REGISTERED AT THE G.P.O. AS A NEWSPAPER.

THE FINEST "FOUR" FOR FOREIGN PROGRAMMES (See Page 527)

Popular Wireless

Every Thursday PRICE 3d.

No. 545. Vol. XXII. INCORPORATING "WIRELESS" November 12th, 1932.

ALL ABOUT LOUDSPEAKERS

HOW TO MAKE YOUR OWN etc. etc.

Also This Week:

The "SKY HAWK"

RECOMMENDED WRINKLES

etc., etc., etc.

READ ALL ABOUT DIRECT RADIO—Page 536

"THEY ARE RELIABLE, FIRST-CLASS PRODUCTS"

"A life-test reveals the fact that their capacities well exceed those laid down as being the minimum for high-grade standard cells, and the cells discharge with consistent evenness"

SAYS THE TECHNICAL EDITOR OF "MODERN WIRELESS"

Guarantee

The Edison Swan Electric Co. Ltd. guarantees that Ediswan Batteries are of full voltage and capacity. Should any Ediswan Battery fail to give satisfactory service, we undertake to deal with customer's complaint within 24 hours of receipt of the defective battery.

Now—H.T. Battery worries are things of the past, for this is the battery you've always looked for; the battery which you can buy with absolute confidence, the battery which is GUARANTEED to give you a good long life and the best of service. Every single cell in every Ediswan battery must successfully pass numerous tests before it leaves the factory, and special precautions are taken to ensure perfect internal insulation between cells.

STANDARD CAPACITY 60 VOLTS 6/9

STANDARD CAPACITY 120 VOLTS 13/-

9v. grid bias **1/-** **108v.** incorporating grid bias tappings **12/-**

Standard Capacity. *Where the anode current required does not exceed 10 M/a these batteries will give highly satisfactory service. If super-power valves are used, the super-capacity type should be used.*

Super Capacity. *These batteries have twice the capacity of the standard type and, owing to their large reserve of power, last nearly three times as long when used as replacements to standard capacity batteries.*

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Send for your FREE copy of "How to get the most out of your H.T. Battery." Full of useful data, hints and tips.

EDISWAN

Guaranteed

RADIO H.T. BATTERIES

THE EDISON SWAN ELECTRIC CO. LTD. PONDERS END, MIDDLESEX

B 175

None but a Moving Coil can reproduce *all* the musical frequencies

—*that is why you need an R & A 'Challenger'*

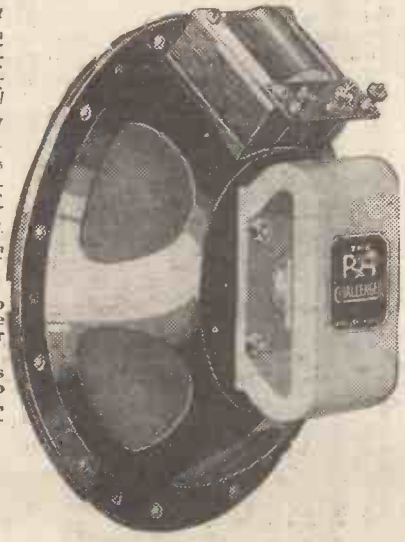
The 'Challenger' was designed to faithfully reproduce not only the upper and middle frequencies, but also the rich deep notes of the bass.

Orchestral music is rendered in all its fuliness and beauty down to the lowest audible note, while the higher notes of violin and piccolo are reproduced with amazing brilliance.

None but a **moving-coil reproducer** can faithfully accomplish this—none so **faithfully** as the incomparable R & A **'Challenger.'**

Read the WIRELESS WORLD'S tribute to this incomparable Reproducer :—

"Performance . . . is such that it merits discussion from an absolute standpoint and without regard to the very reasonable price asked . . . overall sensitivity . . . slightly better than average of its class . . . the reproduction in the bass below 100 cycles, quite definitely above average . . . full-bodied bass without boom . . . speech natural . . . balance in music exceptionally good."



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The 'Challenger' is complete with 3-ratio Ferranti Transformer, and is more than moderately priced at

35/-

REPRODUCERS & AMPLIFIERS LTD., WOLVERHAMPTON

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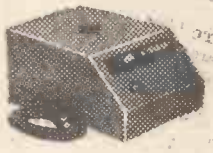
Holdens

H.T. for your set for less than 1/- A YEAR

10/- DOWN AND BALANCE IN EASY MONTHLY PAYMENTS

D.C. 15/25. H.T. for 3-4 Valve Sets from D.C. Mains. 39/6 Cash.



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●●● Why pay at least 50/- a year for quickly exhausted dry batteries? Get your H.T. from the mains with an "ATLAS" Unit for less than a shilling a year. There's a Model for every receiver, fitted in a few minutes without alterations to set or valves.

Ask your dealer for a demonstration to-day, and insist on "ATLAS," the Expert's choice and winners of the "Wireless World" Olympia Ballots. No others can give such a reserve of hum-free power.

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CASH — C.O.D — or H.P.

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COSSOR MELODY MAKER. Model 334. With metallised Variable-Mu S.G. and detector valves, power valve and cabinet. Cash Price £6/7/6. Carriage Paid. Balance in 11 monthly payments of 11/10. Send 10/- only

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

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

SLEKTUN SCOUT S.G.3—S.G., Detector and Power. "A" (less valves and cabinet). Cash or C.O.D., £3/19/6. Carriage Paid. Balance in 11 monthly payments of 7/3. Send 7/3 only

CELESTION P.P.M. MOVING-COIL SPEAKER. For Standard or Pentode output valves. Cash or C.O.D. £2/7/6. Carriage Paid. Balance in 11 monthly payments of 4/5. Send 4/5 only

R & A "VICTOR" PERMANENT MAGNET MOVING-COIL SPEAKER DE LUXE. With 6-ratio input transformer and protecting grille. Cash Price £3/10/0. Carriage Paid. Balance in 11 monthly payments of 6/5. Send 6/5 only

EPOCH "20 C" PERMANENT MAGNET MOVING-COIL SPEAKER. (New Edition.) With 5-ratio input transformer. Cash Price £1/15/0. Carriage Paid. Balance in 5 monthly payments of 6/3. Send 6/6 only

BLUE SPOT SPEAKER UNIT AND CHASSIS. Type 100U. Cash Price £1/12/6. Carriage Paid. Balance in 8 monthly payments of 5/2. Send 5/2 only

BLUE SPOT UNIT AND CHASSIS, Type 99 P.M. Including matched transformer. Cash Price, £2/19/6. Balance in 11 monthly payments of 5/6. Send 5/6 only

ROLA PERMANENT MAGNET MOVING-COIL SPEAKER F.8. With Universal tapped input transformer. Cash Price £2/9/6. Carriage Paid. Balance in 11 monthly payments of 4/6. Send 4/6 only

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

R & A "CHALLENGER" P.17. MOVING-COIL SPEAKER, Cash or C.O.D. £1-15-0. Balance in 5 monthly payments of 6/6 Send 6/6 only

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

W.B. PERMANENT-MAGNET MOVING-COIL SPEAKER. Type PM4. Complete with transformer. Cash Price £2/2/0. Carriage Paid. Balance in 7 monthly payments of 5/9. Send 5/9 only

SKYHAWK

DESCRIBED IN THIS WEEK'S ISSUE.

KIT "A" 39/9

Author's Kit of specified components including *ready drilled ply panel* and terminal mounts, but less valves and cabinet. Or 6 monthly payments of 7/-. CASH or C.O.D. Carriage Paid. Carriage Paid. One Set of Valves £1/12/3

KIT "B" £3-12-0

As Kit A but WITH VALVES, less cabinet. CASH or C.O.D. Carriage Paid. Or 9 monthly payments of 8/6. Carriage Paid.

KIT-BITS You pay the Postman. We pay post charges orders over 10/-.

1 Colvern Screened-Coil Type T.D. 8/6
1 Goltone Screened-Coil Type G.G.R. 5/9

APEX

EXACT TO SPECIFICATION

KIT "A" 79/-

Author's Kit of specified components including *ready drilled panel* and terminal mounts, but less valves and cabinet. Or 12 monthly payments of 7/3. Carriage Paid. One Set of Valves £1/12/3. One Specified Cabinet 15/-. CASH or C.O.D. Carriage Paid.

1933 FOUR

AS DESCRIBED IN LAST WEEK'S ISSUE.

KIT "A" *CASH or C.O.D. Delivered Carriage Paid.* £4-12-6

Author's Kit of specified parts including ready drilled panel, but less valves and cabinet. *or 12 monthly payments of 8/6.*

ESSENTIAL KIT-BITS

You pay the postman—we pay post charges orders over 10/-.

Set of 4 Specified Valves	£1	19	3
Cabinet to Specification		15	0
Polar Uniknob 2-Gang Condenser		19	6
2 Telsen Screened Coils		17	0
Lissen Hypernik Transformer		12	6

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

PETO-SCOTT WALNUT CONSOLE

Constructed in Walnut with contrasting inlaid Walnut Veneers.

Comes to you with vignetted front, as illustrated, ready to take your own Set. No skill or expensive tools are required to transform your Radio into a beautiful Console instrument, presenting the professionally finished appearance of the most luxurious Radio Receiver money can buy. Or 12 monthly payments of 5/8. 62/-

Baffle Board Ready Drilled, 3/6 extra.

Carriage and Packing 2/6 extra England & Wales.

Dimensions: 36" high; 21½" wide; 15¼" deep. Panel 18" × 8". Baseboard, 14" deep. Lift-up Lid.

1933 KELSEY SHORT-WAVE ADAPTOR

Tune-in the Short-Wave Stations on your present set. Plug the Kelsey Short wave Adaptor—it fits without any alteration. No extra valve required; no extra apparatus. Ready for immediate use and sold complete with Dial Calibration Chart and simple tuning notes. "How to Hear the Short-Wave Stations," specially compiled by an expert. 45/- CASH or C.O.D Or 9 monthly payments of 5/6.

Tunes in the World's Short-Wave Stations on your Existing Set.

PETO-SCOTT WALNUT CABINET SPEAKER

Fitted with the famous BLUE SPOT 100U.

In handsome Walnut Cabinet with Contrasting inlaid Walnut Fascia.

CASH OR C.O.D. CARR. PAID 47/6

Send 4/6 Only

Balance in 11 monthly payments of 4/6

Equal in performance to a good Moving-Coil Speaker. Sensitive to very small inputs and is therefore entirely satisfactory for battery operated sets, as well as all mains sets. It needs no matching transformer; can be used with normal or Pentode valves.

NOV. 11 REMEMBRANCE DAY Give generously for your poppy

ANY PARTS SUPPLIED SEPARATELY. ORDERS OVER 10/- SENT POST & C.O.D. CHARGES PAID

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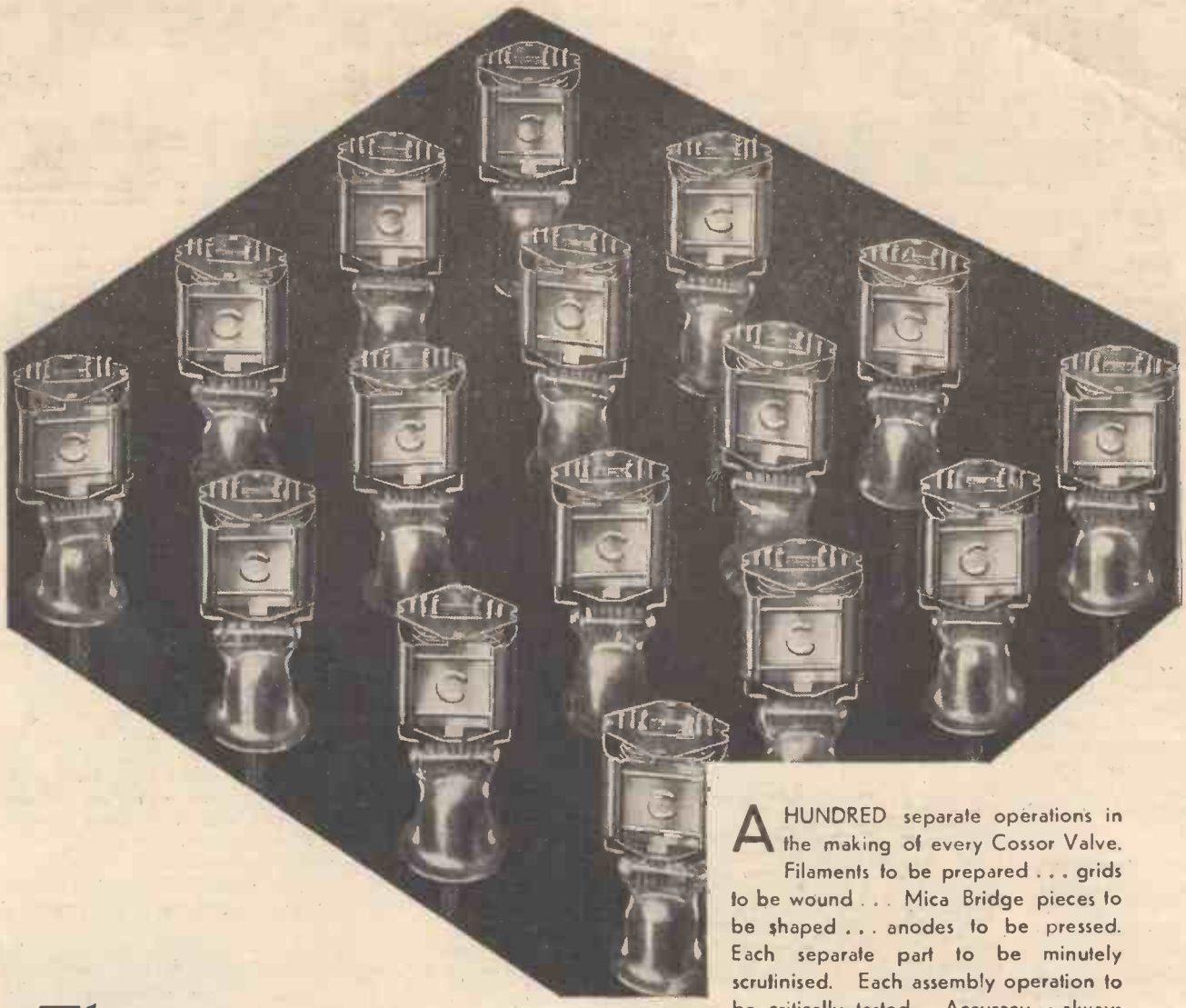

A HUNDRED separate operations in the making of every Cossor Valve. Filaments to be prepared . . . grids to be wound . . . Mica Bridge pieces to be shaped . . . anodes to be pressed. Each separate part to be minutely scrutinised. Each assembly operation to be critically tested. Accuracy — always accuracy—is the watchword at the great Cossor works. For without it the good name enjoyed by Cossor would become of no account. For all the time safeguarding it is the Mica Bridge construction which permits a higher efficiency than had ever before been thought possible.

The Meticulous Accuracy

which ensures

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Please send me, free of charge, a copy of the 40-page Cossor Valve and Wireless Book B.17.

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"P.W." 12/11/32.

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A. C. Cossor Ltd., Highbury Grove, London, N.5. Depots at Birmingham, Bristol, Glasgow, Leeds, Liverpool, Manchester, Newcastle, Sheffield, Belfast and Dublin.

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A POT AND A PIPE DIPPED IN LEMON SOUND AS A BELL ROBOT RECEIVER

RADIO NOTES & NEWS

"LESS CONVERSION" HEFTY ENERGY WE SHOW THE WORLD POPULAR PAPA

Hunt the Slipper.

SOME readers appear to think that there is definitely afoot a game of "Hunt the Slipper," the slipper being the identity of the insignificant individual who writes "Notes and News," over the *nom de plume* "Ariel." What does it matter who "Ariel" is, anyway?

I have written enough to convince you, I hope, that I am a regular fellow, who likes a pot and a pipe, a song and a joke, and that I am interested in radio besides having been professionally connected with it for—well, quite a long while.

"Ariel" the Protean.

YOU would laugh to know all the things which inquisitive readers have alleged that I am or have been. A naval paymaster, a wireless operator in (a) the Navy and (b) the Mercantile Marine, an ex-signaller of the Army, a decaying amateur, a pukka Fleet Streeter who has picked up radio jargon from sixpenny booklets, and so forth. All wide of the mark!

Paymaster? Naval operator? Only the War drew me Navy-wards and I skedaddled out early in 1919. Yo-ho! The grog was too weak.

Cease from Troubling.

I WOULD desire my friends and detractors to cease from troubling about my real self. Can it not suffice them that "Ariel" is able to survey radio mankind "from China to Peru," and to comment on life, listeners and licences with a pen which he dips in the milk of human kindness, in vitriol, or in lemon-juice, as the occasion may demand?

Allow him to sink back into the oblivion of anonymity. Next year I hope to prevail upon the Editor to reproduce a photograph of my left hand feigning ignorance of the operations of my right hand—which is usually busy with a fountain pen which I bought in 1919 to write a book on physics. There's a clue!

"Wireless for the Blind" Fund.

I HAVE watched the progress of this most laudable charity with much interest. Already nearly 21,000 sets have been supplied, discussion groups have been formed, pamphlets have been issued in Braille and the "Braille Radio Times" and Braille lists of wavelengths are flourishing mightily.

If you are chappy or have had a stroke of luck, why not celebrate by sending a donation to the National Institute for the Blind, and help on this work of making up by sound what the sightless are deprived of in vision?

ON THE CONTINENT

An "expert" with the correct knowing air gives her opinion on interference to the engineer of a travelling "anti-interference" van in Germany.

Mains or Batteries?

ACCEPT a few statistics. The number of homes in Great Britain (including Canvey Island and St. Mary Axe, E.C.), is computed to be 11,197,620, not including Dog's Homes. Of these homes, 6,887,891 know not the blessings of electric light bills. Battery makers please note.

Of the remaining homes, 1,068,340 are said to be electrically fed by D.C. supply, leaving us with 3,241,389 on A.C.—which is the stuff to give 'em. This is not a very good showing for the land which gave Faraday and Swan to the world, is it?

The Flying Fans.

PRESUMABLY inspired by Mr. Scott-Taggart's exploits in behalf of our contemporary and cousin, "The Wireless Constructor," there is an agitation for the construction of a Radio and Gramophone Trades Flying Club. They want the ether-users to become air-minded. It's a good idea.

The "S.T.400."

I ALWAYS read the "Wireless Constructor." It is such a jolly little magazine, sound as a bell in its technical aspect, and comfortable as to price, which is equivalent to three ha'pence a week. The next number will be out on November 15th and I earnestly advise you to get a copy and consider John Scott-Taggart's new set, the "S.T.400," full details of which you will find therein. I understand that it is a four-valver designed for the man who is by birth, training, inclination, and cash position a builder of three-valvers. When the "S.T.300" was published the whole edition melted like sugar on a hot shovel, and tens of thousands of folk were like Ma Hubbard's dog. A word to the wise!

ANOTHER LITTLE WAR

And here is the director of the Surété Générale, France's Scotland Yard, who makes full use of wireless in his efforts to exterminate French criminals.

Battery Note from Motor Show.

ON the occasion of the Motor Show Exide luncheon, the Exide's managing director dropped what I think must be

(Continued on next page.)

NEWS—VIEWS—AND INTERVIEWS *(continued)*

taken by other manufacturers of radio and allied apparatus as a pretty broad hint. He said that this year's output of Exide batteries was greater than last year's, which is a justification of last year's reduction of over 20 per cent in prices. I wish that book publishers and gramophone record makers would try a like procedure.

Hints to Inventors.

"P.W.," always progressive and helpful, begs to point out that the 1933 Radio Show will soon be upon us! Would-be inventors anxious to get, say, 2,000 inches of publicity, might do worse than consider "Ariel's" suggestions, as follow.

What about a combined loud-speaker and electric fire? Hear and see romance in the fire, eh? Almost television. Then, can you not produce a receiver which will start, stop, or change wavelength at the word of command—a Robot Receiver?

They can make little model dogs jump out of kennels by means of a shout, so why cannot the same principle be applied to a series of switches? Again, I should like a device which would enable me to listen to Stravinsky by will-power!

Genuine Howlers.

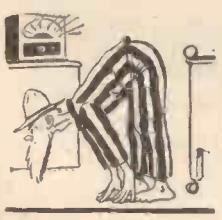
I RELY upon two friends, a male and a female teacher, to keep me posted about the latest "howlers." Here is the bag, up to date.

"The Heaviside liar is the place where wireless bounces off." "Telephony is two-pence each, but a trunk is more money and less conversion." "Marconi is the man who invented dance bands and made the girdle go round the earth in fourteen minutes."

"Wireless is blue prince, my father buys them to make vals fit into boxes." "Volts are things that make valves go; they are full of holes for plugs to plug into and are always running downwards."

The World's Workers.

FOR hefty, double-chinned energy I commend you to the Australians. When I saw recently some of the programmes of 3 L O (Melbourne) I blushed hotly and set my alarm clock an hour earlier.



Believe me, between 7 a.m. and 8.15 a.m. 3 L O presents *thirteen* items! Think of "Shipping News" at 7.1 a.m., "Physical Exercises to Music" at 7.3 a.m., followed by "Mail Notices," "Market Reports," "Arrival times of Express Trains," and other thrilling bits of real life. If the Aussies get through all that before brekker, just imagine their condition at midnight. And they do it all on tea!

Popular Variety Turn Recorded.

THE clever impersonations by Florence Desmond of talkie stars, which are high spots of the B.B.C.'s "vaudeville," are now recorded by the H.M.V. people on a disc entitled "A Hollywood Party." The record includes impersonations of Janet Gaynor, Zazu Pitts, Tallulah, Marlene Dietrich, the Garbo, Marie Dressler, and our own Gracie Fields.

I don't often allow myself to enthuse in public about grammy records, but I can say that the papa who takes home *this* one will be a popular papa. Think what that means!

Return of a Star.

WELCOME back to John Henry! He seemed to me to be more subdued, as though Gladys had been gaining ground on him rather more rapidly than was her wont. And I missed "It's all wrong," and the song about the wheelbarrow, too.

"SHORT WAVES"

LONDON'S UNLUCKIEST LISTENER.

The shopkeeper who found a dud Treasury note amongst his takings, and that evening tuned in Daventry just in time to hear a well-known actress singing: "Fain Would I Change That Note!"

* * *

"Wireless set thought to be infernal machine," we read in a provincial daily.

Some people with super-hets say there's no doubt about it at all.

* * *

"The need for a universal language in broadcasting is a matter of extreme importance," we read.

Why not try English?

* * *

A Sunday newspaper writes: "And now every Sunday evening there are thousands of listeners who, with humble mind and devout heart, tune-in to the B.B.C. sermons."

Not including, of course, the new amateur who took two hours to "get the thing to work."

* * *

TELEVISION SETS FOR POLICEMEN.

With a television set for each policeman,
All is "under observation" of the policeman;
Though the trouble be afar,
He'll "see to it" where 'e are,
And he'll nab 'em every time, will that policeman.

Perk up, John Henry, and fling your weight about a bit more vivaciously. Glad to hear your soothing voice again, but you really must scintillate more brightly. You were merely the crooning to Gladys's jazz, even though you did win the round.

The Murder is Out.

NOTHING could condemn the present American broadcasting plan more than the following extract from the "Chicago Herald and Examiner."

"(The public) wants the great music of the masters. And it wants it not only regularly but skilfully presented.

"The commercial sponsors are not in a position to pay the broadcasting freight of such bands, even were they disposed to back such a venture. The broadcasters themselves, obviously, cannot foot the bill and stay on the black side of the ledger. Therefore, if radio is to advance musically it would seem the only step is for the broadcasters to evolve some plan by which the public would support with cold cash consistent airings of the best orchestras."

Eggs-actly. Let the public pay a licence fee. But there—we have to show the world every time!

"Bang" Comes a New Microphone.

A FEW days after I wrote in these pages that I thought a new development in microphones was overdue, I learned that the R.C.A. Victor Company, of Camden, New Jersey, U.S.A., has announced such. They call the new type of "mike" the "velocity" microphone, and state that it reproduces sound with a fidelity never before possible.

Instead of a diaphragm, the new device employs a sensitive ribbon of duralumin and the engineers of the company liken this microphone's operation to a mirror which presents an exact image. It is said to respond uniformly to the entire audible range up to more than 14,000 cycles.

Answers by 'Phone.

