

THE "OVERSEAS" TWO—FOR EMPIRE PROGRAM

# Popular Wireless

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No. 551. Vol. XXII.

INCORPORATING "WIRELESS"

December 24th, 1932.



*How to*

Also This Week:  
**RECOMMENDED WRINKLES**  
□ □  
**SHORT-WAVE HOOK-UPS**  
□ □  
**BEHIND THE SCENES OF THE KING'S BROADCAST**  
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□ □ □

**MY SET ON YOUR AERIAL**

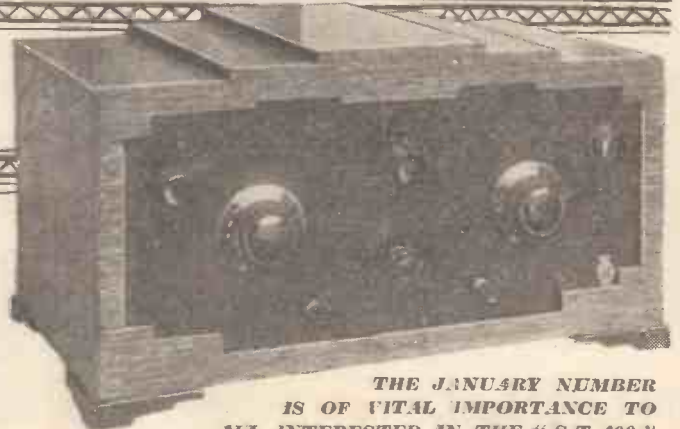
**DIFFERENTIAL ANODE  
COUPLING**

□ □ □

**FROM MY ARMCHAIR**

□ □ □

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# POPULAR WIRELESS



**THE FIRST AND FOREMOST RADIO WEEKLY**  
 Scientific Adviser: Chief Radio Consultant:  
**SIR OLIVER LODGE, F.R.S. Capt. P.P. ECKERSLEY, M.I.E.E.**  
 Editor: **N. F. EDWARDS.**  
 Technical Editor: **G. V. DOWDING, Associate I.E.E.**  
 Assistant Technical Editors: **P. R. BIRD and K. D. ROGERS.**



*The Paper that Made Wireless Popular*

**XMAS WISHES  
 UNIQUE DEVOTION  
 MOVING AGAIN?  
 CASALS THE CATALAN**

## RADIO NOTES & NEWS

**A HEALING VOICE  
 COLLECTING NOISES  
 DRUM SIGNALS  
 POT POURRI**

**"Ariel's" Grand Christmas Wishes.**

**A** HAPPY CHRISTMAS—to the lonely DX fan as he sits aloof from society, lost in rapt auditory contemplation of the illimitable ether; to the persevering home constructor, baffled though he may be by an obstinate baffleboard; to the ordinary listener—may he get the programmes which he likes; to the would-be radio constructor—let him start the new year with a brave heart and a "P.W." circuit; to all Britons overseas, especially our esteemed correspondents; to the fellow who during the year has kept us *au fait* with that bedstead; and—

**The Greeting Continues.**

**T**o the jolly schoolboys who write us such jolly letters; to the jolly old boys who become red-hot "fans" at the age of seventy odd—may their beards elude the gluepot! To the Welsh, the Scots, the Irish, who provide us with our jokes and no offence meant or taken; to all readers in the U.S.A.—may they never be taxed like we are; to the B.B.C. and all the bands, orchestras and artistes who serve it and us; to the fellow-fans who are out of work or otherwise down on their luck—"Ariel" wishes a Happy Christmas and better luck next year.

**Unique Devotion to a 3-Valver.**

**C**ONSIDER the unparalleled devotion of a writer to the "Nottingham Evening Post," who relates how he was interfered with by a motor in a garage next door, and then by a cinema five-hundred yards away. "Rather than scrap [my set]," he says, "I removed to another district."

He signs his letter, "Modest Three-valver," but he really ought to be a proud man. He is the fanniest fan on earth. Nothing like it has been heard since Marconi braved a Newfoundland winter in order to receive three dots from Cornwall on a coherer detector.

**Moving Again?**

**B**UT a thought strikes me. One day Mark Twain was seen by a friend, lounging in the street with a cigar-box under his arm. "What," cried the

friend, "not moving again, Mark?" Well, what has that to do with radio? Nothing. But it's an afterthought about the fellow in the preceding paragraph.

**Proper Outlook on Radio.**

**A**ND talking of interference, here is a refreshing report from Czecho-Slovakia. At a Kosice court a man—a dentist, I believe, though he retained enough humanity to like radio—sued another, a man of business, because the latter's set interfered with his (the torturer's) reception.

In ordering the business man to remove the cause of the trouble within two weeks the beak said, in Czecho-Slovakian, that radio had become a normal necessity of life and is regarded as being as essential as electric light. "Oh, upright judge!"

**The Season's Greetings.**

To every reader of "P.W."—from stalwarts who brought the first number before broadcasting began, to the very newest recruit to our happy family—the Editor and Staff of "Popular Wireless" proffer their best wishes for

**A Happy Christmas.**

**Casals the Catalan.**

**E**XTRAORDINARY! This rage of nationalism! When I lived in Spain and met natives of Catalonia I used to have that Irish Home Rule feeling, because I was everlastingly being assured that a Spaniard was a Spaniard but a Catalan was a Catalan—and no "connection with next door."

Barcelona, home of the Catalan movement, with, 'tis said, the finest opera house in Europe, owns Pablo Casals as one of its staunchest sons—and he has his own orchestra there. Now that Catalonia has become a nation, Casals wishes to be called Pau, not Pablo. It's very important, so don't overlook it, please.

**Radio Society Notes.**

**T**HE Thornton Heath Radio Society (Secretary: Mr. C. H. Piper, 55, Fairlands Avenue, Thornton Heath) holds its meetings at St. Paul's Hall,

Norfolk Road, Thornton Heath, every Tuesday at 8 p.m. all the year round, and wants some more members. Write to Mr. Piper, ye who feel, like Dr. Johnson, "clubable."

Again, the Smethwick Wireless Society, whose headquarters are at the Crown Hotel, desires new good companions, and applicants are invited to write to the Hon. Sec., Mr. E. Fisher, M.A., 33, Freeth St., Oldbury, nr. Birmingham.

**Car Wireless.**

**T**HE Prince of Wales has given a fillip to car radio by having one of his buses fitted with a set. The gear is actually built into the car, being concealed in a case under the rear seat foot-rests. The aerial is hidden in the roof. A volume control is worked automatically, so that reception is assured during "screened" areas, and is modified for good areas. A second loudspeaker is provided for the chauffeur—a princely idea!

**The Healing Voice.**

**I** WISH that I had listened to the singing of Madame X. d'Orso recently for her voice is alleged to be "healing." This lumbago is the very dickens!

Did any of you cure your "cows id der doze" that night? A Swiss doctor is said to liken

this lady's singing to the casting out of devils.

Yes, I had a landlady in Gravesend, years ago, who could cast out Lucifer and all bad angels with her voice and still keep a bit in hand to paralyse a policeman or two.

**Have You Got a "C.H. P.R."?**

**T**HOSE letters stand for the "Complete Handbook of Practical Radio," which we have produced by herculean labours, and are giving away at sixpence a copy, the sixpence being required merely to satisfy our auditors. You know what auditors are? Quite so!

This book, despite its paper covers, covers a multitude of facts, and is as near to the point as the business end of a tin-tack.

It is practical radio written large by practical radio men.

(Continued on next page)



# ARIEL CONTINUES HIS RUNNING COMMENTARY ON RADIO

Ask any old bookseller how many copies of it he has sold—and then prove that he is wrong by buying one more. Treat yourself to it for Christmas, and have a radio New Year.

## Water, Water Everywhere.

OUR "dry" B.B.C.! I have been looking through the B.B.C.'s technical description of Broadcasting House, which is crammed with charming statistics about the number of tons of air (260) which pass hourly through the "conditioners," and the number of units of electricity (5,300) consumed daily, etc. But the thing which leaves me



prostrate with amazement is that the B.B.C. at home consumes 193,000 gallons of water (real H<sub>2</sub>O) per day. Why, even allowing the Director-General six baths per diem, that leaves gallons and gallons for Len. Henry, Stainless Steve, Harry Lauder, Val Gielgud and A. J. Alan and all!

## What's in a Name?

THEY are still looking for a word to describe the television patron, and following the line of thought which produced "listener"—horrible word! reminiscent of the butler and the keyhole—they have in a moment of inspiration hit on the highly original "looker."

I do not admire it. It rhymes with cooker, and, moreover, I am not even sure that there is such a word in English. I should prefer "seer."

A man may look but fail to see much—as in television. But a seer! That word would invest the television fan with the dignity of Old Moore.

## The Noise Collector.

MR. MALCOLM FROST, who has gone hawking records round the Empire for the B.B.C., is to collect "noises" in his spare time; these noises we may hear when they are incorporated in broadcast plays. The mental picture which I get is amusing. I see Mr. Frost at the Pyramids trying to record an Arab dragoon making a noise like *bak-sheesh*. I see him taking a record from an angry camel—for use when a continental grand opera fails—and several of hyenas. (Applause during "non-stop variety"?) And I see him asking a tiger, through a long-distance megaphone, "Pretty puss! Growl for uncle!"



## What's the Answer?

WHEREAS we have authority for stating that the number of German listeners has dropped by 42,000 since September, nevertheless we learn that the radio trade in Germany is enjoying

a boom and that there is expected to be an output of 600,000 sets this season. The only explanation of this which occurs to me is that Germany has successfully solved the export trade problem. But where are the receivers going to?

## Ultra Short-Wave Television.

TRANSMISSIONS of television by the Baird process are now being sent out on Wednesday and Friday from 3 p.m. to 5 p.m. on the 7.3-metre B.B.C. transmitter at Broadcasting House.

These transmissions are entirely experimental, the subjects transmitted being, for the most part, the artistes rehearsing in the television studio in preparation for the regular television transmissions.

The Baird Company will welcome any

orators, and so on. I think that here is a chance for someone to reach the heart of us listeners. Let's hope that they won't spoil it. Opening day, January 6th, London Regional.

## Drum Signals.

THE mysterious way in which natives of Africa can send news over great distances by sound has always been a source of interest to me, but I have never found out how the signalling is done. I know that hollow tree-trunks, drums, etc. are beaten, of course, but the language of those transmitters is a secret. I recently heard a demonstration by a Belgian Congo native, who used primitive drums. The operator beat the drum with a stick held in the right hand, and with the palm of his left hand. Whatever the message was, there was only one code form used, so far as I could follow the beats—hand, stick stick; hand, stick stick, and so on. I believe that one day I shall have to pour half a bottle of whisky down one of those chaps and make him divulge his methods.



## SHORT WAVES.

Feverish Activity at Broadcasting House. 7.45. A Flue recital by Edith Penville.—Wireless Programme.

### THE OTHER LICENCE.

Your wireless must be licensed,  
Says the G.P.O. to-day;  
But there's too much licence given,  
To the set across the way!  
—"Pictorial Weekly."

Adam: "What on earth is the idea of these kilocycles instead of metres in the wavelength?"

Eve: "Goodness knows—unless it means the number of times you twiddle the knobs to tune in."

Professor G. B. Toshiwal, of Allahabad, is hoping to be able to kill locusts and other pests by wireless. It would be interesting to know what sort of programme he thinks will be the most deadly for his purpose.—"Punch."

A naturalist declares that bees are stone deaf. We understand, however, that his is not the only reason why they don't listen in.

Mother (to youthful owner of one-valve wireless receiver): "Bit 'opeful, ain't yer, expectin' to get 'olland on one bulb?"—"Punch."

## Ireland Calling.

THE Editor of the "Irish Radio News" would be glad to have reports on the transmissions from the new Irish Free State station at Athlone. The test transmissions usually take place at 10.30 p.m. nightly, on 413 metres.

This station will ultimately use a power of about 80 kw. Anyone who is interested in the voice of the Irish Free State may perhaps oblige our contemporary.

## More About the Nigger Minstrels.

THE B.B.C., who are forming a nigger troupe, have decided to call it the Kentucky Minstrels. I hope that there will be no jealousy registered by Alabama.

Doubtless we shall hear "My Old Kentucky Home" on several occasions. Harry Pepper is organising "budders," and promises us all the time-honoured features such as the bones, corner men, stomp

## Pot Pourri.

TALKING of codes, Sir T. Purves, Engineer-in-Chief of the Post Office, has predicted that for this country, the Morse operating system of telegraphing is doomed, owing to the advent of the teleprinter.

A radio service has been opened between the League of Nations' station in Geneva and Japan. A chance for short wave Morse, readers.

A man in London has been heard using the radiotelephone service to America, at £2 a minute, to make love to a girl in Philadelphia. Possibly he regards the telephone fees merely as investments!

## Brief Rejoinders.

T. N. T. (Galashiels).—Jeremy, I do not like your initials! I do not think that an English version of Burns would be suitable for broadcasting from Daventry Nat.

Keep his poems for Scotsmen. L.R.N. (Arbroath).—No, sir. There is no means under the sun of running a valve-wireless receiver without the expedition of energy. You can derive energy direct from the sun, free of charge, but it's difficult to apply it to a radio set. I advise you to patent a valve-exhausting machine and so get something for nothing. S. F. (Gloucester).—It is nothing to do with radio—but you are correct. A Scotch turkey is a borrowed sausage with a feather stuck in it.







# THE "OVERSEAS" TWO

## VALVES TO CHOOSE

	Detector	Output
Mullard	P.M.1 H.L.	P.M.2 A
Cossor	210 H.L.	220 P.A.
Mazda	H.L.2	P.220
Marconi	H.L.2	L.P.2
Osram	H.L.2	L.P.2
Tungram	H.210	P.220
Lissen	H.L.2	P.220
Eta	B.Y.1814	B.W.604
Six Sixty	210 H.L.	220 P.A.
Clarion	H.2	P.2
Micromesh	H.L.B.1	P.B.1

## OUTSTANDING FEATURES

All Continents Can Be Obtained—  
Short Waves—Only Two Valves—  
Inexpensive to Run—Long Satisfaction and Service.

will be quick to realise its many good points and, I hope, equally quick in sampling them in practice. To those who have never been below the 200-metre mark, I say, give the short-waves a trial, and you will not be disappointed.

### All Within Your Grasp.

Under favourable conditions, America, Australia and the furthestmost corners of the earth are within your grasp. All the way from 20 to 80 metres, the approximate range of the set, you will find a host of transmissions, every one bringing its tale of distant lands and strange peoples.

Short-wave listening is the most fascinating pastime in the world, and provided you

## ACCESSORIES TO USE

**BATTERIES.**—L.T. Accumulator: (Oldham, Ediswan, Pertrix, G.E.C., Lissen, Exide).

**H.T. BATTERY:** This should be of ample size to deal with the requirements of the valves chosen (Ediswan, Lissen, Pertrix, Magnet, Drydex, Marconiphone, Ever Ready).

**G.B. BATTERY:** See above list.

**RECOMMENDED AERIAL AND EARTH EQUIPMENT:** Electron "Superial"; Graham Farish "Filt" earthing device.

HERE is an inexpensive and highly efficient receiver with almost unlimited possibilities, and one that will open up a new field of interest for the broadcast listener. It is designed expressly for use on the short waves, and although it employs but two valves, it will perform the most amazing feats in long-distance reception.

Those readers who have already experienced the delights of "short-waving"

exercise a certain amount of patience and care with tuning, the most remarkable ranges will be achieved. Headphones are, of course, the order of the day with a set of this type, although it is sometimes possible to obtain quite satisfactory results from a loudspeaker, particularly from some of the American stations.

### Exceptionally Fine Tuning.

The set covers three wave ranges, approximately 18-25 metres, 20-45 metres, and 40-85 metres. And all this without changing a single coil.

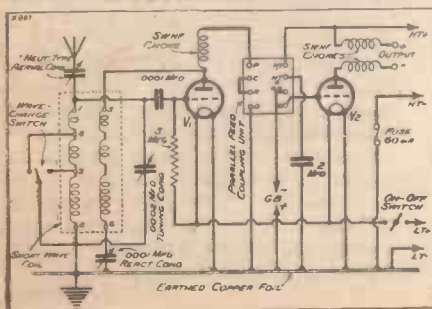
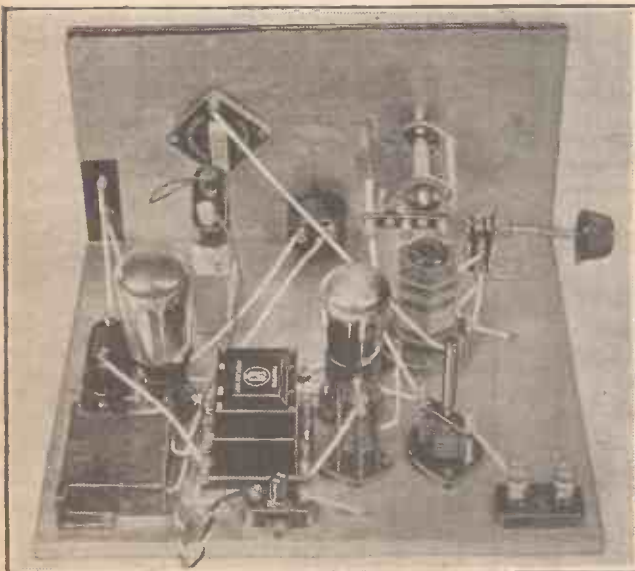
You will also notice that a special type of tuning dial has been adopted. The large knob, which is used normally, gives a reduction of 10-1, while the small micrometer adjustment allows for exceptionally fine tuning, with a ratio of something in the neighbourhood of 500-1.

You see, short-wave tuning is ever so much more critical than the medium waves,

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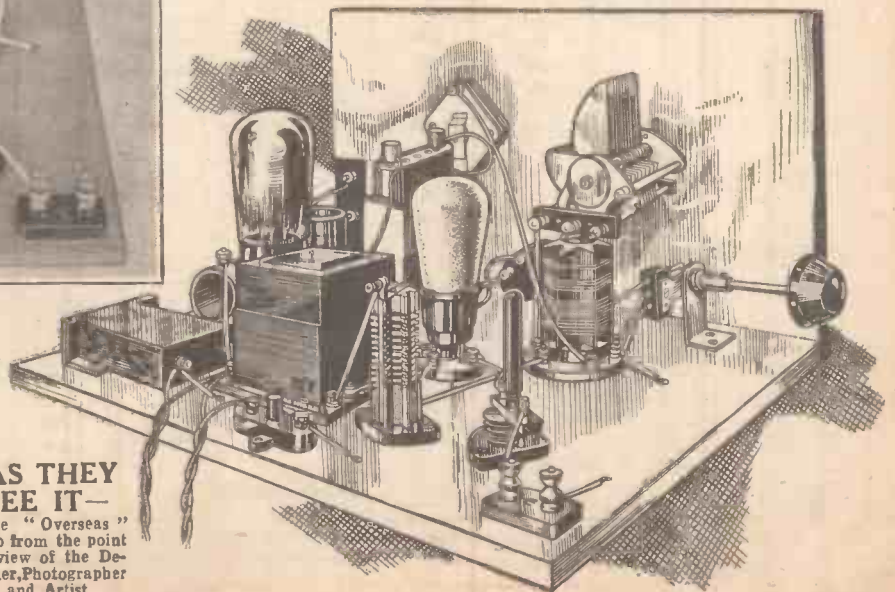
## RANGE AND RELIABILITY

The circuit and the actual construction are both simple and straightforward, but the range of the set is phenomenal. Note that several of the "earth" connections are made to the copper foil on the baseboard.



## AS THEY SEE IT—

The "Overseas" Two from the point of view of the Designer, Photographer and Artist.





## THE "OVERSEAS" TWO

(Continued from previous page.)

and it is for this reason that a good dial is essential for satisfactory working.

Body capacity effects which, in poorly designed sets, are liable to become somewhat troublesome are completely obviated by the use of copper foil both on the baseboard and over the back of the wooden panel together with the special H.F. choke arrangement in the anode circuit of the last valve, making the set a delight to handle.

