

**The
Ear of
Many
Successful
Receivers—**

**THE
LEWCOS
(Regd.)
LEWCODENSER**

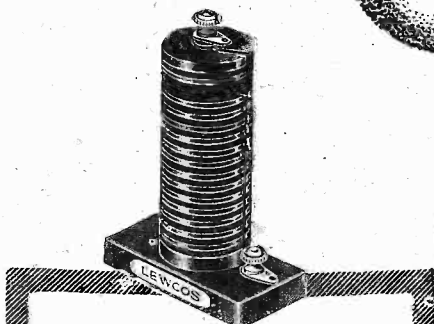
Type "O" .. Capacity .00015-.001 mfd. .. Price 2/6 each.
Type "W" .. Capacity .00002-.0002 mfd. .. Price 2/6 each.

As many wireless experimenters are aware, the Lewcodenser has figured prominently in the specification lists of many of the most successful sets, constructed, tested and described by the experts of this Journal.

Thousands of discriminating amateur constructors who have taken the advice of the experts know that the Lewcodenser is as vital a necessity to their receivers as are the ears to the human being.

Write for fully descriptive leaflet Ref. R. 60.

**Spells
Superiority**



The Lewcos H.F. Choke is specially constructed to eliminate self-oscillation. Price 7/9.
Write for fully descriptive leaflet Ref. R. 33.



A Lewcodenser, as illustrated above, is specified for the "Comet" Three Receiver described in this issue.

LEWCOS RADIO PRODUCTS FOR BETTER RECEPTION

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED, CHURCH ROAD, LEYTON, LONDON, E.10

REPRODUCTION.....THAT MAKES YOU VISUALISE

Chamber music

SIMPLE HARMONY

So alluring and yet so restful... each instrument clearly distinguishable... the whole a perfect rendering... soothing in its movement....

Such is the function of Chamber Music, and when broadcast it will lose nothing of its charm if the Transformer, a vital part of your set, is a Telsen.

TELSEN Transformers are scientifically designed, built by expert radio engineers, and when incorporated in your set will amaze you with their purity, volume and clarity.

Enjoy perfect reproduction through

TELSEN

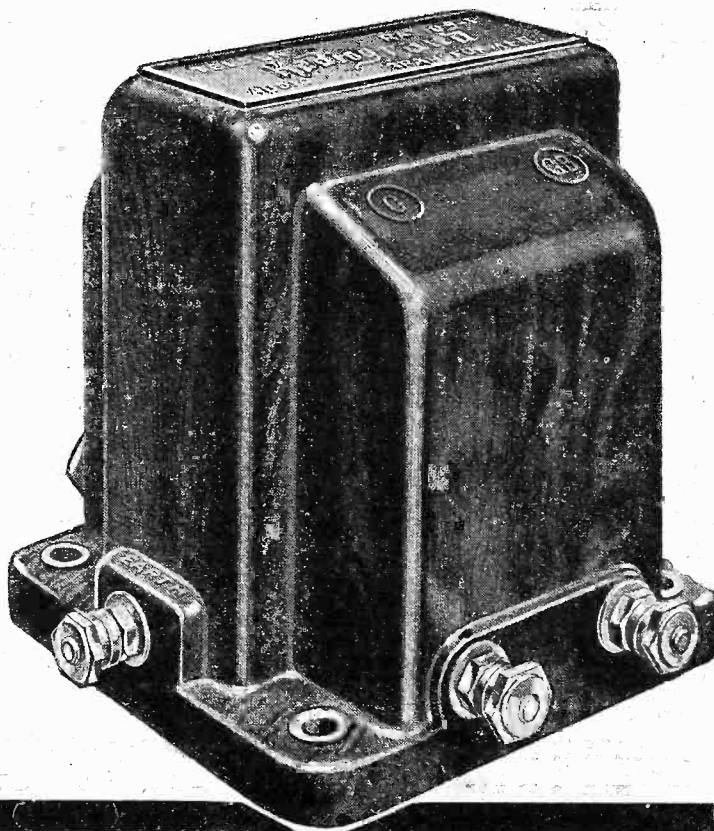
TRANSFORMERS

"ACE" - - - Ratios 5-1 & 3-1 - 8/6

"RADIOGRAND" .. 5-1 & 3-1 - 12/6

"RADIOGRAND" SUPER, Ratio 7-1 - 17/6

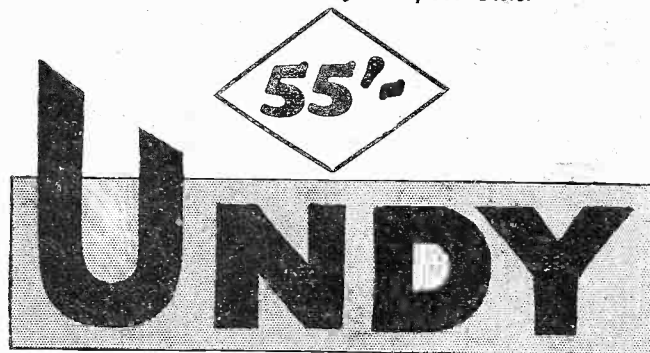
The complete range of Telsen Components includes H.F. Chokes, Fixed (Mica) Condensers, Grid Leaks, Four- and Five-Pin Valve Holders. For complete details and prices of these, see advertisement elsewhere in this issue.



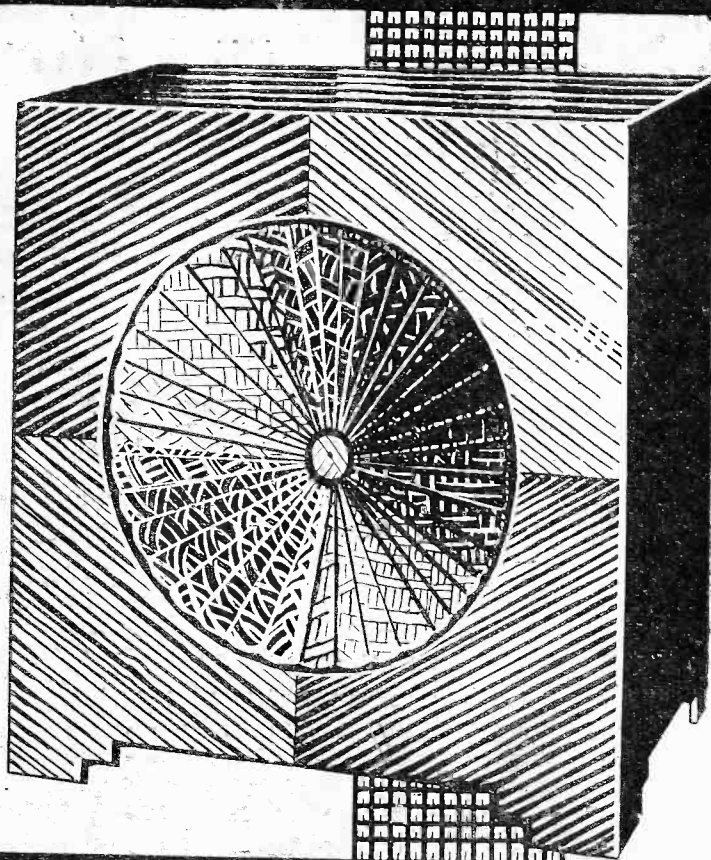
UNEQUALLED FOR VALUE UNEQUALLED FOR RESULTS

A most dignified and attractive design in fine American Walnut. The thousands of letters received prove this loudspeaker to be well worth the reasonable price asked. It is indeed unique in remarkable purity and volume of reproduction.

