THE LARGEST LONG-WAVER ?

An account of the new 160-kilowatt station at Warsaw, which works on 1,411 metres and is probably, therefore, the highest-powered long-wave station

NO matter what one may think of the giant stations, they have come to stay. Brussels Number One has just gone up to 20 kilowatts, many new European high-power stations are planned, and Warsaw, as an example, has just budded out with 160 kilowatts.

The aerial is of the half-wave type ending in a feeder house beneath the aerial. Lines from the transmitting hall to the feeder house convey the power to the aerial, which is supported on two masts 600 ft. high and 750 ft. apart. With the exception of the Eiffel

equipment amounts to 700 kilowatts. The modulation has a straight-line characteristic throughout a frequency of from 30 to 10,000 cycles, and this is the reason for the good quality.

A valve drive (not a crystal control) is provided in order to ensure that the station will remain



This is the main building of the new huge Warsaw transmitter. The panels of the transmitter itself are in the main hall to the left of the building behind the tall windows, and the machine room is in the right wing. In the foreground are two of the enormous stay adjusters for the 600 ft. high aerial masts

While it is, to a certain extent, regrettable that British stations have not this huge power, it is some consolation that the Warsaw station has been built by British engineers in the Marconi works at Chelmsford.

The power of the new Warsaw station can be understood from the fact that with its 160 kilowatts (C.C.I.R. rating) it is about five times as powerful as 5XX and four times as powerful as Motala. Reports already received show that it gives good crystal reception all over Poland and many listeners in this country describe it as perfect in volume, quality and freedom from fading.

Tower these are the highest masts in use at any of the European stations. The station works on 1,411 metres, which was the wavelength of the old Warsaw station.

The Transmitter

The various parts of the transmitter are contained in aluminium and glass panels completely screened from one another. In the main or last stage magnifier eight 100-kilowatt valves deliver the modulated energy to the aerial which, at 80 per cent. modulation, will amount to 160 kilowatts. Normally, six of these powerful valves are used. The total power required to operate the whole of the

accurately on its wavelength and to prevent it from interfering with other stations on neighbouring wavelengths.

The three-phase power for the valves is rectified by a mercury-arc rectifier delivering rectified current at from 8,000 to 16,000 volts. These huge figures make interesting comparison with the humble 100 or 200 volts used on ordinary receivers.

Special land-line gear has been provided to link the studio, which is situated in Warsaw, with the transmitter. Land-line apparatus for simultaneously operating the high-power station at Warsaw and the other broadcasting stations at Lvov and Wilno is also being fitted up.

“ WHY SIGNALS SOMETIMES FADE ”

(Continued from preceding page)

good strength for the direct ray on the longish wave of 479 metres does not become quickly attenuated. But I expect that at night the signal from North Regional will, at this distance, roughly 200 miles, be a fading signal, due to the subtracting influence of the reflected ray that will then manifest itself.

Reflected rays are a mixed blessing. They enable medium-wave stations to be heard loudly at long distances at night, with or without some fading; but they prevent non-fading reception over the critical area where the direct and reflected rays are about equal. Unfortunately, the reflected ray of a high-power station starts to cause a variation in signal strength long before the direct ray has become so attenuated that the reflected ray is needed to augment signal strength.

This fact definitely limits the service area, that is non-fading area, of a medium-wave station, quite irrespective of power. In fact, an increase in power may well cause an increase in fading at the critical distance referred to. The B.B.C.'s high-power stations are not designed to provide extreme range but rather to provide a good signal

Wavelength	Maximum range without serious fading	Maximum range for negligible fading
200 metres	40-50 miles	15-25 miles
300 "	60-70 "	20-30 "
400 "	80-90 "	30-40 "
500 "	100-120 "	40-60 "

within the so-called service area. The accompanying table co-relating wavelengths and non-fading range has been compiled by the B.B.C., by whose courtesy I include it.

HOTSPOT.

TESTING L.F. TRANSFORMERS

IN case of a burn-out, the primary winding is usually the one at fault. To test for a break under working conditions, first remove the connections to the two ends of the primary, and place a pair of headphones across them. If you hear good signals you know that everything is O.K. so far as the input to the primary is concerned. Now place the telephones in series with the primary by replacing one of the connections just removed, and bridging the telephones across the other connection and the terminal on the transformer to which it belongs. If the primary has been burnt out, signals will either not be heard at all or else will be very much fainter than before. If they come in at the same strength as before, the primary winding is O.K. and one must look elsewhere for the source of trouble.

B. A. R.



IN MY WIRELESS DEN

WEEKLY TIPS—
CONSTRUCTIONAL AND THEORETICAL

By W. JAMES.

Using Reaction

REACTION cannot be made to compensate for poor coils or condensers in a circuit. Some people have the idea that a little reaction completely offsets the losses.

This is all wrong, as any careful experimenter will tell you. A good circuit with reaction is much better than a poor one also with reaction. The selectivity is better for one thing, and that in these days is important.

A Whistling Portable

I have just been testing a portable set of the usual five-valve type. There was a high-pitched whistle from the moment of switching on.

This was found to be due to a high-resistance high-tension battery, a common enough fault, but one which I mention for the benefit of our newer readers.

The whistle disappeared when a valve of lower impedance was placed in the detector stage, the extra damping due to the valve removing it. But after a time it came on again and a new battery had to be fitted.

Choosing a Choke

I wonder how many readers can judge the size of choke needed for the output stage of a valve.

The rule that I remember is this: when the impedance of the choke is equal to the impedance of the valve, the amplification is 70 per cent. of the maximum.

If, therefore, we choose a frequency of 50 cycles and the valve is of, say, 4,000 ohms, the inductance needed is 13 henries. The reactance of a choke is $0.3 \times$ frequency \times inductance, and the impedance is just a little more because of resistance.

If you work this out you will find that 13 henries is correct. For frequencies higher than 50 cycles the impedance is naturally greater and a bigger proportion of the possible magnification is obtained. The inductance must be present when the choke is carrying the feed current.

A larger choke can be used with advantage, but the above rule is satisfactory and then you can choose the next biggest size available. Some chokes have a fairly uniform inductive value over a range of polarising currents, but others are so constructed that the inductance falls off as the current is increased. Therefore you should always be sure of the inductance when the choke is carrying the steady anode current.

For Mains Users

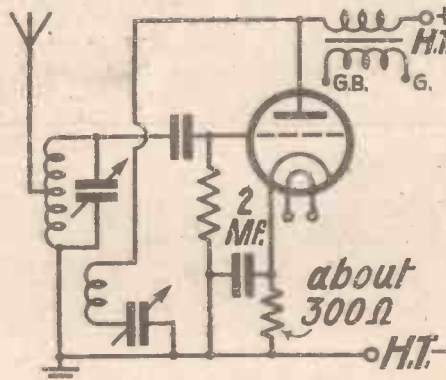
A point worth noting in mains sets is

that better detection is often obtained when the grid leak is taken not direct to the cathode, as is usual, but to a point which is a little negative with respect to the cathode.

The diagram shows how the bias may be cheaply obtained. You connect between the cathode and negative high-tension a resistance of about 300 ohms, and then join the bottom end of the grid leak to the negative.

Reaction may well be improved by this means as well as the detection itself.

Less grid current flows and the results are better for the bias. Mains valves seem to differ considerably in the point at which grid current starts to flow and those experimentally inclined may try various resistances in the cathode circuit.



This is a good idea for the detector stage of mains-driven sets. Negative bias is applied to the grid

Of course, the drop across the resistance depends upon the current passing as well as the value of the resistance. The size of the leak, too, will make a difference to the current. The refinement of this resistance is well worth while in most cases, as you can easily prove for yourself.

THAT SPEAKER!

You should have an output choke or transformer. With a speaker of normal impedance used with a power valve, the transformer ratio may be anything from 1 to 1 to 1 to 5, but with low-impedance speakers ratios so large as 25 to 1 may be used.

If you have more than one speaker, it is a good plan to try working them together. Then if one accentuates the bass notes and the other the high notes, the overall response will sound extremely satisfying.

Some Good Reception

Lately there have been exceptionally good nights for the reception of distant stations. Fading has, in some instances, been pronounced, but otherwise reception has been good.

When the strength comes up above the usual we are able to form an idea of what we should be able to receive normally with a little better set. How much better is difficult to say. It is certain, though, that the addition of a valve to a standard three-valve arrangement makes an amount of difference in sensitivity.

It is necessary to improve the selectivity by a corresponding amount as well, of course, or you will find the increased sensitivity of little value.

A filter circuit can sometimes be added and then, with the extra amplifying valve, the results are improved in every way. The capacity-coupled filter appears to have advantages over other types, and is cheaply and easily constructed. In this type of filter the selectivity is fairly easily adjusted by altering the value of the coupling condenser. A normal value is .01 microfarad. With .015 the tuning is sharper, as the coupling is reduced by the larger capacity.

Push-pull Transformers

Push-pull transformers ought to be so constructed that they are balanced. If you consider the input transformer, for example, you will see the point.

This has a single primary winding and a secondary having a centre tap. When voltages are applied to the primary winding we should have equal voltages across the ends of the two parts of the secondary.

In practice these equal voltages are not always obtained, with the result that the pair of valves in the stage do not provide equal outputs. Distortion is, therefore, produced.

Similarly, the output transformer must be of correct design or here again distortion will be introduced. It depends upon the transformer as to whether the true electrical centre is the centre turn of the coil. There is the possibility that the out-of-balance will vary with frequency. The windings have capacity with each other and the core, so that there may well be effects at the higher audio frequencies which throw out the balance.

All I know is that some transformers that have been carefully tested are not really satisfactory, as the outputs from the two parts are not equal.

For large volume

**WITHOUT HUM
or DISTORTION**

In A.C. mains Sets where the output valve—whether triode or pentode—is directly heated by A.C. mains, hum is difficult to eliminate. A valve using an indirectly heated cathode should therefore be employed. The Mazda AC/PEN is a high power Pentode capable of an enormous output with only 250 volts H.T. Its characteristics ensure excellent bass response and brilliant high notes and a detector can fully load it without an intermediate stage and complete freedom from hum is assured.

**THE
AMAZING**

**MAZDA
RADIO
VALVES**

CHARACTERISTICS

TYPE	Fil. Volts	Fil. Amps.	Max H.T. Volts	Amp. Factor	Anode Resistance (ohms.)	Mutual cond. m A/V	PRICE
AC/SG	4	1.0 approx.	200	1200	—	—	25/-
AC/HL	4	1.0 "	200	35	11700	3.0	15/-
AC/P	4	1.0 "	200	10	2650	3.75	17/6
AC/P 1	4	1.0 "	200	5	2000	2.5	17/6
AC/Pen	4	1.0 "	250	—	—	2.5	27/6



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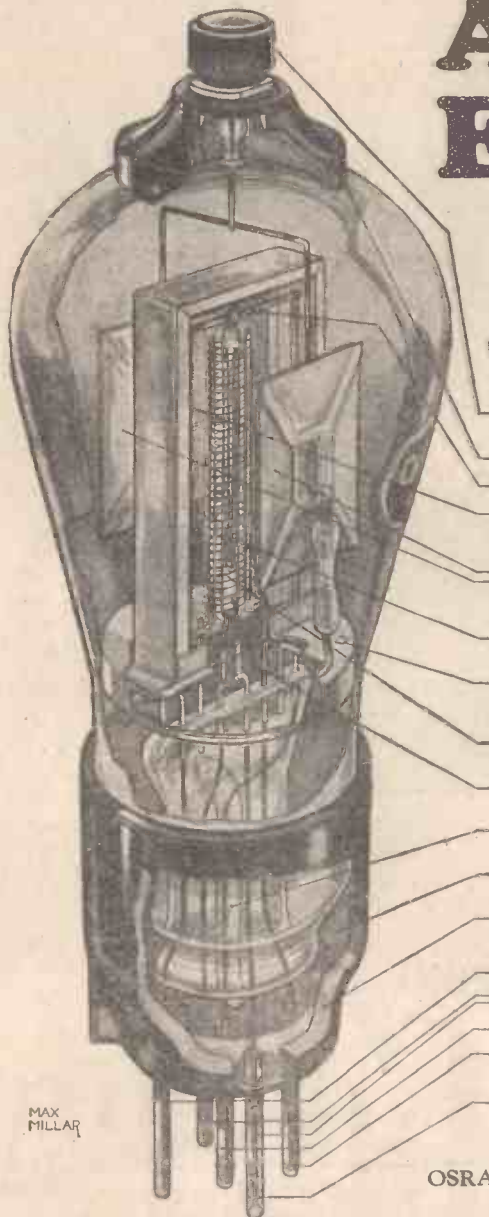
V.103

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- BAKELITE BASE giving maximum insulation and minimum losses.
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- HEATER PINS
- CATHODE PIN
- CONTROL GRID PIN
- SECTION OF PIN showing countersunk end for perfect soldering of wire.

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Oh You Wavelength!

A GROWING PROBLEM

THE outcry against man-made "static" seems to be gathering force from day to day, judging by my correspondence. I can quite understand how sufferers from this particular form of interference finally lose patience and go out for blood. Unfortunately nobody seems to be directly responsible, so that it is difficult to know at whom to shoot. The Postmaster-General and the B.B.C. both do the best they can in particularly bad cases, but neither of them can force matters beyond the point of polite remonstrance. I think myself that the increasing use of high-frequency amplification has helped to make matters worse. The more one amplifies on the high-frequency side, the more one is likely to accentuate any extraneous noise. But as the number of transmitting stations increase, the only way to prevent being crowded out is to improve selectivity. And since this can only be done by using H.F. amplification, the problem looks as if it is going to get worse before it gets better.

WANTED—A REMEDY

SOMETIMES a lot can be done to improve matters by altering the position of the aerial, or by improving the earth connection, but frankly I do not know of a remedy that will give relief in all cases. Of course, there is the so-called local relay service, which claims to give interference-free reception over supply wires—but this does not appeal to everyone, quite apart from the fact that the service is usually restricted to definite programmes at definite times. Personally I prefer to manage my own set and receive, within reason, whatever programme I like.

IN FRANCE AND GERMANY

THE problem is, of course, world-wide, at least so far as town-dwellers are concerned. Listeners abroad, however, seem to be more vigilant in protecting their rights than we are over here. In France, for instance, a Bill has recently been introduced into Parliament to compel all makers of electrical apparatus to fit anti-static devices designed to prevent such apparatus from radiating any disturbance likely to interfere with wireless reception. The manufacturers are to be given a year's grace in which to take the necessary precautionary measures, and after that they will become liable to various pains and penalties. There will, no doubt, be a lot of argument before the measure becomes law, but at all events it is a step in the right direction.

In Germany, on the other hand, listeners in many of the towns are banding themselves together to track down the worst offenders. Once they are found, persuasive methods are employed in the first instance. If these fail a civil action can be taken in the Courts to secure an injunction. Even

failing a legal remedy, there is a certain moral force behind any protest backed by a strong association of radio listeners which the offender must find it difficult to ignore. There is a lot to be said in favour of this idea. In fact, we may see similar "vigilance committees" getting into action over here, unless matters improve pretty soon.

AN ALL-MAINS WEAKNESS

A FRIEND of mine complains that his all-mains set, when used during the morning hours, develops a decided hum, which, strangely enough, practically disappears in the evening—at least it is so subdued as to be barely noticeable, even when the aerial is switched off. He is naturally annoyed and, at the same time, puzzled why this should be so. Probably the explanation lies more in the electric-supply service than in the set itself. It must not be forgotten that the supply from the mains varies a good deal from hour to hour. When the overall load is low, as is the case during the hours of daylight—both morning and afternoon—the terminal voltage is likely to be considerably higher than at night, when all the lamps in the neighbourhood are switched on. A really well-designed set would probably rise superior to such fluctuations—but there are others—and this is one of the things that is likely to find them out.

SUPER-HETS ARE CHEAP

WITH reference to my remarks forecasting the early return of the super-het, I have been asked whether this type of set is expensive to build. Without hesitation I can say that a modern super-het is no more expensive than a three or four-valve set with band-pass tuning.