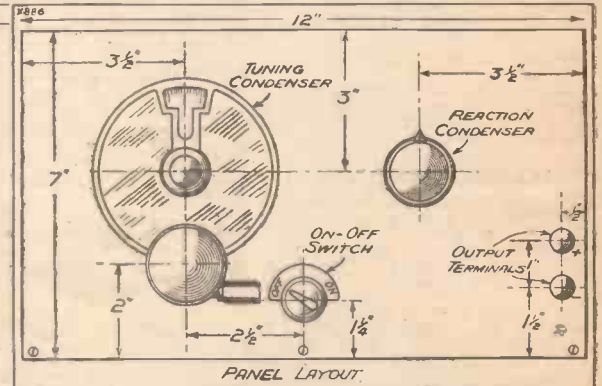
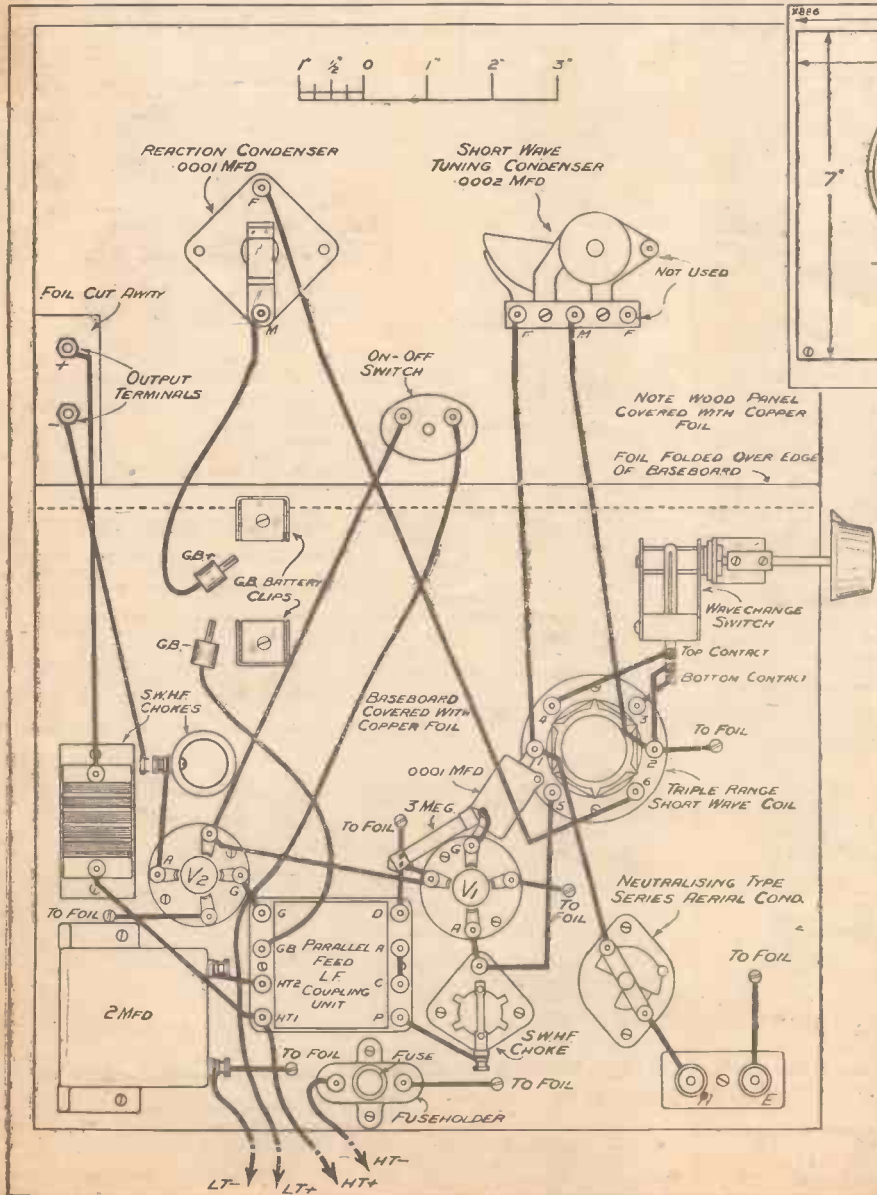
### Keep 'Em Short!

The wiring diagram, drawn to scale, shows all the main dimensions and connections, and you will find no difficulty in construction if you follow this, and the panel layout, etc., using the components recommended. One of the most important points to watch is to see that all the leads comprising the tuned circuit are kept as short and direct as possible. The reason for this is because of the extraordinarily high frequencies with which we are dealing, any stray capacity may introduce serious losses.

## NEEDED BY YOU FOR THE "OVERSEAS" TWO

- 1 PANEL, 12 in. x 7 in. (Permeol, Becol, Wearite, Lissen, Goltone, Peto-Scott, Direct Radio).
- 1 BASEBOARD, 12 in. x 10 in.
- 1 CABINET for 12 in. x 7 in. panel, and 12 in. x 10 in. baseboard (Morco, Camco, Lock, Gilbert, Peto-Scott, Osborn, Direct Radio).
- 1 .0002-MFD. SPECIAL SHORT-WAVE TUNING CONDENSER (J.B.).
- 1 SPECIAL SLOW-MOTION DIAL (Igranic, type "Vinad").
- 1 .0001-MFD.-.00015-MFD. REACTION CONDENSER (Graham Farish Littlos, Lotus, Ready Radio, J.B., Polar, Lissen, Ormond, Peto-Scott, Telsen).
- 1 BASEBOARD TYPE NEUTRALISING CONDENSER (Igranic "Horon," Bulgin, J.B.).
- 1 2-MFD. FIXED CONDENSER (Telsen W.226, T.C.C., Dubilier, Lissen, Igranic, Ferranti, Sovereign, Peto-Scott).
- 1 .0001-MFD. FIXED CONDENSER (T.C.C. Type M., Dubilier, Telsen, Igranic).
- 1 3-MEG. GRID LEAK, with wire ends at terminals (Dubilier 1-watt type, Igranic, Goltone, Ready Radio, Lissen, Graham Farish Ohmite).
- 1 TRIPLE RANGE SHORT-WAVE COIL (Lissen L.N.5137)
- 3 SHORT-WAVE H.F. CHOKES (Goltone, Type S.W.C/26, Keystone, Bulgin type H.F.3, Polar, Igranic, Slektun).

- 1 SINGLE POLE DOUBLE THROW ROTARY SWITCH (Wearite type I.31).
- 1 ROTARY ON-OFF SWITCH (Ready Radio, Tunewell, Bulgin, Colvern).
- 2 FOUR-PIN VALVE HOLDERS (Lissen, type L.N.5069, Telsen, W.B., Igranic, Lotus, Clix, Bulgin, Benjamin, Junit, Wearite, Peto-Scott).
- 1 PARAFEED COUPLING UNIT (R.I.).
- 1 FUSE HOLDER (Bulgin type F.5, Goltone, Telsen, Belling & Lee).
- 1 TERMINAL BLOCK, with two terminals (Lissen type L.N. 308, Telsen, Belling & Lee, Sovereign).
- 2 INDICATING TERMINALS (Belling & Lee Type R, Igranic, Clix, Bulgin, Eelex, Goltone).
- 4 WANDER PLUGS (Clix, or see above).
- 2 ACCUMULATOR CONNECTORS (Belling & Lee, or see above).
- 2 YDS. OF SYSTOFLEX, and 3 yds. of 18 gauge tinned copper wire (Goltone, Wearite).
- 1 FUSE, 60 m/a (Belling & Lee Scrafuse, Goltone, Bulgin, Telsen).
- 2 PIECES OF .004" COPPER FOIL, 12 in. x 7 in. and 12 in. x 10 in.
- 1 2-in. SWITCH BRACKET (Wearite).
- 1 2-in. x 7/8 in. EXTENSION SPINDLE (Wearite).
- 1 1-in. x 7/8 in. COUPLING LINK (Wearite).
- 1 PAIR OF GRID BIAS BATTERY CLIPS (Bulgin type No. 1).
- Flex, screws, etc.



### BOTH SIDES OF IT

Drilling dimensions are given in the above diagram, while to the left the spacing and back-of-panel connections are shown. Curving lines indicate that flex leads are used.

Above all, make sure that all the connections are really tight. There is no need to bother about soldering; do the terminals up finger-tight, and then give half a turn with the pliers.

You will find nothing difficult about the actual constructional work, for the photographs and drawings make everything quite clear. When cutting the piece near the terminals out of the back-of-panel foil, take care that ample clearance is left for the terminals. It should also be noted that contact between the panel and baseboard foil is made by tucking the latter over the front edge of the baseboard.

### Getting to Work.

After the constructional work has been completed, the next thing to do is to connect up. Join a pair of headphones to the terminals on the panel, making sure they are the right way round, connect up a two-volt accumulator and an H.T. battery having a voltage somewhere between 60 and 100 volts.

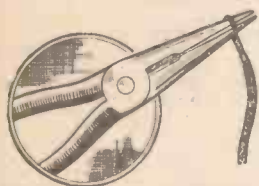
Plug an H., H.L., or det. type valve in the holder nearest the coil, and another H.L. or small power type in the other valve-holder. A power type is, of course, essential for

(Continued on page 900.)



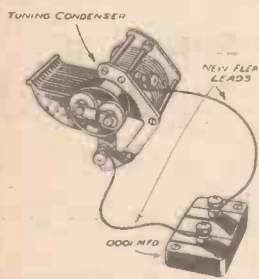


**MAKING LOOPS IN FLEX.**  
**WHEN** it is necessary to make a strong loop in the end of a flex lead for putting over a terminal, the best way to proceed so that the loop may be taken off and on without "fraying out" is as follows:  
 Bare the wire for an inch or so, and first twist the strands tightly together. Then shape the wire round the jaws of



See that the wire is twisted tightly.  
 a pair of round nose pliers as shown in the sketch.  
 The tapering of the jaws enables loops of different sizes to be made, and also facilitates the removal of the loop after completion.

**INCREASING WAVE RANGE**  
**THE** recent articles in "P.W." on A-Z tuning have created a wide interest in stations like Wilno (on 563 metres) to which ordinary sets are unable to tune. Is there an easy way of increasing a set's wave range to enable such stations to be heard?  
 The owner of a couple of .0001 fixed condensers can usually try without extra cost or much trouble. The



The simple insertion of a condenser puts up the wavelength.

apparatus needed is one fixed or pre-set condenser of about .0001 mfd. to back-up each of the set's tuning condensers. Thus, if your set has one "aerial" and one "H.F." tuning condenser, you need two .0001's, each fitted with short flexible leads.  
 Connect each .0001 mfd. across one of the tuning condensers, as shown in the sketch, and you will find the dial readings for any given station will have "moved down." This leaves room at the top of the dial for stations well above Budapest in wavelength.  
 To revert to normal tuning, merely disconnect the extra condensers.

**DO THE JOB THOROUGHLY**  
**MANY** readers, if they are honest, will probably confess to having, at one time or another, been content to leave a transformer, a valveholder, or a choke on the baseboard with only two fixing screws instead of the four deemed necessary by the makers.  
 The usual excuse is anxiety to get the receiver working as soon as possible—or else the constructor gives a temporary fixing to the components, while

spacing them, and then forgets to finish off the job properly.  
 Large components are apt to work loose if insufficiently fixed, with consequent disaster to wiring.  
 So don't spoil the ship for a ha'porth of wood screws!

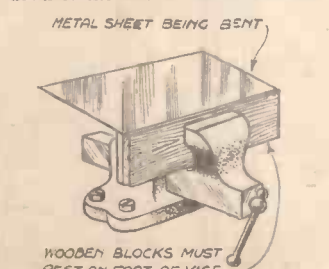
**DRILLING POLISHED PANELS**  
**MANY** people, when preparing the panels for their receivers, mark out the positions of the various holes on the back, place the panel face downward on the table and drill through. This procedure, however, nearly always results in spoiling the highly-polished side of the ebonite.  
 No matter how careful one might be, a certain amount of rubbing is bound to take place between the table and the panel, even if placed face downwards on a duster, or soft rag, and small chips of ebonite are bound to get underneath and spoil the surface.  
 The correct method of preparing a panel, and one that ensures that your set shall have an unspoil appearance,



Don't spoil a new panel.

is to mark the ebonite on the polished side using a centre punch for the purpose. If a proper square and steel rule are employed, this should not present any difficulty.  
 When drilling the holes the panel will be face upwards and very little damage, if any, will be done. In any case, the panel stands a much better chance of coming out unscratched than if it were placed face downwards.

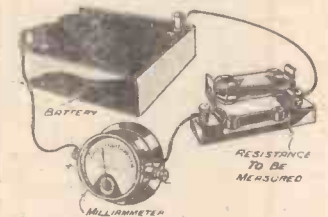
**BENDING METAL**  
**WHEN** bending a sheet of metal in a vice, it is best to have a couple of blocks of wood on either side of the metal, the sheet being bent over one of the blocks. In doing this it is essential to see that the blocks reach down to the foot of the vice so that



when the metal is struck to form the bend, the wood blocks cannot slip down at all, and thus cause a bad bend.

**CHECKING RESISTANCES**  
**THOSE** who wish to check the value of R.C. anode or decoupling resist-

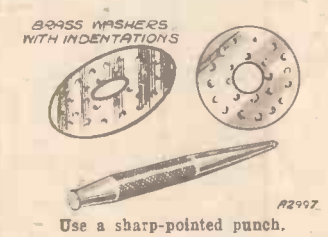
ances can do so quite easily if they have a milliammeter on hand.  
 The resistance to be measured is joined in series with the meter and an H.T. battery, the voltage of the battery



Another job for the milliammeter, being adjusted so that the meter registers a convenient reading.  
 Then the battery voltage divided by the meter reading in milliamps and multiplied by one thousand gives the resistance.

To take an example, if the battery voltage is 100 and the meter reading 2 milliamps, the value of the resistance will be 50,000 ohms.  
 It is better to measure the battery voltage with a voltmeter if one is available, otherwise the resistance value is very approximate, depending upon the condition of the battery.

**ONE-HOLE FIXING**  
**ALTHOUGH** the modern plan of making all panel components so that they can be attached by a bush and a clamping nut is simple and convenient, this method has a certain



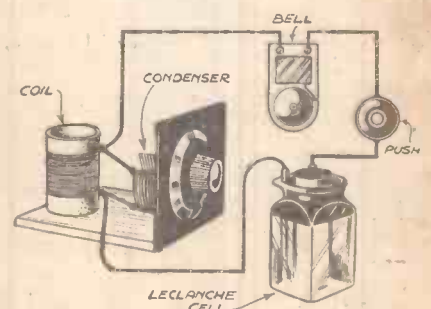
objection in that delicate components can be easily thrown out of adjustment when much strain is placed on the tightening nut.  
 The tendency to slip can be reduced considerably if a suitable washer be placed behind the panel. A washer cut out of a piece of patching rubber or from an old inner tube will supply the necessary friction.  
 Another plan is to cut out a washer from a piece of thin brass and punch a number of indentations on both sides of it with a really sharp pointed punch.

When placed between the component and the back of the panel it will "bite" on both sides and reduce considerably the tension needed to tighten the nut.

**MAGNETS FOR NEEDLES**  
**EVEN** in the most careful hands gramophone needles are occasionally upset, either in the top of the radiogram or on the floor. The task of picking them up with the attendant finger pricks is enough to make even

the mildest of men use language that is not fit for B.B.C. announcers.  
 The difficulty of saving the needles can be easily overcome by using a small magnet of the horse-shoe type which can be purchased at the majority of toy stores for a penny or twopence. The magnet will attract needles from awkward positions and will save a great deal of time in picking up a large quantity that may have fallen on the floor.

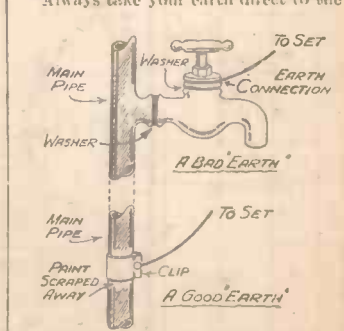
**A RING AT THE SPEAKER**  
**IN** these days of really loud loud-speakers a "ring at the door" often goes unheeded.  
 Where an electric door bell is used, it may be arranged easily to announce a caller automatically via the loudspeaker. All that is required is to insert in one of the battery leads of the bell circuit a coil and condenser tuned to the wavelength of the station being received.



Tune the bell circuit as well as the set!

When the bell is rung the tuned circuit radiates in the same way as a buzzer wavemeter.  
 In fact a miniature "spark" transmitter is formed which is easily received by the set.

**WHERE'S YOUR EARTH?**  
**IS** your receiver earthed to a water-pipe? If so, are you sure that you are getting the best possible results from it?  
 Quite a number of people are in the habit of connecting their earth wire to the nozzle or neck of the tap. This means that at least two—sometimes more—insulating washers come between the earth wire and the actual earth contact.  
 Always take your earth direct to the



Make sure the pipe is scraped clean.  
 pipe itself, and make sure that all paint has been scraped off before making the contact.  
 (Continued on next page)



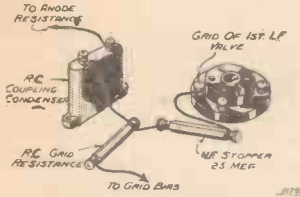
## RECOMMENDED WRINKLES

(Continued from previous page.)

### A CAUSE OF DISTORTION

WHEN the first L.F. amplifying stage of a receiver is resistance-capacity coupled, it is always advisable to use some means of preventing any H.F. oscillations from getting on to the grid of the first L.F. valve, and thus appearing in amplified form in the output circuit.

The presence of such currents is a frequent source of distortion.



This scheme prevents unwanted H.F. in the first L.F. stage.

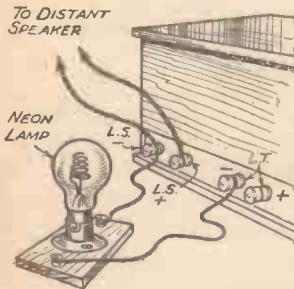
A simple and effective method is to insert a .25 megohm grid leak directly in series with the grid of the first L.F. valve, i.e. between the coupling condenser and grid resistance, and the grid.

### ELEMENTARY "TELEVISION"

WHEN the receiver and speaker are in different rooms, tuning-in is not too easy, as many who have tried will agree.

If an extra speaker is not available, and the expense of acquiring one is not looked upon with favour, a neon lamp will afford visual indication that the set is tuned to the local.

Connect the lamp to the L.S.—and L.T.—terminals of the set as shown and the programme, when tuned in, will be "seen" as the lamp will flash in sympathy with the music.



Watch the lamp flicker when dance music is played.

The idea as shown can only be used if no output choke or transformer is in the set.

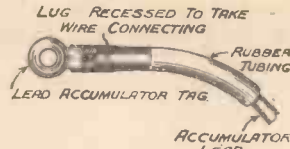
### BATTERY-LEAD CORROSION

LEAD is one of the few substances not readily attacked by sulphuric acid and for this reason it is extensively employed for accumulator terminals and tags. Special accumulator tags and the judicious use of "vaseline" will prevent corroded accumulator terminals, but this precaution does not prevent the acid from attacking the actual battery wire at the point where it is connected to the battery connector.

A special accumulator tag, sold for motor car batteries, is readily obtainable from most garages. These tags are in the form of a washer with a small tubular lug attached for connecting purposes, the whole being made from one piece of lead. Two of these connectors or tags should be obtained and the hole in the connecting end recessed for a quarter of an inch or so, so as to allow the outer covering of the

connecting wire to pass inside the tubular part of the lug.

The hole for the connecting wire in the lug should now be filled with molten solder, and having carefully cleaned and tinned the accumulator connecting wire for half an inch or so of its length, push this into the lug



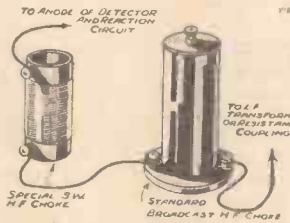
Coat the rubber tubing with anti-sulphuric acid paint.

while the solder is still molten, and then allow to cool.

Now procure some rubber tubing with an internal diameter, sufficient to allow a tight fit over the tubular part of the lug—at least a foot should be allowed for each battery lead—and push over the lug as shown. If the rubber tubing and lug are now given a coat of anti-sulphuric acid paint or varnish and the remaining battery lead is treated in a similar manner, no further trouble should be experienced from corroded battery leads.

### ALL-WAVE CHOKES

DIFFICULTY is sometimes experienced in all-wave receivers due to one H.F. choke not being suitable for both medium and long broadcast bands and short waves.

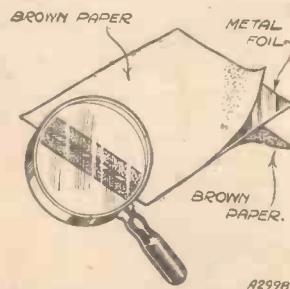


Connect two chokes in series for an all-wave set.

A good plan is to use two chokes, one a choke intended for broadcast wavebands and the other a short-wave choke. These should be connected in series, a fair space being allowed between the chokes, and the short-wave choke being connected to the detector anode.

### A SIMPLE SCREENING METHOD

ALTHOUGH the modern system of using canned coils dispenses with the earlier type of cumbersome metal shields, there are frequent occasions, particularly in experimental work, where it is desirable to employ a shield, which generally has to be improvised quickly. This can be done quite easily by sandwiching some thin foil—preferably



A sandwich of brown paper and aluminium foil makes an effective improvised screen.

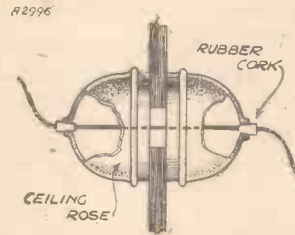
copper or aluminium—between two sheets of stiff brown paper. A small amount of gum will be needed to fasten the sandwich together and the sheet should be thoroughly dried afterwards.

This plan has a considerable advantage over the solid metal sheet in that there is no danger of inadvertently shorting any of the wires or components to the shield as the brown paper acts as an insulator.

### THE AERIAL LEAD-IN

WHEN the aerial has to be taken into a building through a damp wall, either brick or wood, it is advisable to take a little more trouble than usual.

A friend who was experimenting in a wooden shed, devised a simple and very satisfactory method of dealing with the difficulty. He happened to have a pair of discarded porcelain ceiling roses as used in electric lighting. A good-sized hole was bored through the wall and the two roses were attached, one inside and the other outside, a liberal coating of paint having first been given to both walls to prevent the ingress of moisture.