Fitted with "Undy" 8 pole Unit.



(British Patent No. 336,930)



The Loudspeaker with the 8 Pole Dynamic Unit

ELECTRADIX BARGAIN SALE

NOW IS THE TIME TO BUY. WE OFFER A WONDERFUL OPPORTUNITY BELOW. SNIPS FOR KEEN BUYERS

If there is anything here you require, don't miss it, as it is impossible to repeat these goods at the prices.

H.T. MAINS UNITS.—Pye-Westinghouse of Cambridge. Fine, brand new five-guinea units, output 120 volt 20 m/a D.C. from 200/250 volts A.C. Fit any portable set. Clearing at 60/-. Post 1/-.
FELLOWS D.C., Type "A." List price £3 10s. 0d. New for 30/-. Ditto, A.C. model, 15 m/a, with valve, 45/-.
For TRICKLE CHARGERS, 2v., 4v., 6v. D.C., from 200/250 volts A.C., use a Westinghouse Rectifier A3 and Transformer. Only 25/- the pair.
STEP DOWN MAINS TRANSFORMERS, for use on 200/250 volts. A.C. Mains. Output 3, 5 and 8 volts at 1 amp. Price 7/6.
PHILIPS 200 to 240 volts A.C. to 2-0-2 volts or 4 volts 5 amps. for lighting A.C. valves, working models and tests, new 27/6 model with flex and plug or adaptor for 15/-.
METERS. 20 m/a 1½ in. Panel, 7/6. Moving Coil milliammeters, 12/6 to 21/6. 0 to 500 volts, 45/-. Weston Meters, 2½ in. to 8 in. dial, 50 per cent. off list. Testing Sets, Elliott, etc., E.108, 4 ranges lamps and volts, 45/-. A.C. Hot Wire, 1 amp., 5/-. 6 and 110 volts, 5/9. Cell Testers, pocket, 15/-. with spikes, 30/-. Bridges, 10,000 ohm 4-dial Wheatstone, with Galvo, £10; G.P.O. type, £7 10s. Mirror Galvos Reflecting Beam, by Paul, Gambrell, Sullivan, and Tinsley, £3 to £10. Standard Resistance Boxes and Universal Shunts, 35/-. Electrostatic Voltmeters to 5,000 volts, £3. Silvertown Galvos, 7/6. Various Testing Sets cheap. Real Meggers, 100 to 1,000 at half-price. Photo Electric Cells, 57/6.
MICRO TRANSFORMERS, 3/6, 5/-. 7/6 and 10/-. 3-Valve Amplifiers for P.A. off D.C. Mains (Panatropes) £3 10s. 3-Valve Portable Type £2 15s. fitted Mike Transformer. 12-volt Motor Horns 4/6.
FELLOWS LITTLE GIANT III, in Oak Cabinet, with three matched valves, 35/-. List £8. Ediswan 2-valve and B.T.H. 2-valve sets, 25/6. Fellows Giant Receiver, Polished Oak Cabinet with valves and blue print. Ready for use, 60/-. 3-valve R.A.F. Portable Receiver and Valves, 37/-. Dynaplas S.G. III Kit, £3 10s. 6-valve Super Het. Receivers, £6. G.E.C. Victor 3-valve in metal case, £4.
MICROPHONES. Remarkably cheap and efficient for all purposes. We have all types from 1/- to £20, and illustrate a few. Prices: No. 11 (Single, 4/6; No. 7 (Special Panel), 12/6; No. 10 (Pulpit), 12/6; No. 8 (Hand), 15/-; No. 4 (Pedestal), 17/-; No. 3 (Table Multi.), 50/-; Nos. 1 or 5 (Announcer's P.A.), 65/-.
SWITCH GEAR. Mains Set Glass Fuses, 2 amps., 3d. Slow-motion Geared-Slide Theos., 250 w., 7/6. 147 S.P. Plug Boards, 9-way, 10 amp., 2/-. Lucas 8-way Switch Boxes, mahogany, Brass Cover, 3/6. S.P.C.O. Switches, 1/6.

H.T. send-receive, 2/6; 100 or 200-volt Lamps, 6d. 2 amps., 110-volt Lamps for charging, 2/6. 1,000 ohm Res. Bulbs, 6d. Auto cutouts, 7/-; Switches, Controllers, and Charging Boards built to order. Open or Ironclad. Send us your enquiries for quotation.

B.T.H.-MACKIE, H.T.-L.T. Double Generators, output 6-8 volts 3 amps. L.T. and 400-600 volts 100 m/a. H.T. Condenser smoothed. Light and compact. List £17. Clearance Sale, £2.

D.C. GENERATORS. Shunt wound for charging 6-9 volts, 8 amperes, ball-bearing enclosed. Fitted Auto cut-in-out, 25/-. 100 volts 4 amps., ditto, £4. 30 volts 15 amps., £6.

M.L. MOTOR GENERATORS. 220-volt to 400-volt, 100 m/a., £9. Brand new 2,000 dynamos, motors & alternators in stock. Kindly specify wants.

PORTABLE 5-v. SETS. Suitcase models. New cases only with panels, 15/6. With parts ready for wiring, 45/-. Complete and ready for use, £6 10s.

BLUE SPOT UNITS. With cone and chassis, 12/6. Cast aluminium cone chassis, 4/-. R.K. Junior, 60/-. 6-volt Magnet Poles, 20/-.
LOUD SPEAKERS. Moving Coil for 220 v. D.C. Mains, £3 10s. The "VIOLINA" Loud Speaker de Luxe in beautiful polished mahogany. Our Price, 25/-. With Reed Reproducer and Cord. List Price £5 5s.

Famous M.P.A. Cone Speakers, Oak Cabinet, 15/-. Boudoir Crystal Sets in pol. oak 4½ in. Vanity Box containing Tuner and Detector complete. Cost 35/-. Sale, 3/11; or with Headphones, 7/6, post free.