This may come as a surprise to some readers, but it is easy to overlook the fact that, although super-het tuning is so selective, it is fundamentally simple. If we assume that the first valve of the super-het is the first of the two detectors, the tuning is indeed simple, consisting of a frame aerial with a parallel 0.005-microfarad variable condenser. With this is intimately connected the tuned circuit of the local oscillator valve; just a simple coil and condenser.

One can build a super-het, capable of cutting out locals within a degree or so of the main tuning dial, and all one needs to achieve this amazing selectivity are two tuned circuits, one for the frame aerial and the other for the oscillator.

WHY THE SUPER-HET IS SELECTIVE

COMPARE this simplicity with the gearing of three tuned circuits in a band-pass set, which could hardly approach the selectivity of a super-het. Of course, the reason one gets such good selectivity with the super-het is that the intermediate high-frequency amplifier, between the first and second detectors, is tuned to a fixed frequency. Whatever the frequency of the

incoming signal, it is changed by the combined action of the first detector and oscillator into the frequency at which the intermediate is resonated.

RECENT IMPROVEMENTS

THE new significance of the super-het is in some measure due to a rival system of selectivity, namely band-pass tuning. It is now possible to make the intermediate tune on the band-pass principle, so that instead of "peaking" this amplifier to the intermediate frequency we double peak it as in band-passing. In this way one of the early objections to the super-het—loss of high notes through sharp tuning—has been completely overcome.

I was greatly impressed recently with the behaviour of an experimental super-het using a band-pass intermediate amplifier. I found that, although stations could be completely separated on adjacent frequency channels, they could be held over an appreciable part of the degree on the dial. In no sense was the tuning critical and yet the selectivity was remarkable.

NORTH REGIONAL TESTING

HAVE you heard the Northern "Raucous Reg" testing yet? In London he is coming in at enormous strength. There seems to be no doubt that North Regional will soon be the loudest signal in the British Isles. Nor is this difficult to understand, for the elevated site of the station is ideal for long-distance broadcasting. Moreover, 479 metres is the longest available medium wavelength allocated to the B.B.C. It is a well-known fact that the longer the signal's wavelength, the less is its attenuation and hence the greater is its service range.

WHAT IS TO BE THE POWER?

NO one seems to know, as yet, what will be the final aerial power of the North Regional stations. As the National outlet on 301 metres will suffer greater attenuation than the Regional outlet on 479 metres, I think I am fairly safe in assuming that the same power procedure will be adopted as at Brookmans Park, where the 261-metre wave has a good deal more power than the 356-metre wave. We may expect something like the full 70 kilowatts from the 301-metre Northern station and probably between 40 and 50 kilowatts on 479 metres. I understand both stations can, if necessary, radiate an aerial power of 70 kilowatts, but the 479-metre station is not likely to need all this power to cover its service area of 100 miles.

Another reason for the great strength of North Regional is traceable to the huge masts, three of which tower 500 feet high to support the two aerials. Any one of these reasons would tend to make North Regional a strong signal, but taken altogether they certainly spell something like selectivity troubles.

On Your Wavelength! (continued)

THE QUESTION OF INTERFERENCE

I SHALL be interested to see how Northern Regional listeners, accustomed as they are to the minute power of 2ZY, react to the idea of a really high-power signal. One advantage Northern listeners will have over London listeners in the vexed question of selectivity is the comparatively large difference in wavelength between the Northern National and Regional stations. They are no less than 178 metres apart. This should certainly counteract to some extent the enormous strength of the North Regional stations when listeners attempt to separate them with simple tuning apparatus. Even so, I have a feeling that a ruthless cutting down of aerial wires around Moorside Edge will soon have to begin. Certainly, those with the full 100-foot aerial wires will find simple wave-trap and series-condenser remedies quite unavailing unless the length of the aerial is at least halved.

THOSE GAPS

I STILL cannot understand why we have these astonishing periods during the afternoons when either there is no transmission at all or the only programme going out is something specially for the schools, to which the ordinary person cannot possibly want to listen. Taking the programmes for the current week, as I write I find that on the Monday, the London Regional is silent from 3 to 3.20 p.m., whilst there is nothing from the Midland Regional between 3 and 5.15 p.m. On the Tuesday both Regional stations are out of action between 3 and 4.30 p.m., whilst at the same time the National is giving a French lesson and a talk on careers for secondary schools. On the Wednesday the London Regional is giving the same programme as the National (a symphony concert) between 3.30 and 4.45 p.m., whilst the Midland Regional is not in operation until 5.15 p.m. On the Thursday both the Regional stations are silent from 3 to 4.30 p.m. At 4.30 p.m. London gives the National programme of light music, but the Midland is not working. On the Friday both stations again do not transmit between 3 and 4.30 p.m., and the Midland does not start until 5.15 p.m. At 4.30 p.m. London does the National programme of light music. On the Saturday there is music from both the Regional and Midland stations during the afternoon, and the National is giving a football commentary. Saturday, then, seems to be the only satisfactory day of the week.

REVISION NEEDED

PERSONALLY I cannot conceive why the afternoon programmes should be either non-existent or completely unattractive. A very large part of the business done in selling wireless sets would in the ordinary course of events take place between 2 and 4.30 p.m., and it is pretty hard lines on the demonstrator to have to confess either that there is nothing at all to hear at such times or to be compelled to turn on a lesson to school children. Such things do not exactly induce newcomers to invest in

wireless sets. In the afternoons there is plenty of good music going which could be relayed, and the cost, therefore, would be quite trifling. I maintain that we have a right to insist upon non-stop programmes from our stations between 11 a.m. and 12 midnight. No other broadcasting authorities have anything like the revenue of our own B.B.C. and few provide such short service hours.

A USEFUL TESTER

I WAS talking to a friend the other day who told me that he had just built for himself a neon tester. He was very pleased with the versatility of this instrument, which he found of considerable value in checking up the values of grid leaks and large-capacity condensers. The principle of the thing is well known, but the gadget is so useful that I feel tempted to run over the basic theory.

An ordinary neon lamp is used for indicating, connected up in the following manner. A battery of about 150 volts is connected across a resistance in series with a condenser. The neon lamp is connected across the condenser. If the resistance is fairly high, the condenser will take an appreciable time to charge up. When the condenser does charge, however, it discharges through the neon lamp, after which it builds up again as before. Consequently, there is a continual charge and discharge, the frequency of which is determined by the values of resistance and capacity.

PRACTICAL USE

WITH very large values of either, or both, the charge and discharge is very slow, and the lamp will flicker visibly. As smaller values are used the discharges become more frequent and occur at an audible frequency. If a pair of telephones is inserted in series with the battery, a musical note can be heard.

Two components, nominally of the same value can, therefore, be compared by substitution. If the number of flashes per second or the audible note is the same, then the two components are of the same value. Actually the frequency is proportional to the product of the resistance and capacity, so that if the discharge frequencies are not the same an estimate of the relative values will enable the difference between the components to be judged with sufficient accuracy for practical purposes.

THE UPPER ATMOSPHERE

SO far, no actual measurements of temperatures and pressures have been made at heights above twenty miles from the ground. Aeroplanes have ascended, if I remember the figures rightly, nearly five or six miles from the ground; but sounding balloons are regularly employed to take barometers, thermometers, and other instruments up to heights between fifteen and twenty miles. We have no actual knowledge of conditions in the upper air, which from the wireless man's point of view, are of enormous importance. The existence of the Heaviside layer and its presumed height above the ground are based entirely upon inference. It is found in the laboratory that if the pressure of air is steadily reduced it continues to be a good insulator until a certain point is reached. At this critical point it suddenly becomes a conductor, and remains such until the pressure has been reduced a good deal, when it once more turns into an insulator. But we have no certain knowledge of these things.

AN EXPERIMENT

NOW news comes to hand of an exceedingly interesting experiment which is to be undertaken in Germany. For some time past the Germans have been very much impressed by the possibilities of rockets for all sorts of purposes, and now one has been designed which is to carry measuring instruments to a height of fifty miles or so. If this can be done we should learn a great deal about the upper air, and the information obtained should be of no small value for wireless purposes. I only hope, though, that you and I won't be standing at the spot where the experimental rocket comes to earth.

FUSE PROBLEMS

THERE are certain interesting problems in connection with fuses, and one of them has arisen only in recent days. In the design of modern multi-valve sets the value of de-coupling is keenly realised, and many of them contain a formidable amount of capacity in the condensers used for this purpose. Now, if you incorporate H.T. fuses which blow under loads of 100 milliamperes or so, you will find that they have a disconcerting way of snuffing out whenever the set is switched on. If it has been out of action for a little while, the amount of current which flows into the condensers for an instant before they are charged up may be sufficient to blow up the fuse. For such sets the most suitable fuse is a ¼-ampere flashlamp bulb. This will probably give a bright flash when you switch on, but will last for a long time. Such bulbs give way, as a rule, instantly when the current rises much above their rated carrying capacity. So short is the time that elapses before they blow that no damage is likely to be done. A second point concerns the resistance of fuses. Some have quite a high resistance, and if these are inserted into circuits that are not de-coupled curious effects may take place.

THERMION.

EASTER HOLIDAYS

Owing to the Easter Holidays,
NEXT WEEK'S ISSUE of AMATEUR WIRELESS will be On Sale on WEDNESDAY, APRIL 1



HOME RECORDING *with the* "ETHER SEARCHER"

With any standard set, such as the "1931 Ether Searcher," either battery or mains driven, it is an easy matter to use a home-recording device for making your own records of broadcast items or of events in the home. Here are some helpful hints in getting the best results

THE latest devices for making records are so simple that there is no reason why everyone should not try the easy experiment of making records either of events in the home or, by means of the wireless set, of broadcast items.

There are two methods of home-recording, the direct acoustic and the electrical. With the electrical system an amplifier of some kind is necessary if you want to make records of speech or music in the home and this can quite conveniently be the low-frequency side of your set. The set is, of course, used for making records of broadcast items.

Recording Broadcast

Recording broadcasts is perhaps the most interesting side of record making and is very easy to carry out.

Some very interesting experiments have been made, using the extremely simple Kingston home-recording apparatus in conjunction with two "1931 Ether Searchers," one battery and the other mains driven. The latest acoustic Kingston recorder has also been used and a great deal of information has been gained in the way of getting best results.

In the Kingston system the 6-in. diameter aluminium blanks are cut by means of a cutter (similar to a sound-box in the acoustic system and similar to a pick-up in the electric system) which is tracked by means of a master disc of a larger diameter than the record being cut. A special needle bears in the grooves of the master record and causes the cutting needle to trace a similar spiral path on the disc.

The method of setting up the apparatus is the same both in the acoustic and electrical systems. A wire gauge is provided with the outfit, one end of which is slipped over the turntable spindle and the other indicates the position for the mounting boss of the recorder arm. The arm, carrying at one end an acoustic or electri-

cal cutter, according to the system used, is slipped over this boss and the counter-balance weight on the other end is adjusted as will be described later. The master disc is placed on the turntable with the studs upwards and a blank disc is placed on the tracking disc.

Tracking

The tracking needle is then adjusted so that the cutting needle is just inside the edge of the blank disc. Generally speaking, it is advisable to have as much pressure as possible on the blank and, provided that the gramophone motor has a good torque, the weight should be swung inwards so that it assists the leverage of the pick-up. A few tests should be made to see how much pressure can be applied to the disc without slowing down the motor.

Now everything is ready for making a record. If the acoustic system is being used, then the horn is placed in a vertical position and one speaks, with the lips close to it, quite loudly.

Connections

There are several points to note, though, in using the electrical system in conjunction with a set such as the "Ether Searcher." The battery-model (in common with very many battery-driven sets) has no output filter arrangements, and the best results have been obtained with the battery-driven "Searcher" when a one-to-one transformer or a choke filter is placed across the loud-speaker terminals, and between these and the gramophone. There is an output choke filter in the mains driven "Searcher" and with this set the cutter can be connected directly to the loud-speaker terminals.

There is no need to have too much volume when making a record of broadcast items—in fact too much power may result in bad sound grooves which cause

the needle to jump when playing back. The best items to record are those of orchestras rather than of soloists, but we have made several successful records of propaganda talks in English from various Russian stations—a good test of recording clarity.

Using a Microphone

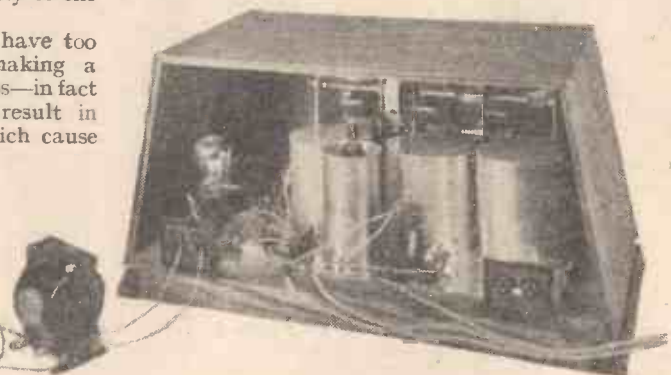
You can fit a microphone to the "Ether Searcher" and make records of home events and the electrical system is, of course, much more flexible than the acoustic system because the microphone satisfactorily records normal conversation or music at a distance of 8 to 10 feet. A microphone, transformer, battery and volume-control are needed and one can buy these parts separately or complete in a device such as the Kingston Microstand.

This is connected directly to the pick-up terminals of the mains-driven "Ether Searcher," or to the battery model in the method recommended for a gramophone pick-up and as shown on page 219 of AMATEUR WIRELESS, No. 452.

Never speak too close to the microphone, and before any important record is made, use a portion of a spare blank in testing for volume.

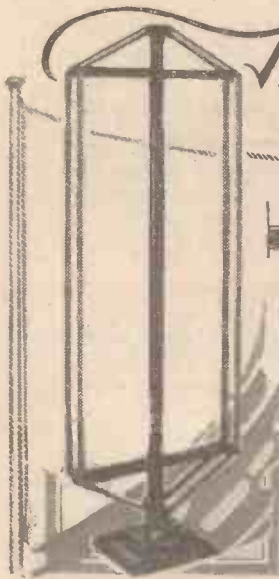
While the reproduction from these easily-made home records is very satisfactory on any acoustic gramophone, the best results are to be had with an electric gramophone where one can keep control on the volume and on the amount of surface noise.

If you have not a separate pick-up for
(Continued at foot of next page)



This is how the "Ether Searcher" is connected up for recording either broadcast items or events in the home: the only additional apparatus required is an output transformer which is connected as shown above. Direct acoustic recording is shown in the heading.

The AERIAL of the FUTURE



From time to time we hear that the outdoor aerial wire, often a very unsightly erection, is doomed. What is to take its place? Our contributor suggests that the frame aerial will play a big part in the future, especially for sets with powerful high-frequency amplifiers

AFTER reducing the length of the aerial from the standard 100 feet allowed by the P.M.G. to the more reasonable length of 50 or 60 feet, what is the logical development? I ask this question because during recent weeks I have been testing sets of a new order of sensitivity; sets so sensitive that the merest fragment of wire attached to the aerial terminal is sufficient to bring in all the big foreign stations at full loud-speaker strength. One set maker actually stipulated 15 feet as the maximum length of wire needed to work the set, an A.C. four with two high-frequency stages, at full volume.

Improving Selectivity

The more powerful our sets become the less shall we have to rely upon a lengthy aerial wire to provide the valves with sufficient voltages to produce loud-speaker results. Everyone who has reduced the length of the aerial must have been surprised at the comparatively small reduction in the volume of sound heard from distant stations. No less impressive is the increase in selectivity imparted to a set by a short aerial. In fact, it is to gain selectivity, or at least freedom from local-station swamping, that first prompts the listener to shorten the aerial.

The Frame Aerial

Now, there is a type of selective aerial that deserves great attention. I mean the frame aerial. This diminutive form of pick-up—it need not be more than 18 inches square—is likely, I believe, to be much more widely used as sets become more powerful. The frame aerial has a peculiar action. When turned edgewise in the direction of a transmitting station the maximum voltage is developed round it. But when turned at right angles to the direction of the station the incoming signals strike both vertical sides of the frame simultaneously and entirely cancel out.