H. M. P. (Manningtree).—Sorry you were tr-r-oubled. Will not accept challenge on subject of "Journalists or Agriculturists?" Both essential to modern life. Keep a sense of humour, do!

Gustave P. (Brussels).—Mister, I thank you. As to your command of English—well, *il n'y a pas de* something or other. You could teach our stolid agriculturists a few points when it comes to the appreciation of humour, anyhow. I do not see much semblance between Harold Nicolson and Anatole France, however.

Ted N. (Oswestry).—*Gur-cha!* It couldn't have been the B.B.C. chief laughing in his office bath. Why? Sunday, m'boy, Sunday! That's why.

L. N. (Bute).—The cheapest set I know is a set of Woolworth's draughtsmen (*avec* board).

Shorts from the Courts.

IT is reported that a Chicago gunman has been fined for an infraction of some radio regulation. The playful little puss, it's only his fun!

A Danish boot-maker is said to have discovered how to drive a ½ h.p. motor by electrical energy derived from the air by an ordinary radio aerial. Coming down to "brass tacks"—how long does the supply of energy "last"?

The Bombay police have found an illicit broadcasting station used by the Bombay Congress. Presumably they copied our P.O. "pirate-detecting" van—and it blew up.

ARIEL.

The "SKY HAWK"

BY THE "P.W." RESEARCH DEPARTMENT.

HAVE you ever been pestered by your friends for details of "a really good three" at a really low price? Have you been asked to cudgel your brains over their varied difficulties, as they enumerate the virtues and qualities they expect their next set to possess?

"Must be easy to tune, old man," says Friend Number One; "I'm not an octopus, you know, and two dials are my limit when tuning."

THIRTY-FIVE "BOB" AT THE MOST.

Friend Number Two chips in with, "None of your millionaire business, either—thirty-five bob is my outside limit, and I would like to use my present components again, if I can."

Somebody else expects really big loud-speaker power for dancing; and there is always the man whose one idea is distance! How can any one confidentially recommend a three-valve design when requirements are so varied as they are to-day?

A "straight" set with two self-screened-coil stages, tuned-anode S.G. coupling, leaky-grid detection, and differential reaction. No European station is safe from the swoop of the "Sky Hawk"!

It looks a difficult task, admittedly, but the experienced set-builder generally finds a way out of the problem by recalling to mind the fundamental advantages of his old favourite, the "straight" circuit.

He knows it, and he trusts it. And that is why the S.G. Det. and L.F. receiver is not merely retaining its remarkable popularity, but is actually increasing its hold on public affection.

The "Sky Hawk," which we introduce to our readers this week, is a straight circuit. It consists of a screened-grid amplifier, leaky-grid detector, and transformer-coupled L.F.

It employs two canned coil units, for aerial and H.F. stages respectively, and thus requires no auxiliary screening—a big point when simplicity of construction is considered.

The H.F. stage is coupled to the detector by our old friend the "tuned anode" system, and differential reaction is applied to this when the set is being used for long-distance reception.

CLEAN LINES AND ACCESSIBILITY.

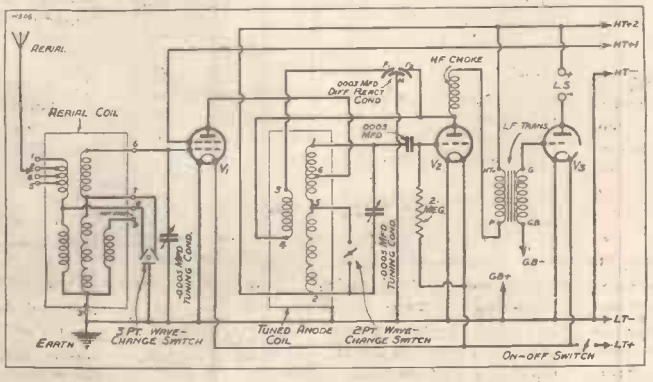
In externals the set has the clean lines and impressive appearance of its namesake, the "Sky Hawk."

The picture at the heading of the article shows its general appearance; it was taken as the on-off switch was being operated, and the raised lid emphasises the easy accessibility of the interior.

The reaction control which is necessary only when you are "out for distance," is the central one immediately above the on-off switch. Left and right of it are the tuning dials—for aerial and H.F.

(*Continued on next page.*)

THE "SKY HAWK'S" CIRCUIT



AND THE PARTS YOU NEED FOR IT

1 Canned aerial coil (Colvern T.D., Sovereign).
1 Canned anode coil (Goltone G.G.R., ..., Lissen).
2 ·0005-mfd. solid dielectric tuning condensers, with dials (Lissen, Ormond, Polar, Telsen, Ready Radio, Graham Farish).
1 ·0003-mfd. to ·00035-mfd. differential reaction condenser (Telsen, Polar, Ready Radio, Lotus, Igranic, Graham Farish, Lissen).
2 2-pt. push-pull switches (Ready Radio, Telsen, Wearite, Tunewell, Graham Farish, Goltone, Bulgin).
1 3-pt. push-pull switch (Ready Radio, or see above).
3 4-pin valveholders (Lissen, Telsen, W.B., Ready Radio, Wearite, Igranic, Ormond, Benjamin, Clix, Goltone).
1 L.F. Transformer (Slektun Colt, Goltone, Graham Farish, Telsen, Lissen, Tunewell, Ready Radio, Lotus, Lewcos, Atlas, Bulgin).
1 2-meg. grid leak (Igranic with wire ends, Lissen, Ready Radio, Graham Farish).
1 ·0003-mfd. condenser (Dubilier type 665, Igranic, Telsen, T.C.C.).
1 H.F. choke (Lissen, Ready Radio, Slektun, Igranic, Dubilier, Wearite, Goltone, Lotus).
4 Terminals (Bulgin, Clix, Igranic, Belling Lee).
2 Terminal strips, 2 in. × 1½ in. (Peto-Scott, etc.).
1 Baseboard, 10 in. × 10 in. × ⅜ in.
1 Plywood Panel, 10 in. × 7 in. × 3/16 in.
Flex.
Wander plugs, etc.

EASY TO HANDLE—EASY TO BUILD—EASY TO BUY

THE "SKY HAWK"

(Continued from previous page.)

respectively—whilst under each of these is its associated wavechange switch.

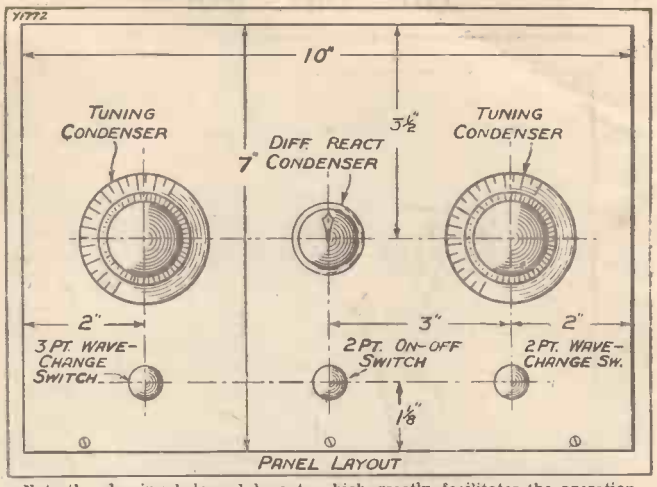
The Battery Connections.

Wonderfully simple, don't you think? And a glance at the back of the set shows that, besides loudspeaker and aerial and earth terminals, there are just the three wires to the H.T.B., the negative one serving also for L.T. — and G.B.+; so the only other leads are L.T.+ and G.B.—, which you can "fit and forget" in two ticks.

up, for a good S.G. stage of this type is the most cosmopolitan creation imaginable, and will run round the Continent in half the time it takes you to run to post!

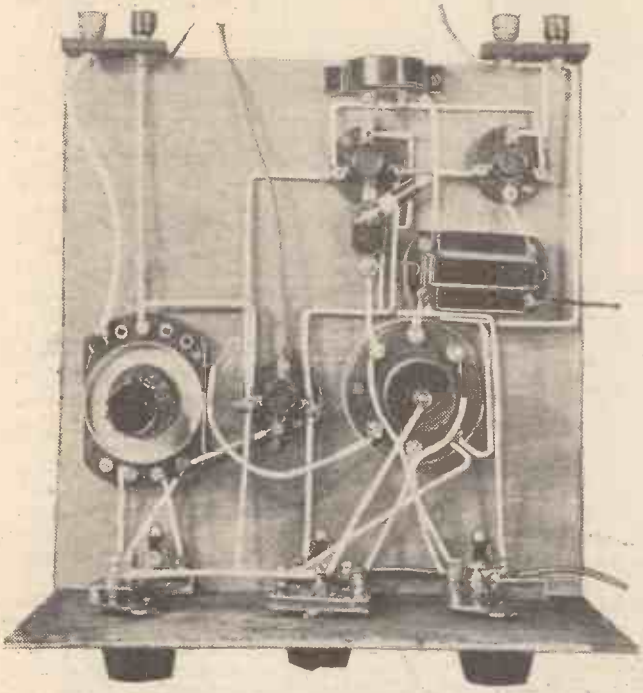
Volume? Yes, there is plenty of it, and probably you will find that selective aerial coupling very handy for "bringing down" some of the foreigners, which otherwise

SYMMETRY AND SIMPLICITY



Note the pleasing balanced layout, which greatly facilitates the operation of the "Sky Hawk."

WIRING WITHOUT WORRIES



The beautiful ease of handling is matched by the simplicity of construction well illustrated in this and the lower picture.

The photographs of the back of the set show the extreme simplicity of its *internal* wiring. Once you have connected batteries, aerial and earth, the only leads you give a thought to are the one from terminal 6 on the H.F. coil unit, and one from the aerial terminal.

The former goes on to the terminal on the top of the S.G. valve. (You can use one of those little anode connectors for it, instead of a spade tag, if you want good contact combined with protection against accidental shorting.)

Varying the Selectivity.

The aerial terminal's lead carries the little plug for the aerial coil unit. When inserted in socket 1 it gives strongest coupling, whilst in socket 5 it gives greatest selectivity or "sharpness" of tuning.

Sockets 4 and 2 give the intermediate results between these two extremes of strong and selective aerial coupling. Make the flex long enough to reach to any socket and you can thus vary your coupling as required in a moment.

What about results? Well, there is no saying what foreign stations you will pick

might tend to "wake next-door's baby," as the saying is.

Cost? The component list answers that question in effective fashion, and the fact that standard parts are used throughout is another important money-saving consideration.

We have already inferred that the set is very easy to handle, and now we must confess that it is so easy to build that detailed instructions are quite unnecessary. The panel dimensions and the drawn-to-scale wiring diagram contain all the information that you will require about that.

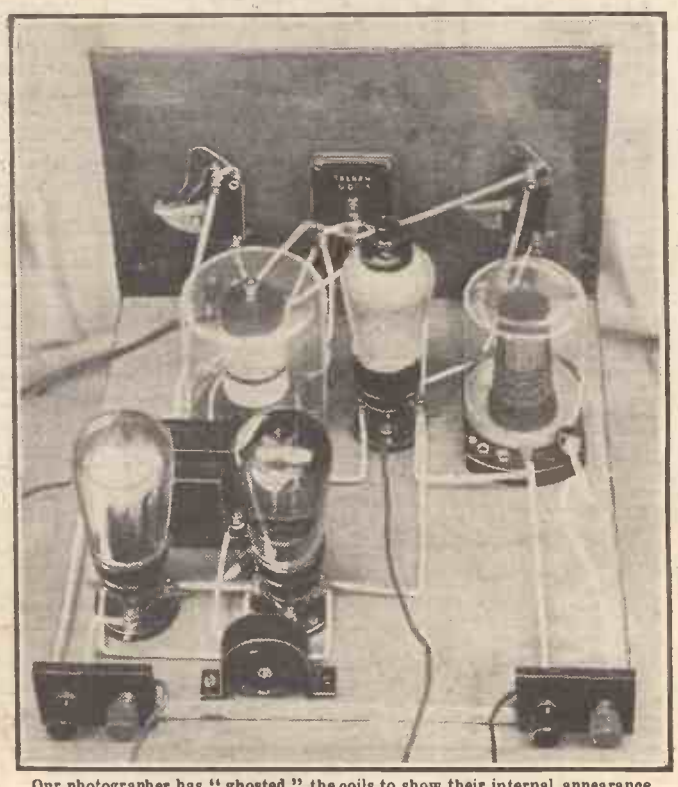
Even if you had never built a set in your life you could go ahead on this with confidence. Simply drill the panel and place the parts exactly as shown, and wire them as indicated by the black lines.

(Continued on next page.)

THE VALVES.

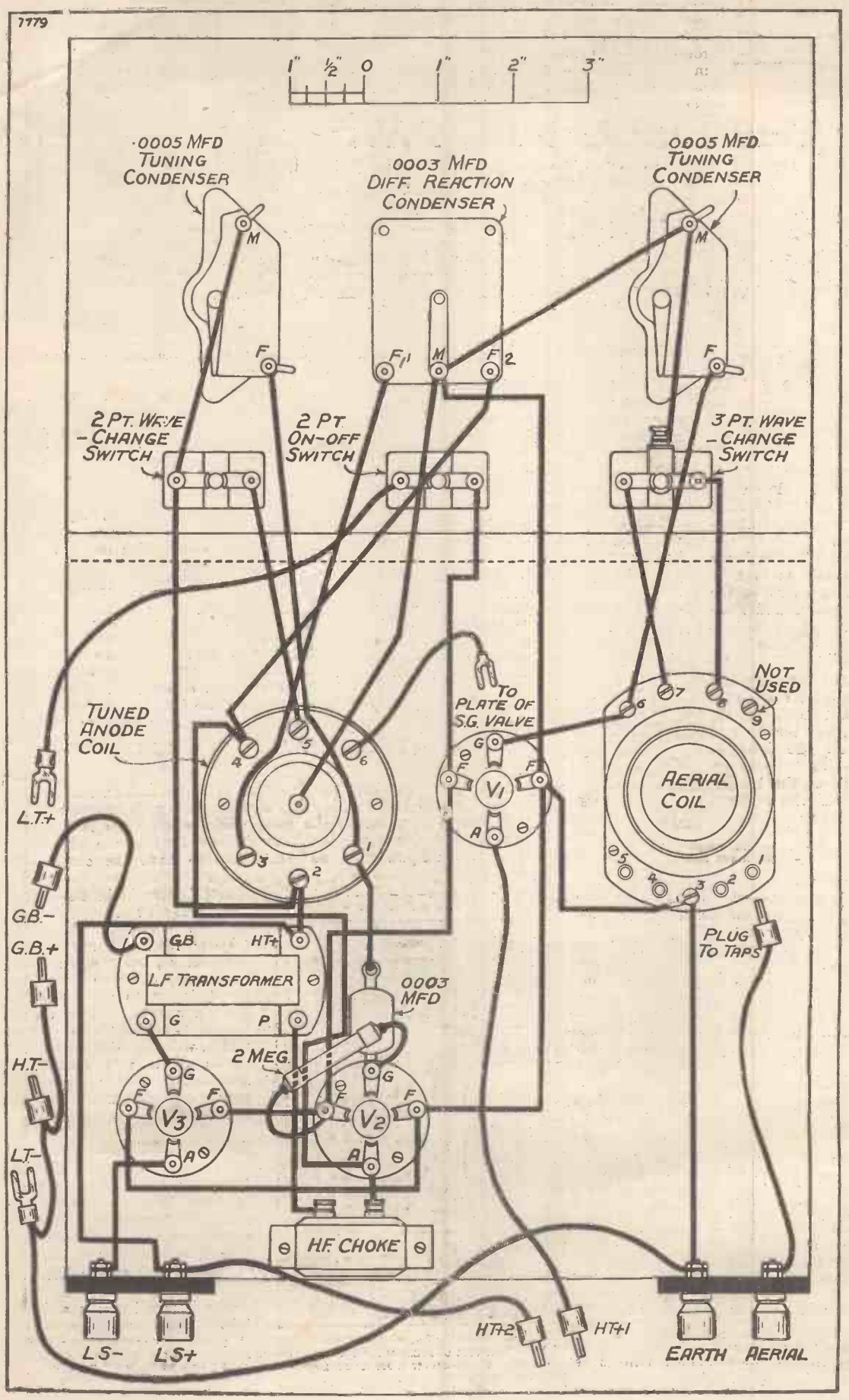
Make	H.F. Stage	Detector	Output Valve	Output Valve for Mains Unit
Mullard ..	P.M.12	P.M.1H.L.	P.M.2A.	P.M.202
Cossor ..	220S.G.	210H.L.	220P.A.	230X.P.
Mazda ..	S.G.215	H.L.2	P220	P.220A.
Marconi ..	S.22	H.L.2	L.P.2	P.2
Osram ..	S.22	H.L.2	L.P.2	P.2
Tungsram	S.210	H.210	P.220	S.P.230
Lissen ..	S.G.215	H.L.210	P.220	P.X.240
Eta	B.Y.6	B.Y.1814	B.W.604	B.W.303
Six-Sixty ..	215S.G.	210H.L.	220P.A.	220S.P.

SELF-SCREENED EFFICIENCY



Our photographer has "ghosted" the coils to show their internal appearance, but actually they are invisible and out of harm's way when their lids are on.

THE "SKY HAWK" *(Continued from previous page.)*



Note that different types of switches are used, all plainly marked. And that the 2-meg. grid leak, though supported by its own wiring, could be held in the conventional clips if desirable.

A small nut and bolt is used through the tag of the grid condenser for connection to coil.

There is not one single likely snag to warn you against, and, provided you take ordinary care, you will find your "Sky Hawk" "goes like a bird" the moment it is switched on. Stick to the types of valves and accessories that are specified and recommended and you will be surprised at the number and variety of programmes it will command.

The black lines show the wires, the "bendy" ones being flexible leads of the length required to reach the various batteries, etc., to which they will be attached when the set is working.

RECOMMENDED ACCESSORIES

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

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

LOUDSPEAKER.—Celestion, Blue Spot, R & A, Clarke's Atlas, Epoch Lanchester, Baker's Selhurst, B.T.-H., W.B., Ormond, H.M.V.

Recommended Aerial and Earth Equipment.— Electron "Superial," Graham Farish "Filt" earthing device.

MAINS UNIT.—This should have two plus tappings with output to suit valves chosen. (Ferranti, Regentone, Atlas, Ekco, Tunewell, R.I.).

Mr. PETER SIMPLE

looks at

THE FERRANTI "P.W." "APEX"

Continuing his series of "Kit Kriticisms," Mr. Peter Simple deals this week with the Ferranti version of "P.W.'s" popular three-valve receiver, the "Apex."

WHO said that the home constructor is dying out, anyway? From all that I can see, the winter of 1932 is going to witness a larger number of home-built sets than ever before.

There is no doubt about it, the home constructor is as enthusiastic as ever he was. Just as enthusiastic. But at the same time he is growing more and more critical of what he builds.

The Best in Component Quality.

The time has passed when any old component was considered good enough for a set as long as it worked. The constructor of to-day demands not only the best in receiver design, but also the best in component quality.

And that is why some of the leading firms of component manufacturers have decided to provide their own versions of the "Apex," one of the most successful three-valvers ever designed by POPULAR WIRELESS.

When so many different receivers follow the well-tried screened-grid, detector and low-frequency arrangement, component design must needs make a tremendous difference between results which are just mediocre and those which are really first-class.

It is with more than usual interest, therefore, that I welcome the "Apex" as prepared for the home constructor by Ferranti, Limited, of Hollinwood.

Outstanding Receiver.

For some time now, of course, various firms have placed on the market Constructional Kits for some of the POPULAR WIRELESS designs. These are kits of components based on the original design, sold in one container for the convenience of the home constructor.

The Ferranti kit has been carefully prepared so as to get the very best results from the very best components. As such, it is worthy of being judged upon its own merits.

Ferranti is a name which has come to be a hall-mark of excellence when applied to transformers, chokes, condensers, resistances or valveholders.

The inclusion of all these components into a circuit which is already a proved success cannot fail to produce a receiver of outstanding merit.

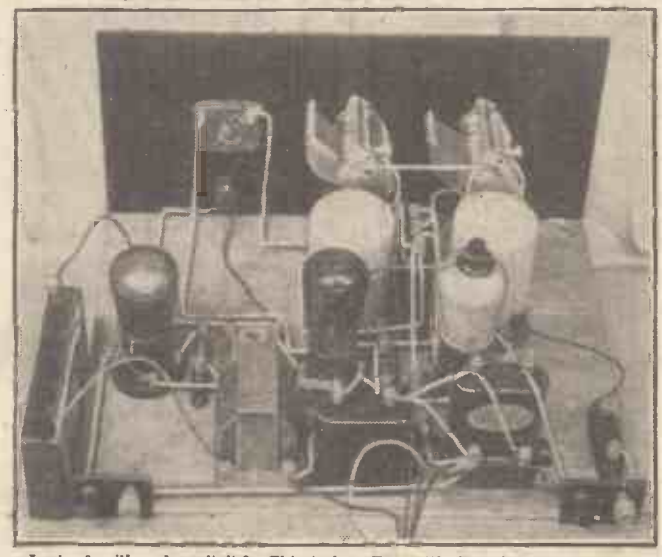
The complete Ferranti "Apex," which was handed to me last week for test, certainly is an outstanding receiver. Those of you who have built the original set—or read about it in "P.W."—already know of the excellent performance the "Apex" gives with regard to logging stations.

This performance is just as good in the Ferranti kit, naturally. But it is with the quality and tone of reception that I want to deal here.

Optional Output Filter.

The makers have made two alterations to the original design. By the introduction of two additional condensers and a resistance they have provided for still further de-coupling; and arrangements have also been made at the option of the constructor for incorporating a choke filter output.

THE SAME—ONLY DIFFERENT!



Looks familiar, doesn't it? This is how Ferranti's have incorporated their famous components into the "Apex." Extra condensers for further de-coupling will be found in the photograph, but otherwise there is no alteration from the original circuit.

These additional refinements would seem to be most successful.

Comparisons of similar sets are always an unenviable task. Consequently I have made a point of not hearing the performance of the original "Apex."

I can, however, state without any sort or kind of qualification that the Ferranti "Apex" provides a powerful and undistorted output which makes my 100 U Blue Spot test speaker sound as it has never sounded before with any kit which I have tested under similar conditions.

And I cannot say fairer than that!

Acme of Simplicity and Clearness.

And what of the construction? The amateur enthusiast who sets out to build the Ferranti "Apex" has no difficult and unpleasant task before him. Everything has been done to simplify his work.

The full size wiring diagram provided with the kit is the acme of simplicity and clearness. And on the back of this chart are all the building instructions, together with details of valves and batteries.

Two characteristic photographs assist in the good work, while there is a special auxiliary diagram for the man who thinks he would like to have the choke filter output.

Nothing could be easier than that, could it?

"The POPULAR WIRELESS 'Apex' receiver," say Messrs. Ferranti on their chart "is a noteworthy effort on the part of the designers to produce a battery-operated receiver of the Screened-Grid Three type which, while meeting the requirements of a vast number of listeners, is at the same time easy to construct and efficient in operation."

Out of the Usual Run.

In reply I would say that the Ferranti "Apex" kit does much to prove that the use of the best matched components which long experience can produce means that the constructor will get the very best results from his receiver.

The Ferranti marks a departure from the usual run of kits in that it incorporates a circuit which is already a success. As such it is to be welcomed.

Getting Foreign Programmes on The 1933 FOUR

"Now that I've built it, what's it going to do?" Isn't that the question you are asking yourself this week? So here are all the details about adjusting and operating your 1933 Four to the very best advantage. Get down to it right away and have all Europe at your beck and call.

By G. V. DOWDING, Associate I.E.E.

THERE are very few initial adjustments to be made to this high-efficiency four-valver—it is what might be termed a "straight off" set. There is no elaborate tinkering to be done. Nevertheless, you need not feel you are losing something because of this almost extreme simplicity of installation.

Providing you use valves of the types we recommend, and apply correct grid bias and H.T., the instrument will get most of the worth-while European stations that are "on the air." Of course, an extended aerial of some kind is necessary. A good indoor type will furnish plenty of "pick-up" although anything in the way of an outdoor aerial will probably be better than the best you can do within the house.

The H.T. current consumption is moderate, about 10 milliamperes, so that a medium capacity battery is indicated. Aim at a minimum of 120 volts. And the maximum available should be given to the L.F. valves and the anode of the S.G. valve. These are all served by the H.T. plus Three plug.