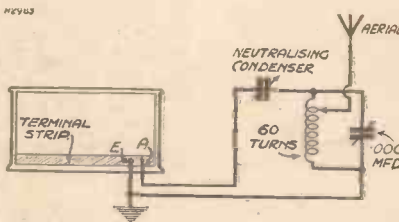
A novel and effective method for you to try.

The aerial wire was taken through rubber corks, plugged into the open ends of the roses and the corks were also treated to a coat of paint.

### SIMPLE BAND-PASSING

A FORM of band-pass tuning that can conveniently be achieved by those with simple, single-tuned circuits, such as plug-in coils, is that in which an additional tuned circuit is coupled to the normal tuned circuit by a small variable capacity, such as a "neutrodyne" condenser.

A plug-in coil of 60 turns for medium waves in conjunction with a .0005 mfd. tuning condenser is suitable, and will greatly increase the selectivity.



Selectivity increased with a plug-in coil and a neutrodyne condenser.

The coupling condenser will probably need re-adjustment as the wave-band is explored, but the slight additional trouble is well worth the increase in selectivity obtained.

### BREATHE GENTLY!

TRYING to remove dust from an ebonite panel is a wearisome task, as many readers have no doubt discovered. The more you rub, the more dust the panel seems to collect.

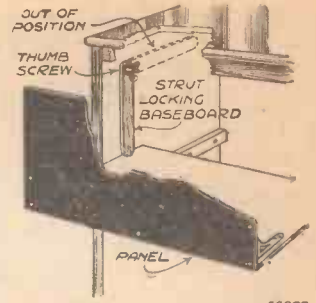
This is due to the same cause as is responsible for the familiar trick of picking up small pieces of paper with a fountain pen holder which has been rubbed on cloth.

Rubbing the panel merely results in an electric charge being set up on its surface which attracts dust.

If you breathe gently on the panel while rubbing away dust and fingermarks, greater success will attend your efforts.

### A SAFETY STRUT

WHEN a set is housed in a cabinet, it is often a difficult job to make alterations or adjustments with comfort on account of the confined area. Such



An easy way to stop your set over-balancing when making adjustments.

work can be performed with greater ease if the set can be drawn partly forward. Then there arises the danger of the set overbalancing and coming crashing down.

When faced with this problem recently, I fitted a locking strut as shown in the sketch. It is attached inside the cabinet near the front edge, and its length is just sufficient to lock the baseboard firmly to the shelf of the cabinet when the strut is pulled down.

A thumbscrew on a short bolt fixes it in position, and when not in use the strut is locked in a horizontal position.

### MONEY FOR NOTIONS

Readers are invited to send to the Editor a short description, with a sketch, of any novel and practical radio ideas which they may have encountered.

Ideas from readers which are published will be paid for at our usual rates.

Send your hint to-day to the Editor, "Popular Wireless," Tallis House, Tallis Street, E.C.4.

### FOR YOUR RADIOGRAM

ONE of the most satisfactory substitutes for lining the top edge of a radio-gramophone cabinet in place of ordinary strip felt, which is difficult to obtain, is felt draught excluder.

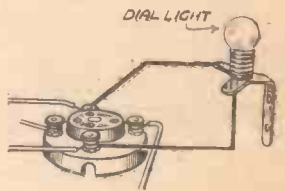
The material is in the form of this double felt with a piece of small bore rubber tubing between the layer of felt. Not only does this act as an excellent sound excluder—excluding the noises produced by the pick-up—but it also cushions the top of the cabinet when it is closed.

Draught felt is obtainable in various widths from 1/2 in. up to 3 in.

### ADDING A DIAL LIGHT

THE adding of a dial light to a radio receiver is a very simple matter indeed. That is, of course, provided the right type of dial has been fitted, with the necessary attachments.

With 2-volt valves a bulb of the 2 1/2-volt type, as used in the smaller flashlamps, should be employed. The connections should be arranged so that



Join the lamp across the filaments.

the light goes out when the set is switched off.

This can be effected best by joining the dial light directly across the filament terminals on one of the valve-holders. The accompanying sketch should make the scheme clear.



THE order has gone forth!

Mr. Gerald Cock, the head of the B.B.C. Outside Broadcasts Department has issued instructions in connection with the King's broadcast on Christmas Day.

B.B.C. engineers have gone out to Sandringham to fix up the apparatus. There are dozens of interesting features about this broadcast which, if it comes off satisfactorily, will be yet another good conduct mark on the O.B. Department's slate.

The King will, as usual, be in residence at Sandringham during Christmas-time, and will have his own private Yuletide celebrations. It is rumoured that he offered to broadcast from London if necessary, but the O.B. Department, pooh-poohing the difficulties of relaying by a long telephone line, offered to take microphones up north to Sandringham.

Had the King been able to broadcast from Buckingham Palace, the B.B.C. by arrangement with the Post Office, would have used one of the two 'phone lines, specially balanced by P.O. engineers, which run from the Palace to the London Trunk Exchange. These are the wires on which the King receives any special message or relay, and it would have been a simple matter to hook the B.B.C. "mikes" to the private 'phone exchange of the Palace.

#### Two Trunk Lines.

Instead, the B.B.C. experts have worked hand in hand with the Post Office and have selected two trunk lines running north, one going via Ipswich. The Ipswich line will be used first. If there is a breakdown, the other line will be switched on without a break.

This switching will be done in Carter Lane, in London. The signal will be received by the B.B.C. on its own telephone line exchange (not the office 'phone exchange but the special line balancer racks on the seventh floor), and it will go out again via the control-room to all transmitters.

The B.B.C. van, which has gone to Sandringham, has taken dual sets of microphones and amplifiers. The new outside broadcast amplifiers will be used. These are specially screened and are built on similar lines to the power amplifiers carried in the travelling reporting vans of the Gramophone Company.

The microphones are being installed in a study often used by the King, and there will be quite a short set of wires, running into an ante-room where there will be a double set of amplifiers.

#### Carbon Microphones.

Although the film-type condenser microphones are generally used now in the studios, the B.B.C. engineers are taking with them carbon microphones similar to those used in an ordinary telephone. These are quite good for speech, and are more reliable in an outside broadcast.

The "mike" popularly known as the King's microphone will not make its appearance at Sandringham! The reason? Simply that it is not a broadcasting microphone, but is used at famous outdoor occasions where the King's speech is amplified by public address equipment. Actually the B.B.C. has no special "royal" microphone. Members of the Royal Family have used

## BEHIND THE SCENES OF THE KING'S BROADCAST

This special account, written on the eve of the Royal Broadcast, tells how the B.B.C. are sparing no pains to make His Majesty's Christmas Day Message available to the whole Empire.

practically all the popular microphones, including the Marconi-Sykes and the Reisz.

Two chiefs of the Outside Broadcasts Department will be up at Sandringham on Christmas Day to attend to the amplifiers and microphones, while a diplomatic personage of the B.B.C. will superintend the actual broadcast.

#### Non-Crinkly Paper.

The King's speech is specially typed to indicate breathing and pausing marks in reading (as is always done with the Prince's broadcast speeches) and on non-crinkly paper, so that the manuscript will not crackle in the microphone! There will be a microphone on each side of the manuscript, not only to prevent breakdown, but to avoid fading as the King moves his head in speaking.

### THE ROYAL VISIT



His Majesty the King on the occasion of the Royal Visit to Broadcasting House.

The King broadcasts, of course, after the amazing Christmas Greetings relay which the landline section of the B.B.C. is carrying out on Christmas Day, starting at three o'clock.

After the radio relays, taken from the s.s. "Majestic" in the Atlantic, Cape Town, Melbourne, Gibraltar and other places, the King's microphone will be brought into circuit and following a few words of introduction he will give his talk.

The "cue" will come on the reserve telephone line which is used by the control engineers for communication with Broadcasting House, but, of course, the King will also hear the Empire relay.

The B.B.C.-designed receiver for the King is at Buckingham Palace, so most of the King's Household at Sandringham will listen-in on one of the commercial receivers

installed there. It is probable, though, that the B.B.C. engineers will manage to get an additional trunk line connected through to the Post Office Carter Lane switchboard, so that the King can hear the Empire broadcasts direct from the Post Office receivers.

While the O.B. engineers will be busy at Sandringham, and while the Post Office engineers at London will be sitting tight at their trunk exchange boards and landline amplifiers, a third group of engineers will be busy at Broadcasting House.

They will be busy making a Blattnerphone record of the King's speech.

Unless the steel tape breaks, this will be the easiest job of all!

The Blattnerphone has its own amplifier in the recording-room. One spool of tape on the machine will probably be more than sufficient for the King's speech. An absolutely full spool will take a twenty-minute talk. The last time that the King had a speech recorded on the Blattnerphone evoked a rather amusing comment from His Majesty. When he went to Broadcasting House he asked for the tape reel to be rerun, so that he could hear how his voice sounded.

"I must have had a cold that day," he said, smiling.

#### Super-het. Record Too.

As a matter of fact it is very rare for anybody to recognise his own voice when heard with the excellent quality that the Blattnerphone gives.

After the Blattnerphone spool has been made, a wax record will be recorded from it, while one prominent firm of record manufacturers will make an additional test wax from a super-het. tuned to one of the B.B.C. transmitters.

An unfortunate part of the relay from the O.B. engineers' point of view is that they will hardly have time to finish before they will have to come southward again to superintend other Christmastide Outside Broadcasts!

### BIASSING AN S.G. VALVE

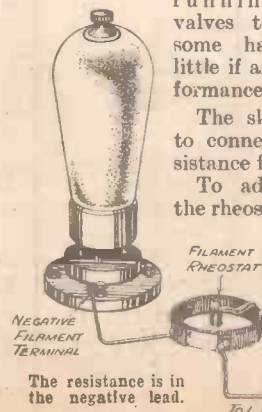
SOME battery S.G. valves work better with their control grids biased to a smaller negative voltage than is obtainable from a dry-cell.

By connecting a resistance in the negative filament lead thereto, the valve may be automatically biased. Fortunately, under-

running modern S.G. valves to the extent of some half a volt has little if any effect on performance.

The sketch shows how to connect a variable resistance for the purpose.

To adjust, start with the rheostat "full on," and turn towards the "off" position as far as possible without weakening signals. A 15-ohm rheostat is suitable.





## THE MIRROR OF THE B.B.C.

DR. RENDALL'S  
SUCCESSOR

The Press Pacified—Once in Seven Years—Empire Contributions—On The Plantation—A News Change.

THERE has been unexpected delay in the announcement of the B.B.C. Board of Governors for 1933. It seems practically certain that there will be only one change and this due to the resignation of Dr. Montague Rendall, which is considerably regretted at Broadcasting House.

Of the numerous candidates whose claims have been advanced in various ways to the Postmaster-General and the Prime Minister, I think that none will be chosen. The appointment will be as unexpected and probably as successful as that of Mr. Brown last year.

## Empire Broadcasting Progress.

The B.B.C. seems to be weathering the storms which have gathered round the inauguration of the new Empire Broadcasting Service. The Press Overseas appear to be pacified, the Musicians' Union also has been induced to agree to conditions which do not impose an impossible situation.

Also, the alacrity of response to the preliminary trials is an indication of a receptive attitude on the part of the Dominions and Colonies where the signal is of sufficient strength. It remains to provide programmes of quality and distinction which will maintain the prestige of British Broadcasting.

## Television Move.

The world of television, such as it is, is full of interesting rumours. The Baird Company seems to have found a new lease of life in the increased confidence of its financial supporters, based on results of reception by a new type of televisor. It is believed also that H.M.V., through one of its subsidiaries, is ready to bring into production television receivers built on the Cathode Ray principle applied to ultra-

## IMMEDIATELY ON ARRIVAL



So keen was the B.B.C. on letting listeners hear the voice of Mr. Victor Smith after his flight from South Africa that he was not given time to remove his flying kit.

short waves on lines similar to those of current development in New York under the aegis of the Radio Corporation of America.

There are interesting possibilities in this

competition, and I am wondering what the B.B.C. will do about it. They would be well advised, I think, to move with extreme caution and avoid the possibility of their being ground in the millstone of conflict between two gigantic financial concerns which afterwards would make peace.

## Christmas Programmes.

It is a pity I think that the B.B.C. has not seen fit to lighten the Christmas Programmes in any way, the excuse being that Christmas this year falls on a Sunday. It would seem possible to reconcile established principles with a measure of accommodation once in seven years or so!

Special arrangements are being made to relay the King's speech from Sandringham, in Norfolk, where the Royal Family always spends the Festive season, and to associate it with a special programme to which various parts of the Empire will contribute. The original intention was to give the programme between 3 and 4 p.m., but the time has now been revised to begin at 2 p.m., following consultations with those participating.

## The Royal Speech.

The programme begins with the sounds of Big Ben and an announcement of what is to come. Messages will then be broadcast from a liner in mid-Atlantic; Halifax, Nova Scotia; Montreal; Toronto; Winnipeg; Vancouver; Wellington, New Zealand; Melbourne; Sydney; a British ship in Harbour at Port Said; Cape Town, and Gibraltar.

All British stations are to broadcast the King's speech, which will also be radiated from the Empire short-wave station at Daventry. At the time of the actual programme the Empire station will be chiefly serving the Indian zone, so that, in addition to these arrangements, the whole of the programme will be recorded by the Blattnerphone process in order that it may be rebroadcast in its entirety in the Canadian, African, West African and Australasian zone programmes.

## "Show Boat" Singers.

Jack Payne, of dance band renown, and Jack Payne, whose ability as a siffleur is familiar to Midland listeners, have no connection with the John Payne who, with his Jubilee Singers, is to take part in the New Year's Eve programme with an item entitled "A Night on the Plantation."

Mr. Payne's company will consist of a dozen singers, all of whom were in "Show Boat," and they will sing negro spirituals and folk songs which he is arranging. John Payne has been heard by listeners in "Mary Celeste," "Going South" and "Conversations at the Dance."

## Regional News.

As already announced, the various Regional News Bulletins are to be discontinued at the end of the year and their place taken by periodical reviews of events in the respective areas served by the B.B.C. Scotland has lost no time in making its own arrangements for the future, and beginning on Saturday, January 7th, Mr. George Blake, who is leader writer on one of the best-known Glasgow newspapers, will give a weekly broadcast under the title of "The Week in Scotland." Meanwhile, other Regions will announce their plans in good time for the change.

THE LISTENER'S  
NOTEBOOK

A rapid review of some recent radio programmes from home stations.

IF I were asked why the revue "Sous le Rideau" was such an unqualified success, I would say it was because it was *not* an adaptation for the microphone. It came from The Empire, York, so it had to conform to no other requirements than those laid down by this and other theatres.

Consequently, George Formby was not hampered; he was in his element; and if he did descend to rather questionable humour at times, one must agree there was just that something in his production, which, absent from similar studio pro-

## SMILING THROUGH THE ETHER



Mr. Carl Brisson did not waste his smile on an empty studio at Broadcasting House. Television made it possible for an audience in the Athena Theatre, Copenhagen, to share his gaiety.

ductions, placed it obviously above the latter in entertainment value.

## Delightfully Vulgar.

It would be unfair, I think, to say that "Sous le Rideau" was vulgar, without some sort of qualification, although I would say it was about as *risqué* a thing as I have ever heard over the air.

All the same, I enjoyed it thoroughly—I confess this without shame—and if some listeners should protest that it was too vulgar for them to be amused, I would answer that it was too delightfully vulgar to be given a miss on that account.

## One of the Audience.

Another fact is worth comment. As I listened to this show, I did not find the theatre audience a bore. On the contrary, I felt myself to be one of them.

Although I have never been to The Empire, York, I was certainly in a theatre of my own imagining on this occasion. I have never hitherto succeeded in thrusting myself mentally into a studio audience.

Of course, this may be because I have never been in a studio, whereas I have often been in a theatre. But I don't think this

(Continued on page 902)



# Capt. Eckersley's QUERY CORNER

Under the above title, week by week, our Chief Radio Consultant comments upon radio queries submitted by "P.W." readers.



Don't address your letters direct to Captain Eckersley; a selection of those received by the Query Department in the ordinary way will be answered by him.

## Where the High Notes Go.

T. E. T. (Chesterfield).—"I understand that the use of anode resistances of the order of one or two megohms is undesirable on account of the loss of amplification on the upper end of the musical scale. I cannot see why this should be so, since there is no capacity or inductance in an R.C. stage."

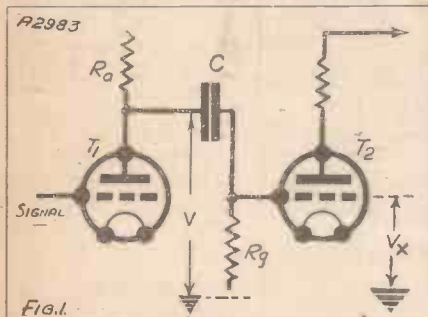
If you draw a resistance-capacity circuit as in Fig. 1 you can turn it into the electrical equivalent of Fig. 2.

Thus the first valve, having an internal impedance  $R_1$ , produces (Fig. 1) a voltage  $V$ . Thus the electrical equivalent inside the dotted line of Fig. 2.

If  $C$  is "very" large we can neglect its impedance and say that  $V$  feeds into two resistances  $R_a$  and  $R_g$  in parallel. But the second valve ( $T_2$  of Fig. 1), has capacity ( $C_v$  of Fig. 2). Thus, the voltage  $V$  feeds into two resistances,  $R_a$  and  $R_g$ , in parallel and in parallel with a capacity.

Such a capacity decreases in reactance

## HOW THE CIRCUIT LOOKS—



You'll have no difficulty in immediately recognizing this circuit as depicting the familiar resistance-capacity arrangement.

(takes more current from the source  $V$ ), as the frequency of  $V$  increases. But if  $R_a$  and  $R_g$  in parallel have a much less impedance than the resistance of  $C_v$  at "high" frequencies, they will take nearly all the current from  $V$ , whatever the frequency (resistances do not change their resistance with frequency). So if the resistances take all the current, it doesn't matter when the condenser takes a little more! The current from  $V$  will be the same whatever the frequency.

But if  $R_a$  and  $R_g$  are large—much larger than the reactance of  $C_v$  at high frequencies—then  $C_v$  will take more and more current as the frequency increases. But the source of current  $V$  has an internal impedance and, in supplying more and more current, the value of  $V$  and hence  $V_x$  drops.

As the condenser takes more current at

high frequencies so the voltage  $V_x$  will be less at high frequencies. So a large value of anode and grid resistance (note a big anode resistance and a small grid resistance or vice versa is all right) makes for top cut.

Don't forget that the anode and grid resistances are effectively in parallel.

\* \* \*

## The "Decibel" Defined.

A. L. (Southampton).—"I have often heard the term 'decibel' used in relation to sound intensity. Will you please explain exactly what a decibel is?"

A decibel is a number (being one-tenth of a bell) to represent a ratio of powers. It need not necessarily relate to sound intensities. If a power of 1 watt was amplified by a valve to become a power of 20 watts, then there is a gain in bells equal to the logarithm of 20 to 1, i.e. the logarithm of the ratio of 20 to 1. The gain in decibels is then ten times this logarithm.

In sound it is possible for the ear to detect a change of one decibel in the power output of a sound source, the ear obeys a logarithmic law; hence the logarithm.

The decibel is very useful in assessing the gain or loss in an electrical network which is dealing finally with sound output, because "volts" do not represent power or the direct effect upon hearing. (See a recent article of mine on volume control.)

\* \* \*

## Reviving the Reflex.

N. N. (Peterborough).—"I can never understand why reflex circuits, in which one valve is made to do the work of two and a crystal is used for a detector, are no longer employed.

It seems to me that such circuits would be very popular on account of their economy in valves. Is there a 'snag' in designing such sets?"

Yes, the usual reflex circuit does introduce distortion. One dare not say that all reflex arrangements must necessarily introduce distortion. One can say with some assurance that most of them, as they existed when more in vogue than to-day, did so.

After all, it's asking a good deal to expect to reflex and not to retroact, particularly with valves with a much higher magnification factor than those we were accustomed to use in the old days.

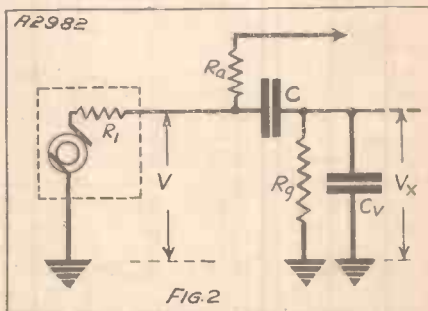
But it's an interesting suggestion to study the old ideas in terms of a wider experience—often and often an abandoned scheme is found to be quite workable because of additional knowledge picked up since the abandonment.

## What Power?

B. V. (Goodmayes).—"Several makers of commercial sets state the undistorted output which their receivers can supply. Is there any rule which can be applied which enables the purchaser to use this information?"

"What I mean is, does a room of a certain cubic capacity require an output of so many watts for comfortable listening?"

## —AND HOW IT WORKS



The unusual scheme of connections of this diagram makes clear how R.C. coupling really does amplify voltage.