“HOME RECORDING”

(Continued from preceding page)

your “Ether Searcher” then you can use the electric cutter of the Kingston device as a pick-up. Use a fibre needle in place of the recording needle. Connect the cutter leads to the pick-up terminals of the set

It is fairly easy to see that this peculiar action gives the frame aerial a great advantage in selective tuning, so long as the two stations it is desired to separate are situated in appreciably different directions with respect to the frame. In passing, it is profitable to note that the selective action of the frame does not apply when it is in line with one station, say, to the north and another to the south, or one station, say, to the west and another to the east. But the frame has very definite selective properties in the reception of a station, say, to the south and another to the east or west.

A Powerful Set Necessary

Because the action of the frame depends on the residual voltage developed by the incoming signal up and down the two sides of the frame winding, only a minute amount of energy is actually picked up. So a fairly powerful set is needed to justify the use of a frame aerial. As I have already said, sets are rapidly becoming more powerful. The other day I had a set on test that would have been hopelessly overloaded with anything more than the frame aerial supplied with it. This set was a six-valve super-het, comprising a first detector, tuned by the frame aerial and parallel variable condenser, local oscillator valve, two intermediate high-frequency amplifiers, second detector and finally a transformer-coupled power valve.

What a Super-Het will Do

With the small frame aerial I logged no less than 65 stations and a good proportion of them loaded the power valve to capacity. The inherent selectivity of the super-het set, plus its great sensitivity, enabled me to separate London Regional from Muhlacker and Graz with ease.

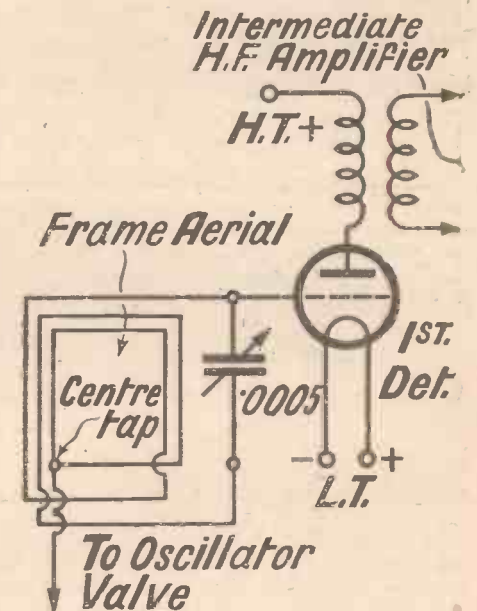
An interesting point I noted during this reception was that a good number of stations came in on one particular setting of the frame aerial. The frame was pointed in a south-easterly direction. On looking at a map of Europe it is easy to see,

(or make the connection already referred to for the battery model of the “Ether Searcher”) and slide the tracking bar to the extreme left of the slot, which raises the tracking needle to its neutral position.

Also the counterbalance weight should be swung back so that there is far less weight on the needle for playback than for cutting.

that many of the powerful French, German, and Italian stations are in line. So, although the frame aerial is at times very useful on account of its directional properties, one cannot rely on being able to separate two given stations by this means. The set itself must be inherently selective.

Those who have had much experience with frame aeriels would agree that they are a vast improvement on open aeriels. Perhaps when the super-het comes in again, as forecast by “Thermion” in his



This diagram shows how a centre-tapped frame aerial is connected to the first detector of a super-het type of set. Such a set gives a great range of reception with only a frame aerial. There is no need for an open aerial, either of the indoor or outdoor type

notes last week, we shall see a great revival of the frame aerial. In the meantime I commend its several advantages to listeners using big sets and troubled by interference.

A. S. H.

Never, on any account, use steel needles for playing back and, when recording, turn the red coloured recording needle in its holder until the best position is found which gives well-defined grooves and silent running. Make sure, also, that both the recording and tracking needles are tightly clamped in their holders.

A Weekly Programme Criticism—By SYDNEY MOSELEY.

Without Fear or Favour



ALEXANDER AND MOSE

SUNDAY PROGRAMMES

THE NEWS BULLETINS

A RETIREMENT

YOU have read the compliments I have paid Alexander and Mose in these columns. In case the news does not leak out, I may say that "Mose" is Billy Bennett and "Alexander," James Carew. Billy was rather nonplussed when I penetrated his secret, so was Jimmy Carew; but both appreciated the nice things we had said about them in AMATEUR WIRELESS.

I asked my readers not to be too impatient about Sunday programmes. Well, as a start, we are to have an alternative to Bach, commencing from Easter Sunday. In a letter written to me the B.B.C. announces this interesting fact. I am hopeful of further concessions on behalf of my readers.

The transmission of the Prince of Wales' speech from South America was technically a tremendous achievement, and is altogether one more feather in the cap of Ashbridge and his splendid band of engineers. The B.B.C. can be enterprising when it likes.

I criticise Jack Payne a lot in these columns, but we are the best of friends. By the by, I like "Choo-choo," but not "The One-man Band," among his latest numbers; and do you notice he has stopped playing "Go Home and Tell Your Mother" since I pulled his leg about it?

Hold your breath! I am becoming a high-brow. The Symphony Concerts have been so wonderfully good that on two occasions recently I gave up opera in order to listen to them.

The other night I went to Number 10 Studio and heard Oscar Fried conduct the "Symphony Pathétique." Well, that little performance was worth the whole year's licence fee.

They should have broadcast the chief engineer's speech to members of the Radio Manufacturers' Association which I attended the other day at Savoy Hill. We certainly must get him to the microphone. In my view, he would be a great asset to the B.B.C. list of speakers.

I have to pay a compliment to the Commodore Grand Orchestra for the inclusion of the pianoforte solos in its programme.

Also for running on the items without the usual intermissions. You may remember that I have had occasion to criticise this orchestra, but there is an evident improvement since, and I am as ready to offer a bouquet as I was ready to throw a brick before. I hope the bouquets may continue to be deserved.

My friend Allison, as the football commentator, still tops the bill; but may I suggest to him to vary his tone a little? It would be rather more restful to his listeners.

Recently I tried the experiment of seeing *La Boheme* one night and listening to it the next, and I fear that the wireless transmission came off a very bad second. For instance, in that beautiful sextet in the second act, what was really a clever vocal interplay became a meaningless jumble over the ether.

The heading of this column includes television. Therefore, I beg to report that

the first film broadcast from London through Brookmans Park was a surprising success. Did any of you happen to see it?

If any of you have ambitions to learn a little about music, listen in to the Children's Concerts when they are given. The one relayed from Birmingham was extremely interesting, and in my view was even better than the drier talks of Dr. Dyson and—yes, Sir Walford Davies.

I must again say, however, that Dr. Wauchop Stewart will have the announcers after her one of these days if she pronounces "finale" and other words according to her own ideas.

I know that items in the news bulletin cannot please everyone, but I was bored to distraction with the long list of football results, soccer, rugger, amateur and professional. The only club they omitted was Blinkum-on-the-Marsh. And this, if you please, was followed by Fat Stock Prices, which in turn was followed by a talk about the North. A wonderful relaxation for Saturday night.

Switch off, you may say. Well, who is going to get up from the fireside to do so; and not knowing, too, when this dreary rigmarole is over? No wonder I took refuge in Rome.

I think Cecil Lewis does well to confine himself to Conrad's plays, and manages, on the whole, to put over a story coherently. Conrad is sometimes rather discursive and not the easiest author to dramatise. Lewis makes the most of a good story.

Sir Ernest Wild is a good "cadger," and I hope he did well on behalf of the Children's Fresh Air-Fund.

Listening to Harold Nicolson the other night I wondered how much longer we were going to hear him, and, curiously enough, I was informed privately that he was leaving the microphone to take up a political appointment. We have had our differences, Mr. Nicolson and I; but, on the whole, we shall miss him from the microphone.

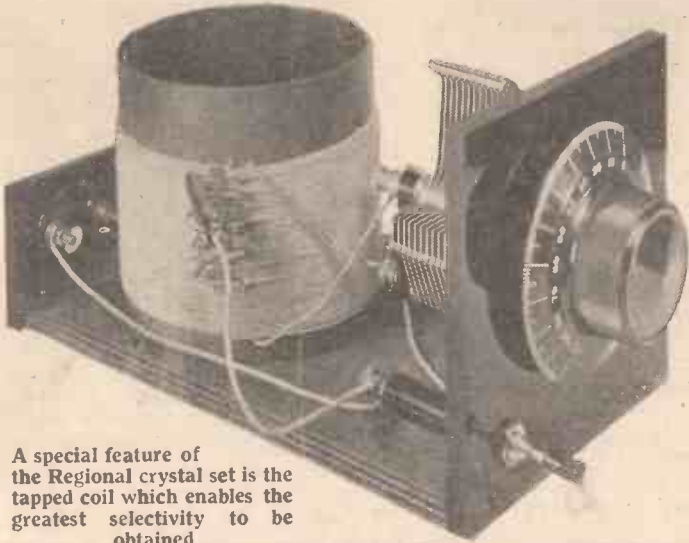


An impression of Maisie Gay

A TAPPED-COIL CRYSTAL SET

Constructional details of a selective crystal set, using an easily-made tapped tuning coil. This little set will give good headphone reception of both transmissions from North Regional

THIS crystal set will undoubtedly meet the needs of many thousands of listeners catered for by North Regional. The main object in designing a crystal set for regional reception is to achieve sufficient selectivity to enable the two alternative programmes to be heard at good strength



A special feature of the Regional crystal set is the tapped coil which enables the greatest selectivity to be obtained

without mutual interference. Many methods could be suggested, but most of them suffer from disadvantages, either of expense or complication of tuning.

The circuit favoured by the B.B.C., included in the crystal set illustrated in these pages, is capable of an inexpensive practical interpretation. The tuning control is the last word in simplicity; and results, as gauged by reception tests of the Brookman's Park stations, are likely to satisfy the needs of most crystal-set users in the North Regional area.

Unusual Circuit

As the circuit is rather unusual, a brief explanation will be of value. Readers will see that a tapped tuning coil is used, consisting of a total number of 46 turns of 20-gauge double-cotton-covered wire, wound on a coil former $3\frac{1}{2}$ in. in diameter and $3\frac{1}{2}$ in. long. The length of winding is about $2\frac{1}{4}$ in., the remainder of the former being needed for fixing.

After winding on 14 turns of wire, the coil is tapped, and further taps are made at every fourth turn until the forty-sixth turn is reached.

As the circuit diagram shows, the .0005-microfarad variable condenser is connected across the whole of the coil. But the aerial and aerial side of the crystal are not taken to the end of the coil remote from earth, but to one of the tappings. In

this way the aerial is aperiodically coupled to the main tuning circuit. Thus the aerial and earth damping effect is reduced and selectivity increased. As the crystal is also taken to the aerial tap, it follows that the crystal and 'phones circuit is connected across only a part of the whole coil. In this way the damping due to the crystal circuit is also reduced and so further selectivity is obtained.

There is very little more to be said about the crystal circuit. Note that across the headphones is shunted a .0003-microfarad fixed condenser. This is needed to give proper rectification and should

on no account be omitted, even though the set may work without it.

The advantage of this circuit can be appreciated only by making up the set. This, I can assure readers, is a delightfully simple job. Firstly, the coil must be wound according to the specification already given. The only point to watch at this stage is the making of the coil taps. I think the best way is to anchor the end of the wire through two holes drilled at one end of the coil former and then to wind on the first 14 turns; at the 14th one must begin to tap; a neat job of tapping can be achieved by raising the turns actually tapped, by slipping a small wooden wedge underneath them, as shown by the

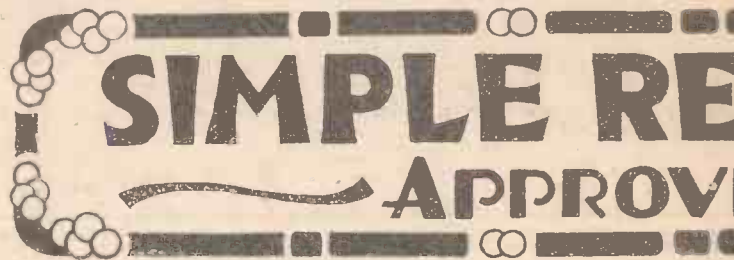
reproduction of the blueprint.

It is a good plan, after winding on the first three turns after the 14th, to move up the wooden wedge to raise the next tap turn and to repeat this moving-up process until all the taps have been made, namely eight, excluding the final 46th turn. After anchoring the end of the wiring and leaving two or three inches for subsequent connection, the raised turns at the tapping points should be bared to about half an inch. To these bared points can then be soldered small right-angle-bent pieces of wire, which form convenient points of connection for the crocodile clip connected to the flexible wire coming from the aerial and crystal.

Coil Mounting

It is important to note the earth end of the coil is the untapped end. So when the coil former, with its tapped winding, is mounted on the baseboard, take care that the end of the winding with the untapped portion comes at the bottom. The coil former can be securely fitted to the baseboard by means of a piece of wood screwed across the lower part, as shown by the blueprint.

The rest of the layout and construction of the crystal set will be clear from the illustrations. The .0005-microfarad vari-



erected and where the listener is situated more than fifteen miles from Slaithwaite. The circuit of the one-valve is very simple, as can be seen from the diagram. It consists of a detector valve working on the leaky-grid-condenser principle, using a .0001-microfarad grid condenser and a 2-megohm grid leak.

Tuning is done by means of a plug-in coil shunted by a .0005-microfarad variable condenser. The aerial is connected to the grid end of the tuning coil through a .0001-microfarad fixed condenser. Reaction is applied to the tuning coil by means of another plug-in coil connected in the anode circuit of the valve, that is, between the anode and the headphones. To make sure of

A PLUG-IN-COIL ONE-VALVER

Full details of the one-valve set recommended by the B.B.C. for headphone reception of North Regional and other programmes

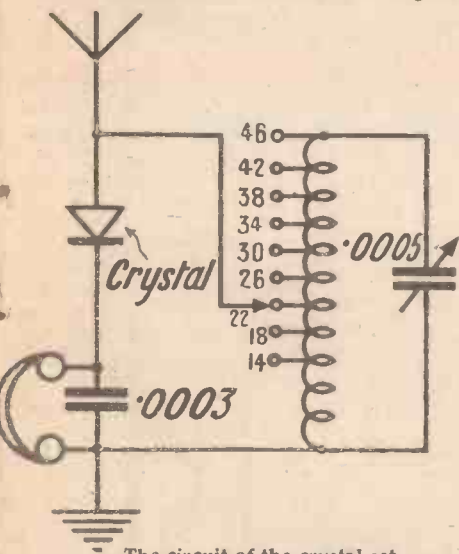
BEFORE describing the one-valve set recommended by the B.B.C., I ought to explain that the B.B.C. suggests changing over to a valve set from a crystal set only where an inefficient aerial or inside aerial can be

smooth reaction a .0003-microfarad fixed condenser is shunted across the 'phones, so that high-frequency current can readily pass from the anode through the coil and fixed condenser to earth.

The practical interpretation of this

able condenser is mounted on a small ebonite panel fitted to the baseboard. At the bottom left-hand corner of the panel is fitted the crystal detector.

Although this detector is of the semi-permanent type, reception tests show that it is very sensitive. I consider it is a great



The circuit of the crystal set

advance on the cat-whisker type of crystal detector, which, if sometimes more sensitive, is very prone to fall out of adjustment.

The 'phones by-pass condenser is fitted in a convenient position on the baseboard and at the back are screwed two terminal blocks for the aerial, earth, and 'phones terminals. It will be seen that a flexible lead is taken from the aerial side of the crystal detector to the crocodile clip used to form a connection with one of the coil taps. I suggest that when experience has shown which tap provides the best compromise between selectivity and volume a permanent connection could be made, by

(Continued on next page)

I found a No. 50 coil for tuning was necessary to cover the wavelengths of North Regional; 301 metres corresponded to 10 degrees and 479 metres to 80 degrees. It will be seen that the National and Regional transmissions of the North Regional stations will come in at nearly the minimum and maximum settings of the tuning dial respectively. For both these tests I used a No. 25 reaction coil, although some aerials may need a No. 35 reaction coil.