For Smooth Reaction

Something between 60 and 90 will do for the detector (H.T. plus Two). This tapping should be varied between the voltages mentioned, if the reaction control is not quite smooth all round the dial. It is not a critical adjustment, the H.T. voltage that is, and you cannot go far wrong if you plug in at, say, seventy-five volts.

Give the screening grid of the S.G. valve (H.T. plus One) about ninety volts. It should be remembered that this tapping must always be lower than that which serves the anode of the S.G.

The G.B. minus One plug should be tapped in at about 3 volts negative. The limits are 1½ to 4½ for most valves. Make sure you connect up the grid-bias battery the right way round.

And now for the gang condenser adjustment. This calls for just a little patience, but the time spent on the task will be amply repaid in increased power.

First of all set the aerial condenser about half in; this is equivalent to a central point between the two extreme limits of the travel of the condenser's knob.

The central controlling knob of the gang condenser should be similarly adjusted.

Adjusting the Gang Condenser

See that the wavechange switch is over to Medium Waves. With the assistance of reaction, tune in a station fairly close to the bottom of the tuning scale. I would not advise a powerful local station such as the London National if you are a Londoner, or Newcastle if you live in the north, but one that does not come in unless the reaction control is referred to.

I might mention that should the ganging not need adjustment, which may well be the case, you may find it difficult to locate a station which does need reaction, and very many which don't on this powerful receiver!

However, the not-very-strong carrier of a distant, low-powered relay transmitter will serve the purpose. Having fixed upon your low-wave test station, tune it in as closely as you can by fine movements of the tuning condenser. Then vary the setting of the condenser's trimmer carefully until you are sure the station is at its loudest. You will find this trimmer at the side of the condenser. Behind the panel, of course. In the particular make we have used, the trimmer control takes the form of a tiny star wheel. You will see it in some of the photographs.

When you are satisfied that the trimming is correct for the low-wave station, go right up the scale to a transmitter somewhere near in wavelength to the Midland Regional and see if the ganging is O.K. for that, too. A fractional correction may be needed.

Finally, repeat the process on a higher wave still—Brussels, for instance. You can then revert to the first station, right at the bottom of the scale, and see if this is approximately as strong as when you first balanced up for it.

Complete Compensation

As you will probably guess, it might be necessary for you to strike a kind of average between the three. But don't let that worry you, for you can compensate for any slight loss that may be occasioned by trifling ganging errors by means of the aerial condenser or, if it is fitted to the make you use, the external trimming device that is often to be found in the form of a control knob concentrically arranged with the main tuning control.

But the initial ganging adjustment must be fairly closely made. That is why the trimmer is fitted to the body of the gang condenser. It brings the ganging error, if any, to within the scope of the accessible compensator.

Having satisfactorily dealt with the trimming of the medium waves, it is hardly likely that there will be any need for substantial correction on the long-waves. However, you must test the long-wave ganging. After all, it is only an initial adjustment and once arrived at need never be done again.

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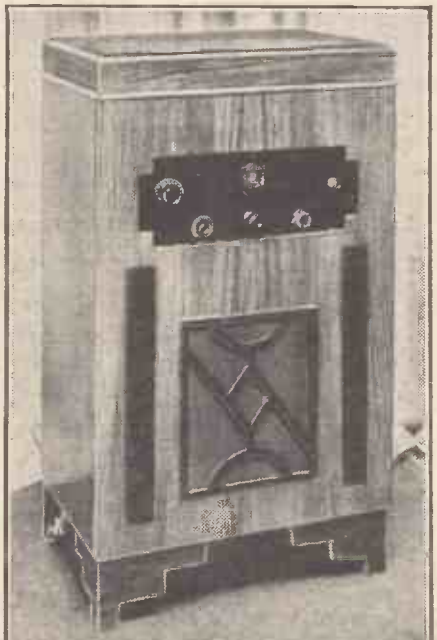
JUDGING BY APPEARANCES



You could not wish for a more handsome radiogram than the 1933 Four. As shown here, it is housed in the Peto-Scott "Adaptagram" cabinet, which, in spite of its fine appearance it is a particularly inexpensive cabinet.

GETTING FOREIGN PROGRAMMES ON THE 1933 FOUR

(Continued from previous page.)

I will just summarise these trimming instructions. The external trimmer, if any, and the aerial condenser should be set at an approximate half-way position. Adjust the trimmer on the body of the condenser so that you arrive at an average position for loudest results from at least three well-spaced medium and at least two long-wave stations.

While adjusting the trimmer don't plunge your hand right down among the coils and condenser, for this may have some noticeable capacity effect. Endeavour to make the adjustment with a long pencil or some similar object so that your hand is kept well away from the interior of the set.

You must have the coil screens and the condenser cover, if there is one, in place during these operations.

Keen Tuning.

The aerial condenser makes a quite good radio volume control, although its main purpose is to provide a control over selectivity. Use it in conjunction with the reaction. As I have already indicated, the set is so powerful that reaction may not be necessary for many of the stations when the aerial condenser is approaching its all-in condition.

Therefore, in order to make it easy to disentangle a distant station from the nightly welter of mush and heterodynes that is to be heard nowadays, take the aerial condenser towards its minimum and thus increase the selectivity. There will be an inevitable loss of power, but this can be allowed because the reaction can be brought up.

An extremely keen tuning then follows, and you will be amazed at the knife-edge separation which is afforded. But don't forget to swing the aerial condenser back again when you go over to long waves. There will be ample inherent selectivity for practically all purposes on the long waves without resorting to the above scheme.

By the way, here is a point which, perhaps, I ought to have mentioned before. Ensure that the radio-gram switch is correctly set for radio reception before you try to compile your first log of foreign stations.

Although this switch may be over to "records," it is possible a very faint sound of broadcasting will creep through when a local station is tuned in closely. By accident you might happen to do that and, not realising that this is "creep-through," think the set is faulty.

Whereas, of course, it would only be wrongly switched—records instead of radio.

Avoid Long Leads.

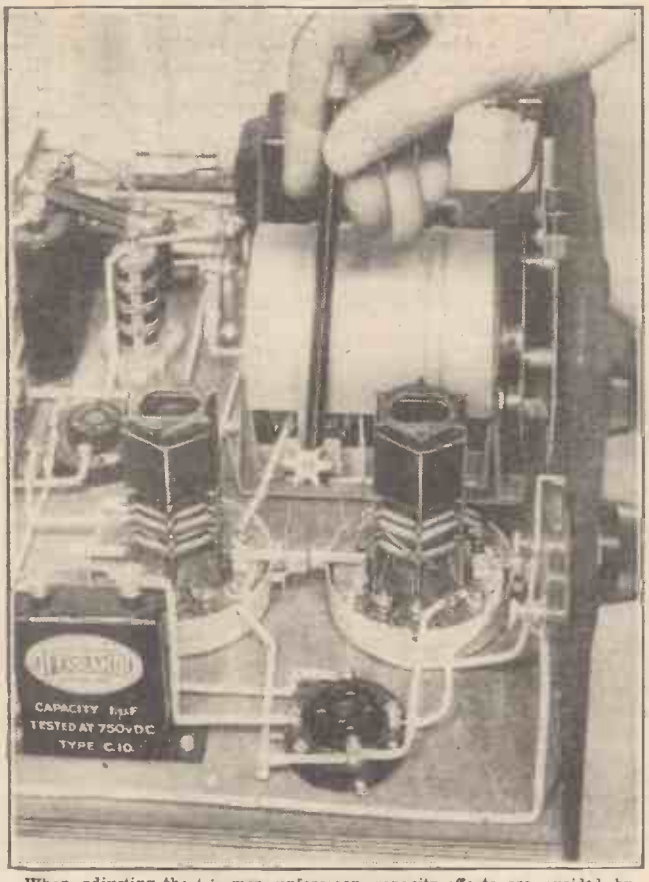
Faint "creep-through" doesn't matter a scrap. It is completely drowned when a record is being run. But there won't be even a faint breath of "creep-through" if the switch is a good one or if there is no radio station closely tuned in.

It is not advisable to run long pick-up leads. If there must be long leads it would be better to have long loudspeaker leads, though long leads of any kind ought to be avoided as a matter of principle as far as is possible.

There is no volume control for the pick-up on the set. It has been left out deliberately, for we find that many listeners prefer to have their pick-up volume controls on their gramophone turntables. Table models are,

(Continued on next page.)

KEEP YOUR HANDS AWAY



When adjusting the trimmer, unforeseen capacity effects are avoided by using a pencil. To depict the method clearly, coil screens are shown removed, but they must be in position when "trimming."

YOUR COMPLETE SHOPPING LIST FOR THE 1933 FOUR

1 Panel, 16 × 8 in. (Permcol, Peto-Scott, Becol, Wearite, Goltone, Lissen).
1 Baseboard, 16 × 10 in.
1 Cabinet for 16×8 in. panel and 16×10 in. baseboard (Cameo, Morton, Peto-Scott, Osborn, Gilbert).
1 Two-gang ·0005-mfd. condenser (Polar Uni-Knob, J.B., Lotus, Radio-phone, Utility, Cyldon).
1 ·0005-mfd. Solid dielectric variable condenser (Lissen, Ormond, Telsen, Ready Radio, Polar, Graham Farish).
1 ·0003-mfd. differential reaction condenser (Ready Radio, Polar, Lotus, Telsen, Graham Farish).
2 Telsen screened coils.
1 2-mfd. fixed condenser (Ferranti type C2, Telsen, T.C.C., Lissen, Dubilier, Igranic, Peto-Scott, Formo).
1 1-mfd. fixed condenser (Ferranti type C 10 or see above).
1 ·01-mfd. fixed condenser (T.C.C. upright type, Lissen, Dubilier, Telsen, Ferranti).
1 ·0003-mfd. fixed condenser (Dubilier 665 or see above).
1 2-megohm resistance and holder (Ready Radio, Ferranti, Graham Farish, Lissen, Dubilier, Telsen, Igranic, Ediswan, Mullard, Watmel).
1 ·25-megohm resistance and holder (Ready Radio, or see above).
1 80,000-ohm resistance (Graham Farish, Dubilier, Colvern, Wearite).
1 25,000-ohm resistance (Graham Farish. Dubilier 1-watt type, Colvern, Lissen, Wearite).
1 2-point on-off switch (Bulgin Type S 38, Telsen, Lissen, Ready Radio, Tunewell, Goltone, Keystone, Ormond).
1 3-point change-over switch (Bulgin Type S 86, Ready Radio, Tunewell).
1 H.F. choke (Igranic Type Z 11, Ready Radio, Lewcos, Slektun, Peto-Scott, Telsen, Sovereign, Tunewell, Wearite, Goltone, R.I., Lotus, Varley).
1 L.F. transformer (Lissen Hypernik, R.I., Slektun, Ready Radio, Graham Farish, Ferranti A.F.10, Telsen, Bulgin, Multitone, Tunewell, Lotus, Lewcos, Varley Nicklet).
4 Valve holders (Lotus, W.B., Lissen, Telsen, Bulgin, Clix, Goltone, Igranic, Ready Radio, Lotus).
1 Terminal strip, 16×1½ in. (Peto-Scott, etc.).
12 Indicating terminals (Clix type A, Belling & Lee, Bulgin, Igranic, Eelex).
11 yds. of 18-gauge tinned copper wire and 9 yds. of sleeving (Goltone, Wearite).
1 Panel bush for ⅛ in. spindle.
1 Ebonite coupling link, ⅛ × 1 in.
1 ⅛ × 5 in. extension spindle.
4 Plugs (Clix, Igranic, Bulgin, Belling & Lee).

ACCESSORIES.

BATTERIES.—L.T. Accumulator (Ediswan, Oldham, Pertrix, Lissen, G.E.C., Exide).
H.T. Battery. This should be of ample size to deal with the requirements of the valves chosen (Lissen, Pertrix, Magnet, Ediswan, Ever Ready, Marconiphone).
G.B. : See above list.

LOUDSPEAKERS. —(Celestion, Blue Spot, Marconiphone, R & A, Epoch, H.M.V., B.T.-H., W.B., Ormond, Ferranti, Baker, Lanchester, Igranic, Clarke's Atlas).

MAINS UNIT.—This should have three H.T. tappings, i.e. S.G., Det and Power with output to suit valves employed (Ferranti, Atlas, Regentone, Ekco, Tunewell, R.I.).

Recommended aerial and earth equipment : (Electron "Superial." Graham Farish "Filt" earthing device).

GETTING FOREIGN PROGRAMMES ON THE 1933 FOUR

(*Continued from previous page.*)

in fact, to be bought. And these obviate the necessity of screwing the control on to the gramophone instrument.

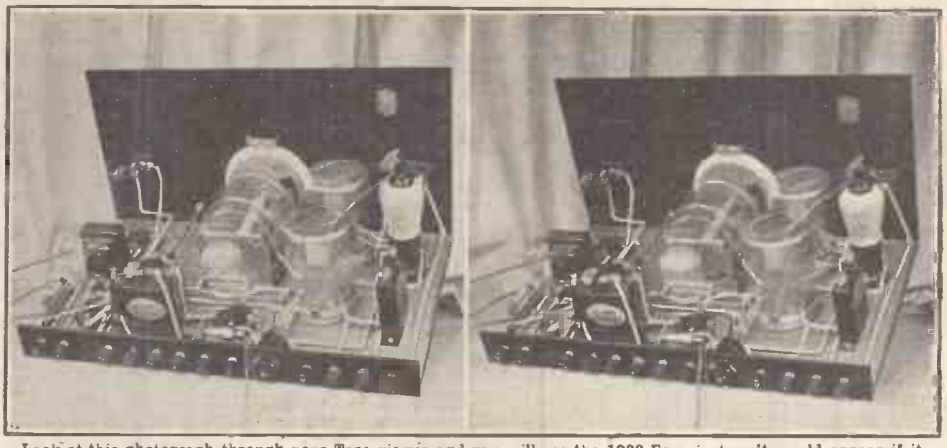
With some pick-ups, no volume control at all may be needed. The amplification provided by the "1933" Four might prove just right for the volume desired by the listener. Personally, I am rather against the use of a volume control as a kind of loudness tap. I like to fix upon a volume level for all transmissions or for all records and take whatever comes to me within that level. After all, so far as broadcasting is concerned, there are dozens of control engineers at work compressing volume variations into arbitrarily fixed compasscs. I'm all for easy listening!

A Thorough-bred.

You've no standards to work to, no fixed criterions, if you juggle about with the volume as your mood changes. What's the good of a talker whispering confidentially, or an orchestra playing a spot of soulful diminuendo, if you've just been down the valley of volume on a band double forte and *come up to* the above low-volume stuff and hear it as a roar?

Certainly as you wander from station to station, volume controlling may be essential but that is station searching, not listening. The same kind of thing may also apply when you change from one make of record to another. But not, I maintain, otherwise.

THIS TRUE-VIEW BRINGS THE SET TO LIFE



Look at this photograph through your True-viewer and you will see the 1933 Four just as it would appear if it were standing on the table in front of you. You will then appreciate what a boon these "P.W." True-views are proving to constructors.

However, we are rather wandering away from the subject in hand. But as a matter of fact there are no more instructions for the "1933" Four. It is a thorough-bred instrument that will leap into vitality almost as soon as you have joined its accessories to it.

The remarks I have made about trimming the gang condenser must not be interpreted as instructions for setting an essential critical adjustment upon which the whole efficiency of the set depends.

If you employ the make of gang condenser used in our original model, or one having a similar external trimming control, the odds are that you will be able to get one hundred per cent results even if you don't trouble about the trimmer adjustment at all.

Family Requirements.

You see, the coils match up very well indeed, and they impose little or no work on the trimmer.

However, as the operation of trimming takes but a little while, there will surely be but few constructors who will not spend the necessary few minutes to carry it out.

The family will only need to switch it on and, by rotating the one tuning control, they will get as many stations as they will want.

The constructor himself will ply the reaction and aerial condenser and, when necessary, use the external trimmer to coax in the weak, distant stations.

You may have been waiting for me to give you a list of stations we guarantee you will get on this 1933 Four.

Long Lists of Stations.

If so, I fear you will be a little disappointed. As I have said on previous occasions, we do not make it a usual practice to provide long lists of stations.

These mean nothing because individual conditions and the dexterity of individual constructors vary so enormously.

Particularly does this apply in the case of the 1933 Four—a set designed for all. The listener making it his first set should at first be gratified to tune in a mere dozen stations in view of his lack of experience. (Later he will surprise himself!)

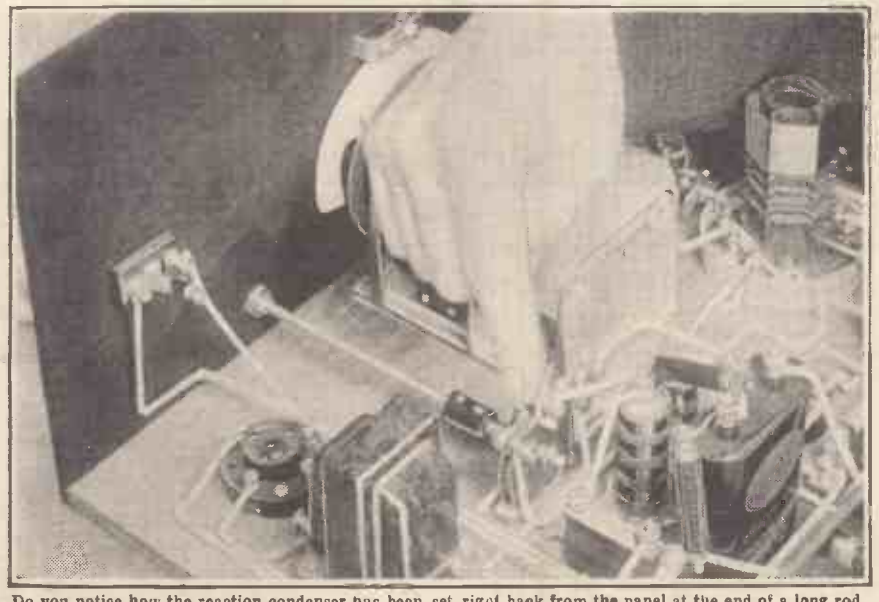
The skilled constructor might secure forty or fifty without difficulty in a rather poor locality.

He wouldn't have built the "1933" Four if he hadn't been convinced that it was an outstanding design. But we mustn't mislead the tyro into thinking that he will be able to rake in the stations with the facility of a practised amateur. Thus, the absence of a "guaranteed list."

THE VALVES WE RECOMMEND.

	H.F. Stage	Detector	1st L.F.	Output Valve	Output Valve Mains Unit
Mullard ..	P.M.12	P.M.1H.L.	P.M.2D.X.	P.M.2A.	P.M.202
Cossor ..	220S.G.	210H.L.	210L.F.	220P.A.	230X.P.
Mazda ..	S.G.215	H.L.2	L.210	P.220	P.220A.
Marconi ..	S.22	H.L.2	L.210	L.P.2	P.2
Osram ..	S.22	H.L.2	L.210	L.P.2	P.2
Tungsram	S.210	H.210	L.G.210	P.220	S.P.230
Lissen ..	S.G.215	H.L.210	L.210	P.220	P.X.240
Eta	B.Y.6	B.Y.1814	B.Y.1210	B.W.604	B.W.303
Six-Sixty ..	215S.G.	210H.L.	210D.	220P.A.	220S.P.

SHORT LEADS AND NO HAND CAPACITY



Do you notice how the reaction condenser has been set right back from the panel at the end of a long rod control? The reason for this is that the leads from the condenser are then kept really short—but there is also the additional advantage that any possible hand-capacity effects while tuning are completely done away with.

THE MIRROR OF THE B.B.C. By O. H. M.

THE BIG WEEK

THE FILM CRITIC ROW—GRAMOPHONE RECORD POLICY—THAT FIVE MILLIONTH LICENCE—PERCY PITT, Etc., Etc.

NEXT week is the big week, the 10th anniversary of British Broadcasting.

Here are some of the stars: The Prince of Wales, Ansermet, A. J. Alan, G. K. Chesterton, Elizabeth Schumann, H. G. Wells.

And here are some of the features if it is possible to select from a week packed with superlative programme material. The Panoramic Survey of communications, 1922–1932, which Mr. Gerald Cock has been working on for months; Tyrone Guthrie's Radio Version of the "Three Musketeers"; Rosenkavalier from Vienna; Tzigane music from Budapest; Paul Whiteman from America, and so on. Truly a feast.

Making Amends.

Hot on the tracks of the lost manuscript episode came the incident of the B.B.C. Film Critic's mention of the "oligarchy of rapacious Jews" which, he inferred, were doing no good to the film on either side of the Atlantic. I understand that it was at least the intention of the B.B.C. officials concerned to have this phrase removed from the original draft of the Talk, but there was a slip-up somewhere, with the result that the thing went out in its original form.

The B.B.C. lost no time in making amends, and the incident is closed.

Far From Sweet.

Although there has been no breach between the Gramophone Company and the B.B.C. about the broadcasting of records, I gather that relations are far from being as sweet as they used to be. Indeed, there are more improbable things than a war between the B.B.C. and the Gramophone Companies, and the former, as a precaution, has taken steps to replace all gramophone records in the programmes over a considerable period.

If it comes to war, it will do neither side any good, because, on the one hand, listeners will not like being deprived of Christopher Stone's features, and, on the other hand, a valuable source of goodwill publicity will be lost to the Gramophone Companies.

Too Much of a Stunt.

The five millionth licence was spectacularly arranged, and got its full share of prominent publicity, but it seemed to me to be a little too much of a stunt. It was surely more than accident that officials at the Post Office and of the B.B.C. with a whole phalanx of press photographers should have been awaiting the arrival of Mr. Fox of Wood Green at exactly the moment when he yielded to the laudable impulse to take out a licence for a wireless receiving set!

Welcome Return.

Mr. Pitt, the former Director of Music for the B.B.C. and world-famous authority on Opera, is beginning to appear more frequently in the programmes as conductor. His return will be welcome.

"Non-Stop" on the Wireless.

The non-stop vaudeville programmes which Mr. L. de G. Sieveking has been putting on in the Portland Place Studios during the last few weeks have, in my opinion, certainly improved that most enjoyable part of the broadcast programmes, as some of us thought they would, in those little matters which are so essential to "slickness" with any form of light entertainment before the microphone.

Vaudeville, or variety as Mr. Sieveking prefers to style his programmes, are different to ordinary concerts, where waits between the items are inevitable, and in which any "gingering up" would be fatal. Only one rehearsal is allowed for each show, but a lot of work is done at other times with private rehearsing by each turn separately.

I understand that a non-stop variety entertainment is being planned for Boxing Night, when one of the old Tivoli "bills" of thirty years ago will be reproduced; but between now and Christmas we shall hear a lot of Mr. Sieveking's work in some other special programmes, including an all-Jewish show and some others to be given by all males, all females, and all children, as well as a series of sketches entitled "Shaking up Shakespeare," in which famous acrobats and comedians will have opportunities of showing how they would play some of the parts immortalised by the great William.

THEATRE AND STUDIO

The largest studio in Broadcasting House—the Concert Hall—is now open to the public for certain of the B.B.C. Chamber Music Concerts on Saturday evenings.

A G.B.S. Sketch from Birmingham.

How will George Bernard Shaw be regarded in another two or three hundred years is a question which often produces varying answers, and, although none of us alive to-day will ever know the answer, the great "G. B. S." himself has apparently no fear for the future of his good name or his work. Some time ago Miss E. M. Barling wrote a little sketch entitled "Back to G. B. S.," a play of nonsense based on the idea that in the distant days to come the great man will be treated by some people much as Shakespeare is treated to-day.

The scene of the sketch is the Memorial Talkiedrome during the Shaw Tercentenary Celebrations at the Malvern Festival in A.D. 2156, and it was published in time for the recent festival at Malvern. Miss Barling had previously written to Shaw asking whether, if the play was published, he would bring a libel action against her, to which he replied, "I could hardly prove damages—on the contrary."

So now we know, and listeners will have a chance of hearing the sketch when it is broadcast on the Midland Regional wavelength from the Birmingham Repertory Theatre studio on Tuesday, November 15th.

THE LISTENER'S NOTEBOOK

A rapid review of some of the recent radio programmes.

WHATEVER others may say, non-stop variety seems to me nothing more than the confession that, as we have nothing for you the best we can do is to bluff you into believing that we have.