Yes, you can work it all out if you like. I once did so, but (writing my reply in the Antipodes) I have forgotten them.

But suppose the dynes per sq. cm. for comfortable music is equal to  $d$ . Then suppose you are  $S$  feet away from the speaker. Taking an inverse distance law then the dynes sq. cm. radiated can be calculated.

Then you must know the efficiency of your speaker (very difficult!)—you must also know the efficiency of your valves.

As I say, I did it all and only remember this, that for a full frequency reproduction right down to 50 cycles, you want something like 1 watt undistorted output at 50 cycles per sec. for small rooms and very minimum requirements, and that I like to have in reserve about 5 watts undistorted at 50 cycles per sec, and that to double that is not a bad idea!



# Short-Wave Notes *By W.L.S.*



**T**HOUGH the Christmas issue of POPULAR WIRELESS is a thing of the past, already devoured by all its readers, there is still time for me to wish everyone that chances to read this page a Happy Christmas. May your enthusiasm never grow less, and your receivers never grow noisy! I can't think of a nicer combination of wishes than those two.

I sincerely hope that all will be well on the "Empire front" by the time this note appears. Five minutes before sitting down to write this I was listening to GSA on 49.6 metres.

The high-speed fading on his carrier-wave had to be heard to be believed, but when he was at "peak"—what a strength! Even near London he sounds like a "punch merchant" already.

## A Difference in Reception.

And this afternoon I received a message from ZS4M, a South African amateur, giving details of reception of the two stations, GSA and GSC, intended to handle the programmes for that part of the world. He reported GSA as R3 with a background of static to the tune of R9. Not so good!

GSC, however, on 31.3 metres, was reported as R5 to R9, with static R5. That looks very much as if the 31.3-metre wave is destined to be the more successful of the two at this time of year. This report applied to reception at 6.45 p.m. G.M.T.

I expect it will turn out that GSA is the best station for listeners in Canada. There is little doubt that the American stations round about this wave are received here more consistently than any of the others, and, personally, I think consistency is more important than sheer strength.

How amazingly well the Americans have been coming across in the afternoons lately! With my own humble little transmitter I worked with thirty-five of them in three days, and most of them remarked that the Europeans were "coming over like locals."

## Breaking Through.

I have heard some of the higher-powered American amateurs pounding their way through all interference and putting real "R9" signals into Europe. It has been quite reminiscent of the "good old days" of 1927-8.

I have no less an authority than my good friend "Ariel" for saying that "the future of radio seems to be with the short waves," and I certainly think "Ariel" has backed a winner. Everyone is thinking and talking about short waves nowadays. Is it just that the prospect of Empire Broadcast has bucked things up, or can it be that the radio public is just finding out that short waves are interesting?

It is edifying to measure the "time lag"

Our short-wave expert has some interesting news for you about the Empire transmissions and an expedition in Alaska.

in these matters. In 1925 I was a still, small, and much-derided voice breathing feebly about the properties of wavelengths below 100 metres. Even then a good, kind Editor allowed me a little space occasionally in which I could air my curious views.

## Do It Yourself.

Yesterday I met a man who was a close friend of that same Editor, and he remarked: "Well, you and your infernal short waves have done something for us now! We shall all have 20,000 kilocycles to worry about instead of 2,000!"

I have before me a pathetic letter from a reader who was foolish enough to entrust his short-waver to the local dealer-cum-

## Ruined Components.

What did the dealer do but rebuild the set, ruin the H.F. choke and a variable condenser, replace them with cheap and nasty substitutes, and send it back looking and sounding like half the set it was before. I join with you, "F.H.S.", in saying, "May he burn himself out!"

From the States comes the news of yet another expedition equipped with short-wave radio, and making jolly good use of it. A big film corporation has a photographing expedition in the wilds of Northern Alaska, and they keep in daily touch with Seattle, Washington, on about 40 metres. If you ever hear K7UT you will know that you are practically in touch with the Eskimos. K7AZ and K7BV are two portables, also attached to the party.

Readers who want a Christmassy atmosphere may reflect that this little party will be frozen in through the winter, with only short waves to keep them in touch with their homes.

I believe I have referred to the Imperial Airways "needle" transmission across the Channel as working on 75 centimetres. Humble apologies—the wavelength is 15 centimetres. Remote control and teleprinters will be used, and the installation is confidently expected to function in exactly the same way as a telegraph line.

## "High-Mag."

Who will be the first to go below this? I once had a "one-tube" receiver for very, very much

shorter waves than this, and with an amplification that was tremendous—but then that was a telescope!

The little transmitter shown on this page gives some idea of the simplicity of five-metre gear. The two valves used are only ordinary output-type receiving valves, yet the transmitter deals safely with the inputs up to 40 watts—and this at a frequency of roughly 60,000,000 cycles!

The next version is going to be very much smaller, with the two valve-holders, coils and chokes all bolted on to the variable condenser, which will form the "foundation" of the whole unit.

My five-metre receiver is also being rebuilt on the same lines, and I hope later to be able to produce a real "vest-pocket" receiver and transmitter combined.

## "W.L.S." ON THE REALLY SHORT WAVES



Five metres is the wavelength to which this set tunes. It is a typical experimental, low-powered transmitter, the 3-turn coil on the right being the anode coil, while beneath it is an H.F. choke.

wireless expert, with disastrous results. He enquires whether there is no possible means of painlessly ending the existence of some of these ignoramus who start up a small shop and acquire the reputation of "knowing all about wireless" immediately.

Of course, "F.H.S.", you should have respected your better judgment and done the job yourself. I don't think the majority of readers of "P.W." would admit themselves beaten over a job and immediately take it to a man who knew less about it than they did.

## Versatile Radio Men.

Luckily there are hundreds of well-run, efficient businesses nowadays. One finds men in the trade who are versatile enough to tackle any job in the whole gamut of radio.



# RECEIVERS

No. 16.

# of RENOWN



THE "CLIMAX" MODEL B.P.III RECEIVER FOR A.C. MAINS.

WITH almost any receiver employing just a single stage of H.F. amplification, there is a technical limit to the degree of selectivity that can be obtained. Perhaps it would be better to refer to it as a compromise limit, for, as most of you know, as the selectivity of a set is increased the sensitivity, as a rule, is decreased.

Thus, if the set is to be a real distance-getter, and, at the same time selective enough for all normal regional requirements, the question of the correct balance to obtain these two essential requirements is a matter that requires very careful attention.

It is true to say that in the majority of the "S.G.-Det.-L.F." threes that we have tested during the present season, the compromise between sensitivity and selectivity has been ideal. In other words, the distance-getting properties have not been sacrificed despite the fact that, almost without exception, the sets have been selective enough for all normal requirements.

### Selectivity and Sensitivity.

In introducing to "P.W." readers still another all-mains set that falls into this category, and bearing in mind what has been said above about the compromise limit, it is only logical to anticipate a somewhat similar performance, which would be sufficient for us to acclaim it as a good modern receiver.

But for once, the technical principles appear to some extent to have been founded. For in the "Climax" Model B.P.III receiver, a model of which has recently been subjected to our usual stringent tests, the designers have definitely gone one better on the selectivity side of the compromise, while on test the set is every bit as sensitive as the best of the threes we have tested.

Exactly how that technical advance has been achieved is a matter that need not be entered into here, for we are only concerned with the instrument as a finished commercial product. All the same, it is gratifying to be able to record anything that is by way of being a definite improvement, and we take this early opportunity of congratulating the designers upon having produced a set "with the little something that some of the others haven't got"!

### Simple to Operate.

Concerning the actual design of this new "Climax" receiver, there are many interesting features worthy of commendation apart from the primarily important one of improved selectivity.

In these advanced days, radio is no longer the prerogative of the malefolk, and, in consequence, the question of operation must needs enter into the considerations governing the choice of a set for domestic application. In this connection, it is true to say of the "Climax" B.P.III that the controls have been kept down to the lowest minimum possible.

At the front of the instrument there are just three knobs, although the comparatively infrequent use to which one of them is put would hardly justify its inclusion as a control in the operating sense. We refer, of course, to the four-way switch on the left, which gives medium waves, long waves, "gramophone" and an "off" position.

### INSIDE FROM OUTSIDE



A neat hinged lid when lifted reveals the neat layout of screened components, valves and loudspeaker.

Of the two remaining controls, the central one is the main tuning device, while the knob on the right regulates volume.

There is, as a matter of fact, a subsidiary volume control which has wisely been mounted on the side of the cabinet inside the left-hand carrying handle. It is there to prevent overloading of the S.G. valve on powerful local transmissions, but it is something more than just a straightforward volume control, for it also enables the selectivity of the set to be adjusted for different aerial arrangements. The inaccessibility of the control does not merit criticism because it should not require anything more than occasional adjustment.

### Accurately Calibrated.

At the back of the instrument, the usual provision is made for aerial and earth, and for the connection of a pick-up and an external speaker. The set can also be used in conjunction with a mains aerial, for which arrangements have been made in the design.

A point of special interest concerning the back is that the hinged metal cover cannot be lifted to any appreciable extent until a two-pin plug has first been removed, and that automatically disconnects the mains.

The cabinet is pleasingly futuristic in appearance, and the polish and general finish are good.

Our aerial tests with this set were both interesting and illuminating. The calibration of the dials in actual wavelengths is a great aid, not only in the identification of unknown transmissions, but for the adjustment of the set to a given station. As an interesting side-line of our principle test, we actually tried this "picking-out-at-random" idea, and it is significant that not in one single instance did we strike unlucky. There was a station at every setting to which we turned.

### Above the Average.

We feel that it is quite unnecessary to refer to the number of stations actually received, for such a procedure is always apt to be misleading. The fact that the set is slightly above the average for selectivity and yet is equally as sensitive as the best of the modern receivers is proof enough of its worth-whileness, and it is fitting that we should draw this review to a close by adding that the quality of reproduction is all that could possibly be desired.

It will be obvious from our foregoing remarks that we have no hesitation in recommending this set to anybody in need of a really good all-electric "three."

(Continued on next page.)

### TABULATED DATA FOR THE TECHNICALLY MINDED READER.

**GENERAL SPECIFICATION.**—Three-valve all-electric receiver for A.C. mains with built-in moving-coil speaker.

**CIRCUIT DETAILS.**—Band-pass S.G. H.F. detector and pentode output. Full-wave valve rectification is employed.

**CONTROL ARRANGEMENTS.**—Central knob is

for tuning. Volume is regulated by knob on right. Left-hand control is four-way switch giving medium waves, long waves, "gramophone" and "off." Subsidiary volume control, which also acts as selectivity control, is fitted to side of cabinet.

**SPECIAL FEATURES.**—(1) High selectivity com-

bined with good sensitivity; (2) ease of operation; (3) provision for pick-up and external speaker.

**PRICE.**—16 guineas, complete.

**MAKERS.**—Climax Radio Electric Ltd., 59, Parkhill Road, Hampstead, London, N.W.3.



THE "CLIMAX" MODEL B.P.III RECEIVER FOR A.C. MAINS—(Continued from previous page)

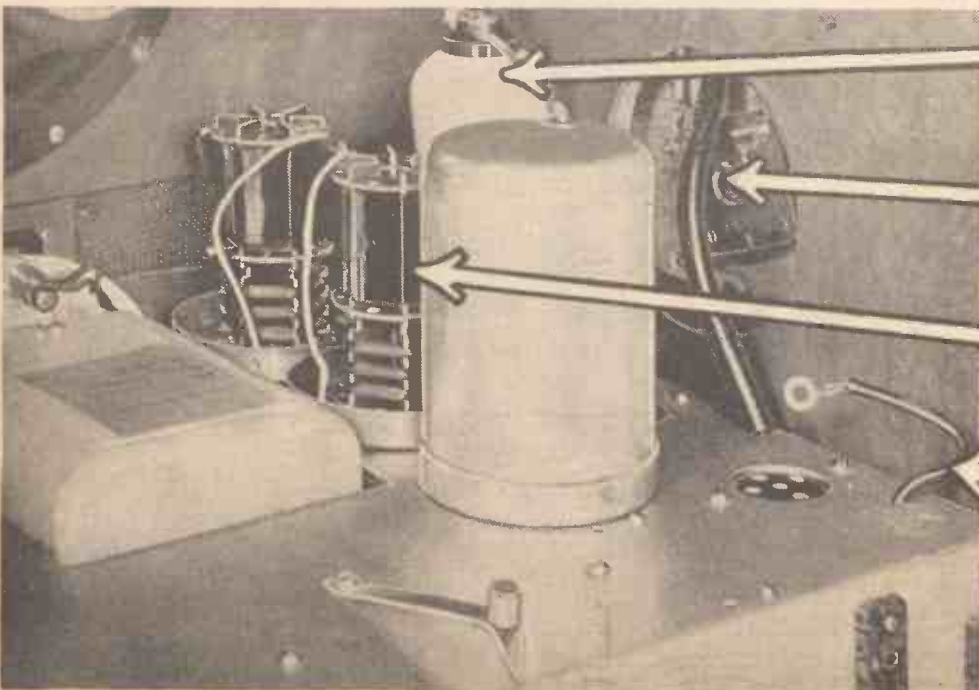
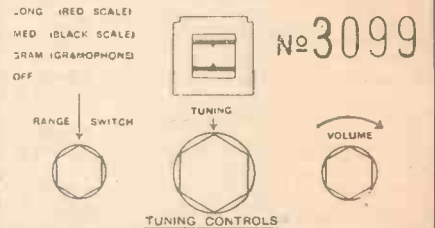
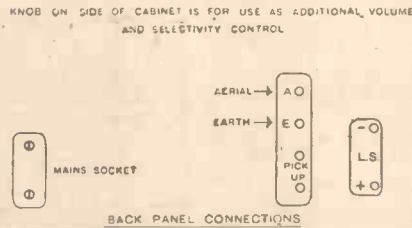
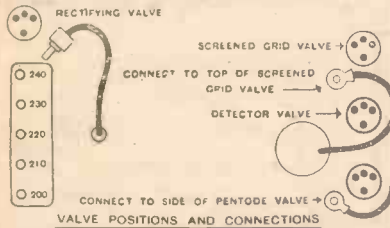
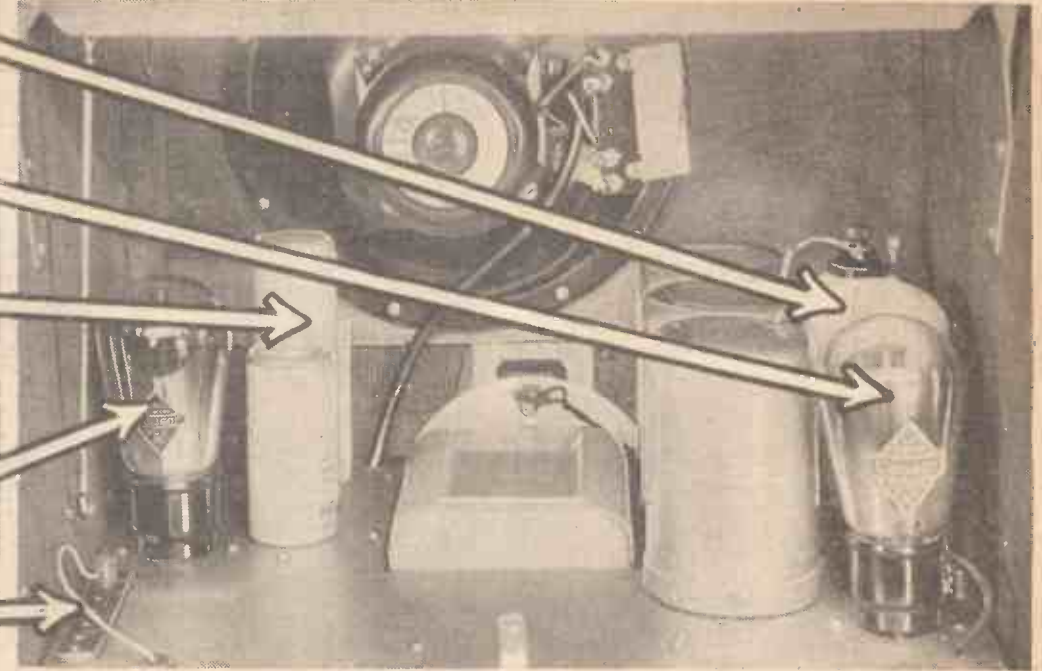
This is the metallised detector valve, while behind it may be seen the top of the S.G. H.F. valve.

The mains pentode valve employed is capable of giving an undistorted output of from 2 to 2½ watts.

Adequate smoothing for all normal mains supplies is provided in the design of this fine set.

Full-wave valve rectification is employed—the valve being the Cossor 442SU.

The mains voltage plug-and-socket adjustment scheme is easily accessible.



The S.G. H.F. valve is of the metallised type, and its anode connection is taken from the coil in the foreground (shown with screen in position).

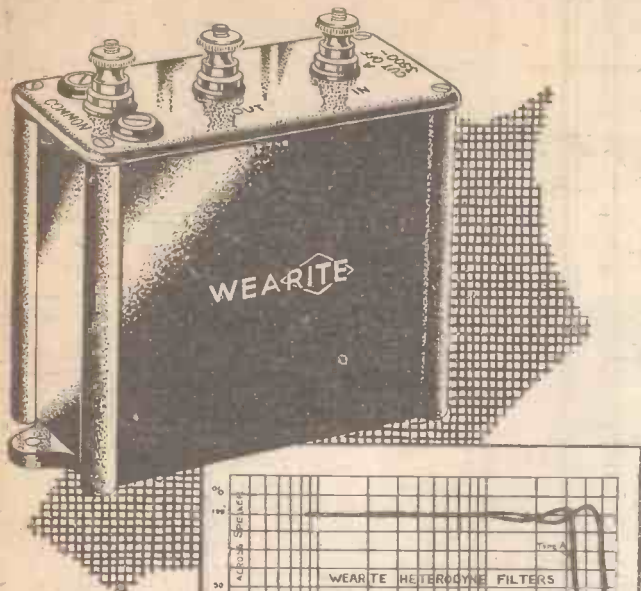
The selectivity-volume control, which requires only occasional adjustment, is fixed to the side of the cabinet.

The high sensitivity of the set is no doubt largely due to the efficient design of the coils.

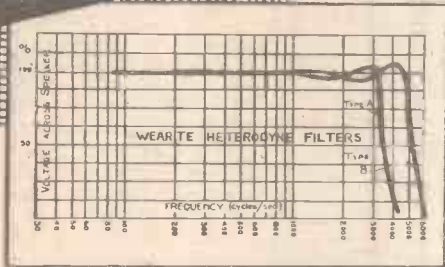
This is the lead which is connected to the terminal on the side of the pentode output valve.

The strip across the centre of this page is a replica of the ivory chart which is fitted externally to the back of the receiver. In our estimation, it is a most commendable idea.





The graph shows the characteristics of the two types of Wearite Heterodyne Filters.



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MUSH and  
INTERFERENCE**

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**10/6**

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# BRINGING YOUR SET UP-TO-DATE

## HOW TO GET MODERN RESULTS WITH ECONOMY



.....  
 \* Wavechanging in old-type H.F. stages involved "swopping" coils and, often, re-neutralising. Both are avoided in modern sets by using S.G. valves and automatic wavechanging components.  
 \* .....

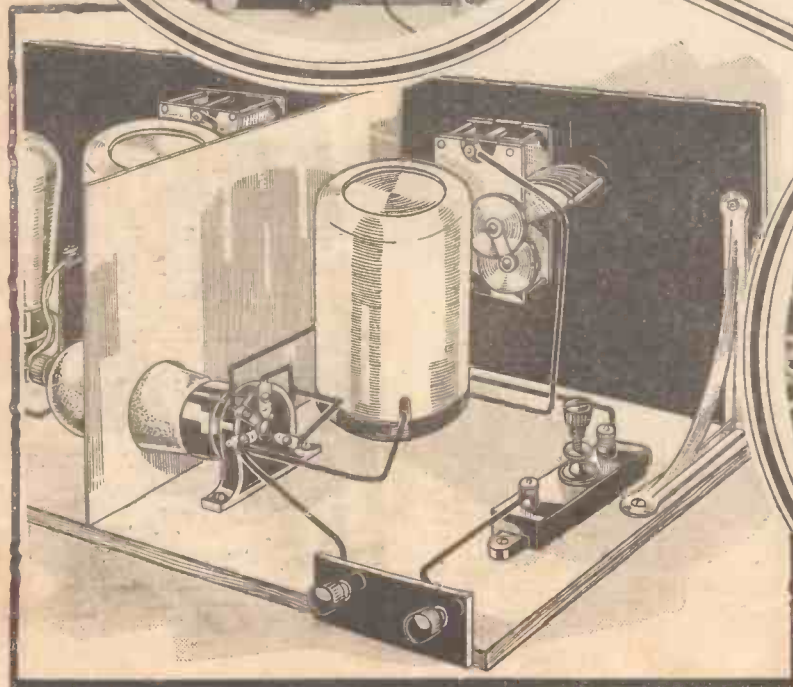
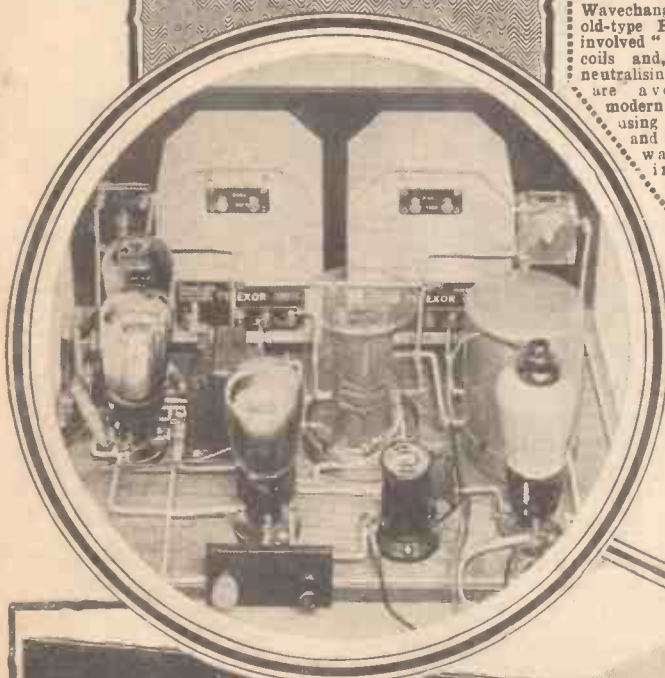
I WONDER how many listeners there are who are still using what I call "old-timers"? By this I mean sets that were designed some years ago, and which were never intended to cope with ether conditions such as exist to-day. In the course of my work I handle thousands of queries, and among these queries there are numerous requests for details of how to modernise the type of set to which I have referred. But I also realise that there are thousands of readers who are carrying on with their old sets because they think that they cannot be modernised, and yet are unable to face the expenditure of buying a complete new kit.