REGIONAL SETS ED BY B.B.C.

simple but effective one-valve circuit is shown by the illustrations and blueprint. On an ebonite panel is mounted a .0005-microfarad variable condenser and at the bottom left-hand corner a filament on-off switch. On the baseboard, at the right-hand end, looking from the front, is fitted a two-way coil holder. To the left of this is the valve holder and in convenient positions are grouped the three fixed condensers, grid leak and holder, and four terminal blocks for the aerial, earth, high tension, low tension, and 'phones connections.

If the set is to be fitted into a cabinet it will be necessary to remove the control knob of the coil holder and to drill a clearance hole in the right-hand side of the cabinet to take the spindle. The final cabinet details are left to the discretion of the constructor.

A Wave-range Test

Using the same aerial as before, an HL210 valve, and a 60-volt battery, I tested this one-valver in order to see which size plug-in coils are needed to cover regional requirements. I found that with a No. 40 coil for tuning, the 261-metre station came in at 30 degrees and the 356-metre station at 70 degrees, both at fine strength and perfectly clear of mutual interference.

Then by bringing the wavemeter into use,

This test revealed a very interesting and important point that should be specially noted by all experimenters living in the North Regional area, namely within 100 to 150 miles of Moorside Edge. I refer to the big discrepancy between the dial readings for North Regional on 301 metres and North Regional on 479 metres. As the readings with a No. 50 tuning coil show, the 301-metre station is 70 degrees lower on the dial than the 479-metre station. Compare this wide difference with the readings for the two Brookman's Park stations, which with a No. 40 coil are only 40 degrees apart.

Separation

The wide difference in wavelength between North Regional Stations, namely 178 metres, is an advantage so far as separating them is concerned. In this respect North Regional listeners will certainly be more fortunate than London listeners, who have to contend with only a 95-metre separation between National and Regional stations at Brookman's Park.

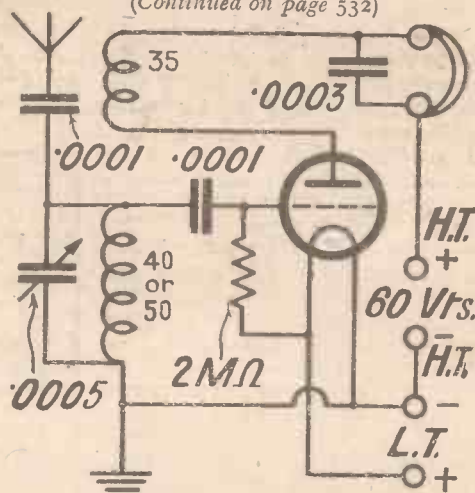
But since North Regional

301-metre station comes in at the bottom end of the tuning scale and North Regional 479-metre station comes in at the top, there is a need for a careful choice of coil and condenser in order to include both stations.

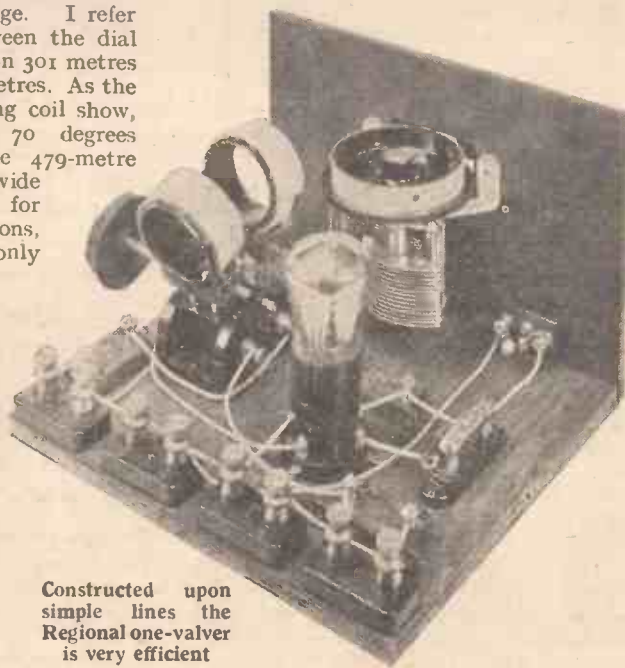
It is conceivable that a No. 40 coil might be chosen for the 301-metre station, but that would not, in this one-valver at all events, tune up to 479 metres, so the other Regional would not be heard. Conversely, the use of a No. 60 coil would certainly enable the 479-metre station to be heard, but it would not tune down to 301 metres. These remarks apply to normal plug-in coils, such as those used in this set

As the two North Regional stations are so widely separated in wavelength they must necessarily be heard, with any given coil, at the two extremities of the condenser dial. But to achieve this one must use a moderately low-loss

(Continued on page 532)



The circuit of the one-valver



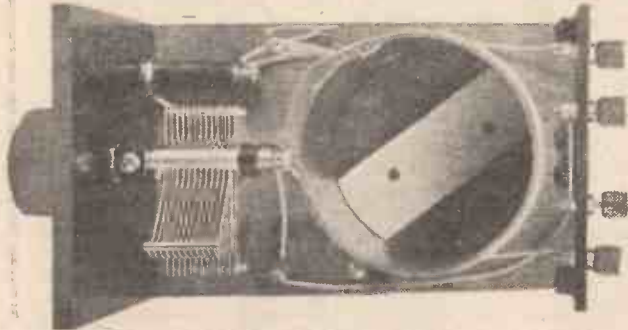
Constructed upon simple lines the Regional one-valver is very efficient

"A TAPPED-COIL CRYSTAL SET" (Continued from preceding page)

replacing the flexible lead and crocodile clip with an ordinary lead soldered to the chosen tap.

To test the utility of this crystal set under regional conditions, I connected it to my standard 60-ft. aerial in south-west

degrees. In the same way the 479-metre mark was found at 75 degrees. These readings were recorded using tap No.4, that is with the aerial connected to the 26th turn from the earth end. It will be seen that the coil easily covers the two proposed North Regional transmissions.



Here is a plan view of the Regional crystal set; the simple construction is apparent

London, some twenty miles from Brookmans Park. Taking the aerial clip to the lowest tap on the coil, namely, to the 14th turn from the earth end, I obtained very sharp tuning and the strength of both Regional and National stations was quite good. The National 261-metre station came in at 40 degrees and the Regional 356-metre station at 60 degrees.

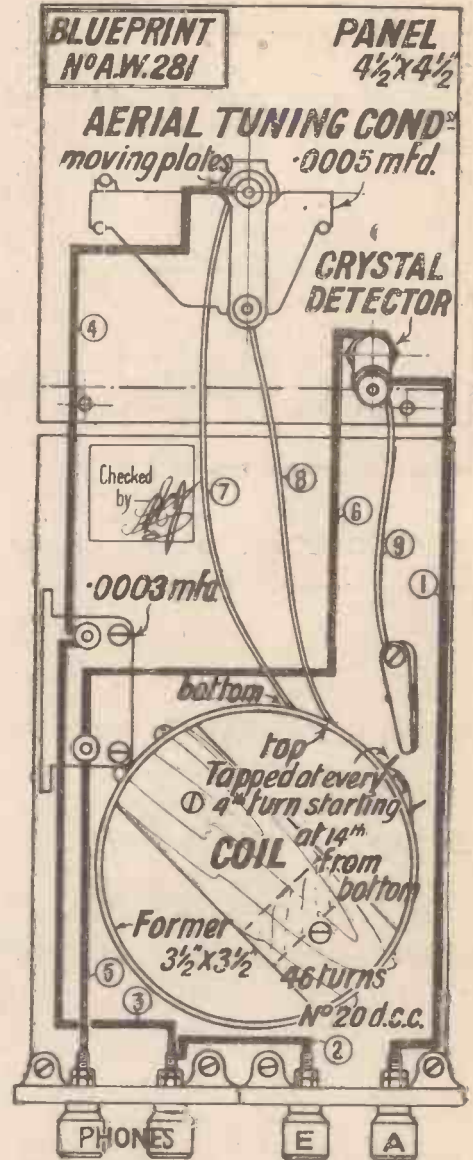
Moving up the aerial clip to the fourth tap, namely the 26th turn in the earth end of the coil, I found results were still better. Both stations came in at great strength on the 'phones without the slightest trace of overlapping. National was logged at 2: degrees and the Regional at 50 degrees. It will be noticed that the discrepancy between the two readings increases as the aerial clip is moved towards the end of the coil remote from earth.

To gauge the possibilities of this set under the full North Regional conditions, when a national transmission will be given on 301 metres and a regional transmission on 479 metres, I invoked the aid of my wavemeter. This was first adjusted to send out a miniature signal on 301 metres, which was picked up on the crystal set at 35

NEXT WEEK:
FULL DETAILS OF A FINE SUPER-SELECTIVE THREE-VALVER

COMPONENTS FOR TAPPED-COIL CRYSTAL SET

- Ebonite panel, 4½ in. by 4½ in. (Becol, Peto-Scott, Trelleborg, Lissen, Read-Rad).
- Baseboard, 4½ in. by 7 in. (Camco, Clarion, Pickett).
- .0005-mfd. variable condenser (Formo, J.B., Lotus, Utility, Polar, Lissen, Cyldon, Burton).
- Crystal detector for panel mounting (Jewel Pen).
- Piece of 3½-in. diameter tube, 3½ in. long (Clarke's Pirtoid).
- 2 oz. No. 20 d.c.c. wire (Lewcos).
- Two terminal blocks (Sovereign, Junit, Belling-Lee).
- Four terminals, marked: A, E, Phones (2) (Belling-Lee, Clix, Ealex).
- .0003-mfd. fixed condenser (Telsen, Lissen, Read-Rad, Dubilier, T.C.C.).
- Connecting wire (Lewcos).
- Crocodile clip (Bulgin).



The crystal set layout and wiring diagram. A full-size blueprint is available, price 6d.

WHEN BIG BEN STRIKES

8.55 P.M. . . . "Now," promises our host in the strained tones that his particular occupation demands. "Everybody ready? Listen! I think it's pretty certain to-night."

Cigarettes are snuffed out; pipes are laid aside. The women let their work slide to their laps and wait patiently for the evening thrill. Snortie, the native commissioner's dog, is thrust into outer darkness. Mrs. Host clasps her tamed wild cat closer to her capacious bosom. The "pub." proprietress shuts her eyes tightly and screws her wide mouth until it resembles a bunch of purple red rubber from a child's exploded balloon. There must be no counter attraction whilst we wait in the tense silence, broken only—or so we like to imagine—by Big Ben clearing his throat to boom out

the hour. Last night we listened in the same absorbed fashion. The previous night the silence was a tangible quantity . . . likewise many preceding nights.

This time, however, the wireless amateur was correct; the atmospheric were propitious. First the preliminary grating; then, faintly but distinctly, each stroke was heard in the stuffy little living-room of the station master. Miles from civilization, with nothing save our flag and common love of England to link us together, we forgather when circumstances permit to hear Great Ben strike the evening note at Home.

One-two-three-four-five-six-seven! Two hours behind us and, probably, a glorious summer's day closing in overseas!

"Dear old London," murmurs the gratified host, who hails from Camden Town.

"Jolly old spot," sighs the huge ex-cavalry officer (now a farmer in a very small way).

"Oh, how I miss you to-night," hums our irrepressible member. "Lord, to be dressing for a dinner and theatre this very evening! And once the effort bored me stiff!"

"Ow 'omelike," agrees the motherly soul who runs the wayside hotel. "Might be next door, so to speak. It alwis mykes me think of the 'Gentle Dove', where they sells the best stout yer'd git in a dy's march. London for me every time," she declares, wiping with the back of a grubby hand, eyes that drip with scarcely any provocation. "I'll be trottin' round to me pub. now, and thankin' yer kindly for the treat. Mykes me want to cry me eyes out, that sound does." A. G. E.

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1 Ebonite panel, 4½ x 4½ x ½	1	3	
1 Baseboard, 4½ x 7			
1 Readi-Rad .0005 mfd. variable condenser with 4-in. dial	6	0	
1 Red Diamond crystal detector	2	0	
1 Bakelite coil former, 3½ x 3½	1	3	
1 2-oz. reel 20 g. D.C.C. wire		6	
2 Junit terminal blocks	1	4	
4 Belling Lee "R" terminals	1	0	
1 Readi-Rad .0003 mfd. fixed condenser		10	
1 Clip, wire, flex, etc.		10	
Total	15	0	

THE "B.B.C. ONE"

	£	s.	d.
1 Ebonite panel 9 x 6 x ½	3	0	
1 Baseboard 9 x 8		6	
1 Cylcon .0005 mfd. thumb control condenser	11	6	
1 Readi-Rad on-off switch		10	
1 Telsen 4-pin valve holder	1	0	
1 Lissen 2-way coil holder model 'A'	4	6	
2 Readi-Rad .0001 mfd. fixed condensers	1	8	
1 Readi-Rad .0003 mfd. fixed cond.		10	
1 Readi-Rad 2 megohm grid leak and holder	1	4	
4 Junit terminal blocks	2	8	
8 Belling Lee "R" type terminals	2	0	
1 Pkt. Jiffilix	2	6	
Wire, flex, screws, plugs, etc.	1	2	
1 Detector valve	8	6	
Total	£22	0	

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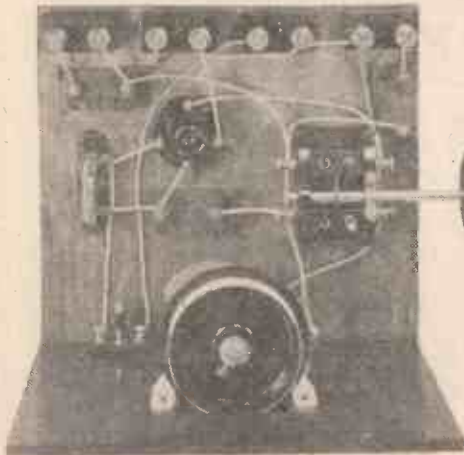
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Mention of "Amateur Wireless" to Advertisers will Ensure Prompt Attention

"A PLUG-IN-COIL ONE-VALVER" (Continued from page 529)



A plan view of the Regional one-valver

coil and certainly a variable condenser with a low minimum capacity. Otherwise the tuning range of the coil and condenser will be so restricted that when the coil is right for one station it will be wrong for the other. Perhaps I am anticipating troubles that will never arise. All I want to do is to help North Regional listeners as much as possible.

Good Reception at 100 Miles

From my tests I can safely say that the one-valver described in this article will provide good strength headphone reception from North Regional stations up to 100 miles. For those situated more than 50 miles from Moorside Edge a slightly larger series aerial condenser may be advisable. Instead of the .0001-microfarad condenser specified in List of components, it might be worth while trying a .0002-microfarad condenser. Another plan would be the use of a pre-set condenser, having a maximum capacity of .0003 microfarad.

This value of condenser is intimately connected with the size of the aerial. The correct value is that which provides the best

compromise between strength of signals and ability to separate one from the other.

ALAN HUNTER

COMPONENTS FOR PLUG-IN-COIL ONE-VALVER:

Ebonite panel, 9 in. by 6 in. (Becol, Trelleborg, Keystone, Lissen, Read-Rad).
Baseboard, 9 in. by 8 in. (Camco, Clarion, Pickett).

.0005-mfd. variable condenser, thumb-control type (Cyldon, Burton, Lissen, J.B., Lotus, Formo, Polar, Utility).

Filament switch (Bulgin, Read-Rad, Lissen, Benjamin, Lotus, Peto-Scott).

4-pin valve holder (Lotus, W.B., Lissen, Clix, Benjamin, Wearite, Telsen).