The compère (pardon! I should say, chairman) works like a horse at his game of make-believe. Hardly has he recovered from one exhausting spell of bluffing than he is on the go again. I cannot share his enthusiasm, however.

In the first place, variety stage jokes are so thin that they need all the help they can get to score with the listener. Radio gives him no help.

On the contrary, radio seems to have killed the old-time variety humour, and as long as a new and more suitable type is not forthcoming the old must carry on, using what devices it can (and bluff is the latest, apparently) to give it an appearance of freshness and vitality.

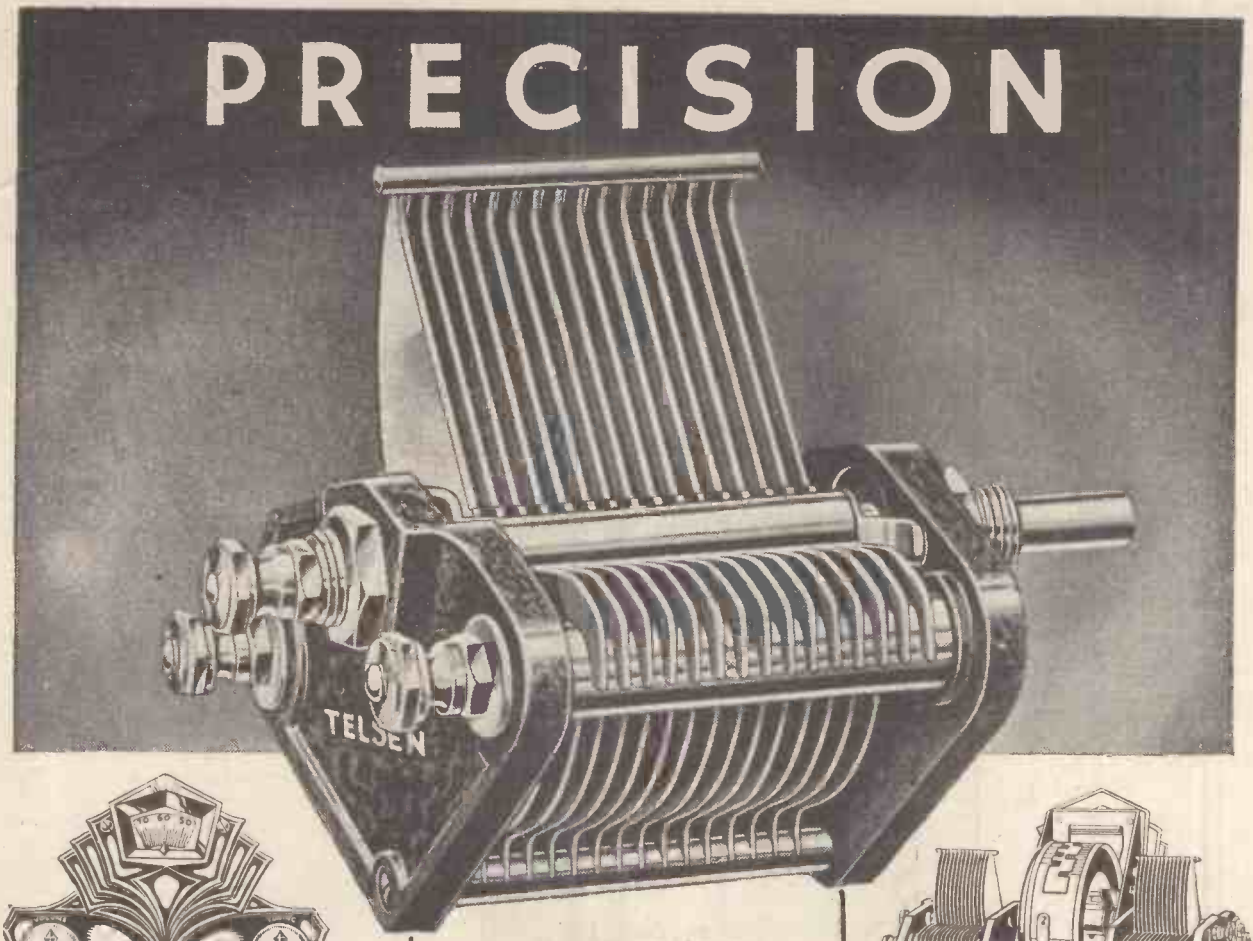
The Root of the Trouble.

The fact is, there is a decided difference between a stage and a radio comedian. It doesn't follow that if a man is a reputable stage comedian he is an equally reputable radio comedian.

The B.B.C. seems to think he is, and that's the root of the trouble. Many comedians are quite reasonably funny if they are seen. Gesture makes their turn.

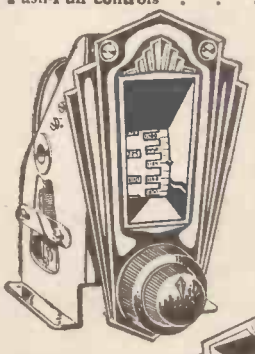
(*Continued on page 564.*)

PRECISION



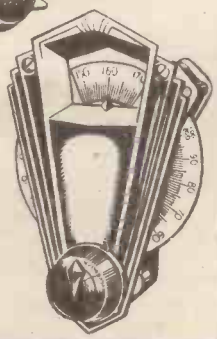
TELSEN TELORNOR

An illuminated Disc Drive embodied into an unusually handsome silver oxidised escutcheon plate, complete with artistically grouped Volume, Tuning, On-Off, and Push-Pull controls **7/6**



TELSEN DRUM DRIVE

Embodies numerous refinements, including cord drive and rocking stator trimmer. An extra scale, graduated for wavelength tuning, is supplied free of charge - **8/6**



TELSEN ILLUMINATED DISC DRIVE.

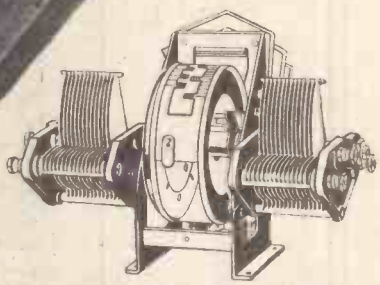
Fitted with handsome silver oxidised escutcheon plate and incorporating an improved movement, making for delightfully easy tuning . . . **3/6**

TELSEN LOGARITHMIC CONDENSER

The Telsen Logarithmic Variable Condenser is a component whose precision, allied to its sturdy construction, ensures years of faithful service. The sturdy frame is braced by three solid pillars, and the vanes clamped at three points, making distortion impossible. The rotor is also built into a rigid unit and the vanes held at both ends, generous bearings preventing backlash or endplay.

Cap. .00025	**4/6**
Cap. .00035	**4/6**
Cap. .0005	**4/6**
Cap. .0005 (left-hand movement with trimmer) ...	**5/-**
Cap. .0005 (right-hand movement with trimmer) ...	**5/-**

TELSEN
RADIO COMPONENTS

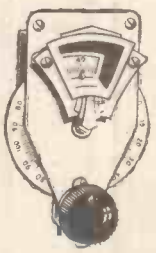


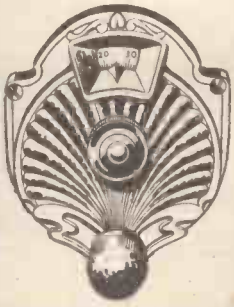
TELSEN DRUM DRIVE AND CONDENSER ASSEMBLY.

A complete drum drive and ganged condensers tuning unit, with a handsome escutcheon finished in oxidised silver. An extra scale (marked in wavelengths) is supplied free **17/6**

TELSEN SMALL FRICTION DISC DRIVE.

A low priced disc drive for auxiliary controls. It is extremely robust and may be used for main tuning condensers where considerations of space make it desirable . **2/6**





TELSEN SLOW MOTION DIAL.

(Black or Brown Bakelite)

Made with a gear ratio of 8-1, the disc being graduated from 0-100 in both directions. Supplied complete with instructions for mounting on all panels up to 3/16" thick . **2/-**

TELSEN RADIO COMPONENTS ARE 100% BRITISH

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

Telsen

MICA CONDENSERS AND GRID LEAKS

MAKE ALL THE DIFFERENCE TO YOUR SET!

TELSEN MICA CONDENSERS

Represent an important advance in technique resulting in the virtual elimination of H.F. losses, even in the larger sizes. Enclosed in a very attractive moulded case, adaptable to flat and vertical mounting. Grid leak clips (which may be mounted in series or in shunt) are supplied free with the smaller capacities. Made in capacities of from .0001 to .002 mfd. . . 1/-
Also .006 mfd. . . . 1/3

FOLLOWING on the recent discovery that no less than 98% of 'Kit' Sets and home constructor receivers are 'down' in efficiency through faulty Grid Leaks and Mica Condensers, Telsen Radio Engineers set to work to discover the cause of, and provide a remedy for, this rapid deterioration and consequent loss of efficiency. Their tests embraced every known make of these components in conjunction with every type of receiver and it is as a direct result of their successful investigation that the new Telsen Mica Condensers and Grid Leaks were introduced. They have been designed on entirely new lines, being made to a standard and not to a size, overcoming the numerous faults disclosed by the investigation and embodying the principles formulated to prevent deterioration. They give lasting efficiency.

TELSEN

RADIO COMPONENTS

TELSEN GRID LEAKS

This new type, of improved efficiency, is absolutely silent and practically unbreakable, the resistance being unaffected by the application of different voltages. They are guaranteed to be completely non-inductive and to produce no capacity effects. Made in capacities of from 5 to ¼ megohms. . . 1/-

IT'S THE 'LASTING EFFICIENCY' THAT COUNTS

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

RECOMMENDED WRINKLES

LOUDSPEAKER EXTENSION WIRES—STOP THAT HUM!—CONDENSER CONNECTIONS—CANS THAT CUT.—COMPONENTS.

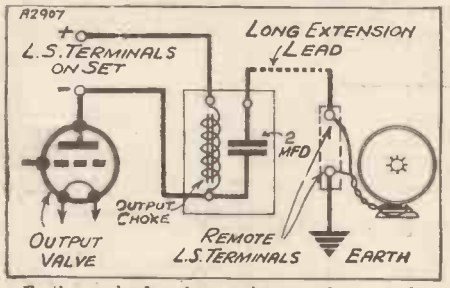
LONG L.S. LEADS.

IN cases where long extension leads must be employed to connect the speaker to the set, it is advisable to use an output filter in order to remove the steady anode current from the speaker leads.

If such a filter is not already incorporated in the set, it can be added externally by connecting it to the speaker terminals as shown in the sketch.

Apart from the advantages of this scheme in shunting the steady anode current, it permits of a single wire only being used. The remaining terminal of the speaker can be earthed to the nearest convenient point,

AN EARTH RETURN



Earth your loudspeaker, as shown, and you can do without a "return" wire for it.

and since the earth is highly conductive the return path is formed without the need of a second wire.

TO PREVENT HUM.

KEEP the aerial lead-in wires well separated from the house-lighting and power wiring, and don't stand a reading lamp near the set.

Don't run an amplifier or receiver extension leads parallel with or near lamp wires and other wiring connected to the mains.

Don't place the set near the house wiring or circuits connected thereto.

Don't run long battery wires to either the low-tension or high-tension batteries down through the floor to the cellar where they may come near the electric power meter or wiring.

Don't place any kind of eliminator too close to the set, either above it, below it, or at the back of it, unless the eliminator is contained in a completely shielded and earthed case.

Keep the mains transformer, the output filter choke, and the first-stage coupling unit the correct distance apart—follow the design of a mains set in detail.

CONNECTING ELECTROLYTICS.

THE large-capacity electrolytic condenser has two great advantages as an H.T. smoothing condenser; namely, low cost and small size. It is essential that these condensers be connected correctly with regard to polarity, as if the positive terminal be connected to H.T. — and the negative terminal to H.T. +, the condenser will be ruined. Therefore, it would be decidedly unwise to use a condenser of this type in a D.C. receiver, as if the mains plug is inserted incorrectly at any time the condenser would be ruined.

DANGEROUS INSULATION.

UNLESS care is exercised, the insulation of connecting wire, although quite safe under ordinary circumstances, is apt to cause considerable and unnecessary trouble when used in sets with screens and screened coils.

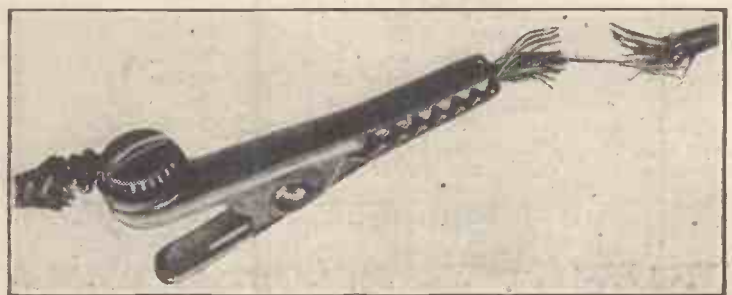
Most constructors, for neatness, aim at square wiring, and, in bending the wire, the insulation stretches and invariably breaks—with the result that the bare wire is exposed to any earthing point in the near vicinity.

Should this wire be carrying mains, it would throw a direct short circuit, or in the case of a high-tension battery, the latter would soon be ruined.

Where a screened coil is used, it is well worth while taking care that the connecting wire is central in the slots, otherwise it is more than possible that the comparatively sharp edge of the can will cut through the insulation.

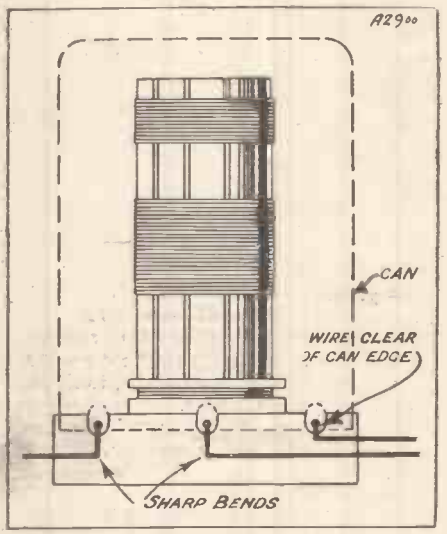
Here again, with the can at earth potential, damage is possible, especially when the coil is used as tuned anode.

THE VORACIOUS CROCODILE



Watch that your clips don't hang on too hungrily! It is easy to fray flexible wires and break them, except, perhaps, for one strand—and that ruins reception at once.

'WARE THE BENDS



In radio as in motoring—don't take the bends carelessly!

COMPONENT COST.

IF the constructor wishes to obtain the very best results from his receiver, he should buy only reputable apparatus. This will certainly cost a little more than inferior or doubtful components.

The small additional expenditure is well worth while.

Cheap parts of doubtful quality are always liable to give trouble, if not at the outset, probably at some later date after the set has been in operation for a little while.

A defective component may cause noisy reception, weak signals, or complete failure.

Realising the importance of providing listeners with up-to-the-minute news about long-distance stations and conditions, "P.W." publishes regularly the notes of a Special Correspondent who nightly searches the ether in order to provide a log that is really up to date.

THE other day I was thinking how completely in error had been the prophecies made four or five years ago by people who said that long-distance listening would soon die a natural death, since the local station must always be the only one really worth listening to from the point of view of general entertainment. When those thoughts crossed my mind, the loudspeaker was filling the room with Tzigane music from Budapest, and even the most critical could have found no fault with the reproduction.

The volume was as great as anyone could have wanted, there was no fading, no distortion, no interference. Reception was, in fact, every bit as good as that from the local station.

First-Rate Reception.

That is just one foreign station. How many are there in the wavelength tables nowadays that can be heard just as well with a reasonably good set?

The number is astonishing. Near the top of the medium waveband, for example, you have, (besides Budapest), Langenberg, Prague, Florence, Brussels No. I, and Vienna, all of which are to be heard just as well when they are in good form.

A little lower down Stockholm, Rome, and Beromunster provide first-rate reception. Another excellent group is that which includes Göteborg, Breslau, the Poste Parisien, Milan, Brussels No. 2, Brno and Strasbourg.

At Your Service.

Again, there are Turin, Heilsberg, Bratislava and Hilversum lying between 274 and 296 metres, whilst between 239 and 257 metres Nurnberg, Trieste, Gleiwitz and Horby are waiting to provide magnificent entertainment. Down near the very bottom of the band Budapest No. 2 on 210 metres and Fécamp on 223 metres both give excellent service in this country.

You cannot say definitely that you will be able to receive to perfection all of these stations on any one evening. Wavelength wandering still unhappily occurs; heterodyne or jamming may affect any station, and spark interference has not yet completely disappeared. But the odds are that of the stations mentioned the majority will be so well received that they furnish items of real entertainment value as alternatives to those of the local station.

On the long waves Oslo, Kalundborg, Zeesen, Radio-Paris, and Huizen are just as good. Long-distance listening has certainly not died out. Far from it; an astonishing proportion of those who write for information on wireless subjects want to know how they can add a valve to their existing sets so as to be able to receive more foreign stations.

Amazing Volume.

There have been a good many changes recently in the results obtainable from various distant stations in this country. Frankfurt, now with a rating of 17 kilowatts, has exchanged wavelengths with Leipzig. Frankfurt is working on 259 metres, but provides amazing volume at times when the London National is silent.

Leipzig's new transmitter has a rating of 150 kilowatts and is already creating a considerable stir on 390 metres, though the full power is not yet in use. Bordeaux Lafayette should certainly be tried for; this station is now splendidly heard over here.

Milan is now using his full 60 kilowatts on 331·5 metres and Göteborg on 322 metres is coming over with great volume. Helsinki may be found on 368·1 metres. This is a 10-kilowatt station and the wavelength is a favourable one. Madrid Union Radio, who was very poor during the summer, is now a good evening station, and you should not neglect Belgrade just above him on 430 metres.

Try For Him.

Stockholm is more powerful at the moment than Rome, Paris Ecole Superieure on 447 metres is still shown with a power of only 700 watts—but just try for him, and see if you believe it. Don't omit to try for Lyons Doua on 466 metres and be sure to tune in Riga on 525 metres.

R.W.H.

NOTES FROM SCOTLAND

"Let the Regions be Rivals," says our Scottish Correspondent in this article telling of the Scottish Region's latest enterprises.

A WRITER in the "Radio Times" recently had the courage to suggest this to the B.B.C.—that its monopoly is acting as a brake on the full development of radio broadcasting as a new art. His reasons are specially interesting to listeners residing in the provinces.

He pointed out that monopoly limits the number of programme-creators, and that German experience seemed to confirm this, for there the existence of nine independent stations has stimulated the production of radio plays to the amazing figure of eight hundred a year.

It Has Its Merits.

Whether the rivalry between stations in Germany has similarly stimulated other departments of broadcasting—music, talks, outside relays—is not clear, and seems less likely, but there is no doubt that the German arrangement of nine different directors of programmes with nine different notions of programme-building has its merits.

On the other hand, competition can be wasteful, and in some directions the co-ordination exercised by the B.B.C. has been beneficial. I suggest that the B.B.C. has the power in its own hands to remedy the main evil of monopoly, by encouraging rivalry between the different Regional directors and thus securing competition from within.

Instead of this, in radio drama the activities of provincial stations have been held in check by stupid restrictions, and the B.B.C. has cut down the orchestras at provincial studios to the status of café bands, with the sole exception of Belfast.

It is worth noting that in the directions where London has allowed the provinces a fairly free hand some notable progress has been made, and in Scotland just now we are seeing Regional initiative developing in several interesting directions.

Of all the "local talent" programmes, perhaps the most whole-hearted are in the series entitled "Frae a' the Airts." For these programmes the artistes are not brought captive to the studio, but are tracked to their lairs and broadcast from their native haunts.

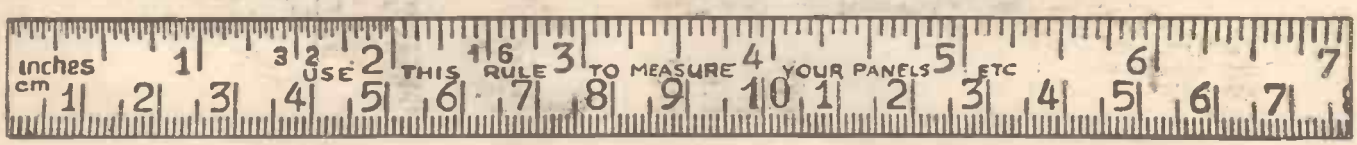
Rural Entertainers.

Believing that native woodnotes wild can best be reproduced in native woods, the B.B.C. periodically makes incursions into the rural districts of Scotland, and erecting a microphone in some secluded spot, brings together a gathering of local characters who spend the evening entertaining one another and, incidentally, the listeners.

Another specially Scottish development is a series of programmes attempting to express the essential character of Scottish towns and cities. The first, entitled "Edinburgh," will be on November 15th.

Other towns will follow. The Glasgow programme has been placed in the hands of a local journalist and will, for the most part, portray a day in the life of Glasgow.

Yet another Scottish enterprise is the series of "Attack and Defence" debates, which are real hammer-and-tongs encounters over controversial subjects.