CONDENSER SNIPS. Bebe Cyldon 8/6 model for 2/6. Atlas S.L.F. .0005 or .0003 mfd., 2/-. Polar Square, .0005 mfd., 3/-; .0003 mfd., 2/3. Slow-Motion Igranic, .0005, 3/6. Western Electric Supersonic geared, .0005, 3/9. Drum dials with bracket and plate, 4/-. Fixed Dubilier No. 577 list, 7/6; .01 mfd. for 1/8. Sterling 2 mfd. 2/6. ex-G.P.O. 2 mfd. 1/3.

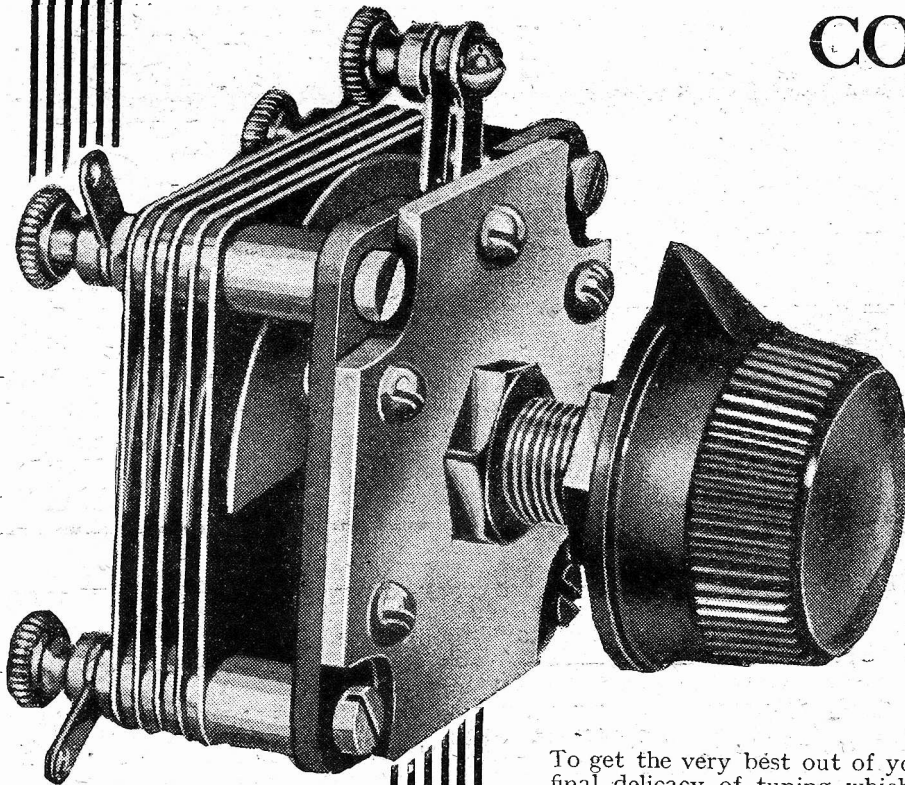
COILS. 6-pin Faradex, 3/6. Colvern Formers, 3/-. 6-pin Bases, 1/-. Burndept 2-pin Broadcast, 1/6. Cosmos and B.T.H. Valves for A.C., 10/-. Gramo Soundboxes, Bakelite case, 2/-.
These are only a few samples from our huge stock. Send 4d. stamp for Illustrated Catalogue and Green Sale List. All manufactured goods advertised in this issue supplied promptly.

ELECTRADIX RADIOS, 218, UPPER THAMES STREET, E.C.4
St. Paul's and Blackfriars Stations.

Phone: CITY 0191.

Specified in the "Comet" Three

THE LOTUS DIFFERENTIAL CONDENSER



LOTUS DIFFERENTIAL CONDENSERS :—

•00007	..	..	5/3
•00013	..	..	5/6
•0002	..	..	5/9
•00027	..	..	5/9
•00034	..	..	6/-

To get the very best out of your set—that final delicacy of tuning which just makes the difference between *perfect* reception and ordinary reception, you must use a Lotus Differential Condenser.

Lotus Differential Condensers have both moving and fixed vanes interleaved with bakelite discs of the highest possible dielectric qualities. All brass parts are chemically treated.

Other Lotus Components which will greatly increase the efficiency of your set are the famous Lotus Variable Logarithmic Condensers, in all capacities from 5/-; Lotus Reaction Condensers in all capacities from 4/9, and the Lotus Drum Dial for Ganged Condensers :

with one	•0005 Condenser	-	15/3
"	two	"	22/-
"	three	"	28/9

Every Wireless dealer stocks Lotus Condensers.
For more detailed information write to the address below.

LOTUS

CONDENSERS

Lotus Radio Ltd., Lotus Works, Mill Lane, Liverpool.

ON SALE THIS WEEK!

**THE MARCH NUMBER OF
THE WIRELESS
CONSTRUCTOR**

Contains full details of another fine set by

VICTOR KING,

THE "PARATUNE" FOUR.

A SET THAT IS DIFFERENT.

This receiver strikes a new note in set design, for besides a remarkably efficient circuit it has quite unusual lines.

In addition the "Wireless Constructor" fully acts up to its name by providing details of a large number of smaller sets, refinements and "gadgets" of all descriptions, all of which can easily be made at home.

The "FOUR-FIVE" CONVERTER, The "Distaswitch," and The "Bryta-Tone" Amplifier
are three excellent examples of the many ingenious designs offered to readers of

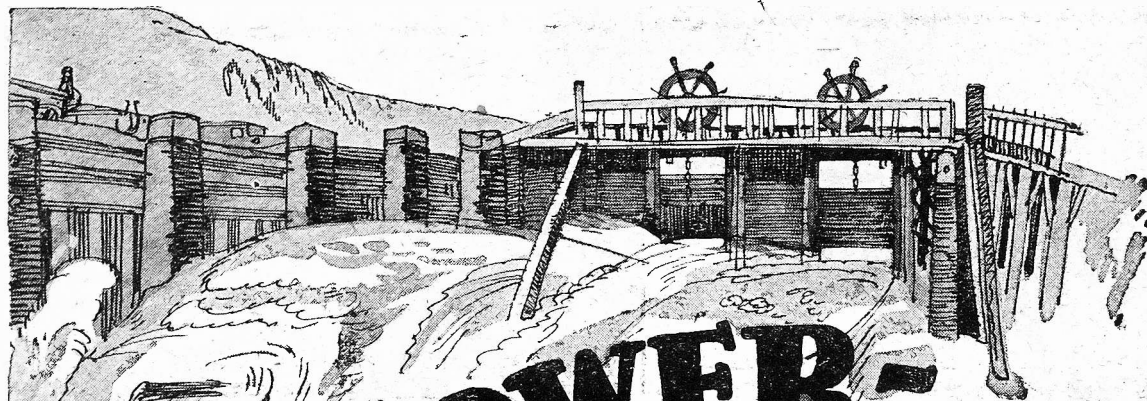
THE "WIRELESS CONSTRUCTOR"

Get a copy of this remarkable magazine and start in on some of the novel and attractive designs it contains.