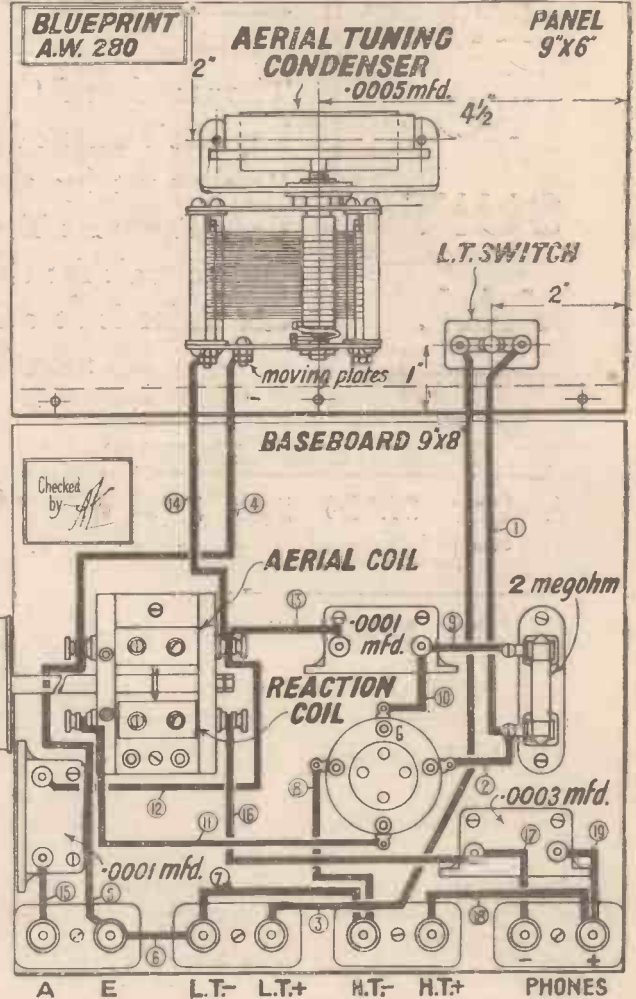
Two-way coil holder (Lissen, model A).

Two .0001-mfd. and one .0003-mfd. fixed condensers (Telsen, Lissen, T.C.C., Dubilier, Graham-Farish, Watmel, Read-Rad).

2-megohm grid leak (Lissen, Telsen, Read-Rad, Dubilier, Graham-Farish).

Grid-leak holder (Bulgin, Read-Rad, Lissen). Connecting wire (Glazite).

Four terminal blocks with terminals, marked: A, E, L.T., L.T., H.T., H.T., Phones+, Phones- (Lissen, Belling-Lee, Junit, Sovereign, Ealex).



Layout and wiring diagram of the one-valve set. A full-size blueprint is available, price 1s.

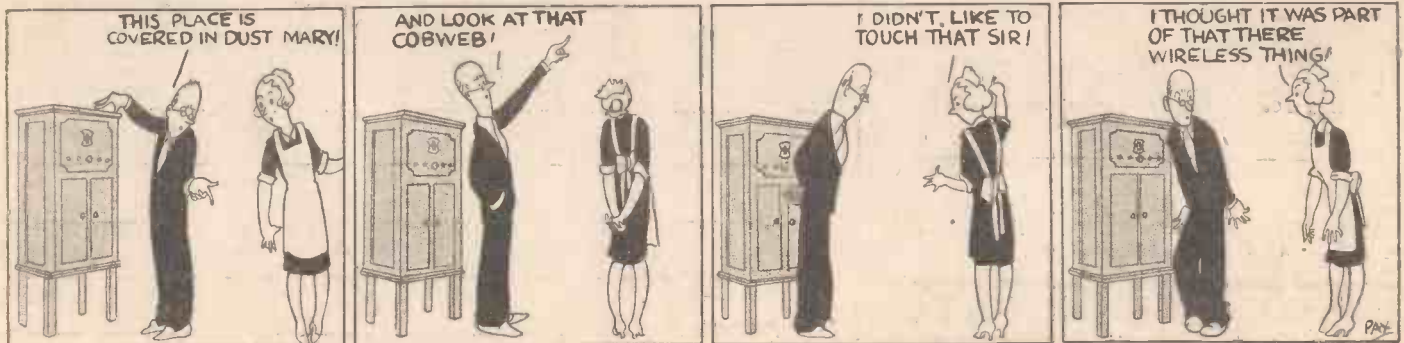
IN a log-law condenser, the plates are so shaped that the angle of rotation is proportional to the logarithm of the actual change in capacity. In other words, starting at any given setting on the dial, a movement of, say, ten degrees will always change the capacity already in circuit by a definite fraction, irrespective of where the start is made. This type of condenser

LOGARITHMIC CONDENSERS

is particularly useful for "ganging" several stages of high-frequency control, because each of the condensers can, if necessary, be initially set to a different value, so as to match up the various circuits. When this

has been done, they can then be locked together to a single tuning-control and will still keep "in step" both as regards angular movement and capacity variation. With any other type of condenser the initial setting must be the same for each separate stage if they are to be successfully operated from a single control over a wide range of frequencies.

B. A. R.





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Both unit and cabinet speakers are fitted with a standard input transformer suitable for a power or super-power output valve. Models 90 and 120 can be operated from A.C. mains with the aid of Type 100 Rectifier.

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H.M.V. RADIO-GRAMOPHONE MODEL 521



Makers: The Gramophone Co., Ltd.
Price: 48 guineas.

WHEN one looks at the specification of the new H.M.V. radio-gramophone one gathers a strong impression of value for money. For 48 guineas the set-buyer gets a really up-to-date A.C. four-valver, including two screen-grid valves for high-frequency amplification, a power-grid detector and a super pentode output valve; a moving-coil loud-speaker with a laminated metalised cone and a permanent cobalt steel magnet; a silent and smooth-running induction disc gramophone motor, automatically starting and stopping; a new high-impedance pick-up fitted with a reversible head, using a cobalt steel permanent magnet and mounted on a well-balanced tone-arm, designed to give good tracking; in other words a first-class radio-gramophone equipment for about half the price ruling a year or so ago.

The Circuit

To avoid any disappointment I should make it clear that this radio-gramophone is for alternating-current mains only. These

valves. The two screen-grid valves are coupled together and to the detector valve by means of choke-feed tuning circuits. The three separate stages of tuning are accurately ganged by the use of a three-gang condenser, providing one-knob control.

As there is very considerable signal amplification before detection I am not surprised to find that the detector valve is arranged to work on the power-grid principle, by the use of a .0001-microfarad grid condenser and a 1-megohm grid leak, working in conjunction with a Marconi MHL4 valve.

The makers have certainly done something in the cause of pentodes by including a PT625 as the output of the H.M.V. radio-gramophone. But it should be noted that special correcting devices have been incorporated in order to overcome the tendency of the pentode to accentuate the high frequencies by attenuating the low frequencies. A step-down output transformer is arranged between the pentode and the permanent-magnet moving-coil loud-speaker.

One of the most interesting circuit features of the H.M.V. radio-gramophone is the volume control. During radio reception volume is controlled by varying the screen voltage on the high-frequency valves, but the spindle of the variable resistance employed for this purpose also operates the potential divider shunted

wide range of frequencies. The top notes are characteristically brilliant, due presumably to the pentode power valve, but there is no attenuation of bass notes, which come out with a very natural timbre.

After hearing and approving the reproduction, both of radio and gramophone records, one naturally wants to handle the controls. When the lid is closed over the turntable the only visible control is that for volume, a knob being mounted just above the top of the loud-speaker opening. Control of volume is equally good in the reproduction of records and broadcast programmes. It provides a wide range of audibility without appreciably affecting the tone.

Simple Control

On opening the lid one sees how simple are the remaining controls. The tuning scale, which is brightly illuminated when the set is switched on, is calibrated in medium wavelengths on the left and in long wavelengths on the right. The calibrations for the medium waves are made every 40 metres and on the long waves every 100 metres. I found the wavelength markings very accurate and a great boon in logging stations. This calibrated and illuminated dial is smoothly rotated by means of a handy sized knob just below it. Turning the knob slowly from minimum to maximum settings of the dial, I logged no less than twenty-five stations on the medium band at what might be termed concert strength and quality; in other words programme alternatives to the local stations. This test was in south-west London, using a short indoor aerial.

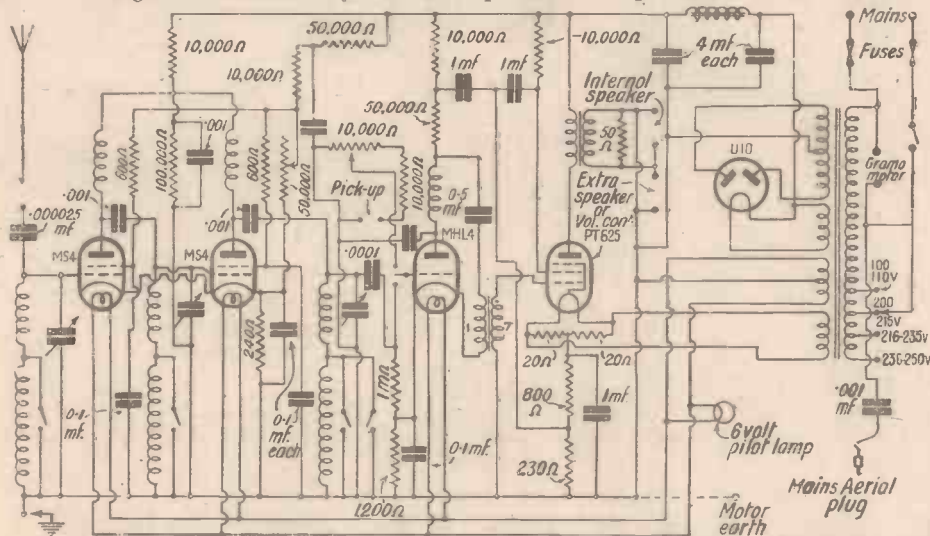
For those who cannot erect any sort of external aerial, provision is made for the use of the electric-light mains wiring as an aerial. This can be very simply brought into operation by a plug-socket arrangement at the back of the set. With the mains as an aerial I was able to get a dozen foreign stations at good loud-speaker strength. There was no appreciable background of hum during this reception.

An idea of the selectivity of the set can be gauged from the fact that in the heart of London the London Regional station on 356 metres had disappeared at 340 and 365 metres. The London National 261-metre station was silent again at 250 and 270 metres.

Finally, I ought to say a word about the very convenient switch mounted above the tuning dial. This has four positions, namely: "off," "gramophone," "medium waves," and "long waves." Here is yet another example of the makers' ideal, simplicity.

Altogether a very fine job; the H.M.V. radio-gramophone is certainly a feather in the cap of the Gramophone Company in particular and the British radio trade in general.

SET TESTER.



The circuit of the Model 521 H.M.V. radio gramophone: note the tone corrector arrangement

may be from 100 to 110 volts and 200 to 250 volts, with periodicities between 40 and 60 cycles. There is no corresponding model for D.C. mains at present, but I understand that a model will be ready by April 1.

The circuit and chassis of the H.M.V. radio-gramophone closely follows those of the Marconiphone model 560 console four-

across the gramophone pick-up. Other circuit details can be seen from a study of the circuit diagram reproduced herewith.

I have seen and handled the H.M.V. radio-gramophone in several localities and I can vouch for its wonderful performance. Probably the first impression one gathers is the fine tonal quality. I have seldom, if ever, heard an instrument handling such a

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1 .0005 Thumb Control Variable Condenser, Cydon		11	6	ACCESSORIES: s. d.
1 Filament Rheostat, Keystones		1	3	
1 4-Pin Valve Holder, Telsen		1	0	
1 2-Way Coil Holder, Lissen		4	6	
3 Fixed Condensers, two .0001 mfd., one .0003		10	0	
1 2-megohm Grid Leak and Holder, Telsen		1	2	
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PILOT KITS LEAD ALL THE WAY THROUGH

You will Help Yourself and Help Us by Mentioning "A.W." to Advertisers

RESISTANCES are employed to a very large extent in the make-up of a modern radio set, and there are now so many types and such widely different uses that a few remarks on the subject will be of interest. Perhaps one of the first points which we may discuss is the rating of the resistance from which we can gather the current which can be safely handled. Many manufacturers, particularly in the case of the spaghetti resistances which are becoming prominent, rate the resistances in terms of the current which can safely be carried. This is really a more satisfactory procedure than giving a wattage rating, since one only requires to know the watts dissipated in a relatively small number of cases. The item of practical interest is the current which can safely be carried.

Wattage Rating

It does not follow, incidentally, that a resistance will dissolve into a cloud of smoke if the rated current is exceeded, and usually an overload of at least a 100 per cent. is possible. It is not desirable to exceed the rating, however, for long periods, owing to the strain which is placed on the fine wire employed. Switching on and off involves an alternate heating and cooling which is, of course, accompanied by expansion and contraction of the wire. If the current is doubled the heating will be increased four times, so giving a much greater range of expansion and sooner or later the wire will break down under the strain.

The wattage rating is a measure of the dissipation of heat. Resistances are stated to have 5, 10, or 20 watts dissipation, and from these the current capacity must be worked out. We can, for example, have a range of resistors the values of which run from 5,000 to 50,000, all rated at the same wattage; yet they will not all carry the same current. The 50,000-ohm sample, indeed, will only carry one hundredth of the current which the 5,000-ohm resistor will carry in order to dissipate the same wattage. The watts dissipation is the product of the resistance itself and the square of the current carried.

Current Capacity

Suppose, for example, we have a 50,000-ohm resistance rated to dissipate 10 watts. We should work out the maximum safe current in the following manner:

$$\text{Watts} = 10 = (\text{Current})^2 \times 50,000$$

$$\begin{aligned} \therefore \text{Current} &= \sqrt{\frac{10}{50,000}} \\ &= .014 \text{ amps.} \\ &= 14 \text{ milliamps.} \end{aligned}$$

Incidentally, it should be remarked that in most cases, particularly with high-value resistances, the rated wattage is never reached under normal conditions, as the voltage involved would be too high.

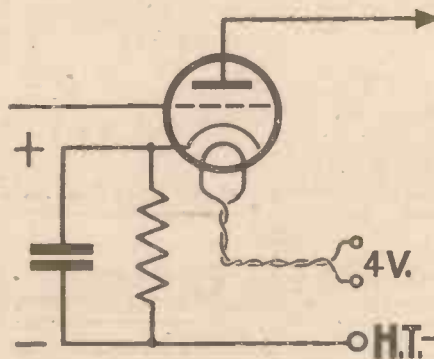
In the case we have just considered the voltage developed across the resistance in order to dissipate 10 watts would be 700 volts, a much higher value than would be obtained in normal practice. In passing, it may also be remarked that a resistance rated at 10 watts should be capable of with-

CHOOSING THE RIGHT RESISTANCE

By J. H. Reyner, B.Sc., A.M.I.E.E.

standing this large voltage without any risk of a breakdown of the insulation. Some resistances which are rated on a wattage basis I have found in practice to be distinctly optimistic in this respect.

So much for the rating. The next question which we have to consider is that of the voltage drop across the resistance and how we are to determine it. This is often of importance when designing series-feed resistances and grid-bias resistances for A.C. sets. To some extent this is a matter of trial and error. Suppose for example, we wish to design a series-feed resistance for the anode circuit of a detector valve. If we assume a certain voltage on the anode of the



How grid bias is obtained by making use of the voltage drop produced by the anode current

valve and find the corresponding anode current we can then determine the value of resistance required in order to drop the necessary voltage. Usually the resistance works out at an odd value, and we have, therefore, to adopt a resistance slightly greater or slightly smaller and the conditions will automatically adjust themselves.

Voltage Drop

Let us assume that we have a valve on which we wish to place an anode voltage of 100, and that our supply is 200. Therefore, we wish to drop 100 volts on the feed resistance. From the valve characteristic or from suitable tables we determine the anode current which the valve will take with 100 volts on the anode and with the correct grid bias—i.e., the grid bias which we are proposing to use in this particular instance. Let us say that this works out at $4\frac{1}{2}$ milliamps.