DIRECT RADIO'S FOUR PRIZE WINNING KITS

"APEX" Triple Wave-Band Kit

	£ s. d.
1 Permcol Panel, 14" × 7"...	4 0
2 Colvern screened coils, type T.D.	17 0
1 Ready Radio ·0003-mfd. solid dielectric reaction condenser...	2 3
1 Ready Radio 3-pt. wave-change switch ...	1 6
1 Ready Radio 2-pt. wave-change switch ...	10
1 Bulgin on-off switch, snap type S.80 ...	1 6
3 Valve holders ...	1 6
1 T.C.C. ·0003-mfd. fixed condenser "S" ...	1 3
1 T.C.C. ·0002-mfd. fixed condenser "S" ...	1 3
1 T.C.C. ·0001-mfd. fixed condenser "S" ...	1 3
1 T.C.C. 2-mfd. condenser ...	3 10
1 T.C.C. 1-mfd. condenser ...	2 10
2 Ormond ·0005-mfd. slow-motion variable condensers No. 6 ...	13 0
1 2-meg. grid leak, wire ends ...	10
1 Dubilier 30,000-ohm resistance, wire ends, 1 watt	1 0
Carried forward ...	2 13 10

	£ s. d.
Brought forward ...	2 13 10
1 Dubilier 200,000-ohm resistance, 1 watt	1 0
1 Ready Radio H.F. choke ...	1 6
1 R.I. L.F. transformer. Dux ...	6 9
4 Belling & Lee indicating terminals	10
2 Terminal strips	1 0
1 Coil Glazite ...	6
1 Belling & Lee 5-way battery cord	2 0
1 Piece copper foil, 10" × 5½" ...	1 0
Plugs, screws, etc.	7
3 Mullard valves: PM12A, PM1HL, PM2A	1 12 3
1 "159" walnut cabinet	16 9
1 Blue Print Free.	
Extra Components for Ultra Short Wave.	s. d.
2 Lotus 2-pin coil-holders	1 4
1 Ready Radio. 3-point switch ...	1 6
1 Belling & Lee terminal	3
1 Magnum neutralising condenser	4 0
1 Terminal strip, 2½" × 1½"... ...	3
Carried forward ...	6 5 4

	£ s. d.
Brought forward ...	6 5 4
1 Set Atlas short-wave coils ...	10 0
	£6 15 4

KIT No. 1 (Less valves and cabinet)
£4:6:4
or 12 monthly payments of **8/-**

KIT No. 2 (With valves less cabinet)
£5:18:7
or 12 monthly payments of **11/-**

KIT No. 3 (With valves and cabinet)
£6:15:4
or 12 monthly payments of **12/6**

KIT No. 4
Complete Kit, including Valves, Walnut Consolette Cabinet, Siemens Batteries, Oldham Accumulator, Epoch Twentieth Century Moving-Coil Speaker.
£10:7:10
or 12 monthly payments of **19/-**

The "P.W." RADIOGRAM

	£ s. d.
1 Lissen 2-gang coil unit with on-off switch ...	17 6
1 Utility 2-gang ·0005-mfd. tuning condenser, type W.312 ...	19 6
1 Telsen ·0003-mfd. variable condenser with shorting switch ...	2 3
1 Wavemaster ·00035-mfd. differential reaction condenser	2 3
1 Ready Radio 3-pt. Rotary change-over switch	2 9
3 4-pin valve holders	1 6
1 Dubilier 2-mfd. non-inductive condenser ...	3 9
1 T.C.C. 1-mfd. condenser ...	2 10
1 Dubilier ·0001-mfd. fixed condenser, type 670	1 0
1 Dubilier ·0003-mfd. fixed condenser. type 670	1 0
1 Lewcos H.F. choke	6 0
1 Ready Radio H.F. choke ...	1 6
Carried forward ...	3 1 10

	£ s. d.
Brought forward ...	3 1 10
1 Dubilier 2-meg. grid leak, 1-watt type with wire ends	1 0
1 Dubilier 2,000-ohm resistance...	1 0
1 Ready Radio L.F. transformer	8 6
1 Permcol panel, 18" × 8", drilled to specification...	5 6
2 Terminal strips, 3" × 1½" ...	6
4 Belling-Lee terminals	10
1 Piece copper foil 9½" × 6" ...	1 0
1 Belling-Lee 6-way battery cord	2 6
1 On-off switch ...	10
Connecting wire, flex, screws, etc.	6
3 Mullard valves: PM12, PM2DX, PM2A	1 12 3
1 Special radio-gram cabinet ...	3 5 0
	£9 1 3

KIT No. 1 (Less valves and cabinet)
£4:4:0
or 12 equal monthly payments of **8/-**

KIT No. 2 (With valves less cabinet)
£5:16:3
or 12 equal monthly payments of **11/-**

KIT No. 3 (With valves and cabinet)
£9:1:3
or 12 equal monthly payments of **17/-**

KIT No. 4 (Complete kit with Valves, Radiogram Cabinet, Epoch Twentieth Century Moving-Coil Speaker, Collaro B.30 Gramo. Motor, A.E.D. Beta Pick-up and Volume Control)
£14:0:0
or 12 equal monthly payments of **26/-**

"1933" FOUR

	£ s. d.
1 Permcol panel, 16" × 8", drilled	5 0
1 J.B. "Unitune" two-gang ·0005-mfd. condenser..	18 6
1 Ready Radio ·0005-mfd. solid dielectric condenser	2 6
1 Ready Radio Bakelite condenser, ·0003-mfd. differential ...	2 6
2 Telsen screened coils	17 0
1 T.C.C. 2-mfd. fixed condenser	3 10
1 T.C.C. 1-mfd. fixed condenser	2 10
1 T.C.C. ·01-mfd. fixed condenser, upright type ...	3 0
1 Dubilier ·0003-mfd. fixed condenser, type 665	6
1 Ready Radio 2-megohm resistance and holder	1 4
1 Ready Radio ·25-megohm resistance and holder	1 4
1 Dubilier 20,000-ohm resistance	1 0
1 Dubilier 250,000 ohm resistance, 1 watt	1 0
Carried forward ...	3 0 4

	£ s. d.
Brought forward ...	3 0 4
1 Ready Radio, 2-pt. on-off switch	10
1 Ready Radio 3-pt. change-over switch	1 6
1 Ready Radio standard H.F. choke	1 6
1 R.I. "Dux" L.F. transformer	6 9
4 Valve holders ...	2 0
1 Terminal strip, 16" × 1½", drilled	1 6
11 Belling-Lee indicating terminals, type "R"	2 3
Connecting wire, 3/16" panel bush, ebonite coupling link, 3/16" × 1" extension spindle 3/16" × 5", plugs, flex, screws, etc. ...	3 6
1 "159" cabinet	1 0 0
4 Mullard valves: PM12, PM2DX, PM1LF, Super Power P.M.202	2 2 6
	£7 2 8

KIT MODEL 1
(Less valves and cabinet)
£4:0:2
Or 12 equal monthly payments of **7/6**

KIT MODEL 2
(Wth valves less cabinet)
£6:2:8
Or 12 equal monthly payments of **11/6**

KIT MODEL 3
(With valves and cabinet)
£7:2:8
Or 12 equal monthly payments of **13/6**

The "SKY HAWK"

	£ s. d.
1 Colvern canned coil, type T.D....	8 6
1 Goltone canned coil, type G.G.R.	5 9
2 ·0005-mfd. solid dielectric condensers with Ormond slow-motion dials	10 0
1 Ready Radio ·0003-mfd. to ·00035-mfd. differential reaction condenser	2 6
2 Ready Radio 2-pt. push-pull switches	1 8
1 Ready Radio 3-pt. push-pull switch	1 6
3 W.B. 4-pin valve holders	1 6
1 Slektun Coil L.F. transformer	4 9
1 Ready Radio 2-meg. grid leak	10
1 Dubilier ·0003-mfd. condenser, type 665	6
1 Ready Radio H.F. choke ...	1 6
4 Belling-Lee terminals	10
2 Terminal strips, 2" × 1½"	6
Carried forward ...	2 0 4

	£ s. d.
Brought forward ...	2 0 4
1 "Easyfix" baseboard, 10" × 10"	1 6
1 Special walnut panel, 10" × 7" × 3/16"	1 6
Flex, wander plugs, etc. ...	1 2
3 Mullard valves: PM12, PM2DX, PM2A	1 12 3
1 Special cabinet ...	18 9
	£4 15 6

KIT MODEL No. 1
(Less valves and cabinet)
£2: 4:6
or 8 equal monthly payments of **6/3**

KIT MODEL No. 2
(With valves less cabinet)
£3:16:9
or 12 equal monthly payments of **7/3**

KIT MODEL No. 3
(With valves and cabinet)
£4:15:6
or 12 equal monthly payments of **9/-**

ACCESSORIES

	£ s. d.
1 Siemens 120-volt H.T. battery ...	13 6
1 Siemens 9-volt G.B. battery ...	1 0
1 Oldham 0·59 accumulator ...	9 0
1 Epoch 20th Century moving-coil speaker chassis	1 15 0
1 Blue Spot 44R speaker	2 12 6
1 Cop aerial lead-in tube and lightning arrester ...	2 6
1 Selectanet aerial	2 6
1 Filt earth ...	2 6

COMPLETE CATALOGUE OF ALL SETS, ACCESSORIES AND GADGETS PRICE 1/- POST FREE

SPECIAL OFFER
Direct Radio's New 1933 Permanent Magnet Moving Coil Speaker chassis incorporating Input transformer for Power or Pentode Valves. Sent on 7 days' free trial with satisfaction or money returned guaranteed. Send P.O. for 26/-.

CASH, C.O.D., AND EASY PAYMENT ORDER FORM
To: Direct Radio Ltd., 159, Borough High Street, London, S.E.1.
Please dispatch to me at once the following goods.....
.....
for which (a) I enclose (b) I will pay on delivery (c) I enclose first deposit of {Cross out line not applicable} £.....
NAME.....
ADDRESS.....P.W.12/11/32

ANY COMPONENT CAN BE SUPPLIED SEPARATELY

CAPT. ECKERSLEY'S QUERY CORNER

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

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

THE CAUSE OF FADING—OUTPUT CIRCUIT—NOISY RECEPTION.

Why Short Waves Fade

H. W. (Leyton).—"I have recently been listening on the short waves, and notice that stations come in for a few seconds and then fade right away. Is this sort of thing common to all ultra-short-wave reception?"

It is quite common for short-wave stations to fade. I want, however, before going on to this to ask you whether you really mean ultra-short-wave reception or short-wave reception.

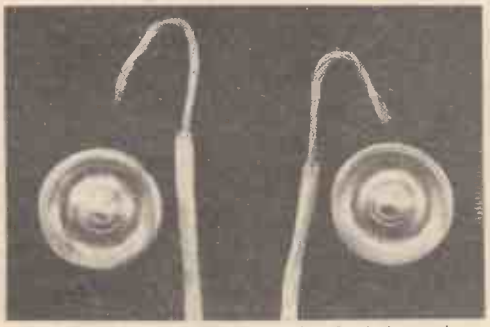
It is common these days, I think, to speak of ultra-short waves as those below 10 metres, say, but what we are going to call the centimetre waves I don't know.

Short waves, however, are those, I always think, around the 30- to 10-metres length, but again I am not sure what I should call a 100-metre wave. I think I should call it a 100-metre wave.

> **Then I would talk of medium waves, as between 550 and 200 and long waves between 1,000 and 2,000 metres. But I should only be concerned with broadcast nomenclature in all this.**

In any case waves of any length can be considered to have two components: waves which go along the ground, called ground waves, and those which go skywards (at once or eventually), and there, hitting the so-called Heaviside Layer, which is an ionised part of the upper atmosphere, are bent earthwards again.

A COMMON ERROR



The right-hand terminal above is about to receive a correctly bent wire, but tightening up the other terminal will only make its wire slip away from the stem.

The ground waves travel farther as the wavelength is longer and the earth conductivity greater. A 2,000-metre ground wave is still appreciable at 300 miles from the station. A 20-metre wave is hardly appreciable at 20 miles. (These figures give the order of quantity and are not accurate necessarily!) But the sky waves are uninfluenced by the ground. They are influenced, however, by the Heaviside Layer, and the relative properties of this layer are by no means constant.

> **Then, again, you must not think there is only one ray of waves. You are receiving several. One ray may have been up and down between earth and sky twenty times, another five times, and so on.**

At the point of reception these rays may all add their energy together, when you get good signals. A few moments later they may cancel, when you get no signals.

It is only when you are within the ranges of the direct ray that you get steady and unfading signals. You can get over this trouble by combining the effects of, say, three aerials spaced, say, 100 yards apart, the idea being that when the signals have died down to zero at one place they are strong at another place 100 yards away from the place where they have died.

With three aerials on the points of an equilateral triangle of 100 yards sides, there is always one working, and so you certainly minimise the fading by this so-called spaced aerial reception.

Avoiding Distortion.

R. W. L. (Bournemouth).—"When using a moving-coil or cone type of speaker which is fitted with a special transformer is it permissible or even desirable also to use a choke output filter in the receiver?

"The reason why I should like advice on this point is because the special output transformer supplied with my moving-coil speaker is very small and I think there may be a possibility of saturation of the primary occurring if this is connected directly to the anode circuit of a super-power valve."

I should certainly think it would be advisable to use a choke feed with any transformer connection because the direct current feeding the valve, passing through a transformers winding, saturates the core and produces non-linear response.

Programmes That Moan.

W. H. (Stratford).—"Often when I tune in stations on the lower half of the medium waveband, I cannot listen to the music owing to moans and whistles which come through.

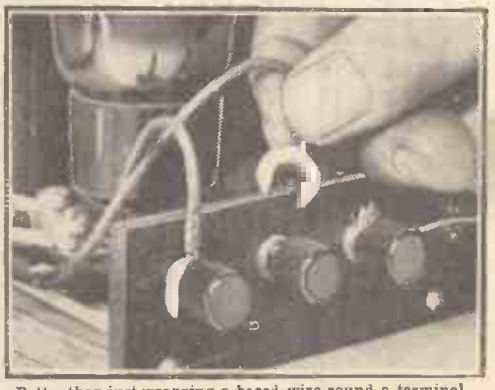
"Sometimes it sounds terrible, and although I take particular care to see that my set is not anywhere near the oscillation point the moans and whistles are still there.

"Is there nothing I can do to separate the stations from these horrible noises?"

The moans and whistles that you complain of may be due to the fact that the station you are attempting to listen to is interfered with by other stations, or it may be due to the fact that other listeners are attempting to pick up that station and in doing so are making their sets oscillate.

If it is the former trouble the note of the heterodyne, or moan, or whistle (all the same thing), will remain moderately constant. If people are oscillating the note will vary from a low rumble to a high-pitched squeak, and up and down.

THE BETTER WAY



Better than just wrapping a bared wire round a terminal is to equip the leads with proper "spades," which make good connection without trouble.

In either case you would get a great deal more information from the B.B.C. by writing to them and explaining in more detail the circumstances. For instance, which station is interfered with? Is it a constant note? What is your address? Do you think that there is any particular offender who lives near you? etc., etc.

I have no doubt the B.B.C. have a form to fill up which gives them the information they want, information which will enable them perhaps to help you.

Short-Wave Notes By W.L.S

WHEN I have enough spare time on a Sunday to spend an hour or so "on the air," I am invariably struck by the number of new British transmitters appearing. The newcomer to amateur transmission nowadays is no "gubbins," as he used to be a few years ago.

A really nice crystal-controlled signal is the rule rather than the exception, good operation in general, and in most cases nothing but the unfamiliar call-sign gives away the fact that it is a comparative newcomer to the game that is behind the gear at the other end.

What *does* strike me more than ever, though, is the dim familiarity of the names on several of the cards that I receive as a result of contacts with the newer British stations. I seem to be able to remember at least fifty per cent of them as readers of "P.W.," who wrote to me inquiring whether there was a hope that they might ever become amateur transmitters.

"The Path to Glory."

The rungs of the ladder up to this desirable end appear to be labelled: "Broadcast listener"; "Short-wave listener"; "Short-wave listener chiefly interested in amateur transmissions"; "B.R.S.—British Receiving Station — Member of the R.S.G.B."; "Artificial aerial licence"; and "Ham."

What comes after "ham" is a matter for conjecture. But in lots of cases the amateur transmitter of to-day is the commercial radio engineer of to-morrow. I know quite a number of young people who were cut out for insurance office jobs, and who, most surprisingly, have found themselves doing research work in radio for their living.

The Making of the Amateur.

Of course, there is no doubt that the short waves have been the making of the amateur transmitter. In the old days he was simply a man with rather more money—and often no more knowledge—than the hundreds like him who were forced to be content with receiving only. Then, as the steady evacuation of each waveband in favour of the next one down the scale commenced, he found himself on a very different footing.

Just at present the amateur transmitter enjoys a splendid position and a splendid reputation in this country; and, more important, he is living up to it. Long may he keep it up!

A Royal Transmission.

I have such a formidable pile of correspondence before me that I *must* deal with several letters herewith, but I will confine myself to the "general interest" variety, and the others must wait.

UNDER WATER IN A BATHYSPHERE

Did you hear the recent thrilling broadcast from American stations by a scientist in a Bathysphere, lowered to the bottom of the ocean? He is here painting it prior to his adventurous trip.

H. G. W. (Basrah) forwards a cutting from the "Times of Mesopotamia," announcing that "H.M. the King will speak into the microphone at Baghdad, which will broadcast on two wavelengths—530 metres and 36·88 metres." Apparently regular transmissions are being arranged on the latter wavelength. The station has no call-sign and announces itself simply as "Baghdad."

The transmission took place on Iraq's Independence Day—October 6th.

R. G. V. (Stroud) is puzzled about the wavelength on which some amateur telephony that he heard took place. I should say, R. G. V., that whenever you hear a Britisher on telephony it is safe to assume that he is in the 42-metre band. "Off-wave" amateurs are a thing of the past, and you don't hear many British stations on their 21-metre band.

No, R. G. V., although we both happened to go to North Wales, "Ariel" and W. L. S. are two very different persons. Your circuit seems to coincide exactly with the rig I use myself, so it *must* be good.

A Revived "Wash-out."

J. B. M. (Glasgow) forwards particulars of station E A R A, Las Palmas, Canary Islands, on about 47 metres. This station is probably the same as E A R-X A, who has also been reported on that wavelength.

W. H. R. (Plymouth) has some interesting stations to report. The first is Leningrad on about 19·9 metres, working with Moscow. Next comes Algiers on 24·3 metres, and W K J (Rocky Point), testing on 31·75 metres with Madrid (E A Q).

Others include L S L (Buenos Aires) at R 9 on 30 metres, working with London, and S U V (Cairo) on 21·7 metres.

W. H. R. remarks that ever since he described W 2 X A D as a "wash-out," the said station has been coming over beautifully up till closing-time (8 p.m.). Many thanks, W. H. R., for all your trouble.

I should like to reproduce your letters in full as an example to short-wave fans of what lengths real enthusiasm may run to.

As a result of a note published in "P.W." for September 24th, a club has been formed in the Maidstone district under the title of the "Dee-X'rs Short-Wave Radio Club." Anyone interested is asked to write to Mr. W. Barden, 9, Grecian Street, Maidstone, Kent.

I hear rumours of a similar venture in the Coventry district. If there are others, I should be glad to hear from them.

Latest News.

J. H. B. (Manchester) comments, with several others, on the excellence of W 3 X A L's programmes on his new wave. As far as I know, J. H. B., it is 16·83 metres at present.

A. D. L. (Quetta, Baluchistan) sends me a photo of his improved "S.G. Four," now made up in radio-gram form, and the envy of everyone in that country! He is asking for the latest news from the "Empire Broadcast" Front.

In case he doesn't know, I had better repeat that programmes definitely commence at Christmas.

I shall be immensely interested in them, and I think they should do a world of good to our overseas trade, if only a few more of the leading manufacturers will get down to things and take an interest in the poor exile.

BEGINNING OF A GREAT NEW SERIES—HOW TO ASSEMBLE YOUR OWN LOUDSPEAKER

By
A. JOHNSON-RANDALL

WHEN I look around my laboratory I see on all sides evidence of that everlasting quest for quality—loudspeakers to the right—loudspeakers to the left—some obsolete, some modern.

In the corner there are two horn-type speakers, which in their day ranked among the leaders. At the back of the bench over by the wall is my old Western Electric balanced armature cone, 1925 brand which, at that time served as my standard.

Vast Strides.

But with the march of progress this trusted friend gave way to the original Rice Kellogg, now discarded and lying dust-covered under the bench.

And with memories dating back to the advent of broadcasting, I can only marvel at the vast strides that have made the words "pure reproduction" something more than a mere platitude—that have brought realism within reach of the man-in-the-street.

To-day the listener is indeed fortunate in having such a wide choice of excellent loudspeaker units and chassis which, selling at prices considerably below those ruling a year or two ago, must be regarded as truly wonderful value.

Easily Remedied.

What a pity it is that so many of these well-designed speakers are treated so inconsiderately by their owners.

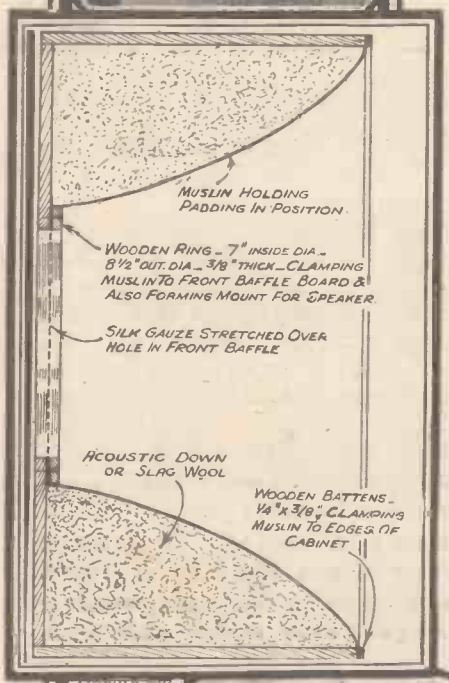
I meet with examples every day of my life—ghastly, hollow-sounding reproduction—wooden piano notes—the announcer sounding as if he were one hundred per cent. adenoidal.

It's all so unnecessary—so easily remedied if you tackle it the right way.

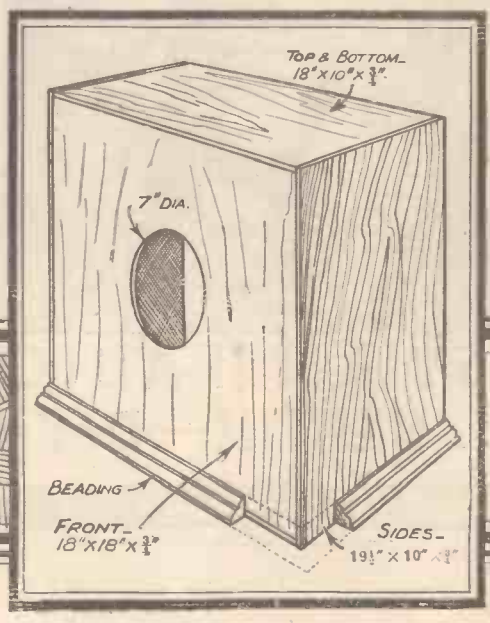
Building up your own loudspeaker with a view to obtaining the best possible reproduction is merely a matter of correctly following out certain accepted principles.

The physicist—I have forgotten his name if I ever knew—who discovered that when sound-waves are allowed to interact they will interfere with each other so that little or no sound-effect is produced on the ear of the listener, performed an incalculable service to searchers after quality. For this is one of the factors upon which the design of the modern baffle is based.

Some months ago a reader asked me if I could tell him why his reproduction suffered from lack of "body." He complained of a general high-



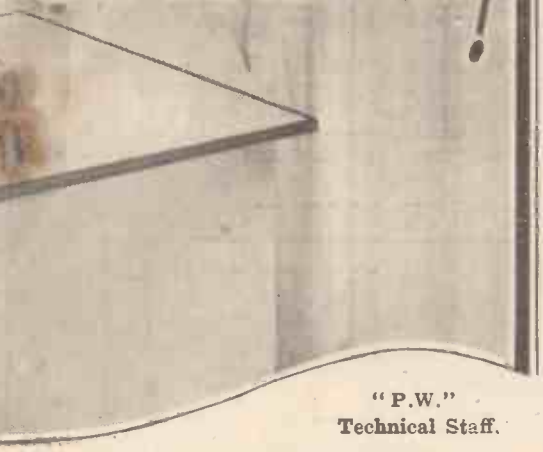
The two diagrams and the photographs on this page show a particularly efficient "box baffle" of the type developed by the B.B.C. Full details for making it are given in this article.



You will see that the box baffle will present no difficulties in construction, even to a novice.

CONSTRUCTI
GETTING RID
BRINGING OU

...ut MAKING UR OWN ...OSPEAKER!



THE BEST INSTRUMENTS TO BUY—HOW THEY WORK—GETTING THE BEST RESULTS, ETC.

"P.W."
Technical Staff.

pitched effect which he could not account for, in view of the fact that he had a perfectly good receiver, and a new moving-coil speaker.

It was only because of his desire for more realistic results that he had exchanged his existing speaker for one of the latest pattern.

". . . . . Yes, he felt very disappointed; he had been led to expect something much better. . . . . ."

An investigation proved to be interesting. The gentleman in question, through the absence of proper guidance, had mounted his speaker—a small permanent magnet moving-coil—on an equally small "baffle."

The area of the "baffle" was such that it only *just* covered the diaphragm, and in consequence the net result was precisely what he complained of, and incidentally exactly what one would expect in the circumstances.

Now a good loudspeaker is not simply a chassis screwed on to a piece of wood any old how, or put into a cabinet which, although decorative, may be the essence of inefficiency from the quality standpoint.

Considerate Treatment.

A good 'speaker unit is the result of endless intensive research on the part of the maker, and it deserves to be treated in a manner calculated to bring out its reproductive properties to the full.

The better the unit or chassis, the more considerate should be the treatment.

Now, as I mentioned previously, when sound-waves are set up in the air, interference may take place so that the effect of one wave is nullified by another.

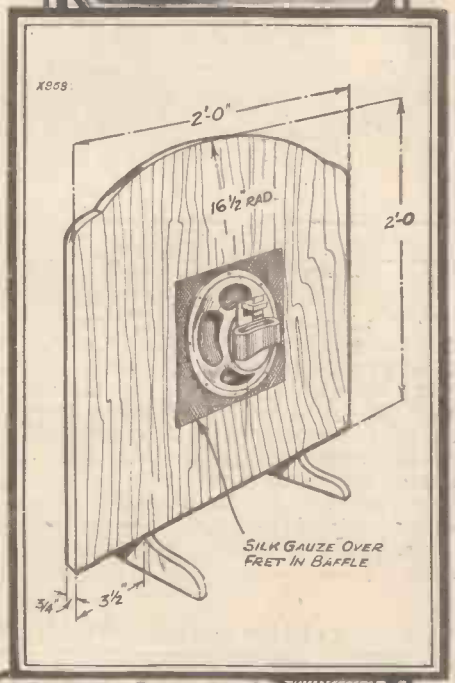
This is what happens when a cone type of loudspeaker is used without a baffle. The energy due to movements of the cone is frittered away instead of being employed usefully.

Harmonious Blending.