Price 6d.

On Sale Feb. 14.

THE HOME-CONSTRUCTOR'S OWN MAGAZINE.



POWER- -running to waste!

**SENSATIONAL DISCLOSURE FOLLOWS
RESEARCH ENGINEER'S DISCOVERY. LOW
INSULATION OF CONDENSERS IS THE
SOURCE OF POWER RUNNING TO WASTE.**

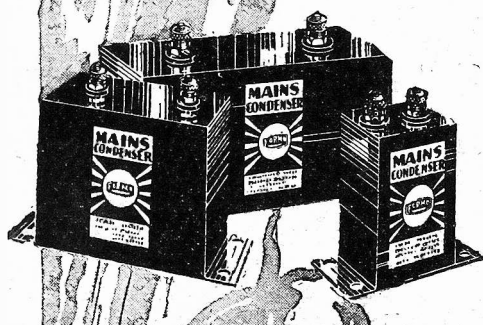
Many years of patient research have been rewarded by a discovery which introduces an entirely new standard of Electrical Efficiency in Mains Condensers. It has been the aim of condenser engineers for years past to produce a condenser having a high test and working voltage, a high insulation value, and long life, at a low cost. The Formo Co. are confident that their latest product will pass the most searching tests and meet with entire approval.

The new Formo condensers are a triumph of manufacturing enterprise. A newly discovered vacuum process makes leakage infinitesimal, whilst working voltages have been greatly increased—and at no additional cost!

Formo Condensers are tested by the sudden application of the test voltage, and not, as is usual, through a non-inductive series resistance. In this way the condensers receive a surge test in addition to the steady application of the test voltage.

The insulation resistance of a condenser is of paramount importance. A condenser having a low insulation value is analogous to a storage tank that leaks.

The new Formo range is obtainable from all radio dealers. Fit one and get clearer, better reception.



Cap.	H ^g ht	Width	Length	Price
1.0	2½ in.	1 in.	1 in.	2/6
2.0	2½ in.	1½ in.	1½ in.	3/3
4.0	2½ in.	1½ in.	3 in.	5/6

Full range of capacities.

**BRITISH INDUSTRIES FAIR
Stand No. D8.**

**Wonderful New High Insulation Value
OF**



**NEW-VAC
PROCESS**

MAINS CONDENSERS

Sets a standard of performance never before achieved.

Arthur Preen & Co., Ltd.
GOLDEN SQUARE, PICCADILLY CIRCUS,
LONDON, W.1.
FACTORY—CROWN WORKS, SOUTHAMPTON

Insulation Resistance is the real guide to condenser quality.

ON THE IMPORTANCE OF USING RELIABLE RESISTANCES

There are many ways in which "background" noises can creep into your set. One of the principal ways is through your grid leaks and anode resistances.

RETAIL PRICES:

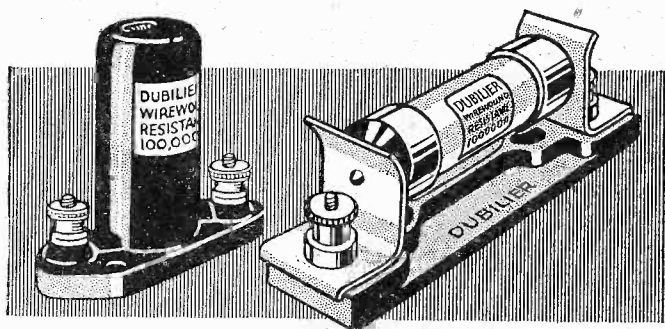
Horizontal
Type (in
holder) or
Vertical
Type

4/6 to 17/6

according
to value

Many types are unstable under working conditions and, when a current is passed through them, minute changes in resistance take place in quick succession—to appear on the loud speaker as hiss, frying noises and, in bad cases, crackling. By the way, the grid leak in a grid detector circuit carries a current and is one of the most fruitful causes of "background" noise.

Dubilier grid leaks and anode resistances are so designed that extraneous noises are impossible—sound reason why they should be used in your set.

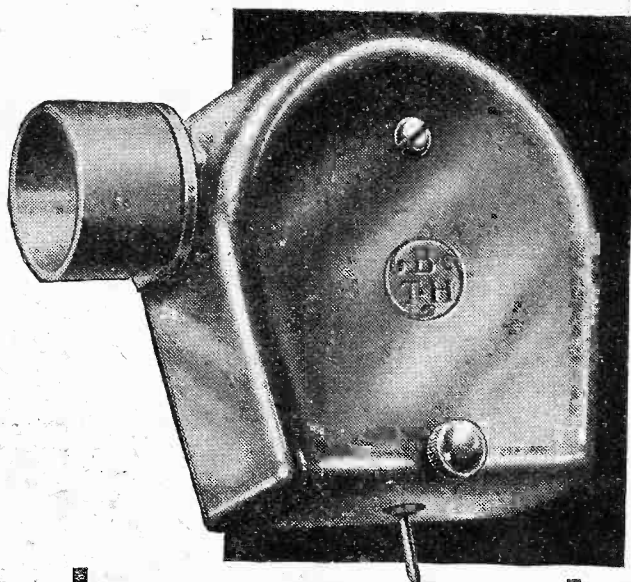


DUBILIER

RESISTANCES

Dubilier Condenser Co. (1925) Ltd.,
Ducon Works, Victoria Road, N. Acton, London, W.3.

Gives you better music



makes records last longer

PRICE

with 4
Adaptors

27/6

When you hear gramophone music reproduced with the aid of a B.T.H. Pick-Up you will scarcely believe the evidence of your ears. So crisp and clear-cut are the notes that you seem almost to be listening to the real thing.

By excellence of design, material and workmanship the B.T.H. Pick-Up has built up a reputation as the finest Pick-Up ever offered to gramophone enthusiasts. It fits any gramophone because it is supplied with four adaptors.

Fit one to your gramophone to-day and enjoy record-music at its best.