Now I want to emphasize here and now that very many existing sets can be brought right up to date in some way or other, particularly those of the det. and L.F. type.

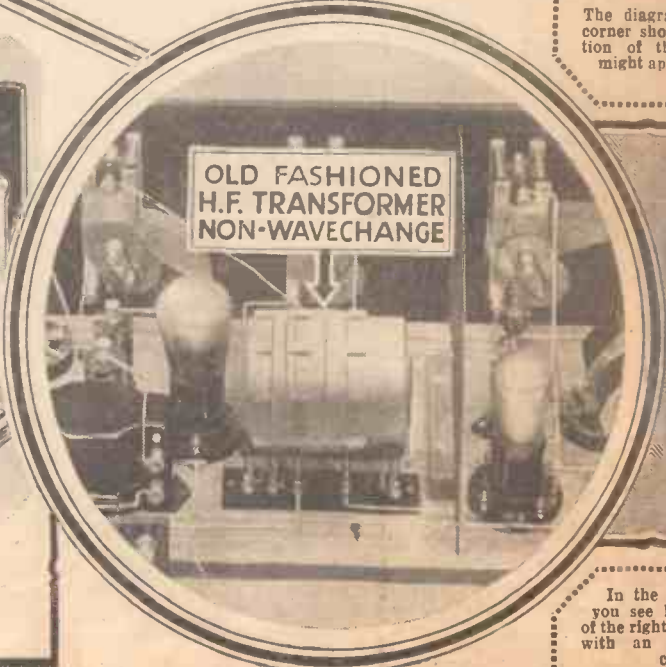
### Avoiding the Necessity of Wavechanging.

Let us take, for example, a design with plug-in coils. What is to prevent a modern wavechange unit being wired into one of these sets, thus immediately doing away with the necessity of having to change the coils upon going over to the long waves?

Lack of wavechanging is not the only disadvantage of the "old-timer." Perhaps the design in question incorporates an H.F. stage; probably the H.F. valve is neutralised. All well and good—the set will give passable results, but the overall amplification is considerably less than one can obtain with a good S.G. stage and "canned" coils.

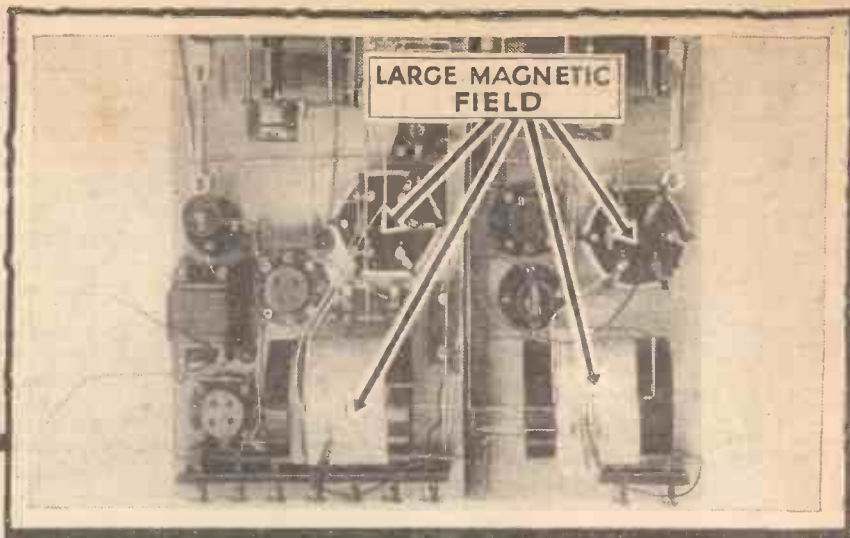


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 \* The diagram in corner shows h tion of the set might appear is  
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BY  
**A. JOHNSON-RANDALL**

So this old-fashioned receiver, although it may work quite satisfactorily, will not bring in foreign stations so well as a similar modern design with a good S.G. stage.

One of the failings of the H.F. amplifying stages of a few years back was that (the coils were unshielded, and at the best separated merely by a vertical shield) the magnetic fields between the aerial and H.F. windings caused instability the moment anything like a substantial stage gain was attempted.

**Selectivity Variable at Will.**

The modern method of using adequate screening everywhere eliminates this, and enables full use to be made of the excellent amplifying properties of the S.G. valve; even the valve itself is available in metallised form.

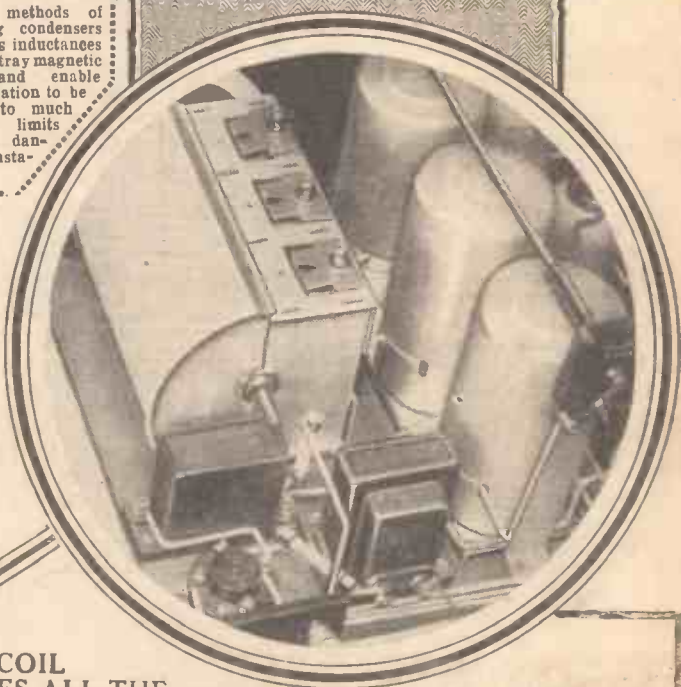
The problem with the old set is not only one of wave-changing or of achieving more amplification from the same number of valves.

Practically any design can have its selectivity improved, and one of the simplest methods is that of connecting a small condenser between the aerial terminal and the aerial coil.

There are two ways of doing this. I prefer to have my selectivity variable at will, and therefore I recommend the use of a .0003-mfd. condenser of the solid dielectric type, as shown in the first of the pictorial diagrams on the next page. This small condenser can be mounted on the panel, and provides the listener with a means of instantaneously

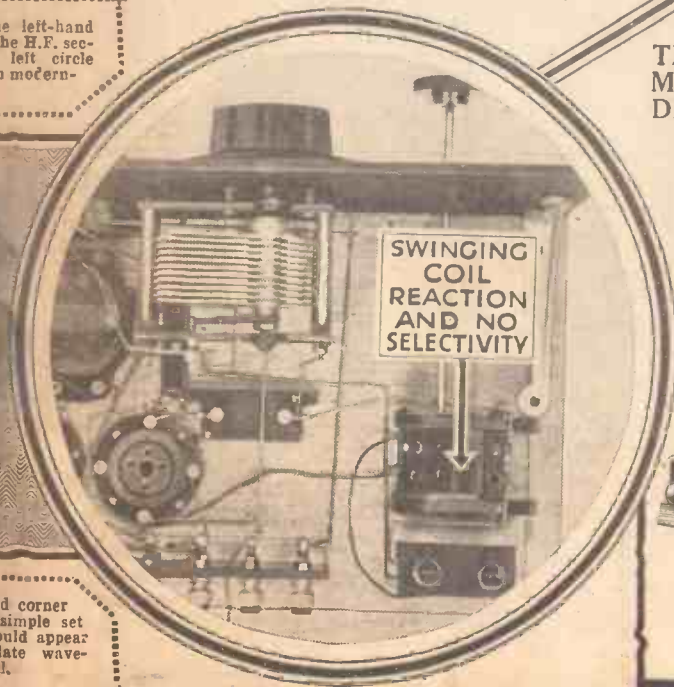
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Modern methods of screening condensers as well as inductances prevent stray magnetic fields and enable magnification to be carried to much greater limits without danger of instability.

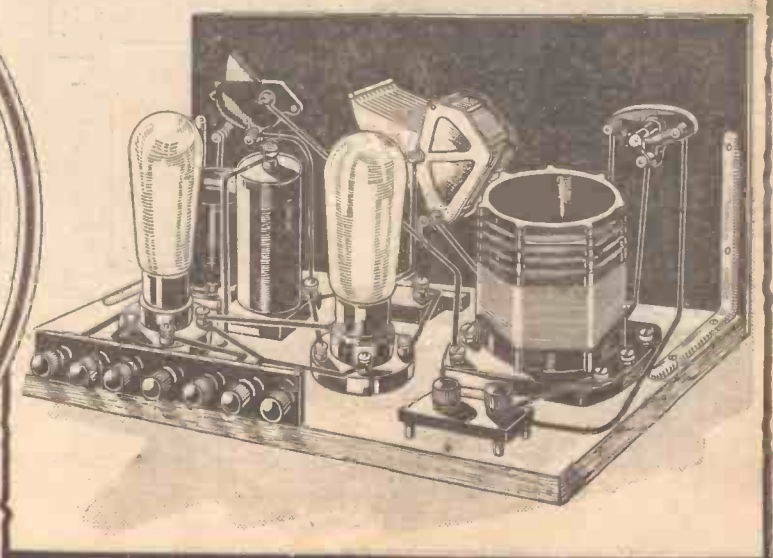


**THE COIL  
MAKES ALL THE  
DIFFERENCE.**

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e coil.





# BRINGING YOUR SET UP TO DATE

(Continued from previous page.)

increasing or decreasing his selectivity, while in addition this selectivity adjuster can also be employed as a volume control on the local programmes.

Unfortunately, there is not always sufficient room on the panel for a condenser of this type, small though it is, but there is an alternative, namely, one of those handy pre-sets that can be screwed to the baseboard between the aerial terminal and aerial coil. The pre-set can have a maximum capacity of .0003 or .0005, and the desired setting is obtained by adjusting the screw in the centre, and then afterwards locking it into position by means of the locking-nut provided.

### Easily Converted.

Practically all of the plug-in coil sets lend themselves to wavechanging, since the latest wavechange coil units occupy no more baseboard space than the non-wavechange type.

Most of these dual-waveband units need a wavechange switch on the panel, but there are few panels on which space cannot be found for such a compact little article.

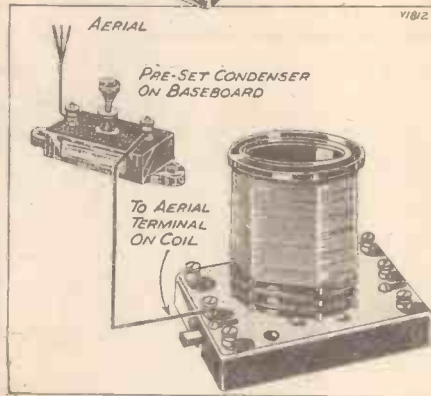
Readers whose sets are of the plug-in coil Det. and L.F. type will be interested in the two pictorial circuits on this page.

One of these includes the Telsen aerial coil and three-point wavechange switch, while the other shows the connections for a Colvern T.D. coil and a suitable wavechange switch.

I have not completed the circuit in so far as the L.F. stage is concerned, because in any case this will remain unaltered, and moreover some of the sets will have R.C. coupling, others transformers, some one and others two L.F. stages.

But I think that the connections will be quite easy to follow if first of all the existing wiring is stripped as far as the plate of the detector valveholder, leaving, if you like, the filament wiring intact, provided it is similar to the pictorial diagrams.

I make this last remark because in certain cases the sets may have L.T. joined to earth, and naturally if L.T. is also



There are two simple methods of improving selectivity. One is to mount a small variable condenser in series with the aerial, and the other to employ a pre-set condenser which can be screwed to the baseboard. The pre-set condenser may have a maximum value of .0003 mfd. and is adjusted by rotating the knob in the centre.

earthed, as in the pictorial circuits, the accumulator will be "shorted." So this is a point that needs watching.

The Telsen aerial coil has two terminals—Nos. 1 and 2—to which the aerial lead may be taken. When the aerial lead is joined to terminal 2, the selectivity control on top of the coil former is brought into circuit, and when the aerial is joined to 1 on the coil base this control is not in circuit. Incidentally, this selectivity condenser renders any external series aerial condenser, such as those which I referred to earlier in the article, quite unnecessary.

### An Alternative Method of Sharpening the Tuning.

Terminals 6 and 7 on this Telsen coil are joined together as can be seen quite clearly from the diagram.

The Colvern T.D. coil is provided with sockets on the coil base, and varying degrees of selectivity can be achieved by inserting the plug to which the aerial is attached into one or other of these sockets.

Both coils give very good results, and I have no hesitation in recommending them to those who wish to wavechange their existing sets.

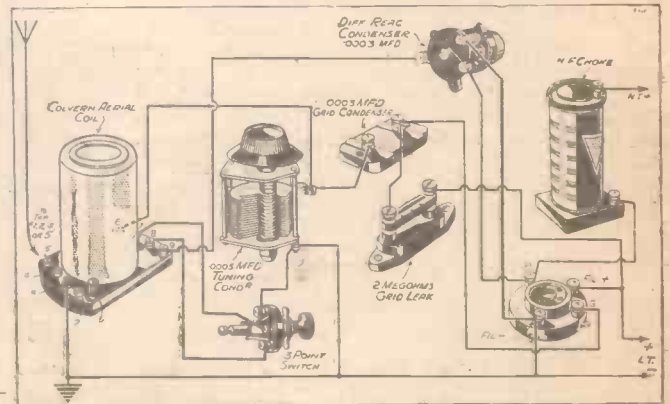
There are many other ways in which existing sets can be improved, and I am going to deal with some of these in future articles. If any reader has a "P.W." set that he would like to modernise, perhaps he would like to write in to me on a postcard, and if there are enough requests for any one set, then I will build up a modernised version, assuming this to be practicable, and describe it in "P.W."

Incidentally, those who have tuning condensers with ordinary dials will find it an advantage to equip their sets with slow-motion dials.

It is surprising how much easier the tuning becomes when dials of this type are used.

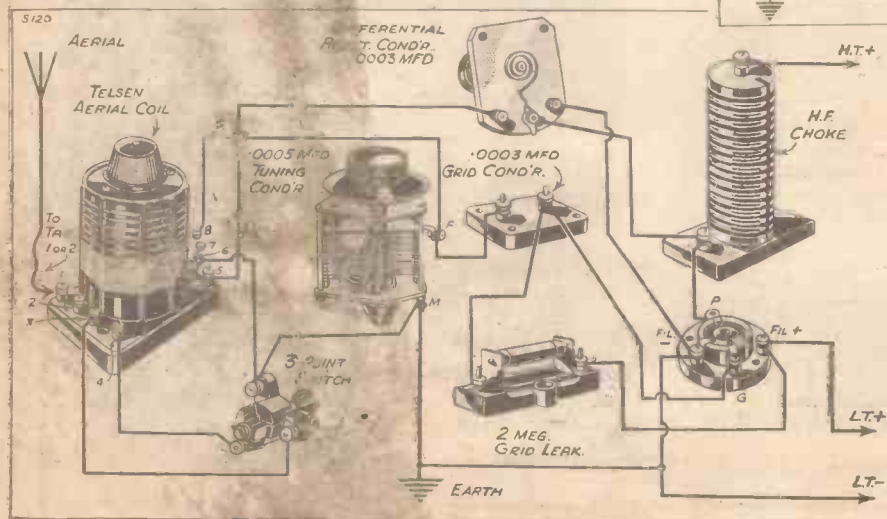
Then, again, it pays to replace old valves with new ones. In the last year or two vast improvements have been made in valve design, and the modern 2-volt steep slope valves give wonderful amplification.

### FOUR AERIAL TAPPINGS



These two pictorial circuits show the connections for dual-range aerial coils. The screened coil in the above diagram is a Colvern T.D., while the diagram on the left illustrates the Telsen unit.

### INCORPORATES SELECTIVITY CONTROL



For the average leaky-grid detector, i.e., the type of detector shown in the pictorial circuits, an "H," "H.L.," or special detector valve usually gives the best results. The H.T. will depend largely upon the reaction circuit, but generally speaking 60-80 volts is about right for the detector, with 120-150 volts for the L.F. valves.

Now just a word about reaction. When you connect up your differential condenser you may discover that the knob has to be turned anti-clockwise in order to increase the reaction effect. Don't let this worry you, because all you need do is to change over the leads to the two sets of fixed vanes. It is, of course, simply a convention to rotate to the right to increase, and vice-versa.



# Christmas Gifts

37'6 FROM L.T.  TO H.T. 37'6

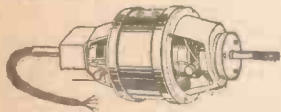
## Get a GENEROMETER

**BATTERY SUPERSEDER.** No H.T. Batteries needed for your set even if you are not on the mains. An H.T. Battery run down to 30 volts is useless and has to be thrown away. Yet you pay for the wasted volts.

The **GENEROMETER** makes H.T. from your L.T. 2-volt battery, rectified and smoothed. Gives 3 tappings and lasts indefinitely. A boon and blessing to all using H.T. Reduced from £3 15s. New and Guaranteed.

37'6

From us only



Double Current **DYNAMOS**, Govt., cost £15. Two commutators, D.C., 6/8 v., 3/5 ams. and H.T. 400/600 v., 100 mm., 5 1/2 in. dia., 12 in. long, 17 lbs., 4,000 revs., ball bearings. We have some surplus soiled sets. Guaranteed 12 months. Sacrificed at 22/6. Carriage 2/6.

**MOTOR GENERATORS.** For Battery Charging Stations and Power Amplifiers. 4 R.C.A. 220 volts to 500 volt 200 m.a. £5. 3-phase 380 volts to 12 volts 10 amps. and 320 volts 300 m.a., £6. 230 volts A.C. coupled to D.C. 350 volts 300 m.a. and 12 volts 10 amps., £6 10s. 100 to 240 volts, £4. S.M.D. Co. 12 volts to 800 volts £4. D.C. 7 1/2 H.P. 400 volts 12 amps. to 100 volts 6 amps., 1,700 revs. by E.C.C., £15. D.C. 115 v. 3 H.P. 23 amps. Motor coupled to 110 v. 14 amp. 50 cycle 1 1/2 K.W. A.C. Gen., £12. 220 D.C. to 310 volt 300 m.a. and 12 volts 10 amps., £6. Ditto to 480 volts 200 m.a. and 18 volts 20 amps., £6 10s. The best bargains we have ever offered in A.C.-D.C. charging sets. A quarter original cost.

**CHOKES.** New Chokes by S. G. Brown less than half price. No. 1, 1 amp., 20 hen., 3 1/2 lb., 8/6. No. 2, H.T. D.C. 30 hen., 1,075 ohms, 1 1/2 lb., 4/6. No. 3 Centre Tap Choke, 1,075 ohms, 1 1/2 lb., 5/- . No. 4, A.C. Mains Choke, Centre Tap, 120 ohms, 1 1/2 lb., 4/6. No. 5, H.T. Unmounted Chokes, 1,020 ohms, 15 hen., 1 1/2 lb. 3/6. No. 6, 5 Hen, 1,500 ohms H.T. 3/-. 200 H.M.V. 10 henry 700 ohms, 4/6. Igranite 20/180 henry 45 m.a., 8/6. 28 ijr. 15 hen., 4/6. Parmeko 16 ohms heavy duty Choke, 500 m.a. 21/-. B.T.H. double yoke, Centre Tap, heavy duty chokes, 500 m.a., 25/-. L.F. double-wound Chokes, 70 ohms 50 m.a., 30 hen., 6/6. Varley double-wound Chokes, 50 m.a. 4/6.