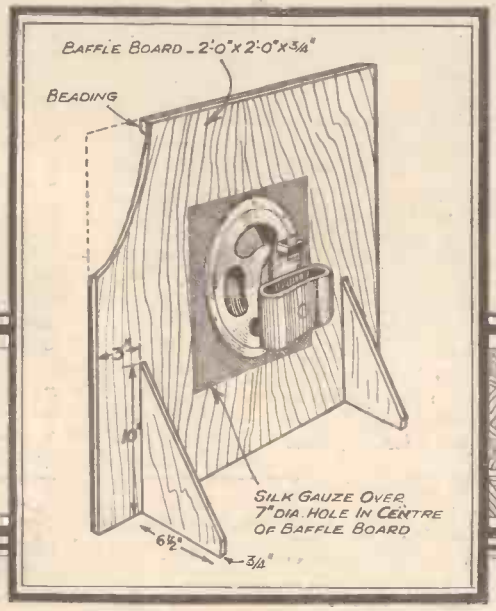
A baffle—which is really only a solid wall between the front and back of the cone—increases the air path between the two surfaces of the diaphragm, enabling the sound energy from the cone to reach the ear of the listener as a harmonious blending of musical frequencies.

Size is an important factor, and in theory, if the low notes are to be fully

(*Continued on next page.*)



The baffle-board to the right is of the "firescreen" type, being ornamentally finished to stand in summer in a fireplace or in a corner. More woodwork details are given in the next page.



To the right is a simple, square baffle board that puts up an extremely good performance in conjunction with a moving-coil or moving-iron unit.

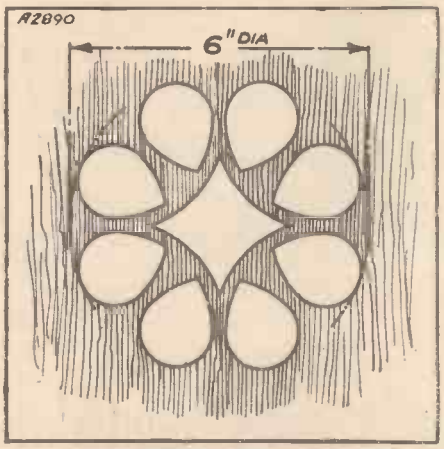
...NG BAFFLES
... OF "BOOM"
...T THE BASS

ALL ABOUT MAKING YOUR OWN LOUDSPEAKER!

(Continued from previous page.)

produced the shortest path between the front and back edges of the baffle should be at least equal to one-quarter the wavelength of the lowest note the loudspeaker or amplifying equipment is called upon to deal with.

WHY FRET?



If you like an ornamental fret, here is a suggestion for the "fire-screen" type of baffle-board illustrated on previous page.

To put it more simply, a baffle not less than two feet square is necessary for notes round about 100 cycles.

For notes lower than this the effective baffle dimensions required increase rapidly, but in practice, apart from other technical considerations, there are obviously limitations as regards size.

One can well imagine the effect upon domestic bliss of planting a four or five foot square baffle in the middle of the drawing-room. "Low notes or not," says she, "that 'thing' is not going to stop here!" And so the dimensions have to be kept down to a practical minimum.

This does not mean that the *very* low notes will not be reproduced at all—they will still be there to some extent, provided the set and speaker unit are capable of responding to them.

But the fact remains that a large baffle area is needed if the bass is to be heard at all.

"Dead" Material.

I have noticed that most of the ready-made baffles one sees in the average radio store are far too thin.

This is a mistake. An efficient baffle is heavy and solid, otherwise its natural resonances may come within the range of frequencies covered by the "speaker." Moreover, a thin baffle is by no means so effective as a thick one of the same area.

There are two main types of baffle, viz. the "plain" and the box.

A plain baffle is a substantial piece of wood or "dead" material — ornamental or otherwise—having a circular hole or fret in the centre conforming to the diameter of the loudspeaker cone.

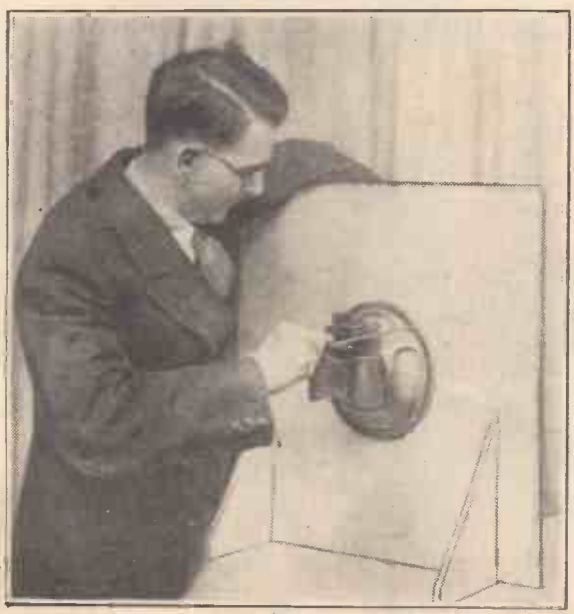
Such a baffle is both effective and inexpensive. The well-known "fire-screen" shape is a good model to follow and easy to construct.

Critical Ears.

The second type of baffle takes the form of a box or cabinet in which the sides in addition to the front are included in the total baffle area.

Hence a box of moderate dimensions will give results equivalent to a fairly large plain baffle. But the box baffle has certain failings which I shall refer to later on.

FITTING THE SPEAKER



Be sure to make a tight job of the nuts, as, if they work loose, they tend to rattle.

At the moment I am going to tell you how to make two simple, but highly efficient and inconspicuous plain baffles, amply large enough to provide a balance of "bass" to "top," which should satisfy the most critical ear.

The first one is a square baffle board consisting of a piece of ¾-in. thick wood 2 ft. square.

There is no need to be a carpenter or skilled cabinet maker in order to construct any of the baffles described in this article. They have been deliberately kept free from elaboration, although there is no reason why fancy work should not be added by those who possess a natural bent for this kind of work.

You will require, in addition to the 2 ft. square baffle, a length of moulding about 8 ft. in all, a piece of silk gauze, and two pieces of wood for the feet.

First get the board itself squared up, with the corners true and find the centre for the hole by drawing two lines diagonally from corner to corner; the point of intersection of these two lines will be the centre of the circle which in the sketch is shown as having a diameter of 7 in.

The Cone Diameter.

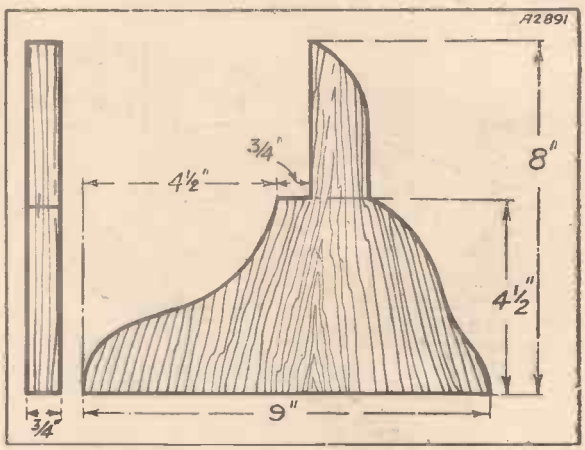
This diameter is not standard, and will obviously depend upon the particular make and type of loudspeaker chassis which is to be affixed to the baffle.

Many of the smaller moving coil and cone units have a diameter approximating to this figure, but some are larger and others are smaller.

The point is that the diameter of the hole should be equal to that of the cone.

Having found the centre, draw a circle of the correct radius with the aid of a pair of compasses, and then drill a hole somewhere inside the circle, preferably near the circumference. The object of this hole is to give the keyhole saw, which will be used for cutting out the circle, a start.

HOW TO FOOT IT



Details of the method of supporting the "fire-screen" baffle-board.

Then cut round the inside of the circle with a keyhole saw, taking great care to keep the saw inside the pencil line which marks the circumference.

Next smooth off the sawn edges with glasspaper, starting first with a fairly coarse grade and then working down to a fine grade for finishing.

At the same time smooth off the board in order to get a perfectly even surface, taking great care to work with the grain and not against it.

Which Wood?

The moulding can then be cut into four lengths and mitred. Now fix the moulding along the edges of the baffle board, as shown in the photographs and drawings, using panel pins and not tacks or nails.

Cut out the feet to the dimensions given and screw these in position.

I have said nothing about the choice of wood for these baffles, since I think that that is best left to the individual taste of the listener. A good white wood can be used, but will, of course, need careful staining if it is to look presentable enough to take its place in the drawing-room. Walnut, mahogany and oak also suggest themselves, but are more expensive than white wood.

(Continued on page 544.)

ALL ABOUT MAKING YOUR OWN LOUDSPEAKER

(Continued from page 542.)

There are numerous little staining and polishing outfits available these days, and it is surprising how professional they make a job such as this appear if a little trouble is taken.

Before screwing the speaker chassis to the baffle, it is advisable to obtain a piece of silk and to interpose it between the chassis and the baffle.

The second baffle is a similar type of thing, but somewhat more ornamental. For instance, the top is shaped, as are also the two supporting feet. A circular fret is used instead of the 7-in. as hole in the first baffle.

Generally speaking, the construction is much the same, and the fret can be cut according to one's own particular taste.

THE BOX BAFFLE FINISHED

Even a plain box with beading looks attractive, but, of course, it can easily be ornamented, if desired.

The Box Baffle

We will now turn our attention to the box baffle, which has many advantages inasmuch as it often fits in better with the room furnishings than a plain baffle.

As I hinted earlier on, the untreated box baffle has certain snags, the chief among these being a pronounced and unpleasant boom that is particularly noticeable on speech and loud passages in music.

This is due to resonance of the air in the box, and it tends to cut out the definition and crispness that is an essential factor of realistic reproduction.

A Superior Type

The B.B.C. development staff have conducted experiments with baffles of this type, and their investigations directed them along a very profitable line.

They discovered that if the ordinary box baffle was equipped with a thick lining of some sound-absorbing material, such as slag wool, the performance of the loudspeaker was considerably improved and actually superior to an ordinary plain baffle, particularly over the range of frequencies between 250–500 cycles.

The treated baffle recommended by the B.B.C. development staff has a front surface about 2 ft. square, but very good results in so far as loudspeakers of the smaller type are concerned can be achieved with a box 18 in. square by 10 in. deep.

If you refer to the two diagrams and the photographs showing the box baffle, you will have no difficulty in getting hold of the idea.

First of all, you have an ordinary box of the dimensions shown in the perspective drawings. The hole in the centre is, of course, chosen to suit the speaker unit, as in the case of the plain baffles.

The first procedure is to obtain a quantity of slag wool or, alternatively, acoustic down. About 2 lbs. of this acoustic down or 14 lbs. of slag wool, together with a quantity of muslin or cloth for holding it in position, are required.

There is one job that you may have to get done by a skilled carpenter, and that is the cutting of the wooden ring which holds the muslin against the inside of the front of the box. This wooden ring should have an inside diameter equal to the hole in the front of the box, and, of course, the same as that of the loudspeaker cone.

Secure the muslin under the wooden ring, which should be screwed to the inside of the box. Then pack the cabinet between the muslin and the sides of the box with the sound absorbing material, carefully shaping it so that it gently slopes away until it meets the back edges of the box.

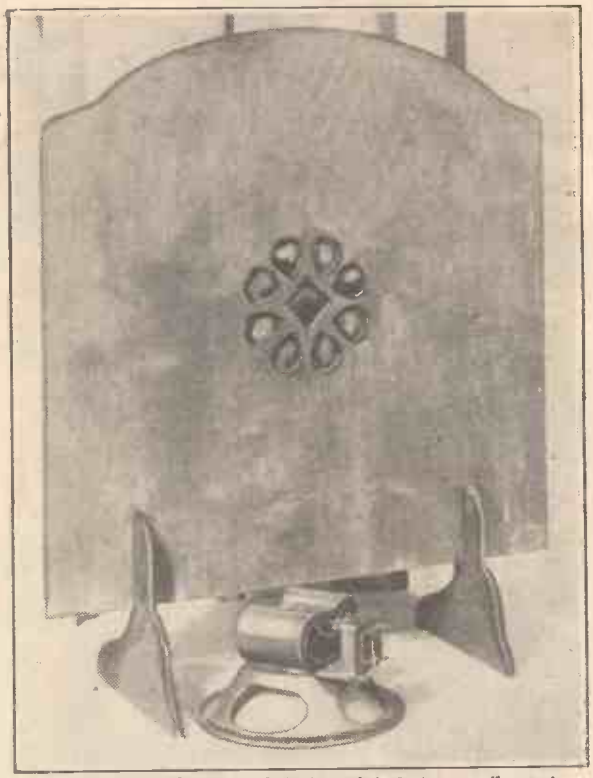
This job requires a certain amount of patience, and one side should be finished at a time, the muslin being gradually pulled tight and finally clamped down by wooden battens, as depicted in the drawing.

Enough of the padding should be put in to pack the muslin out so that when it is tacked into position it is quite firm.

Next week I am going to give constructional details of an efficient cabinet cone and also to deal with the simple theory of the various types of speakers.

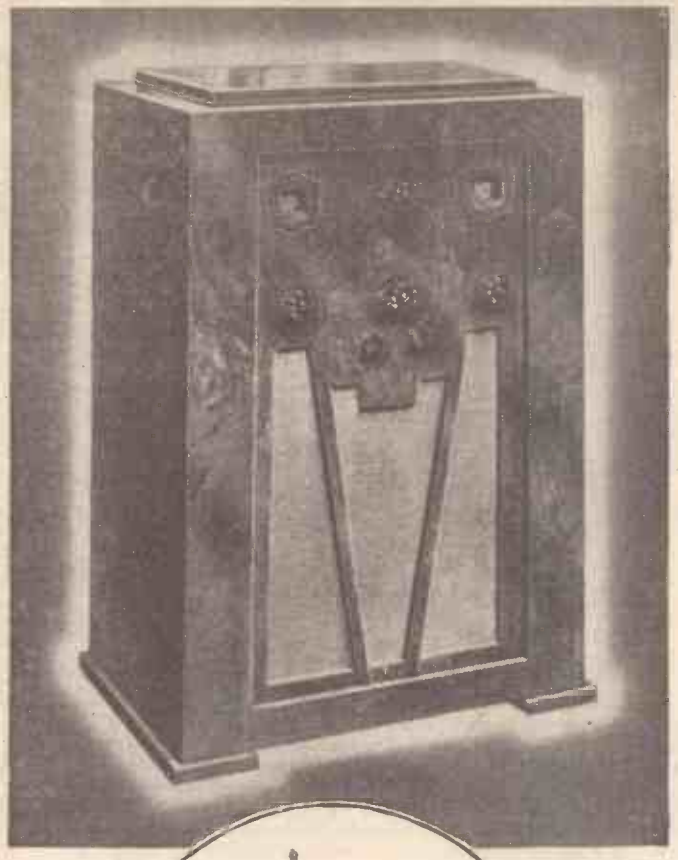
After this I intend to tackle the question of choosing speakers, and how to arrange the circuit constants so as to ensure maximum efficiency.

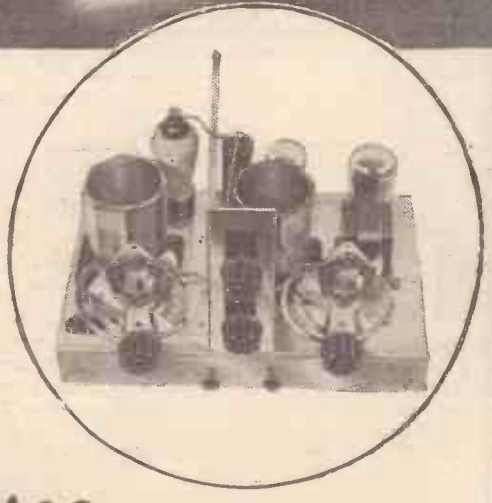
SIMPLE, BUT EFFECTIVE



The baffle-board should be of stout wood, in fact, generally speaking, the thicker a baffle-board or cabinet the better is the resulting reproduction. Incidentally, the speaker shown is the Epoch "20th Century."

METEOR S.G.3





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To **READY RADIO LTD. (Book Dept.), Eastnor House, Blackheath, S.E.3.**

Please send me free copy of the **Meteor S.G.3** and **303** Book and tell me about your **Registered Users' Scheme.** I enclose 1½d. stamp to cover postage.

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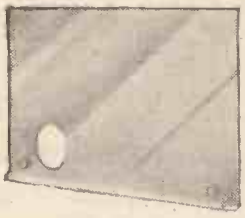
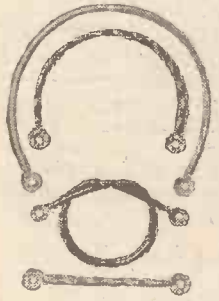
TELSEN COMPONENTS



TELSEN SCREENS. Provided with series of fixing holes and movable terminals. **2/-**

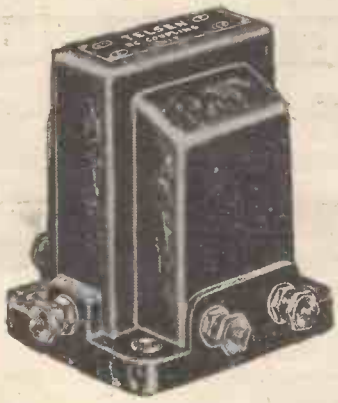
Also with hole for mounting S.G. valve horizontally **2/6**



TELSEN SPAGHETTI FLEXIBLE RESISTANCES. Made from finest nickel-chrome wire, wound on a cotton core, and stoved and impregnated. Moisture and corrosion proof. In resistance values of from 300 to 100,000 ohms, at prices from . . . **6d.**

TELSEN GRID LEAK HOLDER. Holds any standard size or type of Grid Leak. With spring contacts and soldering tags in one piece, and easily accessible terminals and fixing holes . . . . . **6d.**

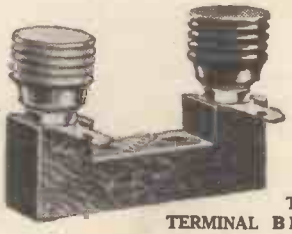
TELSEN FUSE HOLDER. A most inexpensive precaution against burnt-out valves. The firmly held fuse bulb ensures a perfect contact which cannot become loose . **6d.**



"DRUM DRIVE" AND "TELORNOR" CONSTRUCTORS' OUTFITS

These invaluable outfits contain all the necessary requirements (including baseboard, terminals, battery cords and all accessories) for the construction of any of the Telsen Receivers employing either the Telornor or Drum Drive and Condenser Assembly respectively—e.g. the Telsen Ajax 3, Triple 3 and Nimrod 2 (Telornor) and the Jupiter S.G. 3 (Drum Drive and Condenser Assembly). The various Components differ only very slightly in each outfit **3/6**

TELSEN POWER FUSE HOLDER. For mounting the Telsen Power Fuse. Soldering tag connections provided, but wire connections may also be made under the clip screws . . . . . **6d.**



TELSEN TERMINAL BLOCK. Provides two insulated terminals, mounted on a bakelite moulding. Very convenient for aerial and earth, speaker, pick-up, extra battery connections, etc. **6d.**

TELSEN R.C. COUPLING UNIT.

A complete assembly in a compact and convenient form for effecting Resistance Capacity Coupling in the L.F. stages of a receiver, conforming in design to the Telsen L.F. Transformers and Chokes. The Unit incorporates a 50,000 ohms wire wound anode feed resistance and a .01 mfd. coupling condenser. For best results it should be preceded by an H.L. type of valve having an impedance of approximately between 10,000 and 30,000 ohms, and be connected to an H.T. supply of not less than 80 volts **4/-**

TELSEN
RADIO COMPONENTS

TELSEN RADIO COMPONENTS ARE 100% BRITISH

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

RECEIVERS OF RENOWN

No. 10.—THE R.I. "MADRIGAL" RECEIVER FOR A.C. MAINS.

IF, by the law of the land, one of each of the most outstanding scientific achievements of the year had to be surrendered to the Science Museum at South Kensington, it's pretty certain that the exhibition would include one of the 1932 R.I. "Madrigal" receivers.

For, without a shadow of a doubt, this new R.I. production *is* a scientific achievement. It lays claim to inclusion in this category in almost every feature of the design.

With the large number of all-electric three-valvers for A.C. mains that is at present available, it is inevitable that certain of them should climb to the top, either on the grounds of workmanship and general finish, or else—and this is perhaps of greater importance—on account of performance.

The Favoured Few.

May we say right at the outset that the 1932 R.I. "Madrigal"—a model of which was recently submitted to us for test—has impressed itself upon us as being one of the favoured few that can justifiably be considered as right at the top of the tree. It is worthy of elevation to such a position not only because its performance as a three-valver is decidedly above the average, but also because the workmanship and general finish leave absolutely nothing to be desired, which, frankly, is in keeping with our expectations of this "thoroughbred" organisation.

TECHNICAL SPECIFICATION

GENERAL DESCRIPTION.—A.C. mains all-electric receiver incorporating moving-coil loudspeaker.
POWER CONSUMPTION.—Approximately 50 watts.
NUMBER OF VALVES.—Three.
CIRCUIT.—S.G., Detector and Pentode.
ARRANGEMENT OF CONTROLS.—One for tuning (with concentric trimmer control), one for volume (left-hand knob), one for range (which is the reaction control), and one for waveband and "gramophone" switching, with central "off" position.
PRICE.—17 guineas, including valves and royalties.
DEFERRED TERMS.—£2 10s. 0d. down and 12 monthly payments of £1 8s. 9d.
MAKERS.—R.I. Ltd., Madrigal Works, Purley Way, Croydon, Surrey.

The 1932 R.I. "Madrigal" is based upon the fundamentally-sound circuit arrangement of one S.G., detector and pentode, but from our practical tests of the R.I. treatment of this basic combination it is quite evident that not an atom of efficiency has been lost in any one of the three stages.

Absence of Hum.

An attempt to perfect such a straightforward but none the less sound circuit scheme is, in our opinion, a policy much more greatly to be admired than a half-hearted attempt at some freakish arrangement which may or may not give results as good but which, as a general rule, is almost certain to be the very antithesis of reliability. In any case, who could possibly expect more out of a three than is given by this particular model?

On the mains side, rectification is by means of a valve, and proof of the adequacy of the smoothing provisions incorporated was forthcoming in our practical tests, where the "hum level" was noticeable by its almost complete absence.

The number of controls of this new "Madrigal" receiver has been kept down to the lowest minimum possible for the achievement of completely satisfactory results. There is one main tuning control with a concentrically-mounted trimmer arrangement, a range control, which is really a reaction control on the right, and on the left is a useful control by which the degree of selectivity can be regulated.

The only other control, which, incidentally, is located immediately below the main tuning knob, is a four-way switch giving medium waves, long waves, gramophone, and an "off" position, all of which are clearly marked.

Outstanding Features.

At the rear of the instrument provision is made for the connection of a pick-up, and, in addition to the usual aerial and earth sockets, there is a useful internal aerial scheme which enables the set to be used without any aerial other than that incorporated in the set itself.

The outstanding features of our practical tests with this new R.I. instrument include all the things that matter in present-day receiver design—high sensitivity, adequate selectivity and moving-coil reproduction—which leaves nothing to be desired.

With the internal aerial in use, there is, naturally enough, a limit to the number of stations that can be received. But under almost any conditions it is possible to hear the locals at more than adequate strength with this arrangement, and provided the receiver is situated in a building where the screening of structural steelwork is not too severe, it is possible, even with the internal aerial, to get several useful alternative programmes.

When using an outdoor, or perhaps we had better say external, aerial with the set, there is no limit within reason to its capabilities. The days have gone when the performance of a set was judged by the length of the list of stations it would receive, simply because the strength of the list with modern sets has become prohibitive from the publication point of view.

To Suit Every Mood.

So that nowadays, the better way of putting it is to say that a set will provide an alternative programme at adequate strength to suit every mood and whim, and that was never more true than of the R.I. "Madrigal."

It remains only to add that the progress that has been made by R.I. during their twenty-eight years of electrical engineering,

WORKMANSHIP!