PICK-UP

and ADAPTORS



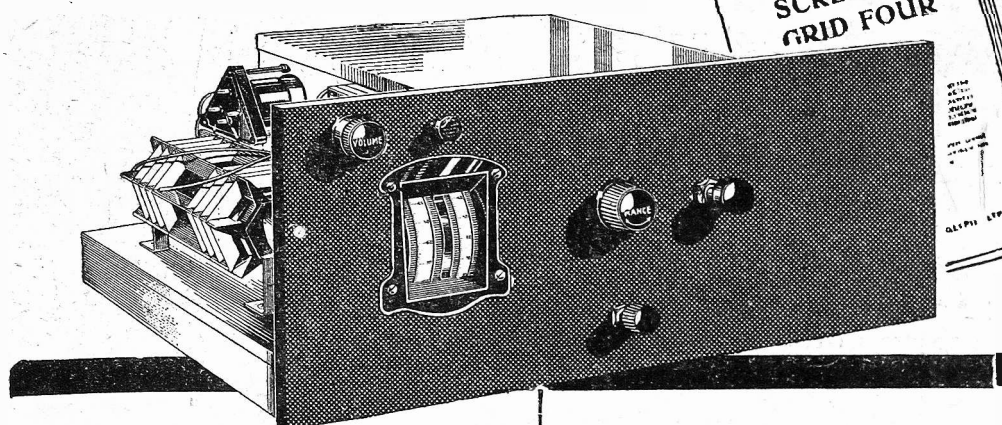
THE EDISON SWAN ELECTRIC CO. LTD.
Radio Division Showrooms:
155, Charing Cross Road, London, W.C.2
Showrooms in all the Principal Towns

EDISWAN

(W 12 D)

Five fine Sets

Charts now available



These Sets are the finest ever put out in charted form for the home constructor.

The full-scale drawings are clear and easy to follow, so that anyone who can drill a hole and drive a screw can build receivers and secure results not equalled by any other home constructor's Sets.

They have been designed to combine the three essentials of good radio: 1st—True reproduction; 2nd—Great range and power; 3rd—Adequate selectivity. Each component employed is the best of its class and has been chosen with one object in view—the ultimate performance of the Set. Provision for Gramophone Pick-up. NO SOLDERING.

1931 Editions

TWO VALVE

Battery operated

TWO VALVE

A.C. Mains operated

SCREENED GRID 3

Battery operated

SCREENED GRID 3

A.C. Mains operated

SCREENED GRID 4

Battery operated

Write for the Chart which best meets your requirements. Free on request.

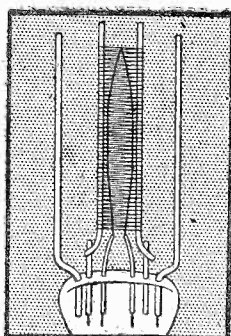
FERRANTI

Ask your Dealer for a Chart or write to

FERRANTI LTD Constructors' Section, HOLLINWOOD, LANCASHIRE

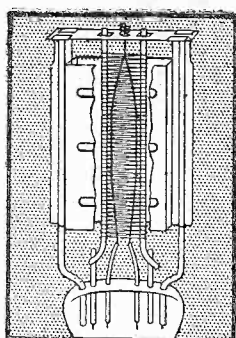
210 H.L.

A new Valve with the famous Cossor 7 point suspension



SEVEN POINT SUSPENSION

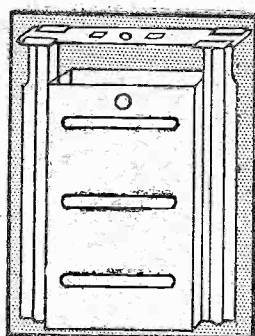
Practical experience has shown that the Cossor 7 point suspension system definitely eliminates microphonic noises. This system is employed in the support of the exceptionally long filament of the Cossor 210 H.L.



UNIFORM PERFORMANCE

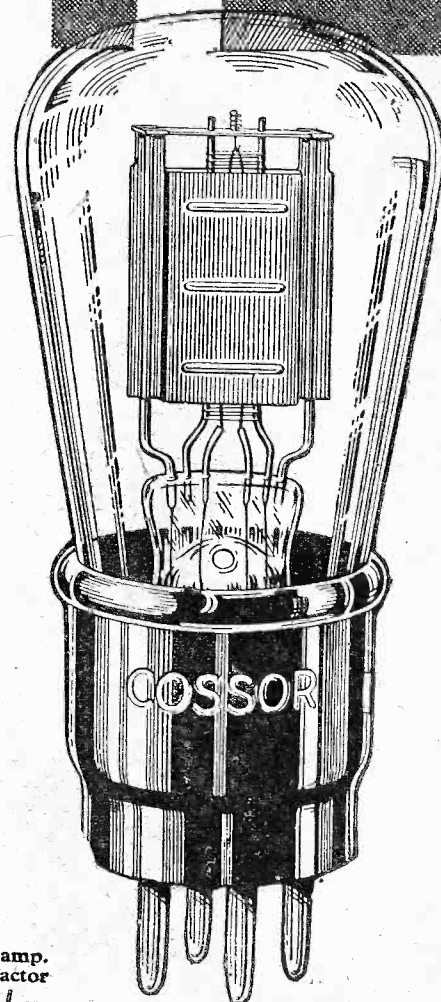
The Cossor mica bridge construction permits no variation of characteristics due to differences in inter-electrode spacing. Complete uniformity of performance is therefore ensured between all valves of the same type.

To all users of non-screened grid Receivers this new Cossor valve is of special interest. Designed specifically for more efficient H.F. Amplification it incorporates all the most advanced constructional features. The famous Cossor System of 7 point suspension ensures complete freedom from microphonic noises. Its favourable grid current characteristics permit a remarkable degree of distortionless H.F. amplification without the use of grid bias. The new Mica Bridge Mounting method of assembly ensures greatly increased accuracy in the inter-electrode spacing and an unusually high standard of uniformity. The use of the new Cossor 210 H.L. will result in a considerable increase of efficiency in any non-screened grid Receiver.



MICA BRIDGE MOUNTING

Permanent alignment of the electrode system is ensured by a stout mica bridge which forms an integral part of the anode assembly. When finally secured in position the whole structure becomes one interlocked unit.



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

THE NEW COSSOR 210 H.L.

Be sure to get one of our novel, circular Station Charts, which give identification details of nearly 50 stations with space for entering your own dial readings. Ask your dealer for a copy, price 2d. or send 2d. stamp to us and head your letter 'Station Chart P.W'

Popular Wireless

LARGEST NET SALES

Scientific Adviser:

Sir OLIVER LODGE, F.R.S.

Chief Radio Consultant:

CAPT. P. P. ECKERSLEY, M.I.E.E.

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A. JOHNSON RANDALL.

MY SILENT SET

ATOMS AND EXPERTS

WORLD-WIDE RADIO

THAT INTERVAL SIGNAL

RADIO NOTES & NEWS

THE "COMET"

SHORT REPLIES

MUSICAL NOISES

STILL MORE LICENCES

My Silent Set.