Now the voltage drop on a resistance is obtained by multiplying the resistance by the current in amperes. Since we usually work in milliamps in radio practice it is necessary to multiply by the milliamps and divide by 1,000, and in this connection a very simple rule to remember is that 1,000

ohms will produce a voltage drop of 1 volt per milliamp. Hence, if we wish to drop 100 volts with $4\frac{1}{2}$ milliamps our resistance will be

$$\frac{100}{4.5} \times 1,000 = 22,500 \text{ ohms.}$$

This is, of course, an odd value, the nearest stock sizes being 20,000 and 30,000. (25,000-ohm resistances are sometimes available.) We shall not be seriously out if we

choose a 20,000-ohm resistance. At first sight it would appear that this would only drop 90 volts giving us a 110 volts on our anode. The increased anode voltage, however, will cause a rise in the anode current which is thus no longer $4\frac{1}{2}$ milliamps, but something a little larger. The increased anode current will cause an increased drop in the feed resistance, giving us something more than 90 but less than 100 volts drop. The conditions will automatically adjust themselves, so that the anode current produces sufficient voltage drop on the feed resistance to make the anode voltage correspond to the anode current.

Grid-bias resistances for A.C. valves are designed on just the same principles. Here it is desired to produce a certain grid voltage, which is obtained by making use of the voltage drop produced by the anode current of the particular valve. The circuit is known as free grid bias and is illustrated by the diagram from which it will be seen that the valve produces its own grid bias by the flow of its own anode current.

Let us suppose here that we wish to produce 30 volts grid bias. Once again we refer to the characteristic curves of the valve (or to charts), whence we find the anode current corresponding to 30 volts bias and the anode voltage in use. Let us assume that this is 14 milliamps. By the application of the same rules the required value of resistance can be readily worked out, and calculation shows that the actual value is 2,140 ohms. Here again this is an odd value, and the question arises as to whether it is necessary to be exact, or whether a 2,000-ohm resistance may be used. Again an actual nominal 2,000-ohm resistance may perhaps vary by 5 per cent. either way, so that the question of the necessity for exact values is an important one.

Fortunately, an automatic adjusting process takes place in the valve just as with a series-feed resistance. Suppose we use 2,000 ohms instead of the 2,140 which is theoretically necessary. The effect of this would be to produce too small a value of grid bias, a little less than the 30 we require. The immediate result will be that the anode current will increase, and this in turn will cause an increased voltage drop on the bias resistance, giving an increased grid bias. Consequently any tendency to increase the anode current will immediately be checked, and the valve will settle down to operate at a voltage a little less than the theoretical 30 volts required, but not seriously different.

In fact, it would probably be found that if the resistance were as little as 1,500 ohms, the grid bias would only be a few volts different.

READ AT A GLANCE



The illuminated scale assists accurate reading and indicates when the set is switched on.

No more fumbling in dark corners . . . No matter where your set is placed you can read the condenser settings at a glance if you use the new J.B. Illuminated Vernier Dial.

It is exceptionally easy to fit, for there are no awkward holes to cut in the panel—the Vizor fits into a round hole. Even faulty panel-drilling will cause but little trouble, for the Condenser is carried on the frame of the Dial.

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Vizor and Frame in moulded Bakelite. Fits any panel up to 1/4 in. Supplied complete with lamp holder but without lamp.



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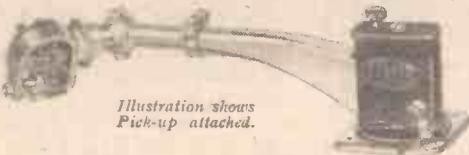


Illustration shows Pick-up attached.

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R.T.A.	29/6
Completely finished in White	47/6
Polished rich Jacobean	55/6

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"I consider it a fine piece of mechanism at a very reasonable price."—C.H. (Birmingham)

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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.

BRYCE MAINS TRANSFORMERS

WE have received notice this week of a wide range of power transformers, marketed by Messrs. W. Andrew Bryce, of Bury, Lancs. These transformers are particularly well made, to judge by the sample which was submitted. There is a generous iron circuit, rather larger than usual, and this is an advantage in that it introduces practically no distortion into the wave form of power supply. It is not always realised that if the iron circuit is too small, the alternating current output is irregular in shape, and consequently additional hum is introduced which is difficult to get rid of.

A red-fibre top-plate is provided, which carries the various terminals for the different voltages, and altogether the job impresses one very favourably. The particular sample submitted was wound for an input of 200, 220, 230, and 240 volts, and had four secondaries. One was a 250-250 volts winding for 60 to 80 milliamps, and the remainder were low-tension windings delivering 4, 4 and 6 volts respectively. The various outputs are set out in the accompanying table, together with the measured voltages both on no load and full load.

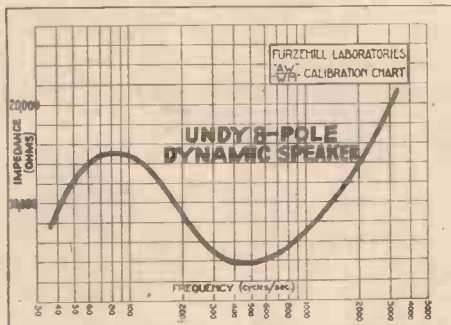
Incidentally, full-load figures are those when all the windings are supplying their full load, and not only the winding under test. It is necessary to check the performance in this manner in order to allow for the voltage drop on the primary as well as on the various secondaries, and it will be seen that the regulation, i.e., the difference

transformers to the notice of all mains users.

Secondary	Rating	Test Volts	
		No load	Full load
No. 1	250 v. 60 m.a.	260	245
No. 2	4 v. 1 a.	4.05	3.85
No. 3	4 v. 3 a.	4.2	3.95
No. 4	6 v. 1 a.	6.2	5.95

UNDY DYNAMIC SPEAKER

WE have tested this week an Undy eight-pole dynamic speaker. The unit of this speaker is provided with eight magnet poles, arranged in two sets of four on each side of the pivotal point of the armature, thus giving an unusual variant



Characteristic of the Undy speaker

of the balanced-armature principle. There are two coils, one for each set of poles, and the windings are arranged so that their forces on the armature are in the same direction. The motion of the armature is transmitted to a large diaphragm, 15 in. across, carried in a light but rigid pressed metal housing. A very massive magnet 6 in. long is a striking feature of the unit.

Mounted on the chassis is a transformer which is designed to match the loud-speaker to the average valve, although it is rather unusual to find a built-in transformer on a moving-iron speaker. This is undoubtedly a step in the right direction. The transformer provided is of the three-ratio type so that correct matching can be obtained.

We took an impedance curve of the instrument at various frequencies, and it would appear that the use of a transformer is justified since the impedance does not rise continuously, as in the case of the ordinary moving-iron type of instrument. A useful point is that the impedance is well maintained in the bass registers, indicating that the instrument is radiating effectively. The test on our standard amplifier con-

firmed this theory. The bass was particularly well in evidence, and the sensitivity was good. It appeared that the high-frequencies were not reproduced as well in proportion, but this may have been due to



A new dynamic speaker—the Undy eight-pole

the fact that we were using it with a rather low impedance output valve.

The instrument is well constructed and will handle a good volume without rattling.

NEW MAZDA VALVES

THERE seems to be no limit to the surprises which the valve manufacturers have in store. Just recently we have received a Mazda PP5/400, which is a valve of positively amazing characteristics. It is provided with a 4-volt filament taking 2 amperes, and is designed for an anode voltage of 400. The internal resistance is 1,500 ohms, and the amplification factor 9, giving us a mutual conductance of 6 milliamps per volt. We checked these figures, and found them correct.

The construction of the valve is ingenious. The filament is 16 in. long, arranged in four V-shaped loops. Around this is the grid, and surrounding the whole is an anode built up like a box, 2 in. long, 1 1/4 in. wide, and 3/4 in. thick. The anode is ridged to give extra strength, and is stayed to give it robustness. The support is generous, and the robustness of the general construction is strikingly apparent.

At 400 volts the valve will handle about 32 volts grid swing, the anode current being 65 milliamps. Under these conditions an undistorted power output of five watts is possible, this being obtained with an anode load of about 3,500 ohms. We have had as much as five watts from output valves before, but never have we been able to produce such an output with only a little over 30 volts grid swing.



One of the range of Bryce power transformers described in the accompanying report.

between no load and full load, is only 5 per cent. This is particularly good, having regard to the fact that this particular model sells at only 24s. 6d. We commend these

IMPROVES ANY CIRCUIT . . .

Fit Sovereign Components. Their quality and performance are famous. The Sovereign Volume Control shown here is in Bakelite case with pointer knob, "de luxe" action and nickelled fittings. It is a necessity in any modern set. Send direct to the manufacturers if your dealer cannot supply this and any other Sovereign lines. Send also for full list of components.



50,000, 100,000 and 500,000 ohms. 1 and 2 megohms. **4/6 EACH**

Sovereign Components are specified again and again in "A.W." circuits. Why not consider for a moment where you can use other Sovereign lines as well?

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S.F.B.

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Send this at Once

I want List 947 showing how easy it is to build the Mains Unit best suited to my Receiver. I enclose 3d. stamps.

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MODEL A.C. 120 - 69/6
120 v. at 20 m.a. Westinghouse Rectification. Assembled in Handmade Metal Case and requires wiring-up only. Screw terminals. Point-to-point diagram.

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Indoor Aerials

SIR,—I do not agree with your correspondent "F.E.S." (Bolton) and his ideas about indoor aerials. It is possible to have an efficient indoor aerial. For two years I experimented with different types of aerial, both indoor and outdoor.

A two- or three-valve set connected to a well-insulated indoor aerial such as I use at home does not need excessive reaction. Using the "James Dual-wave 3," no reaction is necessary for the local stations and the volume control has to be used. Many of the powerful foreigners need very little reaction. K. M. (Beckenham).

SIR,—Allow me to reply to letter from "F.E.S." (Bolton) regarding indoor aerials. If he has obtained such poor results his method of erection must be faulty. On an indoor aerial of 55 ft. I can obtain twenty stations (all medium-wave band) and fifteen of these are at good loud-speaker strength. The set is an "A.W." circuit, now about four or five years old (Britain's Favourite 3) and is, I think, one of the finest straight 3's ever designed. No,

"F.E.S.," the indoor aerial if properly erected is, if any, little inferior to an outdoor one.

In Edinburgh the tramway authorities do everything in their power to prevent interference by the electric cars. I had considerable trouble with this, but on tracing the cars responsible the tramways manager was communicated with and he immediately withdrew the offending cars from service for overhaul with the result that "man-made atmospherics" are now absent. J. O. C. (Edinburgh).

Directional Aerials

SIR,—It is possible to get a directional effect by using a horizontal aerial, the length of the overhead part of which is greater than three times the length of the down lead; but can a double-directional effect be obtained anyhow?

L. M. J. (London, E.).

Yes, by using a "T" type aerial. An ordinary horizontal aerial is erected, but the down lead wire is connected to the exact electrical centre of the overhead wire. In this case the length of the two arms should be about three times the length of the down lead wire, but

quite good directional effects can be obtained from a "T" type aerial whose arms are only the same length or a little longer than the down lead.—Ed.

Frame Aerials

SIR,—Using a screen-grid valve set with an outdoor aerial, I find it impossible to separate stations working on the same wavelengths. Will the directional properties of a frame aerial be of any use?

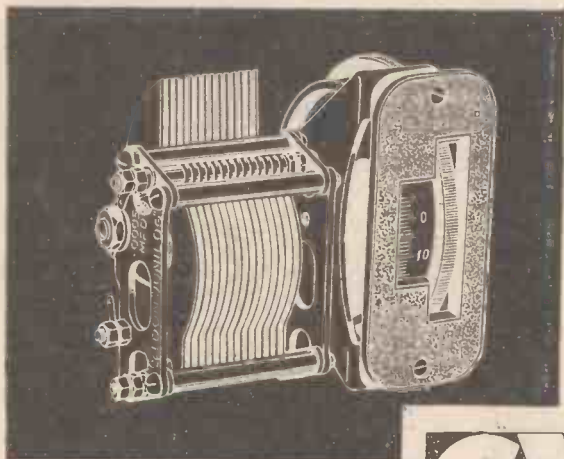
K. P. (Manchester).

A frame aerial will certainly be an asset, as only by using a frame aerial will there be any possibility of receiving such stations' transmissions clear of each other. Pointing the frame aerial in the direction of the station it is desired to receive will enable the operator to tune in the station, provided it is within the normal range.—Ed.

Le Laboratory Standard, Paris

SIR,—I should like to draw your attention respectfully to the paragraph in "News and Gossip of the Week" in the March 7 issue of AMATEUR WIRELESS. It states that a transmission on 403 metres (Continued on page 542)

ADOPTED ON MERIT*



CYLDON Single Drum Drive Condenser

Complete with escutcheon plate, drum dial control and template. If your dealer cannot supply send P.O. for delivery direct. C.O.D. if desired.

11/6
COMPLETE

CYLDON
FIVE YEARS GUARANTEE

THE CYLDON Single Drum Drive Condenser has been adopted immediately by the Radio press and public on its merits alone. No other condenser at the price can claim the same experience, resources and care behind it as this popular precision built model. Remember, it has the same outstanding CYLDON features that make CYLDON Condensers universally recognised as best. Further, the CYLDON Single Drum Drive Condenser is specified again in this week's "Amateur Wireless." Build with CYLDON — never known to wear out.

★
THE CYLDON SINGLE DRUM DRIVE CONDENSER IS SPECIFIED IN
"THE COMPANION FIVE"
"THE B.B.C. ONE"
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There is a CYLDON Condenser for every Radio need and purpose. Send for free catalogue.

SYDNEY S. BIRD & SONS LTD. CYLDON WORKS, SARNESFIELD ROAD, ENFIELD, MIDDLESEX Telephone: Enfield 2071-2

S.F.B.

MOTOR UNITS • CHASSIS • SPEAKERS



Type S4

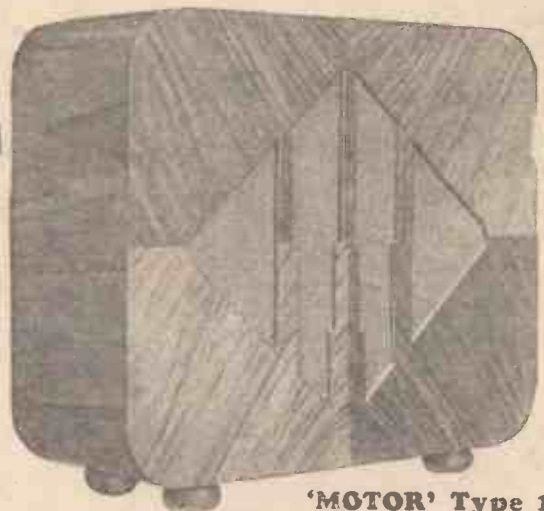
Type S4. Isophon • MOTOR Super Power Unit

A 4-pole balanced armature Super Power Unit which represents the very highest achievement in Loud-speaker perfection. The quality of reproduction and wealth of volume are exceptional. High notes are brilliantly clear, and bass notes richly emphasised. The very powerful field-magnet has a pull of approximately 10 lb., making the unit sensitive to the slightest impulse, yet capable of handling an amazing top load power without rattle or distortion. Provided with alternative resistances to suit various output valves.

PRICE 27/6

Type S5. Super Unit

An extremely efficient Unit, compact in size but generously large in power. Faithfulness and purity of reproduction are combined with a richness of tone which is equally prominent on both high and low notes. Handles an output up to 3 watts. 22/6



'MOTOR' Type 1 LOUD-SPEAKER 'DYNOLA'

A handsome cabinet speaker of highly polished walnut, fitted with the new Isophon-MOTOR Super Unit, Type S5. The modern fret design is backed with figured gold silk gauze, and the performance of this desirable Speaker is in keeping with its beautiful appearance. Size of Cabinet, 14 x 12 1/2 x 6 in. 45/-

The range of MOTOR Cabinet Speakers and Chassis caters for every individual need. If any difficulty in seeing and hearing them locally, send us the name of your nearest dealer.