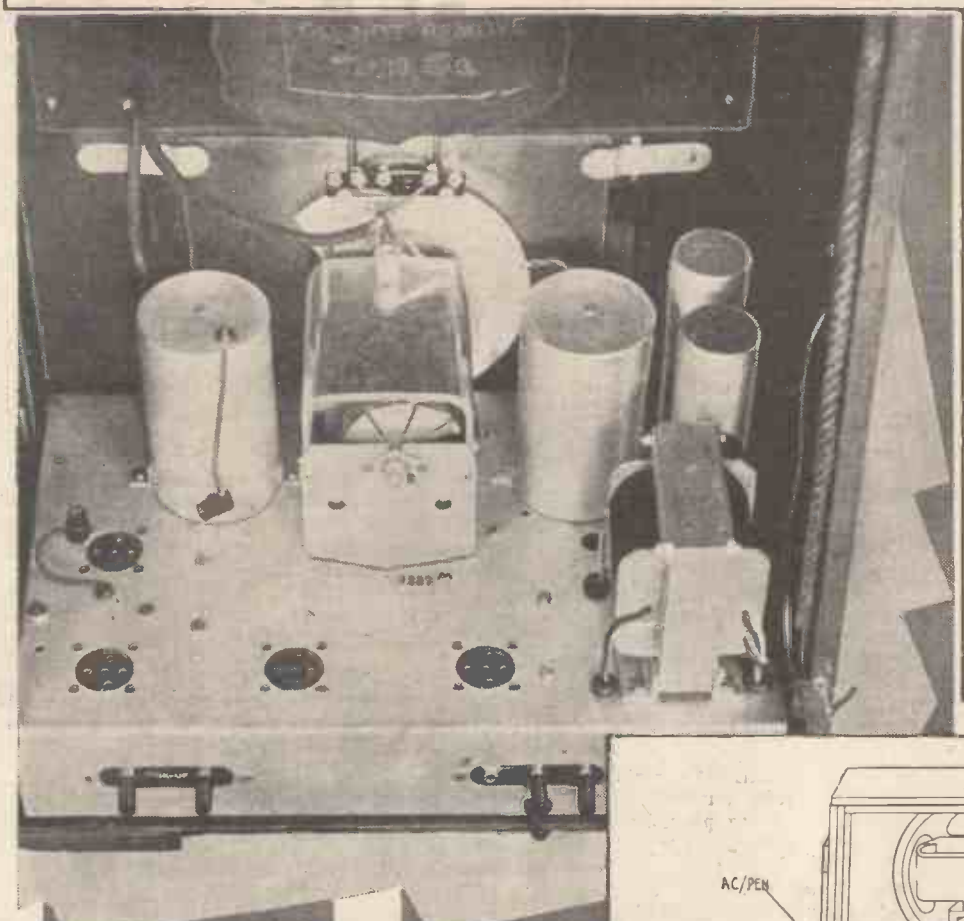
The high standard of workmanship to be found in the R.I. "Madrigal" will be evident from this picture in which the back is removed.

and particularly during that part of it which has been devoted to the development of radio, is fully maintained in this, their latest production. The 1932 R.I. "Madrigal" is a set of which anyone could justly be proud.

(Continued on next page.)

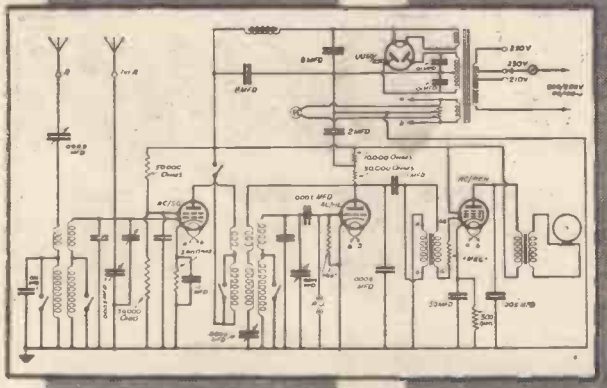
THE R.I. "MADRIGAL" THREE-VALVE RECEIVER—*(Continued from previous page.)*

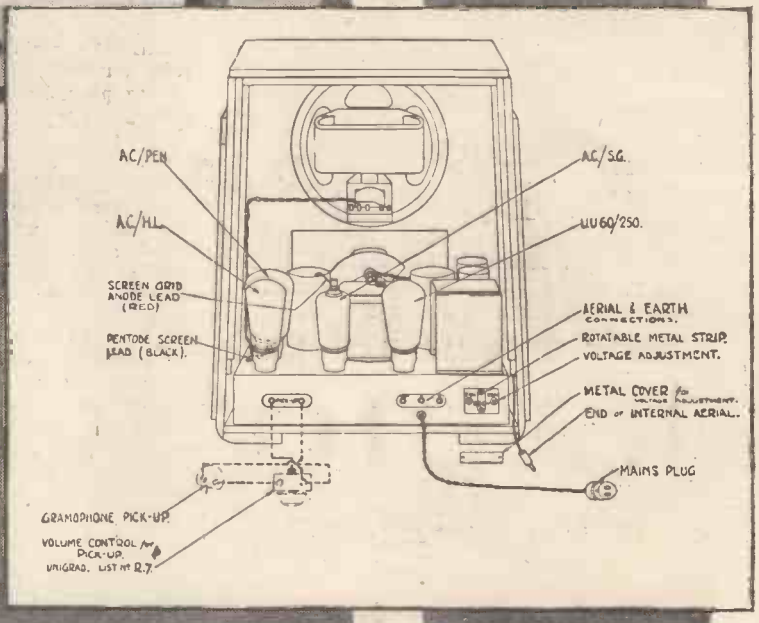
A MAGNIFICENT ALL-ELECTRIC SET FOR A.C. MAINS.



The high standards of workmanship for which R.I. are renowned are fully in evidence in this—their latest production. The wavelength-calibrated tuning dial (which is illuminated when the set is switched on), and the provision for the connection of any external pick-up are only two of the many fine features which bring this set into the front rank of modern receiver practice. The set will give an undistorted output of between 2 and 2½ watts, which is more than adequate for any domestic requirements, and even when loaded to this extent the speaker incorporated shows no signs of mechanical distress.

The housing of the receiver is entirely worthy of its interior! The cabinet, which is carried out in figured walnut, is of modern design, and the polish and general finish are excellent.





The reliability of any receiver depends to some extent upon the soundness of the circuit employed. In this respect, the R.I. "Madrigal" three-valver is a most commendable arrangement. Fundamentally, the circuit follows conventional lines, which is a strong point in its favour. But the refinements incorporated leave no doubt concerning the amount of careful planning that has been put into the design. The diagram on the right is interesting, inasmuch as it provides a most useful key to the "behind-the-scenes" pictures appearing in this review.

FROM THE TECHNICAL EDITOR'S NOTE BOOK

TESTED AND FOUND-?

THE BLUE SPOT 66 K.C.

AS I have often said before, the improvements which have taken place in moving-coil technique must not blind us to the fact that in a large number of cases an electro-magnetic type of speaker may be the best choice for the constructor.

And I am not thinking only of cost, although there is no doubt at all that some of the better electro-magnetics are superior in value for money to some of the cheaper moving-coils.

AN INEXPENSIVE SPEAKER

This attractive Blue Spot assembly costs only 19s. 9d.

I have in mind owners of moderate-sized battery sets having comparatively small outputs. Moving-coils, to put it bluntly, are wasted in these instances, for the simple reason that an electro-magnetic will handle the output adequately if it is of sound design and construction.

Its response may even be more suitable for the conditions. On the other hand, a poor moving-coil loudspeaker might prove terribly disappointing. Although it could easily cost twice as much as, for example, the excellent Blue Spot 66 K.C.

This subject could be greatly expanded with advantage, but I fear space restrictions prohibit on this occasion.

The Blue Spot 66 K.C. is a cone assembly representing the very latest developments of one of the most famous loudspeaker makers, from which it will be obvious that its principle of working can in no way savour of obsolescence!

Actually, it is an extremely sensitive speaker with a better top register than the average moving-coil costing double the 19s. 9d. which is asked for it.

And in my opinion its transient-reproduction in that part of the frequency spectrum is first-class. Indeed, it requires nothing in the way of an *apologia*, but can stand alone as a worth-while proposition.

LEWCOS L.F. TRANSFORMERS

London Electric Wire and Smiths Co., Ltd., have considerably extended their range of radio components during the past few months. New lines have been added and existing ones even further improved.

In view of the enormous amount of business they do in wire and cables, it is fitting that they should include two L.F. transformers in their list, for successful transformer-making demands great knowledge of wire and its compacting into windings.

There are two Lewcos L.F. transformers, a 1–6 general-purpose type which sells at 10s., and a small nickel-iron for parallel-feeding at 6s. 9d. This last has a ratio of 1–4.

I was rather surprised by the unconventional method of core assembly, etc., to be seen in the latter, although doubtless Messrs. Lewcos are satisfied that it achieves the desired ends.

Anyway, those Lewcos transformers which we have used in "P.W." sets have given very clear evidence that they are high-grade components.

NEW LISSEN CONDENSER UNIT

Lissen have introduced a novel and ingenious new system of condenser coupling in their Ganged Condenser Tuning Control Unit.

It consists of two small, smooth-working solid dielectric condensers driven by concentrically arranged knobs from a handsome escutcheon.

The one knob also operates a tuning scale. The condensers can be operated separately or locked together if desired.

But in the wider applications of the device the one condenser would be used for tuning and the other for reaction control.

There is a switch at the bottom of the escutcheon and this single lever switch operates contacts for wave-changing and for filament switching.

As Messrs. Lissen truthfully state, "every control for any simple receiver is contained in this component."

Indeed, you have only to add a valve

NEARLY A SET!

Wave-changing, tuning, reaction, and filament control are all possible with this Lissen device.

holder and a coil in order to make a complete radio set!

I had one of these Lissen units built up in this way, but with an L.F. valve added, and it was perfectly satisfactory. At 14s. 6d. it appears to be a decidedly attractive home-constructor article.

(*Continued on next page.*)

MADE BY A FAMOUS WIRE FIRM

The two Lewcos L.F. Transformers.

TESTED AND FOUND—?

(Continued from previous page.)

A GOLTONE PRODUCT

I noticed the following statement regarding the Goltone Dual-Range Screened Coils in a recent list issued by the makers. "Scientific tests of the units have shown the efficiency to be of a high order, bearing in mind losses caused by the surrounding metal."

While heartily admiring their candour it occurred to me that many constructors might miss the true significance of the remark.

I can hear them asking themselves "What metal? Why not do away with it, then?"

Of course, it would be perfectly obvious to many other constructors that the shielding

AN INEXPENSIVE UNIT

The Goltone Screened Coil.

cover of the component, and the inevitable losses which always accompany metal screening of any kind, were being referred to, and on balance the "Goltone" coil cannot but benefit in popularity from being advertised in such a manner.

At least, that is my opinion, for I am convinced that constructors appreciate and admire methods of this kind. Similar conservatism is seen in the reference to "break-through" in connection with the "Goltone" Coil. It is said "Break-through on long-wave band, of medium-wave stations, is avoided to a large extent by careful design."

It remains for me to add that the screening of the Goltone Screened Dual-Wave Coil is very carefully carried out, and the losses due to its presence are less than in most other screened coils.

Regarding break-through, it will be well known that a certain degree of it does not matter a scrap and so long as it can be kept below a certain arbitrary limit it can have no deleterious effect on results.

The wave-bands covered by the Goltone coil unit are generous and, taken altogether, it is an attractive component. It lists at 5s. 9d.

MORE ATTRACTIVE LISSEN LINES

So far not one radio season has passed when it has not been my duty and pleasure to discuss numerous new Lissen products. It must be quite seven years ago when I first referred to Lissen as makers of really high-grade radio apparatus at prices within the reach of all.

Since then the general price level has fallen and the average quality of wireless components has risen, but Lissen are still to be found well in the van.

On this particular occasion I have three new Lissen chokes to deal with. The first is a General-Purpose Choke able to handle up to 70 m/a's. Even at that high figure I find its inductance is approximately 20 henries. This rises to 26 henries at 20 m/a's in my sample, and that indicates the published specification is generously conservative. The price of this fine choke is 12s. 6d.

There is the Lissen Intervalve and Smoothing Choke for somewhat lighter duties than those for which the "G.P." can be used. And the price of this is 7s. 6d. That is also what the Lissen Centre-Tapped Output choke lists at. This is, of course, primarily for use with Pentode valves.

These Lissen chokes are substantial in construction and cleanly finished, and we can fully recommend them to "P.W." readers.

NEW LOEWE RESISTANCES

There is a great deal which can be said in favour of the composition type of resistance. For one thing, it will possess negligible inductance and practically no capacity. This condition does not have to be fought for; it is almost incidental to the use of composition instead of wire.

But composition resistances of "muckite" made by inexperienced manufacturers can be hopeless propositions.

However, this does not apply to the Loewe Radio Co., Ltd., who are noted for their resistances.

It follows therefore that their new High-Ohmic-Resistance is good.

From a technical point of view I consider it equals anything that has been done previously if it is not actually superior to all others. Both mechanically and electrically it is first-class.

As for its price, 6d. each in values from 1,000 ohms to 10 megohms!

PIX INVISIBLE AERIAL

Have you heard about that "Sticking Plaster" aerial? I'll let the people concerned tell the story themselves. I couldn't improve upon it!

"Just imagine listening in on an aerial actually in the room yet you cannot see it! Like radio itself—invisible.

"Getting the same reception as an outside aerial that is usually strung up on an unsightly pole which may be shorting on the window ledge or wall, and loose wires that are an eyesore to visitors.

"The bugbear of every listener is now modernised at last. A modern set needs an invisible aerial. Grandma will have no fears of lightning now, and 'long-distance fans' will wonder what's happened to static.

"Take it with you from room to room. Just press it into position and it sticks—no tools required; pull the end and it's down and leaves no mark. Ideal for use in flats.

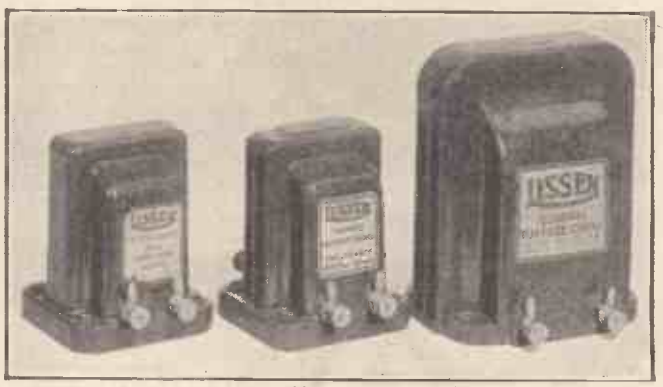
"If you cut your finger cut a lump off the end, wrap it round and forget sticking plaster. WHAT AN AERIAL!

"Just a 30-ft. roll of narrow tape with an aluminium conductor in the centre; just press it around the room beneath the picture-rail, above the wainscoting, underneath the carpet, or up the side of the staircase—in fact, anywhere—and hook the end of the insulated lead to terminal 'A.'

"What an aerial, and it costs just two bob. Like its predecessor the PIX—it is as ingenious as it is efficient. Use it also for the earth lead, loud-speaker leads, or in place of all those loose, unsightly wires around the house, and don't forget the bell leads that are always getting loose."

It only remains for me to add that Pix Invisible Aerial can be obtained at almost any radio shop, price 2s., or direct from The British Pix Co., Ltd., 118, Southwark Street, London, S.E.1.

THREE GOOD CHOKES



The Lissen Intervalve and Smoothing, Tapped Output and General-Purpose Chokes.

Manufacturers and traders are invited to submit radio apparatus of any kind for review purposes, All examinations and tests are carried out in the "P.W." Technical Department with the strictest of impartiality, under the personal supervision of the Technical Editor.
We should like to point out that we prefer to receive production samples picked from stock, and that we cannot in any circumstances undertake to return them, as it is our practice thoroughly to dissect much of the gear in the course of our investigation!
And readers should note that the subsequent reports appearing on this page are intended as guides to buyers, and are, therefore, framed up in a readily readable manner, free from technicalities unnecessary for that immediate purpose.

THE SECRET OF RADIO REALISM IS PARAFEED AMPLIFICATION

The Original System of Coupling dependent on the patented principles of the "PARAFEED" Transformer—which cannot be copied—is embodied in the "PARAFEED" Coupling Unit.

No other combined component of this type can give the full advantages of superb Radio quality given by the "Parafeed" Coupling Unit.

THE "PARAFEED" COUPLING UNIT

embodies in one unit the original "Parafeed" system, completely metal screened, with a bakelite case and provision for earthing. The "Parafeed" Transformer included in the coupling unit gives ratio changes of 1 : 2, 1 : 3, 1 : 4. The resistance capacity unit is completely ISOLATED from the transformer and eight terminals are fitted on base, four each side so that the transformer and resistance, although encased, can be connected in ten different ways by following diagrams issued with each unit. The internal resistances and condenser have values as originally recommended for the "Parafeed" system. *"Parafeed" Coupling Unit. Overall size 2½ x 2½ x 2½ ins. high. List No. D.Y. 32.* Price **11/9**

THE "PARAFEED" L.F. TRANSFORMER

is available separately where it is desired to use suitable existing condensers and resistances. The original, and still the acknowledged best "Parallel Feed" type Transformer, it has an **inductance of 100 henries** and N.P.L. performance curves 25 to 8,000 cycles. **The proof of "Parafeed" superiority is evidenced by the many set manufacturers who are now using it in their latest receivers - - - 8/6**

A comprehensive brochure on the "Parafeed" Coupling Unit is issued free and explains the advantages of the system in full. It includes diagrams clearly illustrating 10 methods of connection. This brochure can be obtained from your dealer or R.I.

and for Undistorted Amplification in direct coupling—at lowest cost

DUX

The Best that least money can purchase

There is no doubt that "Dux" has set the standard of super-efficiency in Low-priced Transformers. Full technical details are given with "Dux" as with the highest priced Transformers. You are assured of its unfailing reliability before you buy—"Dux" never disappoints.

INDUCTANCE 30 HENRIES

Ratio 3 - 1 (standard) 4 - 1 (Auto-connection) List No. D.Y. 29.

6/9

RI LTD.

Advt. of Radio Instruments Ltd., Croydon, Surrey. 'Phone: Thornton Heath 3211.

Fitting an Extenser

Some practical notes on the method which has so many advantages.
By a "P.W." TECHNICIAN.

THE fitting of an extenser to a set is the easiest thing possible; it is just as simple as fitting an ordinary variable condenser, though it carries out, besides the tuning, the wave-changing of the receiver.

On every model of the extenser there is a group of terminals that take the place of the wave-change switch used on ordinary sets. In the case of double- or triple-gang extensers the terminals are duplicated or in three groups.

Easy to Understand.

Perhaps it will be easier to understand if we refer to the theoretical diagrams on this page. You will see in Fig. 1 an ordinary aerial input circuit with its accompanying tuned secondary coil and the reaction winding. The whole unit is connected to a simple detector valve, such as would be used on a straightforward two- or three-valve receiver.

It will be noticed that the aerial winding, secondary, and the reaction are tapped between the medium and long-wave portions of the coils, and that a four-point switch is required for the wave-changing.

This switch is so arranged that in the medium-wave position it short-circuits to earth the bottom windings of the three sections of the coil unit, and for long-wave reception the switch is placed in the "open" position, when the full windings on each section are in use.

Now this wave-changing can just as well be carried out by the extenser when judged from an electrical point of view, and far better when looked at from a utility standpoint.

There are three contacts on the extenser, connections being provided to these contacts by means of terminals. On the rotation of the spindle of the extenser the vanes that vary the capacity in the same way as do the vanes of an ordinary condenser also move a cam which on one half a revolution of the control short-circuit all the contacts together.

Switch abolished altogether.

A further half-revolution brings us to where we started and the contacts open again. Now if the extenser is to be used with the coil shown in Fig. 1 it is done in this way: The variable condenser part (that is the two sides of the condenser) are connected to the grid circuit and to the earth of the receiver in the same way as are the two sections of an ordinary variable condenser, as shown in Fig. 2.

The switch in Fig. 1 is abolished altogether, and in its place the three contacts of the extenser are connected to the three points on the coil unit. One goes to the junction between medium and long-wave winding on the aerial coil, the second to the junction on the secondary coil, and the third to the reaction junction.

Optional Common Contact.

But what about the fourth contact on the switch in Fig. 1, you will say. This is ingeniously taken care of by the actual moving vane spindle and framework of the extenser, which are taken to the earth side of the set in the same way as the frame of the variable condenser in Fig. 1.

Also, this frame and spindle are in contact with the metal cam which actuates the switch, so that we have in reality the four points of the switch in Fig. 1. The theoretical diagram of connections is given in Fig. 2 and clearly shows how the extenser takes the place of the variable condenser and the switch.

Actually, on the extenser the common contact between the rotating cam and the spindle is optional, and is controlled by a small grub screw in the cam at the end of the spindle. By screwing this small screw home a definite connection between the cam and the spindle (that is the earthed side of the extenser) is obtained, but if the screw is turned some way to the left (unscrewed) the contact is broken and the cam is insulated from the spindle.

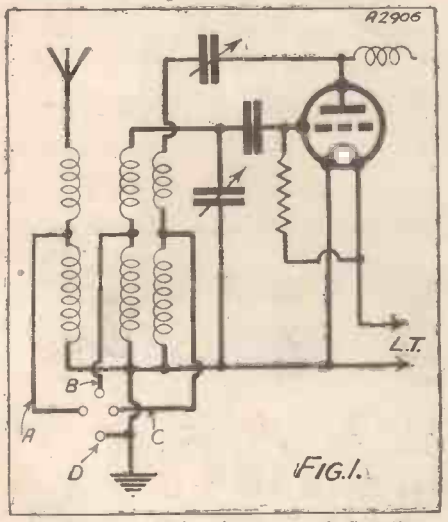
This alternative state of affairs is very useful when dealing with band-pass circuits, in which case it is frequently undesirable to earth the coil, as this has to be done via a fixed linking condenser. In this case the extenser contacts control the switching of the coil, while the tuning section of the extenser is electrically separated, and is carrying out its part of the business alone.

Easy Change Over.

In the case of ganged extensers the contacts controlling the wave-changing can be either common to the spindle or separate as in the case of the band-pass circuit just mentioned, giving a two-gang extenser assembly either eight or six contacts respectively.

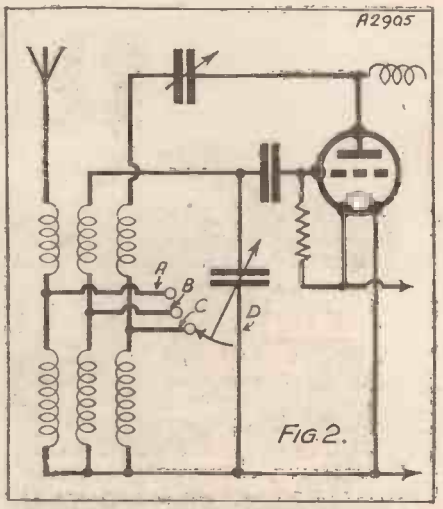
Those of our readers who have what may be called the old type of wave-change sets, with panel switches, will find it interesting to see how easy it is to change over to extenser switching, taking the circuits on this page as a guide of alternative switch-point connections. The extenser contacts in Fig. 2 are shown in curved line with the arrow denoting the variable condenser part curved and ready to run through them. This is symbolical of the cam action controlled by the moving vanes, and diagrammatically shows how the extenser operates.

AN ORDINARY ARRANGEMENT



The dual-wave coil is switched at A, B, C, to the earthed connection D.

THE LOGICAL WAY



By the Extenser method the tuning automatically changes when the dial rotation causes D to make contact simultaneously with A, B and C.

Scrap the Wave-change Switch.

All that has to be done in sets that have the ordinary three or two-point wave-change switching is to scrap the wave-change switch or switches, and to replace the variable condensers with extensers. Then the connections that used to go to the wavechange switch or switches are taken to the contacts of the extenser, looking upon the latter as if the contacts were those on the wave-change switch in each case.

There is one point to remember in this alteration: It is that the contact on the switch that went to earth in the original form need not now be connected at all to the extenser.

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

The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

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 specialities 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

INSTABILITY IN THE LOW-FREQUENCY STAGES.

N.T. (Bodmin).—"Can you give me some hints on distortion in low-frequency stages, the distortion not being due to motor-boating or microphonic howl, but consisting of a sort of hiss behind the programme which is very distorted all the time?"

In the majority of cases this trouble can be traced to L.F. oscillation, due to a coupling effect in the H.T. supply circuit. It is, therefore, necessary first of all to make sure that the source of H.T. is "clean."

If dry cell H.T. batteries are employed, the voltage should be taken with the aid of a high-resistance voltmeter, after the set has been working for some time. Even if the battery is a new one, it does not prove that it is in perfect condition, since dry cells deteriorate if they are kept in stock, even though they are not in use.

A single defective cell can in itself produce L.F. troubles, so sometimes part of the battery will work if not all of it, but, of course, this loses valuable voltage.