RATHER funny! An evening or two ago I was telling a visitor how silent my set was—quiet background and so on. Well, we listened in. G-r-r-r! Pong! (*Oh, that's the maid switching on the scullery light!*) "What's that humming noise?" "Oh, that's the mains; I can improve that!" G-r-r-r! Pong! (*That's the maid switching off the scullery light!*) Pip, pip, pip, pip, pip! Our watches duly checked. *Schlischen schlischen schlosschen ein zwei, etc. (Oh, that's that darned Mühlacker station!)* Pong! (*That's my daughter switching on the drawing-room light!*) Pong! It's off again! Sizzle phutt grrr! (*That's the electric masseur chap next door but two!*) And so it went on.

Frank Discussions.

THE "Catholic Herald" has made amends quite prettily for its error in calling "P.W." an organ of the B.B.C., and I acknowledge it with thanks. I am sorry that its Editor cannot, apparently, see the humour of his suggestion. No organ of the B.B.C. would be allowed to wallop the B.B.C. as we are privileged to do! Well, I must not continue this little bicker with our contemporary. The "C.H." does not like scientists to broadcast about religion. Right ho! But H. G. Wells is not a scientist, though he once was a teacher of science. He is, however, a clear and independent thinker.

What They Get In Ceylon.

I HAVE been examining the broadcast programmes of Ceylon, and wish to tell you and the B.B.C. announcers that on January 26th the Rev. Paththalagedera

Bodhi Mangalaramadhipathi Matale Sri Panna Sri Thero spoke on "Kama Vachara Pin." This little bit of fun was kindly organised by Mr. A. A. Gabo Singho! Sing hey, sing ho! I should be interested to know what the Editor of the "C.H." thinks about that lot. But, I say—what a test for a suspected case of "under the influence of"! Scotland Yard ought to secure the English copyright!

Atoms and Experts.

A MAN from Aberdeen asks me—on a postcard—why I have not japed with the "experts" lately. I am profoundly touched to think that some shafts

Just Wire.

HAS it ever struck you what an enormously important part wire plays in our everyday life in this so-called wireless age? Wireless, as we of the Friendly Following know right well, is based on the use of wires. Our telegraphs, telephones, light, heat, bells, trams, railways, in so far as they are electrically worked, are dependent upon wire. In fact, wire is a wonderful study in itself, and its mathematics are too, too gorgeous—as they say in London's most advanced circles.

When one "thinks of a wire, coil it, pass a current through it, think of the microhenries you first thought of, double it, subtract the lines of force and add the magnetic flux," one realises from what simple beginnings sprang the mighty science of electrical engineering.

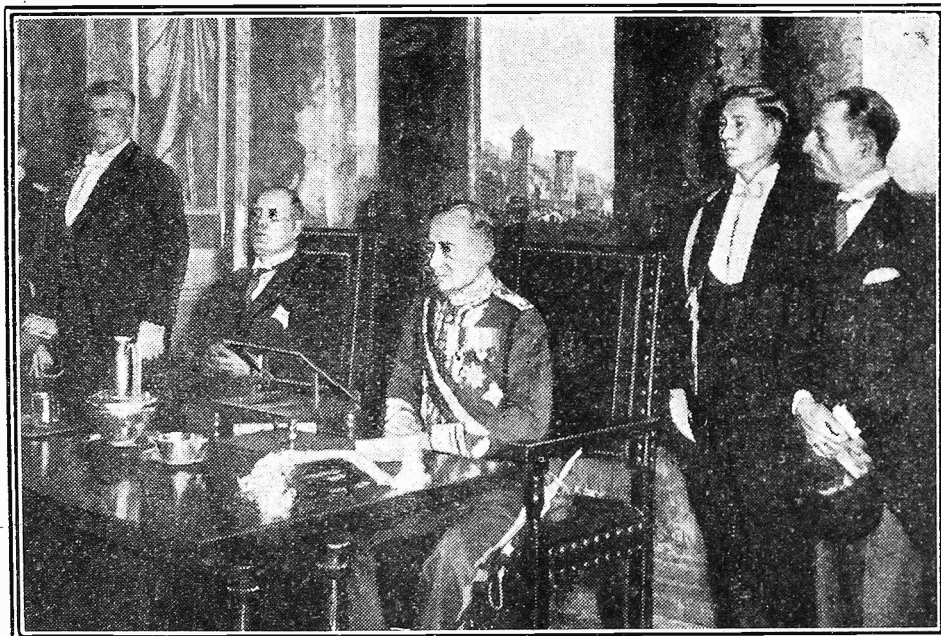
One-Man Radio Sets.

PROFESSOR W. R. BRYANS, of New York University, is alleged to have made the following statement: "Loud speakers are driving hundreds into the divorce courts annually. No two members of a family want to hear the same radio programme." The professor—I know not of what!—thinks that the rule ought to be "one man, one set" plus ear-telephones. Making due allowance for the

ease with which citizens of the U.S.A. can be legally unhitched on trivial excuses, I still feel inclined to describe the professor's dictum as—er—not correct. In short, I don't believe him. Loud speakers in America very probably send people to the nerve specialists, but not to the divorce courts by hundreds.

(Continued on next page.)

HONOUR FOR RADIO INVENTOR



The scene in Rome when Marchese Marconi was elected President of the Italian Royal Academy. Seated on his right is Mussolini.

of (my brand of) humour have pierced the hide of a denizen of that beautiful city. Let him remember that I have reformed. Anyway, I am afraid there are precious few targets for me, for the "Yorkshire Observer" says in its blunt, manly way, "No man can claim to be an expert on wireless until he has become the master of modern research into the structure of the atom—"

RADIO NOTES AND NEWS

(Continued from previous page.)

Round Earth in 44 Minutes.

IT is much more heartening to consider what was done on the occasion of the Richmond, Ind., Palladium's 100th birthday. I do not know whether this is a theatre, vaudeville show, a hotel or a restaurant, but all the same, it is a 100 years old and during a banquet in its honour a message of congratulation was given a push off by Mr. R. Crandall, an American amateur transmitter (W 9 F K E), who received it, forty-four minutes later, after it had been handed on from amateur to amateur, right round the earth.

World-Wide Radio.

RADIO and "P.W." share a world-wide distribution. All the way from Chile, S.L.L. writes to congratulate us on our Christmas Number. *Mille gracias señor.* He also points out that the Enfield reader who reported reception of "Grad-Radio, Buenos Aires" (see S. Wave Notes on page 638) really heard "Transradio Argentino," which is located at Monte Grande near Buenos Aires and works on 28.98 metres. S.L.L. asks what has become of 5 S W and Koenigswusterhausen, which appear to him to have been silent for some months. As far as I know 5 S W has never stopped sending on 25.53 metres, and K.—now known as Zeesen—is still sending on 31.38 and 1,635 metres.