**RESISTANCES.** 140 Varley Wire-wound 500,000 ohms, 1/3. Tubular 400 ohms, 6d. 5,000 Vacuum Resistors, and Grid Leaks, Fig. 8, "Sutra," '01, '025, '05, '5, 1 meg. all new rods, 1/- line, for sale 3d. each. Tapped Wire-wound Eliminator resistances, 2/6. Edibell wire-wound Resistance Coils, 6,000 ohms, 16,000 ohms, and 38,000 ohms, 1/9. Reg. Volume Controls, as illus., for Gramos. or Mikes, 300,000 ohms, rocking type, 3/- line for 1/7. 48,000 ohm Western Electric wire-wound, 1/6.

**FRETS.** For Speaker Panel Fronts or Baffles. Fine 8 in. Octagon in flanged, black moulded, Bakelite, as on Brown's 30-guinea sets. 1/- only. Post Free 1/3.

**COILS.** Cossor 3-pin Short-wave, 1/- each. Aerial Reaction, Long, Short and multiple-tuning Coils, 2 1/2 in. by 3 in., 1/6. Ribbed Former, only 9d. H.M.V. Tuning Long and Short-wave Aerial Bandpass 8-in. Coils, 1/- . 2-pin Coils, B.B.C. or Short-wave, 6d. Aerial Fine-tuning Coils on Ebonite Former, 12 tapping with Rotary Switch Arm and Studs, 1/- . Tapped Inductances, 11 in. by 4 1/2 in., 4 taps, 2/6. Tapped Inductances, 9 1/2 in. by 7 in., with 7-stud Rotary Switch, 5/-. 1,000 Ebonite 6-ribbed small 1 1/2 in. dia., 1 in. long, 2d. Star Reaction Tuners, Broadcast Band, new, 9d. each. Igranite Unitone Couplers, usually 2/6, Major and Minor, 9d. each. **FELLOWS 5-PIN AERIAL COILS**, 200/500. Listed 5/6, Sale 3/9 each. Large stock of various makes of 6-pin coils at half price. 8-pin bases, 8d. Igranite Gimbal Coils, 1/- . Holders, 2/-. Igranite Twin Uni-tune Couplers, 1/- . Vario-couplers, 4/-. 2-pin Coils, 6d. Coil Holders, 2-way, 1/6. 3-way, 2/6. 12-in. Spark Coils, £8. Medical Coil Sets, 6/6, 10/6, 15/-, and 21/-.

**PHONES.** Sullivan's 120-ohm, with headbands, sacrificed at 3/6. 8,000 ohms, 4/6, cost 35/-. Brown's Reed, 1,500 ohms, 12/6 per pair; 120 ohms, 7/6 per pair. Single Receivers, 750 ohms, 7/6; 60 ohms, 4/6. Single Phones, Western or Ericsson, 1,000 ohms, 2/6 each with Cord. Single Receiver Magnets.

Bobbins and Case for conversion to Gramophone Pick-ups, 1/- . Soft Rubber Earpiece Cushions, 2d. pair, or 1/6 doz. pairs. D.III Field Phones, L.R. Leather Headband and Cords, 2/6 pair. Brown's Swivel Headbands, 1/6 pair. G.P.O. Long Magnet Receivers, price 2/- only. 5-way Outdoor Telephone Wire, cheap, 3d. per yard. Indestructible Phone Cords, 1/- .

**TRANSFORMER & CHOKE STAMPINGS** in 15 sizes, all at special price of 50 per cent. off list. Several tons in stock. Send 1 1/2d. stamp for sample and diagram, 52 page book on Transformer Construction, 1/- post free.

**PARCELS** of experimental odd coils, magnets, wire chokes, condensers, switches, terminals, etc., post free, 10 lbs., 7/-; 7 lbs., 5/-; 1,000 other Bargains in New Sale List "A."

# THE RADIOPAK specified



## for the P.W. "ALL-IN THREE"

THE band-pass 'Radiopak' specified last week for the "P.W." 'All-In' Three has already proved its case. First reports show the wisdom of the designers in specifying this unique unit.

The band-pass 'Radiopak' simplifies construction as well as it simplifies electricity. Revolutionary in conception and construction, compact and robust, above all the Radiopak is efficient. Consisting of screened coils, a provision for reaction, ganged condensers, a combined volume control, and an on-off switch, mounted neatly on a metal chassis, the Radiopak needs only the addition of a low-frequency circuit, loudspeaker, and batteries for mains unit to form a complete receiver.

Because the coils and condenser are matched with the highest possible degree of accuracy before leaving our factory, all ganging difficulty is eliminated, and each unit is supplied with a tuning scale calibrated in wavelengths.

FOR THE "P.W." "ALL-IN" THREE  
Type 535A/50,000, with extra knob for Reaction Condenser  
60'6

# RADIOPAK

THE ONLY COMPLETE BAND-PASS TUNER

BRITISH RADIOPHONE Ltd., Ltd  
Telephr

**ELECTRADIX RADIOS**  
218, Upper Thames St, London, E.C.4



FROM THE TECHNICAL EDITOR'S NOTE BOOK

TESTED AND FOUND?



A CHAT ABOUT SOME INTERESTING NEW COMPONENTS.

A COMPLETE BAND-PASS TUNER

THE British Radiophone Radiopak is a very sound piece of radio engineering, and although it costs three pounds it must be remembered that it embodies all the essential H.F. components of a first-class S.G. band-pass set. There are three screened dual-wave coils wound with Litzendraht wire to maintain a high degree of selectivity and having special oval-shaped, low-loss shields.

The gang condenser is a standard radiophone complete with disc drive, scale light

THE RADIOPAK



Almost a complete set

and a handsome escutcheon. It is calibrated in wavelengths.

There are also a wave change and a quick make and break on-off switch which is able to handle up to 750 watt power if the mains be employed.

All these components are neatly mounted on a stout metal chassis and this, as well as the coil screens and the cases of all the other components, is cadmium-plated and lacquered.

The overall dimensions are 10 in. x 6 1/2 in.

The coils and condenser are accurately matched and, by means of inductively and capacitatively coupled, a most reliable constant impedance coupling is achieved.

certain definite advantages over the "front door" method.

We have already employed a Radiopak in a "P.W." set, so our opinions regarding its technical efficiency will be obvious!

Technically it is, in fact, above criticism and in practice gives you better band-passing than is easy to obtain with separate components which, in any case, could hardly cost less.

NEAT COMPONENTS.

I have recently had the opportunity of testing two British-made Preh potentiometers. The one is the Standard "Multiohm," which retails at 3s.

It is a wire-wound potentiometer of clean, compact design and is able to dissipate two watts without undue heating.

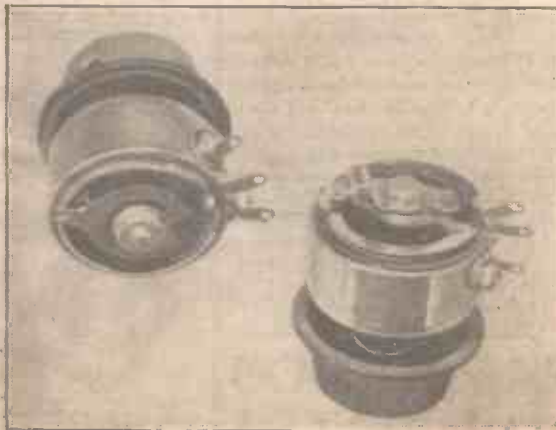
The action is smooth and no flaws exist in the resistance variation.

The Multiohm-Luxus is, as its name suggests, a de luxe type, and instead of the contact bearing directly on to the resistance wire, a contact disc is interposed.

This renders the action very velvety indeed and there is, as in the other model, an efficient, unbroken and therefore noiseless adjustment.

These Preh potentiometers deserve a wider use than they are likely to receive in

TWO PREH POTENTIOMETERS



The Preh Multiohm and Multiohm-Luxus wire-wound potentiometers.

home-construction circles. Why do I say that? -Simply because of one, in itself small, omission in their design. They have not got terminals.

There is less and less soldering done by constructors these days, and so I suggest the Preh Manufacturing Co. would be very well advised to equip their potentiometers with terminals as well as soldering tags.

A GOOD H.F. CHOKE

Coupling can in cases take place between an H.F. Choke and another component, but it is not likely to be a useful kind of coupling.

One method of preventing this happening, or at least greatly reducing the possibility of it, is to make the choke binocular.

The winding is divided into two parts, each being wound on its own former. But they are wound so that their magnetic fields tend to cancel out.

THE IGRANIC BINOCULAR



The moulding is an attractive green in colour.

An excellent illustration of this successful method of construction is afforded by the Igranic Binocular type of H.F. choke.

It is a good choke and suffers from no peaks over its rated range of 150 to 2,500 metres. The list price is 3s. 9d., and in view of its indisputable technical attractions, it is good value for money.

NEW CLIX SOCKET

Lectro Linx Ltd., are now making their insulated socket for metal mounting with a thread and nut for a screen connection. Hitherto it has had a soldering slot only. Many leading set manufacturers have standardised this Clix socket for their productions, and now it is available with a "non-soldering" connection it should prove as popular among constructors.



# A CROWDED CHRISTMAS EVE



BERT BENDER had spent the night of December 23rd-24th in fleeing from a blue-faced lion which made noises like a turkey and was tireless in action. Hence when he awoke with a jolt which almost flicked his toes off it was with a sense of relief that seemed too good to be true.

Bert was stranded in Hilldock, the Devonshire Biarritz, for Christmas; but how good it was to wake up, sans Leo with azure frontage, and smell frost, coffee, bacon, soap and tobacco! Golly, how matey he would be all Christmas.

A Crime Cameo. At six of the clock that evening, Herb Hoskins, maker of archbishop's mitres, unemployed, hungry, stood before the window of Stowpingle's Wireless Depôt. At six-one, a brick hot from Herb's hand described a parabola, and Potts' Perfect Portable ("Look for the Pipe in the Face!") lay naked to the hand of the spoiler—"all Danaë to the stars."

### One Under the Eight.

At six-fifteen of the clock that evening Bert Bender, having been matey all day, stood before the "Duck and Turnip," meditating on Poetry, and particularly on that poetic gem called *We Are Seven!* One under the eight!

He had just decided that he would complete the family circle more comfortably over his hotel dinner, when enter to him, at a jog-trot, a man who thrust into his hand a neat but heavy attaché case, and muttering, "Old it for us, guv'nor! Shan't be morna minnit," disappeared into the shadow through the stable yard of the "Duck and Turnip." "Righto, mate," shouted Bert to the retreating figure of Herb Hoskins.

Police-Sergeant Cobby, waddling heavily up Donkey Lane, little dreamed that a glimpse of his sturdy figure had sent his old professional friend, Herb Hoskins, into a Safety First Complex!

Bert waited faithfully. After an hour's vigil he returned to his hotel and dumped the case in his room. He had decided to open the case because he might find therein a clue to its owner.

Very interesting! He sat on the bed, half-dressed for dinner, poking buttons and turning knobs, but although the valves lit he could get no music.

Presently a woman's scream, a sustained upper C fading to a whimper, made him sit up and open his mouth. Then he burst into the next room.

An enormous lady, embellished with a

luxurious black moustache, lay crushing a small bedroom chair and weeping wetly, whilst around her capered something like a large yellow monkey. "Husband and wife. Spaniards," thought Bert, who had travelled.

"Dios!" cried the husband. "It are enormous tempest which you molest. We are arrive, my señora and me, at—how does it say?—the meeting of the parts, and are

Then the lady's toe began to tap in time with the music. The *Bolero!*

Yellow monkey snapped his fingers, took a few *pasos*, and then broke into the dance itself. Presently the "ouman" took the floor and anon Bert was fain to try his skill. And so there they were, snapping fingers, tapping toes, waggling hips, all very matey. Half an hour later, as he left to finish dressing for dinner, Bert asked, "What was the trouble?"

Nothing serious, I hope?"

"Sir, my wife pretends that the best blood oranges grow in San Juan de la Torre. Bud she is my wife and I love her."

"Well, I'm . . . ." said Bert.

At dinner Bert got into talk with a young man who said he was a student of dentistry, and who told some good stories of the

ivory business. He told Bert that the "trade" gives "gas" according to a quadratic formula meaning, "the first stage is anaesthesia and the fourth-good-bye!" and said that beginners in extraction have to practice pulling out dummy teeth and throwing them into a box on top of a high cupboard, in order to train them to keep the surgery fireplace tidy.

### Stop Thief!

This young hopeful was so pleased to find Bert such a responsive listener that he confided that he was also an inventor and had perfected a new portraiture process.

"Come on up 'n I'll take you," he said. "We'll take bottle up with us 'n case gets lorssh, eh?"

So Bert, divested of collar and tie, and clad in dressing-gown and carpet slippers, sat in his new friend's room and had his face daubed with a rich mixture which gave him the appearance of an apoplectic baboon. The "shot" being made, young "ivories" went to sleep in the middle of a yarn about elephants' tusks being the Dentists' Bad Dream, and Bert slipped out towards the bathroom.

Out of the tail of his eye he saw, as he passed athwart the corridor, a slim figure nip out of his room, carrying the portable. Bert gave chase but found it difficult to make haste down the fire emergency ladder, because the belt of his dressing-gown came undone and curled round his legs.

But on the flat he made a better show and soon the fugitive felt the hot breath of his pursuer on his neck—as Zane Grey might say; accordingly the thief dropped his booty, and vanished like the substance of a dream.

(Continued on page 899)

## BERT BENDER'S BLUE-FACED LION

Being the outcome of that "good will to all men feeling" and a smash-and-grab raid at a radio shop.

By ARIEL.

waiting at the meet for the parting of the ways. And you emboss yourself upon the scene! But you shall be the judge. Thees ouman—*la señora*, I mean—seeks to declare against the troot. She know not *ouat ces troot*—"

"Enrico," sobbed the lady, "I swear it ces troot." (*Valgame Dios! Diez mille pescaditoe pobres, etc., etc.*)



Muttering, "Old it for us, guv'nor! Shan't be morna minnit!"

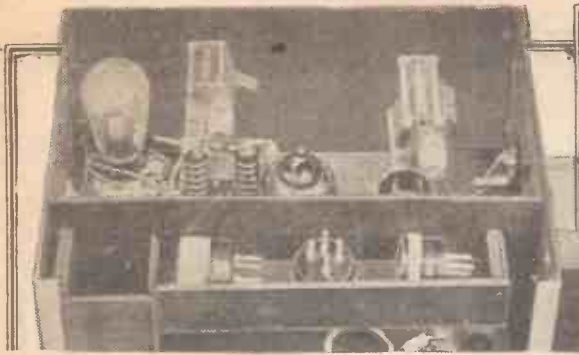
"Silence, ouman," thundered the yellow monkey.

"Flea of a fig-packer!"

"Ancestress of beardless bull-fighters!"

Just as this love-talk began to embarrass Bert the sounds of music came from his room. The portable had come into action. The three listened to the welcome diversion.





# Short-Wave HOOK-UPS

IN the previous two articles in this series I referred to the simplest forms of short-wave detector circuit, both series and parallel-fed. The time is now ripe to mention one or two different detector arrangements before we pass on to the subject of H.F. amplification.

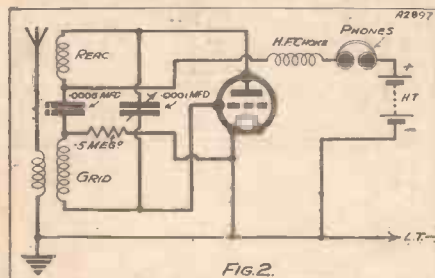
As I have already hinted, it usually works out that the circuit you like best is the one that works best. This, then, is

In his usual downright style our popular contributor reviews various circuit arrangements and comments pungently upon their peculiarities. You may not always agree with everything he says, but every short-wave experimenter will admit that W. L. S. gets down to the meat of the matter—and very often reveals the bare bones in a couple of masterly sentences!

sufficient reason for giving them all a trial, at least, in order to find out which is your favourite.

Fig. 1 shows a circuit of the "mongrel" class that I have always found to work very well from the start. It is a cross between the two circuits known as the "Ultradion" and the "Colpitts," and although it looks at first sight as if it shouldn't work at all, the ease with which it may be made to oscillate, right down to 5 metres and below, is surprising.

## THE BALANCED COLPITTS



Both sides of the tuning condenser are "live." But you must remember that it is a lively circuit!

Readers will note that there is no grid condenser, and that the grid leak is taken from the bottom end (although in the diagram it looks like the top end!) of the grid-coil.

When I first made the 5-metre receiver that some of you must have seen on the stand at Olympia I used the normal reaction circuit, and had difficulty in making

it oscillate smoothly. The mere removal of the grid condenser and inclusion of the leak in the position shown put matters right at once.

### Nothing to be Afraid of.

Fig. 2 shows the proper "Balanced Colpitts" circuit. The only disadvantage here is that both sides of the tuning condenser are "live." Hand-capacity effects are, therefore, troublesome unless we either mount the condenser back from the panel and "remote-control" it, or use a double condenser and earth the centre point. There is no need for a separate diagram of that—a series-gap condenser with one set of fixed plates going to the plate, the other to the grid, and a soldered earth connection on the moving plates will do the job beautifully.

Don't be frightened by the rather strange appearance of the circuit. It is very straightforward really, but it happens to "draw" in rather a queer way. The layout can be made simply beautiful by mounting the detector valveholder immediately behind the tuning condenser. The 0.005 fixed condenser that "splits" the tuning coil may be used as a support for the two "middles" of the winding. Control of reaction in both circuits is effected by varying H.T. by the inclusion of a variable resistance in the H.T. lead.

### Successful Working On 5 Metres.

The "outers" go to plate and grid, the tuning condenser across the whole thing, and the only remaining connections are the grid leak—on to one side of the fixed 0.005—and the H.F. choke—on the other side of the same component.

This nice symmetrical layout is doubtless the reason for the successful working of this circuit on 5 metres, where every centimetre of extra wiring becomes a serious matter.

There are other detector circuits in use, but most of them, when carefully re-drawn and analysed, resolve themselves into small modifications of one or other of the circuits that we have already dealt with, and may therefore be left out for the present.

We have more important things to deal with, among them the question of screened-grid H.F. for short waves. As this has been more fully dealt with in a recent issue of "P.W." than is possible in a general review of short-wave circuits, I do not wish to go down to the very fine points of the matter.

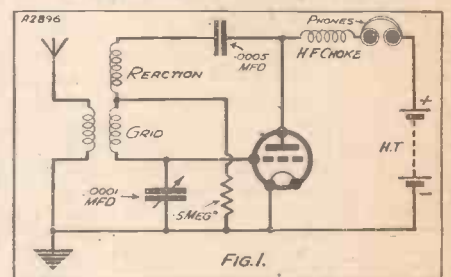
### Only Practical Arrangement.

I am, therefore, content with showing what, in my own opinion and experience, appears to be the only really practicable arrangement of a screened-grid H.F. stage (Fig. 3). There is nothing unorthodox about the circuit, but I have found most definitely

that one *must* use a parallel-fed arrangement of this kind. So many people who have tried S.G. on short waves and given it up in disgust have only tried a series-fed circuit of the "tuned-anode" type.

With the arrangement shown, the coupling condenser from the plate of the S.G. valve is a small adjustable condenser which

## A WORK-WELL "MONGREL"



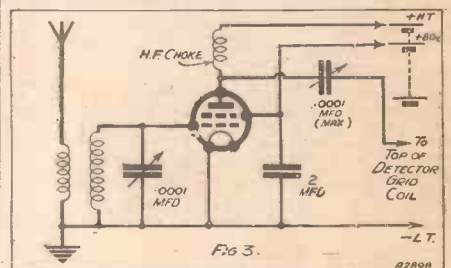
It is a cross between an Ultradion and a Colpitts—but it oscillates right down to 5 metres with great gusto.

is taken to the top end of the detector grid coil. In cases where the detector uses the popular capacity-coupled aerial one only has to remove the aerial from the coupling condenser and hitch on the plate of the S.G. valve instead!

This has practically no damping effect upon the detector circuit—if the coupling capacity is kept small enough—and there is very little "pulling" between the S.G. and detector tuned circuits.

The aerial coupling to the H.F. stage

## "W.L.S." RECOMMENDS THIS ONE



If you have tried only the series-feed type of S.G. circuit you should certainly have a go at this one. It has virtually no damping effect on the detector following it.

should be fairly tight, and may be either inductive (as shown in the diagram) or capacitive, by means of the usual "pre-set" condenser.

If the aerial coupling is adjusted to the right degree the tuning of the S.G. grid circuit can be made quite flat.





# RADIOTORIAL

All Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

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The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialties described may be the subjects of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

## QUESTIONS AND ANSWERS

### THE VOICE WITHOUT THE SPEAKER.

"JOTOMA" (Brixton, S.W.).—"The astonishment of one of your readers at hearing a voice from the set when no loudspeaker was attached—through the vibrations of a choke core, or something—reminds me of a point I wanted to ask you about before the children's parties are in full swing. It concerns a 'loudspeaker' that is really a sideboard.

"You gave a description a long time ago of how an armature type of loudspeaker unit could be fixed into a sideboard, or on a door, in such a way that the woodwork acted as a loudspeaker diaphragm and the sounds came out into the room clearly, without any type of horn or cone being used. Only the woodwork.