Even H.T. *accumulators* can cause trouble if they are in a partly run-down condition, or if any of the cells are sulphated, or there are poor connections between the cells. All contacts on top of the batteries must be kept perfectly clean.

In the case of H.T. mains units, it is essential to see that the output is adequate. If the set is a large one, and has a super-power valve in the last stage, it may take 20/30 milliamperes. It is, therefore, quite useless to expect a small mains unit with a smoothed output of 15/20 milliamperes to supply the necessary current.

In any case, overloaded mains units cannot give their rated voltages, and a loss of volts is quite sufficient in itself to account for distortion.

Sets with three, four, or more valves usually need separate H.T. "feeds" to each valve or group of valves when used with a mains unit. For instance, one H.T. tapping should be taken to the H.F. side,

(*Continued on page* 558.)

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.

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page 556.*)

another to the detector, and another to the L.F. stages, and so on.

If the H.T. is found to be up to the standard, the following schemes should be tried :

1. Reverse the leads to the secondary terminals of one of the L.F. transformers.
2. Earth the cores of both transformers.
3. Connect a ·25-meg. resistance across one of the secondary windings.
4. In the case of R.C. coupling, try reducing the size of the coupling condenser or of reducing the value of the grid resistance.
5. Insert a ·25 megohm resistance in series with the lead to the grid terminal of each L.F. valve-holder.

Remember that an output filter with one side of the loudspeaker taken to L.T.— is a very useful method of improving the stability of the L.F. stages.

WHERE SHOULD THE EXTERNAL RESISTANCE BE MOUNTED?

L. W. H (Cranbrook Park).—" I suppose D.C. sets will go out of fashion as the grid system of A.C. grows, but there are many points about having one that appeal strongly to me, and I should be glad if you could clear up the following two little items :

" (a) When a heat-dissipating resistance is employed, where should it be affixed—as near the set as possible, or where it will be coolest, or where ?

" (b) Is it always an advantage to have a fixed condenser in series with the aerial to prevent shock, etc. ? And should this preferably be mica, and what capacity ? "

(a) The heat-dissipation is usually of quite low degree and provided that the resistance is not boxed inside a small cabinet it does not matter much about its surroundings. Usually the best place for it is at the back of the cabinet (outside, of course), where it is not an eyesore and has ample air circulation around it. It should not be placed a long way from the set ; but is better considered as an integral part of this.

(b) Yes, a fixed condenser is always admirable, and the best place for it is inside the set between the aerial terminal and the wiring to this. The usual capacity is of the order of ·001 mfd. and a sound high-test-voltage mica condenser is recommended.

HOW MANY OHMS?

S. K. F. (Loughborough).—" Could you help me to decide what is the correct value for a resistance in my detector's plate circuit, to act as a decoupling resistance and also as a voltage dropper ?

" I only want to use the one H.T. plus lead to the maximum of the battery which will be 120 volts. The detector works best with only just over half that voltage, i.e. 60 to 65, or a little more.

" So if I put the detector's H.T. to 120 volts, through a decoupling resistance, I can evidently get a lower voltage than 120 and also a decoupling effect by joining a 2-mfd. condenser from the set end of this resistance to L.T. neg.

" I have tried various resistances I have on hand and the benefit of the decoupling effect is very clear, especially when two old H.T. batteries are connected in series to give the 120 volts. But should the decoupling resistance be 20,000, or 25,000, or 30,000, or what ?

" They all work, I find, and obviously they all affect the detector plate volts, but I don't know which to use to give me between 60 and 70 volts. How can this be calculated ? "

You can tell exactly what voltage will be dropped across the resistance if you know the current flowing

(*Continued on page 560.*)

"P.W." PANELS, No. 97.—BRUSSELS, No. 1.

The Brussels No. 1 station works on 509 metres, with a power of 15 kw. It is 209 miles from London.

* * *

All announcements are made in French. The usual call is " Ici Bruxelles," which sounds like " E. C. Broussells."

* * *

Usual hours of working are 12 noon to 11 p.m. Closes down with " La Brabanconne," the Belgian National Anthem.

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 value of automatic grid bias is obtained by connecting a 500-ohm resistance in a cathode circuit through which 3 milliamps will flow ?

* * *

(2) Which is Europe's most powerful station ?

* * *

(3) If a short-wave set fails to oscillate, would a small condenser in series with the aerial be likely to help or hinder it ?

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 558.)

through it. Ohm's law and a milliammeter will give all the necessary facts.

Suppose by measurement you find that the anode current at, say, 65 volts is, say, 2½ milliamps. How are you going to get the 65 volts from a battery giving 120 volts?

Obviously you must drop 55 volts, for 120 minus 65 equals 55.

And this is where Ohm's law comes in. Ohm's law says $V = R \times I$, where V is the voltage across the resistance, R the number of ohms, and I the current flowing (in amps.).

THE ANSWERS

TO THE QUESTIONS ON PAGE 558 ARE GIVEN BELOW.

(1) The voltage developed will be the product of ohms and amps. In this case 500 × ·003 = 1·5 volts.

* * *

(2) Leipzig, now working on 150 kilowatts, 390 metres.

* * *

(3) Generally speaking, a small series aerial condenser of ·0001 mfd. or less is an aid to easier oscillation.

DID YOU KNOW THEM ALL?

You want V to be 55. And you already know that I (the anode current to flow through the resistance) is to be 2½ milliamps.

Now 2½ milliamps., expressed in amps. is: $2\frac{1}{2} \div 1{,}000 = \cdot0025$ amps.

So the equation $V = R \times I$ becomes $55 = ? \times .0025$, the query representing the number of ohms required.

To satisfy the equation you must obviously divide 55 by ·0025, and this gives $\frac{55}{\cdot0025} = 22{,}000$. And the complete figures are:

{Volts to be dropped in the Resistance 55} = {Anode resistance in ohms, 22,000} × {Anode current in amps., ·0025}

In this way you see that to "drop" the 120 to 65 volts and to pass the required 2½ milliamps, you must have a resistance of 22,000 ohms. Other examples can be worked out in exactly the same way.

TRADE JOTTINGS

By G. T. KELSEY.

I WANT to commence my notes this week with an item of news which I am confident will be of interest to every "P.W." reader.

Hitherto, in my jottings, I have endeavoured to keep you *au fait* with all the latest catalogue productions by reviewing them as they came out and by telling you where to write for copies.

Henceforth, all references to catalogues, leaflets, etc., will be keyed with a number, and if you want copies of any or all of them, just send me a postcard giving the key numbers of those in which you are interested and the required literature will be sent to you free of charge.

That means that it will only cost you a penny to obtain a set of catalogues which might otherwise cost you 9d. or 1s. or even more in postage.

Postcards should be addressed to me at Tallis House, Tallis Street, London, E.C.4.

A Bit of a Problem.

The would-be purchaser of a commercial set must find it difficult these days to try and decide which model will best suit his particular requirements. To my certain knowledge, there are at present something like 30 different models between the prices of 15 and 17 guineas—*all* three or four valvers, *all* for A.C. mains operation, and *all* really nice-looking jobs!

But apparently Cossor's have been thinking about this somewhat involved subject, too, for they have just issued a broadsheet to describe their 533A receiver which does them credit. The centre page spread has impressed me very much, for it tells you everything that you would possibly want to know about the set in about 30 seconds.

If you are interested in a good all-electric S.G. four-valver for A.C. mains, I strongly advise you to see a copy of this new broadsheet. I shall be pleased to have a copy sent along if you send me a postcard. (No. 1.)

Another Price Reduction.

I am always glad to be able to pass on any good news concerning price reductions. This time it concerns the famous G.E.C. "Gala" model receiver for A.C. mains, the price of which has been reduced from 18 to 15 guineas.

I was always of the opinion that it was good value for money at the old price, so that you can draw your own conclusions as to what I think now that this substantial reduction has been made! You can obtain further details of this new set through "P.W.'s" new catalogue service. (No. 2.)

About "Micromesh" Valves.

If you are interested in valves for A.C. mains operation, you will be interested in a leaflet which has just been produced to describe the new "Standard" Micromesh valves. They are made by a firm whose name is a sufficient guarantee of their efficiency, and although I have not yet had an opportunity of testing them, I must admit that the method of construction impresses me very much. You will find details of characteristics, etc., in a leaflet which is available through our postcard scheme. (No. 3.)

For Indoor Aerial Users.

If you wanted to put up an indoor aerial, how would you set about it? By banging nails into the plaster? No, I am confident that "P.W." readers do not do such things!

All the same, it isn't always easy to know where to go for small indoor aerial insulators that will do the trick neatly and efficiently. But that is because you have not seen the new "Clix" folder in which the very thing for the job is described! It is only one of about a couple of dozen of the things for which Clix are renowned and which are to be found in this new leaflet.

The rest you can read about by including the appropriate reference number on your postcard to me! (No. 4.)

The "Bantam" Reproducer.

Exactly as I had imagined, news has just reached me that the R. & A. "Bantam" reproducer is going over with a real bang. After all, an efficient permanent-magnet moving-coil speaker at 27s. 6d., complete with a Ferranti three-ratio output transformer, *is* something of a remarkable proposition, isn't it?

Incidentally, the price of this R. & A. "Bantam" reproducer was erroneously given in a recent issue as 17s. 6d., but I expect that most of you spotted the misprint. The price should, of course, have been 27s. 6d.; but, even at that price (which isn't a misprint!), it strikes me as being remarkably cheap.

RADIO RAPS

By

A SPECIAL CORRESPONDENT

NEWSPAPERS are fond of writing about battles going on behind scenes, but there is some truth in the statement in the Press the other day of a battle going on behind the scenes of the B.B.C. Board of Governors. For at the end of this year four important points will have to be settled in connection with the Board of Governors:

1. Whether the principle of having a woman representative on the Board shall hold good.
2. If so, whether the woman representative shall continue to be the Viscountess Snowden.
3. Who will retire from the Board; and
4. Whether a well-known Fleet Street personality will be elected.

Lots of Rumours.

There have been lots of rumours lately concerning the re-appointment of Lady Snowden, and it has been suggested that if she retired from the Board many other well-known women in the public eye will expect to be noticed by the Prime Minister in connection with the appointment. But certain it is that it will be a very great pity if Lady Snowden's services are not renewed.

There is not the slightest doubt that she has been the most energetic member of the Board, and that she has put in some first-class work on behalf of broadcasting interests. Everybody is agreed that she has proved a thorough, if not the most hard-working member of the Board, and it is hoped that the Prime Minister will appreciate this fact, and that Lady Snowden will continue to be a Governor of the B.B.C.

As for the hints and rumours concerning the well-known Fleet Street personality who is willing to serve as a Governor, the names of Sir Harry Brittain, Sir Robert Donald, Lord Riddell, Major Astor and Sir Campbell Stuart have been mentioned, but we understand that Mr. Ralph D. Blumenfeld, of the "Daily Express," must also be added to this list.

Great Popularity.

Writing of B.B.C. appointments reminds us that the Plymouth Station's Chief Engineer, Mr. D. Curd, has been promoted to the position of Assistant Chief Engineer to the new West Regional station at Watchet, and Mr. H. M. Fitch, the Station Director at Plymouth, has been appointed to be Assistant Director of the North Regional station at Manchester. Both these gentlemen have enjoyed great popularity in Plymouth.

Mr. Fitch has been Director at Plymouth for over three years, but lately he has been occupied with investigations into the question of interference between the Scottish National and Plymouth transmitters, which has caused so much heart-burning in the Plymouth district.

Mr. C. P. Parsons, of the Swansea Relay Station, will succeed Mr. Fitch.

Just lately there have been many complaints from listeners regarding poor reception from the new National and Regional transmitters at Falkirk. Listeners say that the National programme is frequently so weak as to be almost inaudible,

(Continued on next page.)

RADIO RAPS

(Continued from previous page.)

and that it interferes with the Scottish Regional programme.

Furthermore, a good many listeners seem to find it impossible to separate the two stations. The B.B.C., however, holds the view that if there is a fault it lies either in the construction of the listeners' sets or in the inability of the listeners to operate them efficiently. Which, to put it bluntly, is a pretty good example of B.B.C. nerve!

The Chief Customer.

No, B.B.C. It won't do to blame the listener!

Besides, the customer is always right, and it is just as well to remember that the listener is the B.B.C.'s chief customer. Unanimous complaints regarding interference in connection with the Scottish Regional indicate that the trouble, if any, is not entirely due to the listener.

According to an official—by the way, we never get the name of the gentleman who makes these official statements to the Press; it's always "an official"—"The attenuation (nice word, that!) on the National wavelength of 288·5 metres is greater than on the Regional wavelength of 376·4 metres. The programme from the National transmitter grows weaker more rapidly as the distance increases, and fading on this wavelength is more pronounced."

With that pontifical introduction the official went on to say: "We are receiving a few isolated letters complaining of difficulty in separating the National and Regional programmes, and in this connection we would draw the attention of listeners to the B.B.C. pamphlet entitled 'Selectivity,' which details the steps necessary to effect the separation."

This is all very well, but to begin with it is not a question of *a few isolated letters complaining*, etc. The B.B.C. has only to look at the local papers published within the vicinity of the two stations to realise that the complaints are far from isolated.

Furthermore, referring disgruntled listeners to a pamphlet on "Selectivity" is not going to help much, especially those listeners who have bought commercial receivers and expect a reasonable amount of satisfaction for the money expended.

No Earthly Good.

"It might," went on the engineer in an interview, "be mentioned that inside the station itself at Westerglen, Falkirk, there is a crystal set which separates the two programmes.

"We are satisfied that the quality of the transmission on the Regional wavelength is as good as that on the National wavelength, and that it should be a simple matter to pick up both and to separate them."

And that's that! In short, listeners in the two districts should note that the B.B.C. have a marvellous crystal set which gives no trouble at all as regards the two stations, although it is in operation in Westerglen station; secondly, that there is an implied suggestion that their sets are no earthly use; and, thirdly, that if they want to put the matter right, the way to knowledge lies through the perusal of a B.B.C. pamphlet entitled "Selectivity."

Anyway, as readers will note from a quotation in the above interview, the B.B.C. are satisfied—so what on earth are you listeners worrying about?

THE LISTENER'S NOTEBOOK

(Continued from page 539.)

When they have to rely on the spoken word only, they fail, and no amount of artificial stimulus will save the situation.

Television may help when it comes, but before that day I hope a new form of microphone humour will have been evolved, and a new school of comedians trained to "put it over."

But I am forced to the conclusion that the studio audience is a real obstacle to real progress in this direction. And, unfortunately, since the audience habit in now more in favour than ever at Broadcasting House, the prospects are very dull indeed.

Somebody in a variety turn recently ragged "Sonny Boy." It pleased the studio audience immensely, for they laughed uproariously. Mr. Somebody was judged a tremendous success, and he had every right to feel satisfied with his performance.

Actually, as a broadcast item, ragging "Sonny Boy" is a dreadful failure, because we hardly hear any of it, and what we do hear doesn't make us hold our sides. You see, ragging "Sonny Boy" is unsuitable as a microphone turn, but ideal for a studio audience; its success depends entirely on the gestures and antics of the comedian doing the ragging.

The nearest we've had to perfection in broadcast variety is Jack Hulbert's six-minute revue. It is funny, and although absurdly short it is complete.

Personally, I don't think any variety programme (as we understand it to-day) should exceed six minutes in length. In other words, let the variety items all be compressed into one turn (à la Jack Hulbert), and the remaining fifty-four minutes be filled with turns of the sketch order (also à la Jack Hulbert).

A Very Fine Thing.

That Chicago sketch of his, for instance, is ideal for broadcasting. The scene is easily visualised and the situations perfect for the buffoonery of the actors concerned.

The Hulbert brothers have obviously studied the possibilities of their medium; they haven't hesitated to cut out (ruthlessly, if necessary) anything of their art that doesn't fit in. Claude Hulbert's funny dancing, for instance, would be wasted effort before the microphone.

He might have insisted on doing it, as some artistes, encouraged by a seen audience, have, but realising its futility, he and his brother have developed the radio-sketch, and a very fine thing they've made of it!

The only advantage I can see in non-stop variety is that it conveniently folds itself into two. The second half being almost identical in substance to the first half, there is no need at all to listen to it.

Time is thus saved, and one's general composure remains only slightly disturbed.

HOW THINGS WORK.

HOBBY ANNUAL (price 6s.) will open your eyes to the secrets of the world's most recent mechanical wonders. It tells you all about your favourite hobbies, how to make things, how things work. There are hundreds of illustrations and two large plates in photogravure.

TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio technique.

By Dr. J.H.T. ROBERTS, F.Inst.P.

Local Interference.

A READER of POPULAR WIRELESS recently described some interference trouble which he got in a battery-operated set, which trouble was ultimately traced to an electric soldering iron in which there was a bad contact, probably producing a minute spark.

I do not think this kind of trouble can be nearly so uncommon as may be supposed. I have myself experienced it on at least two or three occasions. I was working some two or three years back with a receiver inside a laboratory when outside, but a few yards away, was a small electric generator driven by a paraffin engine.

The sparking of the plugs on the engine could be heard with perfect clearness in the receiver. I think the case of the ignition system of an internal combustion engine interfering with radio reception is very common indeed, and on aeroplanes special précautions have to be taken to overcome it.

Have You Noticed This?

I have also noticed interference from an "electric fire." I daresay that you have noticed that when an electric fire is first switched on you often see little glowing sparks, particularly at the points where the resistance element is connected to the copper leads. Some time ago I had an electric fire which gave an awful lot of trouble owing to interference in this way, particularly when it was first switched on.

When you have peculiar interference with a radio set, it is a good plan to suspect any electric apparatus nearby, as in nine cases out of ten you will find something of this sort occurring. The most familiar case is the enormous "plop" which you get in a mains-operated receiver when any electric lights in the house are switched on or off.

If you care to investigate this you can try the effect of switching off an electric light very slowly so you get an arcing in the switch, when you will be left in no doubt whatever as to the raucous effect in the loudspeaker if the set happens to be in operation at the time.

Oscillating Screen-Grid Stage.

When using a screen-grid stage of high-frequency amplification you may find that if the tuning coils are very efficient and the screen-grid valve is working well the set will go into oscillation on the slightest pretext.

This is sometimes rather troublesome, and it seems a pity that the stage cannot be used at its maximum efficiency, and that some sort of sacrifice should have to be made. Nevertheless, if you cure the instability by a very small sacrifice in efficiency, it is well worth while.

One thing you can do is to reduce the voltage on the screen of the valve. This will have the effect, of course, of decreasing

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the efficiency of the valve, but it must be done with care because sometimes the proper operating part of the characteristic curve of the valve will be seriously reduced. You should only lower the voltage on the screen grid by a very small amount at a time so as to take care that you are not running into fresh trouble.

Another thing you can do is to put in a filament rheostat with the valve which will enable you to adjust the filament current and so control the efficiency in that way.

Increasing the Amplification.

Sometimes good results can be had by connecting the anode of the valve to a tapping on the coil instead of to the end of the coil. This is sometimes the best way of doing things, because it cuts out the oscillation without diminishing the amplification; in fact, in certain cases you may find that you get better amplification when using only a part of the coil than when using the whole of it. If you are using a high-frequency transformer, then the above argument applies to the primary, and only a portion of the primary should be used instead of the whole.

If you shift the aerial connection on the aerial tuning coil to a point nearer to the grid end, this will have a loading effect and may sometimes meet the case, but obviously you want to be careful about this if you are using ganged condensers.

When using a screen-grid high-frequency stage, even if it seems to be working satisfactorily, it isn't a bad plan to try different arrangements of the connections to the coils, and so on, as you may find that, quite apart from the question of oscillation or instability, you will be able to get better results.

Grid Bias on Mains Receiver.

Automatic grid bias is so well known and so commonly used in connection with all-mains receivers that many people who own battery sets wonder if the same principle cannot be applied to them also. On the other hand, a lot of people seem to think that the automatic grid-bias principle is applicable only to mains receivers and cannot be used with battery sets.

This is not the case, and it is quite a straightforward matter, as a rule, to introduce automatic grid bias into a battery set. This can be done by connecting a resistance in the high-tension circuit between the high-tension and low-tension negatives, this resistance being, of course, shunted with a condenser of fairly large capacity. Having done this, you connect the grid-bias terminal of the L.F. transformer to the H.T negative instead of the grid battery as before.

The anode current flows through this resistance and consequently gives you a drop of potential which is tapped off by the connection. This resistance may be 500 ohms or more, and by Ohm's Law you will soon see, knowing the current which is passing through the resistance, what is the voltage drop across it.

Which is Better?

On the other hand, automatic grid bias with a battery-operated set is not really to

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be recommended. It is always a bad plan to introduce any unnecessary high resistance into the H.T. circuit because it will bring about a coupling effect.

You want to avoid high resistance in the H.T. battery or in series with it as much as possible. If the resistance is at all appreciable it will be necessary to use decoupling arrangements so as to avoid oscillation trouble such as you get with an old or ageing H.T. dry battery.

Anyhow, if you already have two batteries in the circuit, namely the H.T. and the L.T., there would seem to be little point in trying to dispense with such a modest and trouble-free affair as the grid-bias battery.

Decoupling.

When you are using an all-mains set the question is really quite different, because one of your principal objects is to do away with all battery attention, and whilst this is largely accomplished by dispensing with H.T. and L.T. batteries, you will still have to keep an eye on the set occasionally for the sake of the grid-bias battery. So here it is definitely an advantage to dispense with the grid-bias battery.

Furthermore, as there are already various quite substantial resistances in a mains set, decoupling arrangements have to be introduced, and one more or less doesn't make a lot of difference. So, all things considered, I would advise you, if you are working a battery set, to use a grid-bias battery and to make sure that it is always up to scratch, and not to worry your head about introducing automatic bias.

Amateur-Constructed Sets.

In a recent competition for amateur-constructed sets it was found that many of the sets sent in were so badly soldered that they did not survive a train journey without the wiring having become disconnected. Before the sets could be properly judged an expert had to go over them and repair many of the soldered joints.

Personally, I always use spirit flux for soldering the wiring of a set, and for other electrical work, although I know that this is quite contrary to the "professional" rules. We are always told to use resin flux for this purpose, because if any of the flux remains on the joint afterwards it is not likely to do any harm. When you use spirit flux, naturally you must take care to remove all traces of the flux before considering the job finished. This can often be done by means of tiny cotton-wool wads on the end of a rod or held in tweezers.

When this is soaked in water and then squeezed out it forms a suitable "mop" for cleaning up a joint.

When resin flux is used the surfaces are not so easy to "tin," and unless quite an amount of care is used you get the two parts mechanically stuck together, but they are stuck mainly by resin and not by solder. This means bad electrical contact and a very poor mechanical joint, which is liable to break with the slightest jar or vibration.

Some Practical Hints.

Resin flux never seems to me to clean up the tip of the soldering iron in the same

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way as spirit flux. Therefore it is necessary at frequent intervals to clean the tip of the iron; this can be done by means of an old rag with which it is quickly wiped while the solder is molten.

If the end of the iron has got badly corroded or dirty, it should be cleaned up with a coarse file. Incidentally, perhaps I may mention that if you use a file on solder, when the solder is solid, you will get the file filled with solder and the file will become practically useless for other purposes.

If ever you want to remove solid solder by means of a file, a useful tip is to draw the file *backwards* and do not use it *forwards*. Its cutting action is quite sufficient for removing solder even when it is drawn backwards, and in this way the particles of solder do not get embedded in the teeth of the file. A *fine* file after having been used for solder is practically useless, as it is almost impossible to get the solder out of the teeth.

L.F. Coupling Units.

The new coupling units for low-frequency coupling are becoming very popular. They consist, as most of you know, of a transformer with a feed-resistance and coupling condenser.

You can, however, make up from components already on hand, a low-frequency coupling unit which is virtually as good as a commercial one. For this purpose, of course, you will require a low-frequency transformer and a condenser and resistance of suitable capacity and resistance value respectively. I should add that the condenser and resistance are both of the fixed variety.

The characteristics of the valve which is followed by the coupling unit will determine the value of the resistance. You will generally find that the best value of this resistance is between two and three times the impedance of the preceding valve, although this value need not be very exact.

As regards the capacity of the fixed condenser, I have sometimes found a value of ·2 microfarads to give best results, but this may be varied up or down; sometimes as much as ·3 or as little as ·1 will give better results. Inasmuch as an average value of impedance of a valve will be, say, between 8,000 and 20,000 ohms, the value for the resistance will vary between, say 15,000 and 50,000 ohms.

RESEARCH

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