Radio and the Metal Industry.

REFERRING to the statistics quoted by me in our issue of January 24th, of the amount of metals used annually by the U.S.A. in the radio industry, W.H.D. (Manchester) says that according to the figures given of the number of sets made and the weight of the metals used, twenty-three sets would weigh one ton. A bit hefty, I agree! But, perhaps the American statisticians included batteries, loud speakers, "earth" plates, aerial wire, and suchlike oddments. These Manchester realists should not spoil a good par. by looking gift figures "in the mouth."

That Interval Signal.

THE B.B.C.'s interval signal continues to excite the criticism of listeners. Since I last commented upon it I have seen it referred to as a "death-watch beetle" and likened to the sound of a coffin being nailed down in an empty house! In fact, one may say that it is a "hollow knockery" of what an interval signal ought to be! It brings to one's mind the alleged rapping of the notorious Cock Lane ghost, the descending thuds in the last bars of the "Pathetic" Symphony, or the tick-tock of a hidden "infernal machine." Poor work!

Note for Parents.

IN these difficult times, when almost every trade and profession is overcrowded, it may be useful for me to make public the fact that positions as Wireless Operator-Mechanics in the R.A.F. are open to 500 lads between the ages of 15 and 17, who pass in open and limited competitions for entry into the technical training schools at Halton, Bucks, and Cranwell, Lincs. For full particulars, apply to the Secretary, Air Ministry (Aircraft Apprentices Dept.), Gwydyr House, Whitehall, London, S.W.1.

The "Comet."

TO C. H. N., of Thornton Heath, who in a pleasant note rather "rubs in" a certain non-"P.W." set and drops a hint to me to try and inspire our technical force to a supreme effort, I think it will be sufficient to point to the "Comet." He can read all about it in this very number and I hope that he will admit that we hold our own. As for those technical research boys, they don't need any prodding. We have to clap their lids on sometimes—they are so fizzy with ideas!

Imperial Airways.

IN view of the Schneider Trophy controversy and what it involves, I was particularly pleased to receive a most interesting story from Imperials Airways, Ltd., showing how British skill and enterprise is

SHORT WAVES.

MUSIC IN CHUNKS.

Then listeners cut it off.—"Daily Mirror."

RADIO SOCIETY FOR CROOKS.

"At a specially convened meeting of several Crook wireless enthusiasts a few days ago, it was decided . . ."

Not to pay for their licences, probably.

"The people on Mars listen to our wireless programmes," declares a scientist.

All we can say is, they must have queer tastes.—"Sunday Pictorial."

THE HARDEST JOB.

Wireless and its general merits was the topic of conversation between several clubmen.

"After listening to the wireless now for some years," said Smith, "my family have decided to have a little orchestra of their own. My wife is learning to play the banjo, Willie is learning to play the flute, Ernest rather fancies himself as a jazz-drummer, and Doris and Mildred are learning the violin."

"And what are you learning?" inquired Brown.

The other made a grimace.

"I'm learning to bear it," he returned.—"Answers."

THOSE WIRELESS TALKS.

"The only way to tell the weight of the stars," says Sir James Jeans, "is to weigh them altogether."

Anyone who intended weighing them separately should therefore abandon the idea.—"Punch."

It is rumoured that television will soon make it possible for us to sit in a theatre and watch a cricket match. No doubt the distractions of the stage will be much appreciated when rain stops play.

He: "How many reception rooms have you got?"

She: "Oh, only one. You see, we've only got one crystal set."

revolutionising modern goods transport. It is a common occurrence for twenty tons of freight to pass through the Croydon air terminus in one day, and during a certain period of nine months seven hundred tons of urgent mails and merchandise were airborne over the European and Indian lines of the Company. Nearly two million wireless valves have been flown between London and the continent, and about £80,000 worth of loud speakers. Amongst the items which have been carried figure brussels sprouts, lobsters, bullion, day-old chicks, a full-grown lion, a horse, and tanks of sea-horses.

A Go-ahead Society.

I HAVE pleasure in drawing attention to the South Croydon and District Radio Society, which is very anxious to increase its membership, a trait which is

Popular Wireless, February 14th, 1931.

characteristic of a "live" society, not of a moribund one, mark you! I believe in clubs and societies and have never failed to do what I can to help them with a little space in these notes. They keep the movement going, foster interest and activity and are altogether beneficial to their members and the radio world in general. Write to the Hon. Sec.: Mr. E. L. Cumbers, 14, Campden Road, South Croydon. The society meets at The Surrey Drovers' Hotel, Selsdon Road, S. Croydon.

Short Replies.

F. R. (Sheffield). Thanks. The slip you mention was afterwards corrected. C. S. (Bognor). Best o' luck with the "Outer Circle." Why don't Bognorites like the Regis? Are you republicans? H. G. B. (Cricklewood).—Much interested! Passed to technicals for consideration, but demand is for most modern circuits. Quite agree that best "foreign" music comes off gramophone records! T. N. (Kilmarnock). No, I do not know where you can obtain the transformers whose name you have forgotten. I've forgotten! J. T. L. (Plymouth). You are in error in believing that I'm Scottish, vegetarian and play bridge. I'm not a business man, eat raw beef and play poker.

Over in France.

POOR Madame Leriche, who, I recently reported, lost her case against the gentleman who complained that her electrically-driven gramophone interfered with his radio reception, appealed against the judgment—and lost again, this time letting herself in for double costs and getting eight days in which to make her "grammy" non-interfering. If the law goes by precedents in France I should think that this case pretty well clinches the matter in favour of radio against canned music. But I feel a certain sympathy for the lady, because I should so like a labour-saving grammy myself.

Musical Noises.

IT is extraordinary how clever composers are able to reproduce, in an aestheticised form, the noise of machines by the use of musical instruments. Take "R.U.R.," for instance. All the sounds of the factory in that play were made by musical instruments. On February 25th a symphonic episode, "The Factory," depicting a steel factory at work, is to be broadcast. The composer is Alexandre Mossolov. I sincerely hope that no composer will now pick on a boiler factory! By the way, Schonberg used huge chains for certain effects in his "Gurre-lieder."

Still More Licences.

BY the end of 1930 the total of receiving licences issued in this country had reached 3,411,910, including 19,460 free licences to the blind. During the year the increase was 455,174, as compared with increases of 326,448 for 1929 and 230,598 for 1928. In December, 1930, the total rose by 85,012, which is to me astounding. Was the increase due to a change of heart on the part of "pirates" or to the newly converted to radio use? In spite of the unemployment which was rife, eighty-five thousand people had half-a-quid to spare for amusement.

ARIEL

BEHIND THE MICROPHONE

BY CAPT. P. P. ECKERSLEY M.I.E.E.