"Would you mind telling me how this is done, as I want to work a similar arrangement? We have a big, old-fashioned sideboard with large panelled sides and front and back, and in the centre of the panel there is a boss, a kind of rosette. One of these is loose.

"Could I fix the driving rod of the unit under it, and stick it in place again? Do you think I should get a recognisable voice or music from such a scheme, the panel being 4 ft. by 2 ft. 6 in.?"

"And what do I have to do to fix it? The set is a three-valve, S.G., Det. and Pentode."

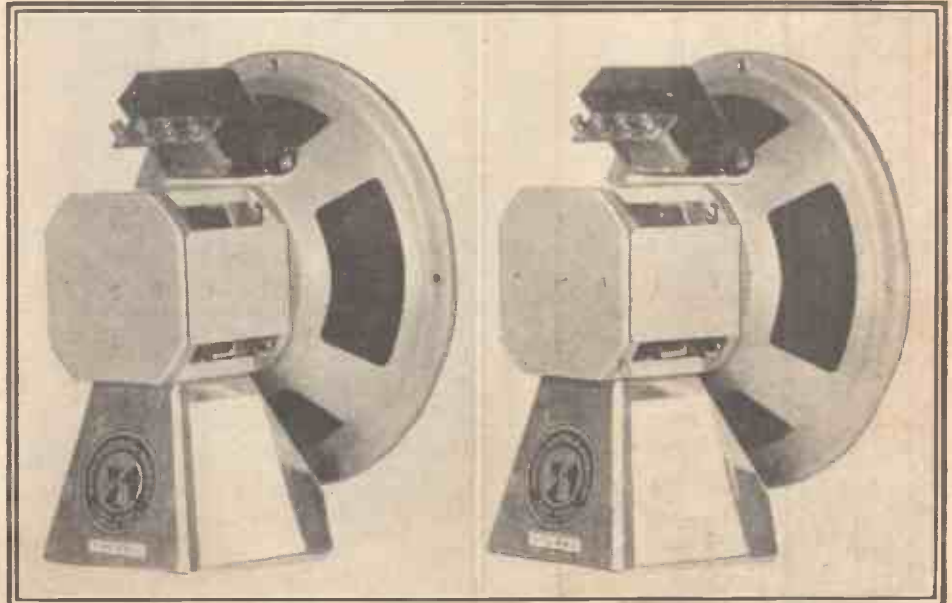
You should be able to get excellent results with the set named, working a "panel" loudspeaker. In fact, you will probably be surprised at the naturalness of speech and music from an arrangement of this kind. There is no question of it being "recognisable"—it is often much to be preferred to the quality given by one of the older armature-driven loudspeakers when working normally with its proper cone.

All you have to do is to fix the unit rigidly inside the sideboard, in a position which allows the driving-rod to project about one-eighth of an inch through the centre of the selected panel. Then screw its fixing nuts on in the ordinary way, to hold the wood exactly as the cone itself was held before.

An ornamental boss over the outer fixing screw is sufficient to conceal it completely. (Even on a plain cabinet surface the screw can be quite inconspicuous, being small—especially if coloured with a spot of stain.)

Inside the cabinet or sideboard there is only the L.S. unit, with two flex leads to it. These can conveniently come from an adjoining room. If desired, and you will find that a three-valve set working the panel loudspeaker will give excellent volume, with a curiously well-distributed effect that makes the absence of the ordinary loudspeaker all the more puzzling.

## FIDELITY IN LOUDSPEAKER REPRODUCTION



This double-view of the W.B. type P.M.4 moving-coil loudspeaker will stand out in a life-like manner when examined through a "P.W." Trueviewer. Note the stand upon which the speaker is mounted.

### TRANSFORMER PARALLEL FEEDING

"CHARLIE" (Dunstable, Beds.).—"Are these the right connections for auto-feed parallel transformer? 1=G, 2=G.B., 3=H.T., 4=A.

"Connected like this: G terminal to a grid resistance, which on its other side is fixed to

grid of L.F. valve. G.B. to a 2-mfd. condenser and also to the A-terminal on the transformer (The other side of the condenser is joined to the resistance in the plate circuit of the detector, and of course the other end of this

## DO YOU KNOW—

The Answers to the following Questions?

There is no "catch in them, they are just interesting points that crop up in discussion on radio topics. If you like to try to answer them, you can compare your own solutions with those that appear on a following page of this number of "P.W."

- (1) What is (approximate) resistance of an aerial, 100 ft. long and composed of seven-stranded copper wire, of the type commonly used and known as "7/22"?
- (2) Why is the wire mentioned above known as "7/22"?
- (8) About how many broadcasting stations are there in Canada?
- (4) What would be the effective resistance of two 50,000-ohm spaghettis joined in parallel?

resistance goes to the H.T. plus terminal, in this case H.T. plus 1.) The H.T. terminal of the L.F. transformer is joined to G.B. negative lead.

"I might as well explain that these are the connections that your Query Dept. gave me,

and on following them out the set went fine. But there is a big BUT.

"It has been pointed out to me that the actual connections named are exactly opposite to what the transformer is marked, its "H.T." being taken to the grid bias, and its "G.B." terminal to H.T. plus on the battery, through the condenser and resistance. Is there a mistake? And if so, why does it work so well as connected?"

Well, it sounds a bit of a mix-up, "Charlie," but actually everything is all right as it stands connected at present.

First, however, we would point out that you yourself appear to have become a bit mixed up in your query, and have written "Auto-feed parallel-transformer," instead of "parallel-feed auto-transformer," which is the usual name for the arrangement.

(Continued on next page.)

### "P.W." PANELS, No. 103.—CRACOW (POLAND).

Cracow works on 312.8 metres, sharing this wavelength with the Genoa and Radio-Vitus (Paris) stations.

As Genoa employs 10 kw. against Cracow's low power of 1.5 kw., the Cracow programmes are seldom received direct in this country; but they are frequently heard via Warsaw and the other Polish stations.

The famous interrupted bugle-call comes from St. Mary's Church, Cracow, and the bells of this church are often relayed as an opening signal.





## STOP PRESS . . .

It has just occurred to us that you will be building The S.T.400 during the XMAS Holidays ...

If so remember to get COLVERN S.T.400 COILS . . . . .

They are guaranteed to be identical to those employed by Mr. Scott-Taggart in his original receiver.

**COLVERN**  
MAWNEYS ROAD, ROMFORD, ESSEX

## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

Now about the connections. The marking on the transformer's terminals is the conventional marking, and if the transformer had been used in the conventional circuit, with H.T. current passing through its primary, the G.B. would be connected to the grid-bias lead, H.T. to the high-tension lead, and so on.

But an auto-transformer parallel-feed circuit is not the conventional one, so we have to interpret the connections accordingly.

Take the secondary of the transformer, for instance. The marking is G at one end, indicating that this is the end to be applied to grid. And in the diagram you have, that end is joined to a grid-resistance which, in fact, does go to grid. So that's all right.

Next, take the G.B. terminal. You say it goes to H.T. via condenser and resistance, but we would like to point out that not a spot of H.T. voltage or current can get to it by those connections because of the 2-mfd. condenser in the way.

On the other hand, grid-bias voltage and current can get to it, because it is joined to one end of the primary of the transformer, and the other end of this is connected direct to the G.B. battery.

We might go on to explain that from a low-frequency point of view the primary is correct also in our diagram, but it would be rather a long description to write, and after all, you know from experience that the arrangement is working satisfactorily.

What has happened to puzzle you is that when the conventional connections were altered to those for parallel-feed, the old markings retain their significance, but not in the same literal way as before, having to be interpreted anew in view of the fact that no direct current is allowed to pass through the primary.

You will find the subject interestingly and practically dealt with in the article on parallel-feed coupling which appeared in "P.W." dated October 29th.

### TUNING-CHART PROCEDURE.

"NEW CHUM" (Paignton, Devon).—"I only started taking POPULAR WIRELESS in November and already I have learned a lot, and I was quite pleased when you altered to come out on Wednesday instead of Thursday, because I was a day up!

"One thing I expect you have explained, but not since my time, is tuning with a chart. I know it uses squared paper and there are stations and wavelengths marked. But could you give me just a short description of how a chart of this kind is prepared?"

It is easy enough, but allow yourself plenty of paper, as in all probability you will need to make a couple of roughs before you get a final and accurate chart prepared.

The idea is to link all the known stations and dial readings with all the unknown ones, by means of a "curve" pencilled across the chart. You need a list of stations and wavelengths, and then you can proceed as follows.

### POSITIONS OF STATIONS.

Suppose your tuning dial goes from 0 to 180° and the stations you receive include North Regional (near the top), Midland Regional, London Regional and Nurnberg, the latter coming in at 10 degrees.

Your wavelength list will show you that Fécamp is working on about 223 metres and Budapest on 550, the others being between these wavelengths.

Draw two sides of a big square on the squared paper, and let the bottom line stand for degrees 0-180. (If you have insufficient room to let each one division stand for 1 degree on the dial, one division can stand for 2 degrees.)

Up one side of the square you must mark wavelengths. At the bottom, near the lower end of the line, the upright can stand for, say, 210 metres, and then mark regular wavelength increases up to about 550 metres, at the top of this line.

Having got this all worked out, you can start putting in the dots that will represent the stations. Near the top of the dial you have North Regional, and we will assume his reading is 100. His wavelength is 480 metres.

## THE ANSWERS

TO THE QUESTIONS ON PAGE 897 ARE GIVEN BELOW.

- (1) Such an aerial wire has a resistance of only about 18 ohms.
- (2) Because it has seven strands, each being of No. 22 gauge.
- (3) Eighty-three.
- (4) 25,000 ohms.

DID YOU KNOW THEM ALL?

Put a dot on the 480-metre line where it crosses the 100 dial line. Mark that N. Regional. Proceed in this way with all the stations you know, down to Nurnberg, on say 10 degrees of the dial and 239 metres.

Fill in all the dots you can. And get them as accurately placed as possible.

Now look at the dots. They will be in the form of a curving line, sweeping right across the chart. So get out your pencil again and join each dot to its neighbours, to make a sweeping non-kinking curve right across the other lines.

Now you are on velvet. That line, accurately filled in, will cross every dial-reading, except perhaps just at top and bottom, of course.

Moreover, it will cross the wavelengths, and will thus connect every wavelength with a dial reading. So if a station puzzles you at 62° on the dial, you don't need to worry about it—just look at 62° on the chart, note what wavelength that dial-reading links up with, turn to your list and find what station is on that wavelength, and there you are!

Incidentally we might mention that the above method, simple though it is, has been improved recently—see the current number of "Modern

## IS YOUR SET BEHAVING ITSELF?

Perhaps your switching doesn't work properly? Or some mysterious noise has appeared and is spoiling your radio reception? Or one of the batteries seems to run down much faster than formerly?

Whatever your radio problem may be remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers its unrivalled service.

Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do. On receipt of this an Application Form will be sent to you post free immediately. This application will place you under no obligation whatever, but, having the form, you will know exactly what information we require to have before us in order to solve your problems.

**LONDON READERS PLEASE NOTE:** Inquiries should NOT be made by phone or in person at Fleetway House or Tallis House

Wireless," if you are interested in easy and accurate station placing.

### WOULD IT MATTER?

J. E. B. (Millwall, E.14).—"Would it matter if I worked a pick-up in one room, where the gramophone is, if the set is in the next room. Total length of lead about 20 ft."

We are afraid you would get very pronounced trouble with that arrangement, for short grid wiring is generally essential to prevent howling, feed-back, etc., and nobody would call a 20-ft. lead short.

It might work, and possibly an L.F. transformer at each end would be worth trying. But in general we should advise against the scheme until every other alternative has been tried.

### SEPTICAL ABOUT AMERICA.

"DON'T BELIEVE IT" (Watford).—"This talk of getting America on a three-valve set without changing coils. Has it ever been accomplished, or is it all fishermen's yarns? To me it seems impossible, and I don't believe it can be done."

It is being done on quite ordinary sets, night after night, and will probably continue right up to, perhaps, March. But there is a certain amount of luck about such very long-distance reception.

Personally, we generally give the dials a twirl if not in bed by 1 a.m., for at that hour Europe has mostly gone to bed, and often one can pick up an American. Sometimes a South American—real distance.

We have, as a matter of fact, succeeded in getting the U.S.A. on a one-valve, but we would rather you did not take our word for it, but try for yourself—first with a real good "distance" set of three or four valves, and then if you find it amusing, with a smaller set.

The more you try the more certain you will be that it can be done—with luck.

### BACK NUMBERS OF "P.W."

"JONA" (Prittlewell).—"I want to get the first 'True-View' article in 'P.W.' Where do I write for the back number?"

Back numbers of "P.W." which are still in print can be obtained from The Amalgamated Press, Ltd., Back Number Dept., Bear Alley, Farringdon Street, E.C.4. Price 4d. per copy post free.



## MORE TELEVISION LETTERS

A further selection from the thousands of postcards received from "P.W." readers in response to our Television Competition.

"Twelve o'clock. Big Ben strikes. One imagines huge cogged wheels and cranks, massive hammers rising and falling, a myriad of pignies dashing in and out with oil-cans and wipers. Big Ben 'tells the world'; let Big Ben show the world. Please let us see inside."

A. E. Watts,  
22, Pitcairn Road,  
Mitcham,  
Surrey.

"Ten years in a radio store tells me that vaudeville items are the most popular. I meet every class and type of radio enthusiast, and must say that the educational attitude that the B.B.C. mostly adopt is definitely resented by the masses. We want entertainment."

M. Maurice (Manager),  
London Radio Co., Ltd.,  
50, Savile Street,  
Hull.

"I think a Mickey Mouse or some other equally amusing cartoon film of ten minutes would be an ideal item for a television programme."

"Because: 1. Black and white caricatures should come over well.

"2. The scenic effects should provide a change from the usual white sheet background."

Ben Whatmore,  
64, Eade Road,  
Finsbury Park, N.4.

"A vision of the Armistice Day ceremony, relayed to the whole world—the laying of wreaths, the service and the two minutes' Silence, would create an impression that mere verbal description could not convey.

"Remembrance of that day, and its significance, would do more for peace than any conference could."

E. A. Cooper,  
99, Harrington Street,  
Pear Tree, Derby.

"Why not televise the inside of Broadcasting House; also apparatus by which television is sent out, and apparatus for broadcasting sound, and give a running description of them?"

"Everybody likes to know how a thing works. Besides satisfying curiosity, it would be interesting and entertaining."

John Peel,  
106, Hawkins Lane,  
Burton-on-Trent,  
Staffs.

"In view of present limitations, consider the ideal television is conjuring and juggling, etc."

"Its appeal is universal. Spectacular effects can be accomplished in a limited space, and relying more on action than sound for effects, can be enjoyed by people possessing only one receiver, also by deaf persons."

G. Baron,  
"Godinton,"  
11, Avenue Road,  
Norbury,  
S.W.16.

"I think one ideal turn for television would be a boxing match."

Reasons: 1. Action takes place within space easily reproduced large enough for details.

"2. Running commentary very ineffective medium for broadcast."

"3. World-wide interest in the sport."

L. Hirst,  
21, Broadway Market,  
Barkingside,  
Essex.

"Television 'jerks' must be my popular choice. It would give an exact copy of the correct gesture of the body during the carrying out of any particular exercise. One and every movement could be depicted more closely, and would enable us to derive full benefits from such courses as these."

Harry Bruce,  
17, Staincliffe Hall Road,  
Batley.

"The ideal television programme item must have as its subject celebrities whose features are familiar to the looker-in. The supreme test of broadcast reception is comparison of the transmission with the original. Progress can only be achieved by the continual comparison of the ideal with the actual."

G. Kerr McKay,  
High Parish Manse,  
Johnstone.

## A CROWDED CHRISTMAS EVE

(Continued from page 895)

Bert had lost his slippers but he had not lost any of the paint on his face, and he was half a mile from his hotel. Nothing for it but to slither through back streets.

Bert drew near to Morden Street. Before one of the shops a small crowd had gathered and he had to pass through this. Muffling his face as well as he could with his handkerchief he elbowed his way in. "What's up, mate?" he asked of one of the by-standers.

"Bin a smashing grab! One o' these poddable wi' liss stolen."

The handle of Bert's portable became red hot! He caught a glimpse of a policeman's helmet. He fled in panic. Up one alley, down another; across the dark and deserted fish market and along by the "Duck and Turnip."

Agustus Stopwingle, proprietor of the looted "Wireless Emporium," still tells how, crazed with grief, he was trotting along to the "Duck and Turnip" for a lithia water, when a madman with a sort of face like a blue lion shoved the missing portable into his hand, saying, "Hold this a tick, mate," and was gone with a swirl of skirts. He had two tails with tassels!

During the night of December 24th-25th Bert Bender fled for ever down the labyrinthine years, closely pursued by a blue-faced lion. This time the lion had two tails and danced the Bolero!

### OSBORN RADIO CABINET

MODEL No. 218.

A Queen Anne Radio or Radio-Gramophone Cabinet. 3ft. 10ins. high x 2ft. 2ins. wide x 1ft. 6ins. deep. Size of baffle board behind fret 24ins. x 24ins. Silk fabric for fret front included. Opening top and back. Takes panel 2ft. x 9 ins. or smaller. Complete with motor board. Cabinet also obtainable as follows:—3ft. 6ins. high x 2ft. 2ins. wide x 1ft. 6ins. deep. Size of baffle behind fret 24ins. x 17ins. Silk fabric for fret front included. Opening at top and back. Takes panel 24ins. x 13ins. or smaller. Accommodates any type of gramophone motor. Both specifications sold at same price.

Machined ready to Assemble: Oak, £3.10.0; Mahogany, £3.15.0; Walnut, £4.10.0.  
Assembled Ready to Polish: Oak, £4.10.0; Mahogany, £4.15.0; Walnut, £5.10.0.  
Assembled and Polished: Oak, £5.10.0; Mahogany, £6.5.0; Walnut, £7.5.0.

All Models Carriage Paid.  
Osborn Super-Acoustic Baffle Board prevents 90 per cent. speaker worry. Any size hole cut FREE. Guaranteed no vibration. 18ins. x 18ins., 38. 24ins. x 24ins., 58. 30ins. x 30ins., 68. 36ins. x 36ins., 118. 3d. Carriage Paid U.K. Send for Free Sample.

WRITE FOR FREE CATALOGUE.

**CHAS. A. OSBORN,**  
REGENT WORKS, ARLINGTON ST.,  
LONDON, N.1. Telephone: Clerkenwell 5095.  
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## THIS HANDSOME OAK CABINET



Will harmonise with your furniture and enhance the appearance of any room. House your set in the Camco "Waverley." This attractive Camco Cabinet is specially designed for converting your set into a Radio Gram, sufficient room having been allowed for housing an electric or clockwork gramophone motor. Space provided for loudspeaker and batteries or eliminators—Price includes baffleboard and baseboard.

Prices: Oak £5-10-0 supplied also in Mahogany £6-15-0.  
Polished wood Panel 18"x17". For converting "Osram Music Magnet Four" 4/- extra.

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FREE Send the coupon for free copy of the new Camco Cabinet Catalogue giving particulars of complete range. See them also at our showrooms. Open 9.15 to 5.45: (Saturday 12.30.)

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Address: .....  
I.P.W.

## WHY BUY GANGED CONDENSERS?



No need to buy expensive ganged condensers. This device enables you to utilize any existing condensers. You can gang them yourself: full instructions supplied. From all dealers, or direct from the manufacturer.

2/6

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Brockley Works, London, S.E.4





**"It is a MAGNIFICENT Unit,** and its adaptability makes it a most attractive proposition. The smoothing is excellent, and I regard it as the peak of Mains Unit achievement. . . . and is designed and built on really sound engineering lines."

"Popular Wireless," December 3rd.

A genuine and unbiased opinion of Heayberd Mains Unit.

HEYBERD M.W.1 UNIT. Alternative Outputs: 150 v. at 30 m.a. or 200 v. at 50 m.a. H.T. - L.T. 4 v. 5 amps. A.C. PRICE - 127/6



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I enclose 3d. stamps for New Handbook of Mains Equipment. Packed with Technical Tips, Service Hints and diagrams

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**F.C. HEYBERD & Co.,**  
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One minute from Moorgate Str

**LOUD SPEAKER REPAIRS**

Any make Unit, Transformers, etc., from 3/-; Blue Spots, 5/-; Moving Coils, Eliminators, etc., from 5/-. Repairs guaranteed laboratory tested and returned, C.O.D. post. Special trade terms or by contract. **WEEDON POWER LINK RADIO CO., 185, Earlham Grove, London, E.7.** (Phone: Maryland 4344).

**THE "OVERSEAS" TWO**

(Continued from page 880.)

loudspeaker work. The amount of grid bias required will depend on the valve in the last stage, but if you follow the valve-maker's instructions in this respect you cannot go wrong.

**A Matter of Experiment.**

The aerial is not very important. It is often found that when listening on short waves just as good results are obtained with a piece of wire slung across the room as with a large outside aerial—it is all a matter of experimenting.

The same remarks apply to the earth connection, for, whereas a good earth is advisable, good results are not uncommon without one.