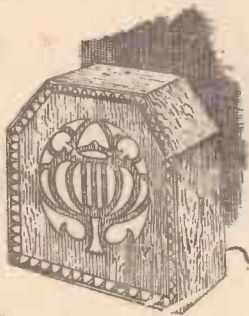
Northern Distributors:

L. KREMNER, 49a Shudehill, Manchester.

HARDMAN & Co. Ltd., The Baum, Yorkshire St., Rochdale; 61 Bridge St., Manchester; 25 Trinity St., Leeds; and 2a Leach Lane, St. Annes-on-Sea.

TEKADE RADIO & ELECTRIC LTD.

29 Farringdon St., London, E.C.4. Telephone: Cent. 2482



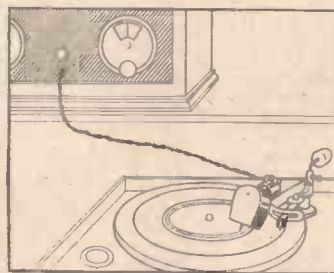
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calling for

*Player's
Please*



More Pleasure!

YOUR 1931 ETHER SEARCHER
coupled to the wonderful
KINGSTON HOME RECORDER
will give you perfect records of all Radio
Broadcast



In addition you can
record your own voice,
or both speech and
music, if you use a
Kingston Microphone.

START MAKING YOUR
OWN RECORDS NOW

THE KINGSTON HOME RECORDER
Broadcast Model - 76/6 Acoustic Model - 45/-

The Kingston Microphone

Complete with Metal Base 63/- Complete with Wooden Base 50/-

The Kingston Microphone and Kingston Home Recorder
are obtainable from all high class Radio and Music Dealers

Free Literature on request. Demonstrations at

RADIO AND GRAMOPHONES

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Distributors: Kingstophone Co. Ltd., 91, Tottenham Court Road,
London, W.1. Tel. Museum 6061-2.

"READERS' IDEAS AND QUESTIONS"

(Continued from preceding page)

was mistaken for Moorside Edge testing. In the same paragraph it was stated that this transmission was due to a Swiss station near Lausanne. I should like to point out that I tuned in this transmission personally and it emanated from the "Le Laboratory Standard, Paris," which was testing and calling for reports, also calling out an address to which reports should be sent. I noticed, too, the engineer was possessed of a Scotch accent. Katowice was at the same time on the air giving a gramophone concert sponsored by H.M.V. Company of Hayes, Middlesex. Both stations were interfering with each other, due to wandering, as I repeatedly checked both stations as near as possible by wave-meter.

J. G. (Altrincham).

Using the Speaker Out-of-doors

SIR,—A number of my friends enjoy their radio in the garden and I have attempted to do likewise by running long leads from the receiver to a speaker arranged in the garden. The arrangement, however, has proved to be unsatisfactory, inasmuch as the volume drops very considerably as soon as the speaker is connected to the ends of the extension wires. What is the trouble?

F. P. L. (Woking).

The long-leads between the receiver and the loud-speaker give rise to a considerable drop in voltage between the H.T. and the anode of the last valve in your set. This accounts for most of your trouble and can be remedied by intro-

ducing a choke-filter output circuit in your set between the output of the last valve and the extension leads to the speaker. We would suggest you make up a unit for attachment to your set inside the house. The Universal Output Unit, blueprint AW153, will be a suitable unit. To add the necessary components inside your receiver, disconnect the wire now joined between the anode of the last valve and the negative loud-speaker terminal. Now connect the anode of the valve to one terminal of an output choke. The other terminal of this choke should be connected to the positive H.T. terminal supplying current to the anode of the last valve. In other words, this other terminal should be connected to the existing loud-speaker positive terminal. Now take another wire from the anode of the last valve and connect it to one terminal of a 2-microfarad fixed condenser. The other terminal of this fixed condenser should be connected to the L.S. terminal.—Ed.

A Lightning Fluke

SIR,—I had the "1931 Ether Searcher" working on a recent Saturday when a thunderstorm took place. About two o'clock the lightning struck the aerial and caused a huge blue flame at the earth rod, but the set is quite O.K. H. B. (E.C.1).

Using a Pentode

SIR,—I have constructed the "Everybody Three" receiver, and it has certainly exceeded all expectations. I am using a small power valve with adequate H.T. supply and I have proved that I am overloading the grid of this valve. In view of this, should I use a pentode valve, or should I get a larger power valve?

S. T. K. (London, S.W.).

If you are already overloading the small power valve, then a pentode is not to be recommended. Granted that it has a larger-grid swing than a small power valve, there is still the possibility that even the grid of this valve will be overloaded. We suggest that you use a super-power valve of the ordinary type. A super-power valve will be somewhat more economical in working than a pentode valve.—Ed.

Universal Language

SIR,—It always gives me pleasure to see Esperanto mentioned in any wireless journal, because Esperanto and wireless should be inseparable.

I cannot understand, however, why "Thermion," in a paragraph nearly full of sound common sense in your issue of February 21, should refer to Esperanto as a "so-called universal language" and "too academic" to carry much weight with the ordinary man."

He has not even the excuse of men who, when telephones first came into use, said, "We will use them when other people do."

If he were to learn Esperanto (an easy thing for him to do) it would serve him now from Iceland to Roumania, from China to Spain, from Russia to Brazil and in between.

"Academic!" When I commenced to learn Esperanto, in 1903, I was a farmer, and now am no more than a building society agent, yet I have at international congresses conversed with men and women of from thirty to forty different nationalities.

F. C. R. (Keighley).

**A NEW W.B.
PERMANENT MAGNET
MOVING-COIL SPEAKER
FOR £4-10-0**

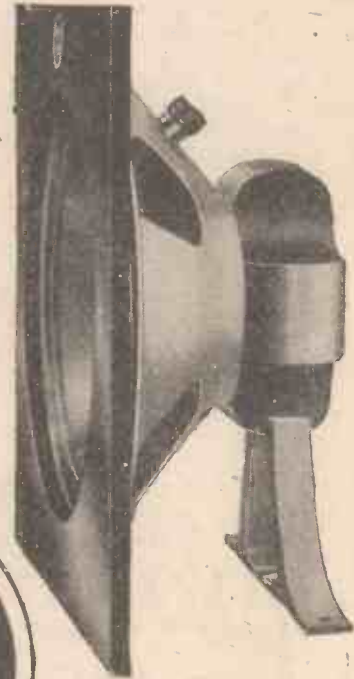
So sensitive that any 2- or 3-valve set will drive it—no mains or batteries needed.

Identical with the very successful Model P.M.1 introduced earlier this season—only the Darwin Sheffield-made Cobalt steel magnet is not quite so massive.

Hear this new W.B. Moving-Coil Speaker at your dealer's. Ask him for the free colour-folder or write to us direct.

The standard model has a low-resistance winding. A multi-ratio step-down transformer must be used between set and speaker, suitable ratios for the average valve set being between 15 and 25/1.

Made by the Makers of the famous W.B. Cone Speakers, Switches and Valveholders.



Type P.M.2. Chassis completely assembled with 11½ in. x 11 in. baffle board.

£4 : 10 : 0

A double-ratio step-down transformer can be supplied attached to the Speaker for 15/- extra.

Whiteley Electrical Radio Co., Ltd., Radio Works, Nottingham Road, Mansfield, Notts.
Irish Free State Distributors: Kelly & Shiel, Ltd., 47 Fleet Street, Dublin.

What are the Sound Waves Saying?

I THOUGHT I heard the sound of Spohr the other night, it set me wondering why he has been so neglected. It may be that his works are out of date now, or that they have dated rather badly. I think, all the same, that we might do well to have a little more of him, for his music was of a very refined type. He was a refined man, and a very great violinist. He knew Beethoven in Vienna and seems to have been much amused at his queer mannerisms.

Spohr's playing attracted great attention; well it might have done, for he practised ten hours daily for many years. His technique was superb and his tone unapproachable. He was a strange character. A huge hulk of a man, he was one of the ugliest beings in Europe one would think, judging from his pictures, but everywhere he went he was adored. He was the first, incidentally, to use a baton for conducting the Philharmonic Concerts in London, an action that brought him into conflict with the management at first, but which gained him a greater reputation than ever subsequently.

The story I like best is of when he went to Erfurt to see as much as could be seen of the famous Congress of Princes, convened by Napoleon, then at the height of his career. Spohr seems to have been very anxious to see Napoleon, and hearing that a French troupe of players were performing nightly to the royal party, he went to the theatre to buy a ticket. It seems, however, that only the privileged few were allowed to attend. Spohr was very disappointed but, as he had his violin with him, decided to see if there was a vacancy in the orchestra. Again he was disappointed on being informed that there were no vacancies for violinists. Spohr contived to get friendly with the second horn player and managed to persuade the gentleman to take an evening off, saying that he would be pleased to play for him. "You will have to lend me your horn, though," he said. "I have not brought mine." That was true enough, for Spohr knew no more about playing a French horn than you or I. He borrowed the instrument and the part he had to play. Seeing that the latter contained chiefly holding notes, Spohr realised that he had nothing to fear from the actual music so long as he could manage to make suitable noises on the instrument. He practised all day, making some very disagreeable noises, and turned up at the theatre that evening with his lips black and swollen from the unaccustomed strain. On entering the band room he espied a notice to the effect that as the royal visitors were occupying the front rows of the stalls the bandsmen were to sit with their backs to the audience and on no account to turn round. This was a trifle disconcerting, but as there were a few minutes to spare Spohr went out and bought a small mirror. This he placed on his desk and thus had an uninterrupted view of Napoleon and his friends for the whole evening.

Spohr wrote an amazing quantity of excellent music, chiefly for the violin. He and

his wife toured a great deal and very successfully; she was an admirable harpist. The effect of the violin with a harp accompaniment took London by storm.

Spohr's oratorio, *The Last Judgment*, has always been popular. It is a perfectly beautiful work and ought to be broadcast more than it is. It is very pleasing occasionally to listen to the work of a man who never proceeded by tone if he could find a semitone to suit his purpose.

WHITAKER-WILSON.

FOR GRAMO-RADIO USERS—

— Surface noise in gramophone reproduction is mainly due to irregularities in the grain of the record.

— Scratch can to an extent be minimised by choice of needles and the weight distribution. Some pick-ups with their carrying arms press far too heavily upon the record. A balanced carrying arm is to be preferred. Correct tracking is essential.

— The output in volts of a pick-up varies with the type of needle used, and so does the quality. For a given pick-up the user should find by experiment the best sorts of needles. Usually there is power to spare, so that medium-tone needles may be used.

CLEAN SOLDERING

CLEANLINESS saves much bad temper and language when there is a job of soldering to be done. One should always have a piece of soft cloth close at hand, and use it to wipe down each joint whilst the flux is still liquified by the heat. This prevents the usual greasy deposit from forming during cooling, and saves the joint from being the happy hunting ground for all sorts of dirt, dust, and fluff which is not easily dislodged once it gets a footing. So far as appearance is concerned this little precaution will often make all the difference between a dirty joint and one in which you can take an honest pride.

M. B.

THE OSRAM P2 VALVE

IN connection with the General Electric Co., Ltd., announcement on page 453 of "A.W." No. 457, it is stated that the Osram P2 valve demands "the maximum expenditure of current." This is, of course, a printer's error, and minimum expenditure is, naturally, implied. The P2 valve is capable of dealing with large grid swings and of giving a large output although taking the very minimum amount of current. This valve is, of course, a two-volter but, as is clearly shown by the characteristics, is capable of giving results comparable with a six-volt super-power valve and, of course, the economy in current consumption is appreciable. A slightly smaller valve is the Osram LP2, which is the first power valve to attain so high an amplification factor as 15 for an impedance of only 3,900 ohms.



FRIEIE BLUE PRINT!

SIMPLE SCREENED-GRID RECEIVER

This receiver has been designed in response to the many requests received from constructors who have built our "Imperial Three" and would like to build a Screened-grid Receiver incorporating our T.31 tuner.

The receiver is extremely simple to construct —without any complications, and has a high degree of selectivity with a long range. There is no coil changing and surprising results will be obtained from this instrument.

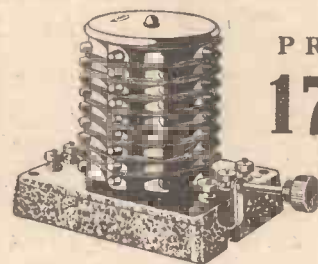
This blueprint will be sent free, but we should esteem it a favour if two 1d. stamps are enclosed to cover postage.

It is approximately full-size and is laid out for easy wiring. Write Now.

UNIVERSAL DUAL - WAVE TUNER

(Type 31)

This tuner can be incorporated in all receivers and greatly increases the selectivity of any set, cutting out all interference. It has had exceptionally good press reports and is accepted as the most efficient tuner possible.



PRICE
17/6

THE BINOCULAR H.F. CHOKE was selected by "Radiolog." It is highly efficient and should be used wherever it is necessary to obtain the maximum choking effect, such as in choke grid H.F. inter-valve coupling or following H.F. Amplification.

TYPE D.X.3

Inductance .. 200,000 mh.
Self Capacity .. 1.6 m.mfd.
D.C. Resistance 1,400 ohms.

PRICE 6/-

TYPE D.X.2

Inductance .. 40,000 mh.
Self Capacity .. 1.2 m.mfd.
D.C. Resistance .. 450 ohms.

PRICE 4/-



WatNet

WRITE TO—
WATNET WIRELESS CO., LTD.;
Imperial Works, High Street, Edgware.
Telephone: Edgware 0323.

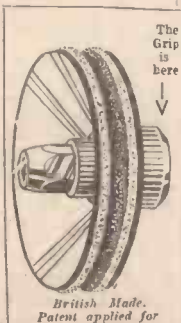
SPECIFIED FOR
The "COMPANION"
 by the designers, to
 ensure pure, clear-
 cut reproduction.
The TONAX CHUCK



TONAX is the Chuck with Patented Split-End Taper and Clamping device which grips firmly AT THE BACK of the Cone definitely cutting out all "chatter" and "rattle." Tonax vastly improves quality of reproduction and increases the volume of all cone loud-speakers.

Price Single Cone Type 1/- Double Cone Type 1/8 From all Dealers or Post & Packing Free, 2/- extra

Write Dept. A
GARRATT STORES,
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British Made. Patent applied for

"RED DIAMOND" SWITCHES

TRADE MARK
RED DIAMOND
 Robust Construction. Definite 'on' and 'off' positions. No shaking. Perfect contacts. Large terminals for easy fitting.

By Post
 RD39 2 point ... 1/3 1/6
 RD49 " dead spindle 1/3 1/6
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 RD47 " dead spindle 1/6 1/9
 RD44 Radio-gram 3 point ... 2/- 2/3

"RED DIAMOND" DETECTOR

As specified for B.B.C. Official Crystal Receiver.
 Can be mounted on brackets or through panel. Once set always ready. Not affected by vibration. Each one is tested on broadcast before dispatch.

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Meters, Switches, Receivers, Valves, Spark Sets, Morse Keys, Buzzers, Transformers, Chokes, Telephones, Wavemeters, Compasses, Meggers, Condensers, Mikes, Transmitters, Hydrometers, Charging Dynamos, Radiators, Blowers, Telescopes, are all offered at sacrifice prices.

If you cannot call send stamped envelope for Sale List. Prompt Delivery by Post or Rail, but do not delay as we are clearing fast.

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BROADCAST TELEPHONY

Broadcasting Stations classified by country and in order of wavelengths. For the purpose of better comparison, the power indicated is actual energy.

Kilo-Metres	Station and Call Sign	Power (Kw.)	Kilo-Metres	Station and Call Sign	Power (Kw.)	Kilo-Metres	Station and Call Sign	Power (Kw.)
GREAT BRITAIN								
25.53	11,751	15.0	285.4	1,051	2.0	410	721	10.0
200	1,500	0.16	295	1,016	0.5	1,250	240	0.6
242	1,238	1.2	304.3	986	35.0	NORWAY		
201.3	1,148	08.0	313.8	956	0.5	235.5	1,275	0.5
288.5	1,040	1.2	317.3	945.4	1.5	241	1,244.5	0.5
288.5	1,040	0.16	328.2	914	3.0	364	824	1.0
288.5	1,040	0.16	329.5	910.3	1.2	365.1	821.7	0.7
288.5	1,040	0.16	345.2	869	15.0	453.2	662	1.5
288.5	1,040	0.16	370	810.5	0.5	493.3	668.1	1.2
288.5	1,040	0.16	385	779	15.0	589.0	508.8	0.8
288.5	1,040	0.16	447	671	2.0	1,082	277.2	75.0
288.5	1,040	0.4	466	644	2.3	POLAND		
288.5	1,040	0.16	1,445.7	207.5	15.0	214.2	1,400	1.9
288.5	1,040	0.16	1,725	174	17.0	234	1,283	2.2
301	995	1.2	GERMANY			312.8	959	1.5
300.9	968	1.2	31.38	9,560	15.0	368.1	815	20.0
356.3	842	45.0	216.3	1,387	1.7	338.1	887.1	1.9
370.4	797	1.2	219	1,309.7	0.6	381	738	21.0
398.9	752	1.2	227	1,310	0.6	408	784	16.0
470.2	626	38.0	227	1,319	0.6	1,411.8	212.5	158.0
470.2	626	38.0	227	1,319	0.6	PORTUGAL		
1,554.4	193	35.0	232.2	1,292	0.31	240	1,250	0.25
AUSTRIA			239	1,250	0.3	ROMANIA		
218	1,373	0.4	248.4	1,217.2	0.3	394	767	10.0
240	1,220	0.6	252.4	1,217.2	5.0	RUSSIA		
284.7	1,053.6	0.6	250.3	1,184	2.3	426.3	703.7	4.0
352	851	9.5	280.8	1,157	0.3	720	416.6	20.0
453	666	0.6	276.5	1,112	75.0	800	375	20.0
517	581	20.0	283.6	1,085	0.6	824	364	25.0
BELGIUM			283.6	1,058	0.6	937.5	320	25.0
206	1,456	0.3	283.6	1,058	0.6	1,000	300	40.0
206	1,456	0.4	283.6	1,058	0.6	1,052.0	285	15.0
216	1,391	0.25	283.6	1,058	0.6	1,115	259	40.0
216	1,391	0.25	283.6	1,058	0.6	1,200	250	25.0
BULGARIA			283.6	1,058	0.6	1,304	230	105.0
319	941	1.0	283.6	1,058	0.6	SPAIN		
CZECHO-SLOVAKIA			283.6	1,058	0.6	251	1,193	8.0
263	1,139	11.0	283.6	1,058	0.6	340	860	8.0
279	1,076	14.0	283.6	1,058	0.6	368	825	1.5
293	1,022	2.5	283.6	1,058	0.6	424	707	2.0
341.7	878	34.0	283.6	1,058	0.6	453	662.2	0.5
487	617	5.5	HOLLAND			SWEDEN		
DENMARK			31.28	9,599	30.0	230.3	1,304	0.75
281	1,067	1.0	290	1,004	8.5	257	1,166	15.0
1,165	257.5	10.0	290	1,004	8.5	293.8	1,004	0.65
ESTONIA			290	1,004	8.5	322	932	15.0
290.1	1,013	0.7	290	1,004	8.5	436	689	75.0
403	648	0.5	290	1,004	8.5	542	554	15.0
FINLAND			290	1,004	8.5	770	389	0.75
221	1,355	15.0	290	1,004	8.5	1,250	240	0.75
453.2	662	15.0	290	1,004	8.5	1,348	222.5	40.0
1,796	167	54.0	HUNGARY			SWITZERLAND		
FRANCE			25.4 and 80	Rome (3RO)	9.0	244.3	1,227	0.5
222.0	1,316	1.0	296	1,013.4	8.5	403.5	743	1.1
235.1	1,275	1.0	312.8	959	1.5	403.5	743	25.0
237.2	1,263	2.0	332	903	1.7	459	653	0.75
ITALY			441	680	75.0	680	442	0.6
240.6	1,247	0.6	453	662	0.2	700	395	1.5
249	1,205	0.5	501	599	8.5	TURKEY		
256	1,172	1.0	ICELAND			1,242	241.5	5.0
265	1,130	15.0	1,200	255	21.0	1,538	195	20.0
272	1,103	1.2	IRISH FREE STATE			YUGOSLAVIA		
285.7	1,080	0.5	224.5	1,337	1.5	306	980	0.7
LATVIA			413	725	1.5	431	696	3.0
525	572	13.0	LITHUANIA			574.7	523	2.8
1,935	153	7.0	25.4 and 80	Rome (3RO)	9.0	NORTH AFRICA		
300.4	832.4	13.0	296	1,013.4	8.5	TUNIS		
NORTH AFRICA			312.8	959	1.5	Radio Maroc		
TUNIS			332	903	1.7	(Rabat)		
Radio Kasbah			441	680	75.0	Tunis Kasbah		
Radio Tunis			453	662	0.2	10.0		
Radio Tunis			501	599	8.5	0.6		
Radio Tunis			*testing on 524 m.			0.6		

LOUD - SPEAKER RATTLE

RATTLE is usually caused by trying to get too much out of the loud-speaker. If the adjusting screw at the back of the instrument is turned so as to reduce the clearance between the armature and the pole-pieces, the sensitivity of the speaker increases. One then gets louder signals for a given input, but any extra strong note will almost certainly cause the armature to strike against the magnet. The remedy is to turn back the adjusting screw a little. The slight loss in signal strength is more than compensated by freedom from chatter. Sometimes, of course, rattle is caused by a screw which has worked loose under vibration. If so, the offender can usually be traced without much trouble and tightened up.

M. A. L.

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.

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.

Queries cannot be answered personally or by telephone.



RADIOGRAMS

TWO of the best known of broadcasting choirs in Scotland are recruited from shipyard workers. The Hall Russell Choir, which is often heard from Aberdeen, is one, and the other, the Linthouse Choral Society whose membership consists entirely of singers employed by Messrs. Alexander Stephen & Son, Ltd., the Glasgow shipbuilders.

The German broadcasting authorities are conducting a postal census of listeners to ascertain what types of receivers are in most popular use.

The Italian National Broadcasting Committee has decided to construct two new stations, one at Florence and the other at Bari. The committee also decided to increase the power of the Milan and Genoa stations to 60 and 10 kilowatts respectively. The new broadcasting-station now being constructed at Palermo is expected to be completed and working this autumn.

For experimental purposes the Vienna programmes will shortly be transmitted on both 520 metres and a wavelength above 1,000 metres. The Ravag authorities are anxious to install a high-power station to provide an adequate service to Austria and every effort is to be made to find a favourable position in the long-wave band.

CTIAA, Lisbon, a private Portuguese broadcasting station, now transmits a short programme every Saturday, Sunday, and Wednesday evening between 10 p.m. and midnight, G.M.T., on 283.6 metres. Announcements are made in Spanish, Portuguese, English, French, and German, the call, *Posto Amador CTIAA, Lisboa*, being given between items.

A dispatch from Bremen states that the Reichspost has just opened a radio-telegraph service for giving medical advice to ships at sea which carry no doctor.

Radio sets in operation throughout Canada totalled 444,676 at the close of 1930, according to a bulletin issued by the Canadian Pacific Railway. A total of 1,351 broadcasting licences were issued by the Canadian Government in 1930. These included 679 amateur transmitting licences, 271 ship-commercial, 210 private-commercial, 44 public-commercial, 84 experimental and 12 miscellaneous.

On a recent trip from New York to Glasgow, the surgeon of the Anchor Liner *Cameronia* responded to two mid-Atlantic wireless calls for medical assistance. In the first case, the commander of the *Manchester Merchant* was suffering from an internal complaint, and, from the symptoms described, treatment was prescribed at a distance of 200 miles.

To assist research work at the Warsaw Technical Radio Institute which has done a lot of valuable work on behalf of Polish broadcasting, Philips have presented the institute with six water-cooled high-power valves which operate on an anode voltage of 12,000 volts.

FYA is the call sign of the new French short-wave high-power colonial transmitter; it will start up on the opening day of the French Colonial Exhibition at Vincennes (Paris) early in May. The broadcasts are to be carried out by the *Fédération Nationale de Radiodiffusion Coloniale* on a wavelength of 40.730 metres.

It is reported in Paris that a French syndicate has secured the monopoly for the broadcasting system in the Grand Duchy of Luxemburg. Steps will shortly be taken to start work on the construction of a 100-kilowatt transmitter near the capital city.

The League of Nations short-wave transmitter, recently erected in the neighbourhood of Geneva, will shortly be brought into operation. It will work on 15 metres during daylight hours and on 35 metres at night. A further channel (18 metres) is to be held in reserve for emergencies.

Providing authority can be obtained from the French Ministry of Posts and Telegraphs, Radio Béziers proposes to increase its power to 15 kilowatts in the aerial, and later to 25 kilowatts, in order to permit special broadcasts for the purpose of advertising French wines.

Station WGY (New York, Schnecktady) has installed a new film recorder to help to train announcers, to enable radio singers to hear how their voices sounded at auditions and to find imperfections in the programmes that escape notice at the rehearsal.

The transmissions from Radio Algiers are to be frequently interrupted in future so that medical bulletins can be transmitted giving instructions for the combating of malaria.

By 1933 Soviet Russia expects to have 13,000,000 radio receiving sets in use for educating their masses under the new five-year plan. By the same time the Soviet expects to have completed its sixty new broadcasting stations, making a total of more than one hundred broadcasting stations sending out Soviet propaganda.

A bill authorizing the expenditure of £29,400 for the erection of two new experimental radio stations by the United States Bureau of Standards has been passed by Congress.

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Postcard Radio Literature

GET THESE CATALOGUES FREE

Here "Observer" reviews the latest booklets and folders issued by well-known manufacturers. If you want copies of any or all of them FREE OF CHARGE, just send a postcard giving the index numbers of the catalogues required (shown at the end of each paragraph) to "Postcard Radio Literature," "AMATEUR WIRELESS," 58/61, Fetter Lane, E.C.4. "Observer" will see that you get all the literature you desire. Please write your name and address in block letters.

An R.I. Stenode

It is good news that R.I., Ltd., have taken up the Stenode Radiostat. They have produced a fine seven-valve arranged on Stenode lines and housed in a console-type walnut cabinet, complete with mains apparatus and a moving-coil speaker. If you want a set which is absolutely ultra modern and capable of dealing with modern wavelength conditions, then you should write, through my catalogue service, for a copy of a folder just issued, describing this model of the Stenode. **211**

Choosing a Battery

Just now you are probably searching round to see what can be done with your old portable or transportable set to make it work well during the summer. Take my tip and bear in mind the high-tension. Ever Ready have just produced a chart, which you can have free, giving suitable battery sizes for every popular commercial portable, transportable and suitcase set. This will certainly help you in your choice of H.T. **212**

A Cheap Transformer

The new low-priced Ferranti AF8 transformer is getting to be well-known because it gives a performance of a kind not usually associated with a transformer selling at only 11s. 6d. If your set distorts because of an old transformer then why not write for a free copy of a leaflet, explaining how to use this new high-quality transformer to the best advantage. **213**

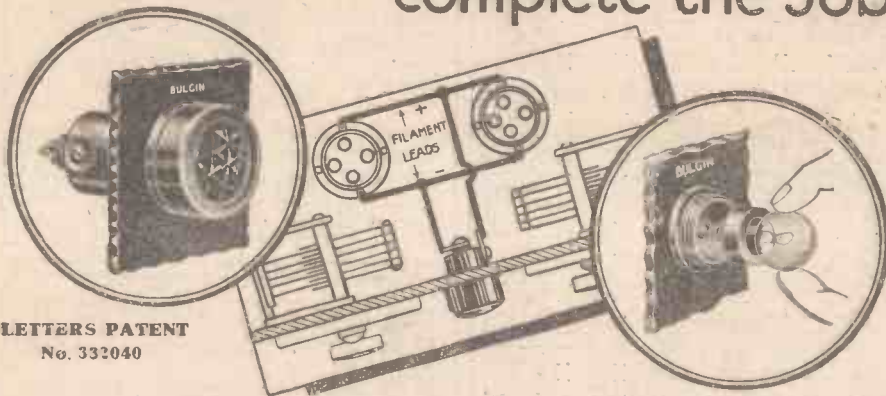
A Non-spill Accumulator

I learn that a reduction has been made in the price of the Gecophone 2-volt 50-ampere non-spill accumulator suitable for many portable and transportable sets and as used in the Gecophone screen-grid four receivers. Particulars of this very handy accumulator can be obtained through my catalogue service. **214**

Coil News

I have just received a fine book on coils from Colvern Radio. This has some very fine illustrations of every type of Colvern coil and the information given is of the fullest possible kind. Every coil user should have this book for Colvern coils are available for practically every type of receiver. **OBSERVER. 215**

Two Simple Connections complete the Job



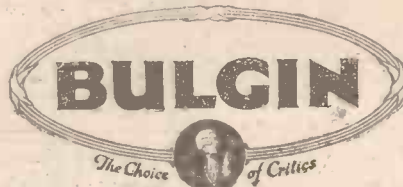
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Lodestone Four (HF, D, RC, Trans) .. WM193
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Five-Point Four (SG, D, RC, Trans) .. WM216
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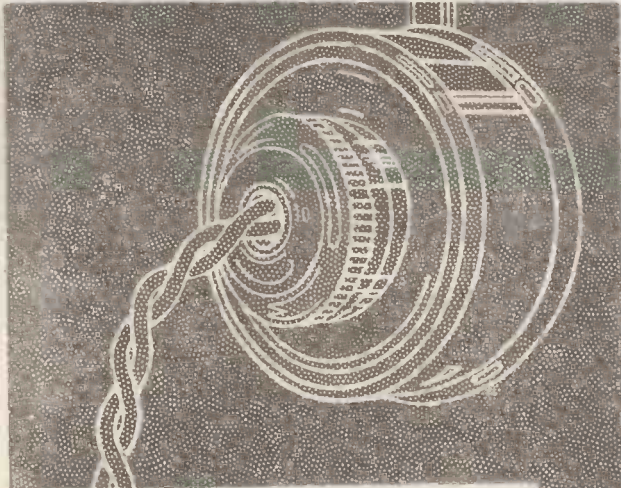
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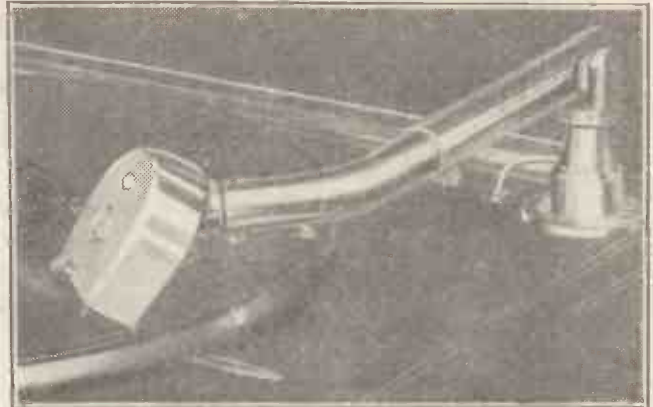
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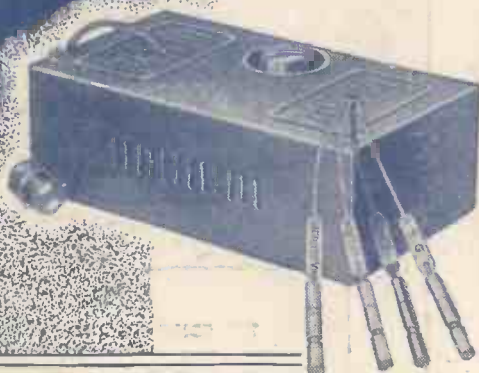
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