The first test should be made with the wavechange switch in the middle position. The set is then adjusted for the longest waveband of the three. Tune in the normal manner, and if difficulty is found in making the receiver oscillate, reduce the series aerial condenser a little. Now try the other two wavebands, adjusting the small aerial condenser until a point is found where smooth reaction can be obtained over all three ranges.

**NEXT WEEK**

**MODERNISE YOUR SET!**

Further practical details about bringing that old receiver up to date.

**ORDER YOUR COPY NOW.**

A little practice will be required before the handling of a set of this type can be mastered completely, but all you have to remember is to turn the dial very, very, slowly, keeping the set just "breathing," right on the edge of oscillation all the time. Every carrier, no matter how weak, should be investigated for conditions on the short waves change so rapidly that a station that is barely audible at one moment may come in at loudspeaker strength a few minutes later.

Space will not permit of going fully into the possibilities and fascination of short-wave listening, but it is sufficient to say that if you build this receiver according to plan you will have something of which to be proud, and from which you will obtain many hours of enjoyment. May your log be a long one.



By G. T. KELSEY.

IF I were the Leader Writer on a daily newspaper instead of the Trade Commissioner of "P.W.," I am afraid I should be sorely tempted at this season of the year to implore all our more fortunate readers to extend the hand of friendship to all those in our ranks who, through the present economic depression, have been deprived of their means of livelihood.

But that, I am afraid in all but one respect, is definitely a matter for our national newspapers. All the same, I do pass on for your serious consideration the suggestion that you will be helping to while away many a tedious hour for our less fortunate colleagues if you spend half an hour or so in sorting out the components that you do not now require. You will not find any difficulty in locating somebody who would be deeply grateful for such a gift, and home construction will help tremendously to stave off the heartbreaking effects of prolonged unemployment.

**The Season's Greetings.**

This is the Christmas week issue of "P.W.," and for that very reason I feel that I have some justification for having commenced my notes rather off the beaten track. And now, just before I settle down to the normal routine, I want to express sincere seasonal greetings on behalf of "P.W." and its readers to all those who are absorbed in this great industry of ours, and from letters and messages I have received I know that I shall be expressing the feelings of the Trade in general by conveying to "P.W." readers a hearty reciprocation of the good wishes.

We hope that the coming year will register even greater strides than have been made during the present one, and that with increased trade it may be possible for us to continue to do our bit towards a reduction in the numbers of unemployed.

**Some Transformer!**

I am interested to learn that our friends at Hollinwood, Messrs. Ferranti, have just completed one of two transformers, which, as self-cooled units, will be the largest transformers in the world.

These two transformers, the capacity of each of which is equivalent to approximately 100,000 horse-power, are to be used in connection with the National Electricity Grid Scheme.

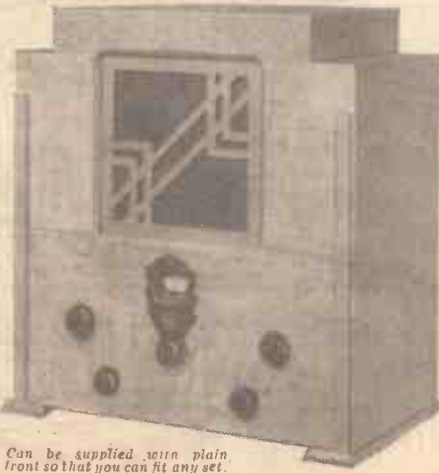
In passing, it is appropriate that credit should be given to the skill of the designers, for despite the exceptional capacity of the transformers in question and the fact that they are 25 per cent larger than any other transformers on the grid system, their dimensions are within the standard railway loading gauge, and the units can therefore be transported without any interference with normal traffic.

Chosen for the "P.W."

**ALL - IN - THREE**

The "Whitchall de Luxe" is a fine solid piece of furniture, and is available in three finishes, natural, golden, Jacobean. The use of solid wood does away with any troublesome boom effect, plywood only being used for decorative purposes, i.e., the fret and detachable front. Make certain that your "All-in-Three" is housed in a worthy cabinet—the "Whitchall de Luxe" price 30/-, complete with base-board and battery shelf. Cash or C.O.D. Carriage paid to your door. Obtainable at all good-class Radio Dealers, or direct from the sole manufacturer.

State style of finish required when ordering. Money refunded if not completely satisfied. **The Myers Hunt Cabinet Co., 7, Austin Street, Shoreditch, London, E.2**



Can be supplied with plain front so that you can fit any set.

All Applications for Advertising Space in "POPULAR WIRELESS" must be made to the Sole Advertising Agents, **JOHN H. LILE, Ltd., 4, Ludgate Circus, London, E.C.4.** Phone: City 7261





## STATIONS WORTH HEARING

LAST-MINUTE NEWS OF RECEPTION CONDITIONS.

NO long-distance enthusiast can have any real grumble about the conditions of reception that have prevailed so far this winter, though I have heard a grouse from one man who complained that many stations were coming in too strongly. Except for odd evenings, there has been very little fading, on wavelengths, at any rate, above 300 metres, and atmospheric have given us a long and very welcome rest.

### Restoring Quality.

Nowadays, the merest "whiff" of reaction suffices in a large number of cases, and if we do have to use a little more sometimes, the quality can be restored by the use of a tone-correcting transformer.

There is plenty, then, for the man who uses foreign stations only as providers of alternative programmes fully worth listening to. He can turn with confidence to the two Brussels stations, Rome, Strasbourg, Leipzig, Toulouse, Budapest, Prague, Langenberg, Heilsberg, the Poste Parisien, Breslau, Hilversum, Munich or Trieste.

He can feel very nearly as sure of first-rate reception from Beromunster, Berlin Witzleben, Sottens, Milan, Goteborg, Bratislava, Turin and Frankfurt.

### For the D.X. Man.

And for the man who wants to compile a long list of foreign stations within the range of his set, and does not greatly mind if there is at times a little fading, a little distortion or some background noise, there is a whole host of interesting transmissions—interesting sometimes because they are always more difficult to receive than the stations already mentioned, sometimes because they vary so greatly that it is only on occasional nights that respectable reception is possible. Then, again, there are the stations which demand knife-edge selectivity if they are to be separated from powerful neighbours.

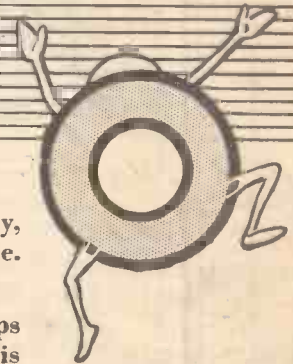
### A Fascinating Frenchman.

Lille is one of the most fascinating of the French stations. Unlike many others, it holds its wavelength very closely; in fact, its record during October, as shown by the last U.I.R. report, compares favourably with that of many more important stations.

Lille's strength varies so enormously that, though daylight reception is occasionally possible, there are many nights upon which nothing can be heard of this station. Valencia and Brno are stations that will attract the enthusiast.

Others that should not escape his attention are Radio Bezier, Marseilles, Hamburg, Bolzano, Poznan, Bucharest, Belgrade and Sundsvall. All of these can be received, but the task is often by no means an easy one. R.W.H.

**WHY  
ROB YOUR  
SET OF THE  
H.T. IT DESERVES  
?**



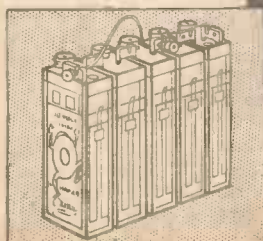
When you throw away an old H.T. Battery, you throw away voltage you cannot use. You are wasting money.

The Lively 'O' H.T. Accumulator stops waste—definitely! From the moment it is charged, up to the time it needs recharging, it is full of power-giving life—full of powerful energy—full of punch! No self-discharge—no leakage—its "Air-Spaced" cells are leakage-proof. The Lively 'O' H.T. Accumulator gives you constant voltage. Smooth, silent current—power that never varies. Isn't that the kind of H.T. supply you've always wanted? Your dealer stocks the Lively 'O' H.T. Accumulator.

Oldham & Son Ltd., Denton, Manchester. Estd. 1865, and at London, Glasgow, Belfast & Dublin

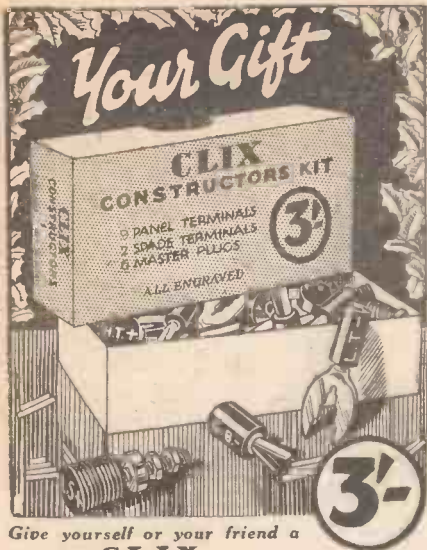
### TWO TYPES

Standard 10 volt unit capacity 2,750 milliamps -	<b>5/6</b>
Extra large capacity 5,500 milliamps (10 volt unit) -	<b>6/9</b>



*The*  
**Lively 'O'**  
**H.T. ACCUMULATOR**





**Your Gift**  
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**THE LISTENER'S NOTEBOOK**  
(Continued from page 884.)

is the reason. The explanation is deeper than that: it has something to do with the differences between the two performances.

**Savoy Theatre Relays.**

The recent broadcasts from the Savoy Theatre were excellent. This cannot be said of both the performances, "The Mikado," for instance, was an infinitely better performance than the "Gondoliers."

Whereas I would use a superlative to describe that of the "Mikado," I cannot rise above a positive in the case of the "Gondoliers." Here, the male chorus was weak, there was obvious uncertainty with the principal Gondoliers in their concerted work, and the libretto generally seemed to lack lustre.

Listeners familiar with the score and libretto of these operas must have noticed, too, the occasional liberties taken by the cast, especially in "The Mikado," and, if amateur actors themselves, they will have something to say to their producer, should he be a stickler for exactness.

**"Consider Your Verdict."**

The "Consider Your Verdict" series has come to an end, and I don't think our Saturday enjoyment will suffer much in consequence. The fact is these Saturday night talks started on too high a plane with the "Escape" and "Hazard" series.

Theirs was a standard scarcely likely to be maintained. In my estimation, these hold an unrivalled position, right at the head of anything that has ever been spoken through the B.B.C.'s microphones, and offered as entertainment.

**Grandmotherly Interference.**

The "Radio Times" pleads on behalf of the last series by saying that "as an idea it was almost wrecked by grandmotherly interference from outside the B.B.C." If this is the case, then the same thing may happen to subsequent series, unless the B.B.C. shows itself strong enough to ignore such interference.

Personally, I would have thought the Corporation had the requisite strength now.

**We Shall See.**

"Should They Be Scrapped," the title of the new series to be opened in the second week of January sounds intriguing, particularly if those taking part in the discussions are given a free hand to treat their subject in their own way.

Such discussions, however well they may be done, can't hope to oust from their pre-eminent position those talks that thrilled us a couple of years ago, for after all, they aren't the same sort of thing, nor indeed are they new.

**The Epistolary Art.**

What concert there was in the League of Mercy concert was good, and it was an experience to hear Sir Henry Lytton in mufti, so to speak.

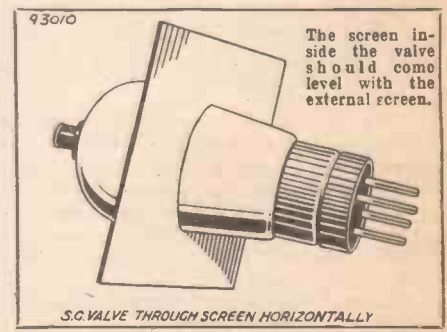
Lady Tree's appeal for the League constituted the major portion of the programme, but a recital of her woes—a caged crow, imprisoned in a Paris film studio she called herself—from a letter read by Owen Nares proved clearly that the epistolary art is by no means dead.

**TECHNICAL NOTES**

Some diverse and informative jottings about interesting aspects of radio technique.  
By Dr. J. H. T. ROBERTS, F.Inst.P.

**Screening.**

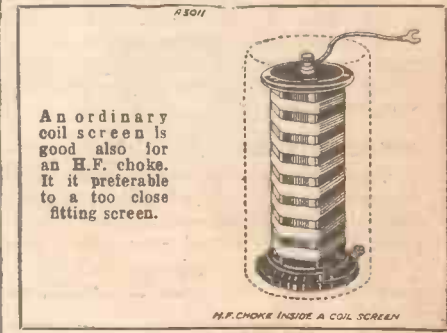
I SAID some little time back that a screen-grid valve should, for the best results, be fixed in such a position that the screening grid inside the valve is virtually part and parcel of the vertical metal screen of the receiver, the valve protruding through a hole in the screen so that one part of it



is in one compartment and the other in the adjacent compartment. I reader points out that with a metallised valve this is not necessary.

This is perfectly true and providing the metal coating on the valve is connected to earth the metallising forms a perfectly good screen. At the same time this is, in a sense, only a compromise for convenience, and for best results in the way of sensitivity the fact still remains that the screen-grid valve should be mounted half in and half out, as it were, with its anode on one side of the screen and the grid on the other side.

Talking about coil screens, you will sometimes find that it gives better results to use a coil screen for covering a high-frequency choke rather than to use one of smaller



size. If you use a screen of rather small size over the choke you may get action between the coil and the screen itself, which causes losses.

**Losses in the Screen.**

On the other hand, if you use a coil screen you get a much bigger clearance between the coil and the screen and, whilst you have the same screen action, you avoid  
(Continued on next page.)



## TECHNICAL NOTES

(Continued from previous page.)

almost entirely the effects mentioned above.

Incidentally, when you have a high-frequency choke in the screen-grid anode circuit and another one in the detector circuit you may find it only necessary to screen the latter choke, that is if you are anxious to economise in the matter of screens. Personally, I think it is better, although, perhaps, something of a refinement, to screen both of the chokes.

### Electrolytic Condensers.

I mentioned in these Notes a few weeks ago something about electrolytic condensers for use in smoothing circuits, and several readers have from time to time asked me a number of points with regard to this type of condenser, the usual question being, of course, whether it can be substituted entirely for an ordinary laminated condenser.

Well, as I think I mentioned before, the electrolytic condenser must work one way, that is to say, it must be used in a D.C. circuit and have a definite polarity. The usual thing to do is to make the centre terminal positive and the metallic container, which generally acts as the other terminal, the negative one.

When I say that it should be used for D.C. current this includes the use of it for rectified A.C. current. In fact, the electrolytic condenser is most generally used for the smoothing of rectified A.C. current, because of its very large equivalent capacity. An electrolytic condenser of fairly small size will sometimes give an equivalent capacity of hundreds or even thousands of microfarads.

### Don't Use in A.C. Circuits.

If you use an electrolytic condenser in an A.C. circuit it will simply act as a rectifier, and will allow the current to pass much more easily in one direction than the other. If used in this way, however, chemical reactions will take place inside the condenser which will destroy it so far as its use as a condenser is concerned.

There is no point in using it in an A.C. circuit, because it will not act as a condenser in the ordinary sense, and as a rectifier will not be nearly so efficient as some of the conventional rectifiers on the market. If you connect it in a D.C. circuit the wrong way round it will pass current and will be soon damaged.

### Pick-up Sensitivity.

If you are using a pick-up with a very low voltage output and you want to plug this into the low-frequency amplifier of the set in the usual way, you may find that the

(Continued on next page.)

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## TECHNICAL NOTES

(Continued from previous page.)

unamplified output from the pick-up is too small to give satisfactory results.

In such a case a simple way is to use a step-up transformer with the pick-up, and the ratio of this transformer may be up to 6 to 1 or even 8 to 1. Incidentally, the transformer should be of fairly good quality because, if it is not so, you will probably get into trouble when using a step-up ratio of this amount.

The output of the pick-up is, of course, fed into the primary of the transformer, whilst the secondary is connected to the negative terminal of the grid bias, the grid of the next valve being connected to the slider of a potentiometer which is shunted across the secondary of the transformer and used as a volume control.

In this way, if the slider is connected into the grid of the detector valve (the previous grid connection being, of course, at the same time broken by means of a suitable switch) the detector may be used as the first stage of the low-frequency amplifier. If there is one stage, preferably a power stage, following the detector, this should be amply sufficient for the purpose.

### Two L.F. Stages.

If there are two stages of low-frequency amplification, it will often be found better not to use the detector stage as a first amplifier stage, otherwise the total amplification may be too great. A point which you want to watch when using the detector in this way is not to overload it.

This can be avoided partly by taking care that the proper high-tension voltage is applied to it, which will generally be somewhat larger when it is acting as a detector, partly by seeing that the grid bias applied is of the correct value (and this will also probably need adjusting from the value previously used), and finally by keeping down the input to the erstwhile detector by proper use of the potentiometer volume control.

If there are two stages of low-frequency amplification in addition to the detector, then you can keep the input into the detector quite small and by spreading the amplification over the three stages in this way you should get much better quality of reproduction.

### Relationship Between Components.

In radio matters you will constantly come across cases where a component has to be considered not alone but in its relationship to other components with which it has to cooperate. The loudspeaker is a very obvious case in point. On the face of it, a high-resistance loudspeaker would seem to be at a disadvantage as compared with a low-resistance instrument.

But if it is connected to an output circuit with a high impedance it may be, and often is, actually an advantage that it should have a high resistance, because in that way it is possible to make the loudspeaker more sensitive without seriously reducing the current in the circuit.

Of course, when I speak of resistance here, it is not the resistance itself which is an advantage, but rather in the higher number of turns of wire, the resistance being merely incidental to the greater number of turns.

### Confusing Terms.

It is rather curious how the terms "high resistance" and "low resistance" have come into use with regard to loudspeaker windings. They are often confusing to beginners and are liable to create the impression that the resistance itself is a desirable factor.

If that were the case, a low-resistance speaker could be converted into a high-resistance one by the very simple process of inserting an external high resistance in series with the loudspeaker windings. This, of course, would not be at all the same thing as a high-resistance winding.

The point is, as I mentioned above, that if you have already a high impedance or resistance in the circuit into which the loudspeaker is to be connected, so that the resistance of the speaker makes very little difference to the electrical conditions in that circuit, then you can use a large number of windings, and so to that extent build up the sensitivity of the speaker.

### Don't Do This.

Bear in mind always that the actual resistance of the speaker is, as I say, only incidental to the extra windings. This is well illustrated by the old story of the

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### Moving-Coil Adjustments.

Talking about loudspeakers, by the way, you may remember that I mentioned in these Notes a little time back that the armature, whether moving-iron or moving-coil, should be normally in a position away from the electrical dead centre of the magnet system: I have had several enquiries on this point, and some readers do not seem to understand quite what is meant.

If you think of it for a moment it will be really quite obvious. When the signal current, or any other current for that matter, is acting on the armature, the armature is subject to a force which tends to bring it into a position in which it will embrace a larger number of magnetic lines and so obey the universal principle of the reduction of the potential energy to a minimum.

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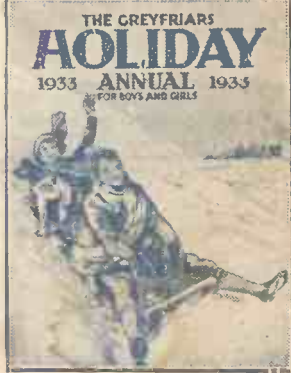
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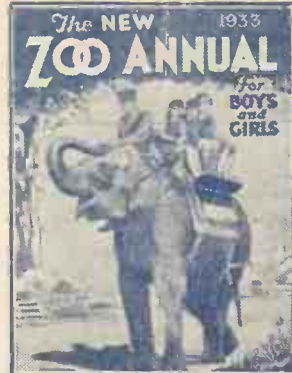
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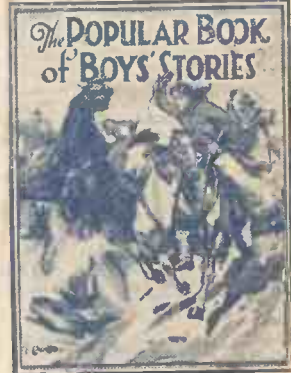
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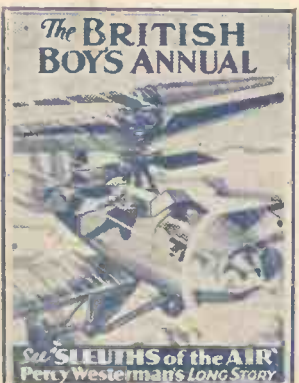
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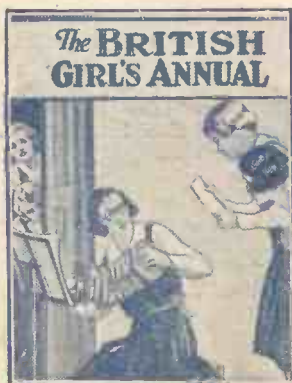
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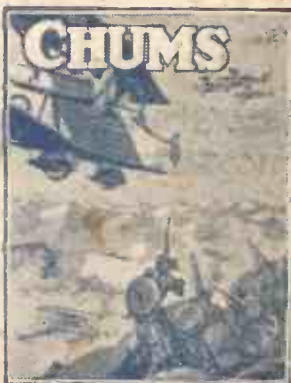
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