Our Chief Radio Consultant takes you behind the scenes before and during the opening of a new broadcasting station. This is his fourth article of a special series.



THE early days of the B.B.C. seemed to me to be most occupied in worrying either about the opening of the next station, or about how the last one was functioning now it had been opened.

Such-and-such a station has to be opened. A date is given optimistically by me, the then Chief Engineer of the B.B.C. I break the news to those who have to go into the details—I mean get the station ready. H. Bishop, now the Assistant-Chief Engineer of the B.B.C., is the first to whom it has to be gently hinted that we have three weeks before station X Y Z has to be officially opened.

After he has been brought round he says he'll see what could be done about it. I see no more of him in London. About three days before zero hour London sees no more of me. I arrive at the "new premises."

Apparently Hopeless Chaos.

The door is wide open and a trail of straw and sawdust swirls into the street. Vans keep driving up and disgorging more stuff. They never drive away. There is, among others, the question whether the Station Director is to have an oak or mahogany table.

Also have the curtains for the studio shrunk too indecently to cover the temporary wiring? There are no rectifying valves, as Z has had a flash over in Y and the valves have had to be sent away. The electricians cannot get on wiring the amplifier room because the wall has collapsed and there is a plasterer's strike. I go to lunch.

I have a habit of trying, as far as possible, to give people a job of work and not fuss them. Bishop is a person particularly to be trusted, a miracle worker as far as my experience goes, so I have two checks to prevent me asking more than once every minute whether he thinks it will be all right.

"What the Eye Cannot See——"

The dawn of the day which must inevitably contain the evening finds me early awake. About 4.30 p.m. Bishop allows me to use the Hoover in the studio and I diligently push it about watching its greedy cleanliness in rapt satisfaction.

My attempts to make it swallow valve cartons, stray flex, tin tacks, as well as straw, dust, a carpet slipper and the charlady's soap produce gratifying noises within, but little result. I get feverish and start hiding things.

This goes behind the "shrunk" curtains, that behind the accumulators, the other fits well into the Station Director's cupboard. Things go anywhere but in that studio

which so soon will be hushed to hear the voices of the white-tied élite.

I have to leave, still to the sound of hammering, and vans still seem to arrive. But there is a kind of hush: it seems expectant, can it really be that we are ready?

I call round, on my way to change, to see the transmitter. I trip over an earth wire, see the dim tops of masts against the hurry of windy clouds, find the orange oblong of the door and listen to the discreet hum of alternators.

A Welcome Scene.

Warmth invades me, backgrounded by that subtle smell of newly-warmed shellac, and I see the pink glow of the control valve anodes to tell me power is on. There is a test. A loud speaker chants the anthem of the engineer.

"One, two, three, four, five, six, seven, eight, nine, ten. I hope this test is quite O.K." It would seem so. Needles are steady, no flickits, all is orderly, calm and prepared.

So, soothed, I go to my hotel to chase a reluctant piece of hot water into a bath

and clothe myself in the black and white uniform of occasion.

Dinner is neither before nor after, as it were, and I am too excited to eat. At last we set out. Mr. Reith, the Admiral, maybe Bishop, calm as ever, to find the long familiar straw

ON "P.W.'s STAFF



Capt. P. P. Eckersley, Radio Consultant-in-Chief to "Popular Wireless."

has gone, policemen to salute us, a red carpet even has appeared to grace our patent leather feet.

An over-worked palm tree, blasé from a surfeit of hunt balls and mayoral occasions, stands satirically above and about the place where the piano hits the balustrade; The station Director's table (mahogany) is discreetly draped with a white cloth.

On it are foodstuffs of that highly-coloured kind that inevitably accompany

any function where refreshments are described as "light." There is also a bottle of "spirits," but we know that it, like so much else that is essential to the occasion, is hidden.

A Terrible Ordeal.

They are coming. Men with chains and their womenkind. Even a man with a sort of jewelled mashie. And there are Lords and Sirs and one is only safe saying "Sir" indiscriminately. One B.B.C. official is heard saying "My Lord," whereat another mutters "My Gawd."

We are in the studio. I stand as if I were a guest. A face peers through the window from the control-room and signals frantically. The General Manager has the advantage of being able to see him. Noises! More noises! Red lights flick! Less noises! More flicks! Less noise! Silence! Deep, hushed, profound! The Station Director faces the mike. He speaks.

Is it going through? Yes? No? NO! Sorry. Sweat pours from me. I sneak out to the control-room. It is going through. "Why did you shake your head?" Because there is a "hiss" in the 'phones! Intermittent. Isn't there another? Mr. Reith wants me.

"Opened" at Last.

Wants to know what he should say about the engineers. Anything—wonderful work—hope it is. Say it afterwards when it will be. What? Sh! The Mayor. Long speech. "This invention which fair bids" (he means bids fair) "waves, mysterious" (he does not know how true that is considering the wiring) "much pleasure. Opened."

It is! It's opened! Cheers! Who's this? A Lord. Hurray! There's a Lord. Good Lord. Nice Lord. "Er—ah—unknown forces, Caxton, joke, end." It is over.

Where is that hidden thing? All going now. So enjoyed, so interesting, where is my fruit salad? Let's go and eat something. Phew! it was good. And the Police Band is going through just beautifully.

The Aftermath.

And so to bed full of trifle and fruit salad, and nuts and grape pips, which are bothering things when an opening is over. But to-morrow, in the cold morning at 11 a.m. precisely, a poor soprano must sing in that dead room. She will, I know, sing of spring. Spring!

I wonder how long it will take to get it straightened up? London for me, and then to promise another opening in a month's time. And the licences are coming in and it's all largely fun, anyway!

THE SEMMERING CONFERENCE

By THE EDITOR.

Latest details about an International assembly of broadcasting authorities that is meeting in an attempt to straighten out Europe's congested ether.

LISTENERS will have learnt with unanimous satisfaction that at last steps have been taken to clear up the present muddle in the ether.

We expressed the fear, in a recent issue, that the situation would get worse and worse unless promptly dealt with—that to wait until 1932, when the International Radio Conference will meet in Madrid, would be fatal.

A Temporary Measure.

We are therefore very glad to note that our fear was removed, for by the time these words are read a specially convened conference of broadcasting experts from all the important European countries, except Russia, will have started to "get busy" at Semmering, in the Austrian Alps.

It is, indeed, quite likely that the conference will have finished by the time this issue of "P.W." is on sale, and, if so, we hope the wave-length problem will have been cleared up.

But we doubt it: some temporary expedient will doubtless have been hit upon, but it is unlikely that the entire problem will have been completely and finally settled. Londoners, however, will be particularly interested in one aspect of the problem—that of interference

caused by Mühlacker and the London Regional transmitter. We certainly hope the German and British delegates to the conference will settle this item, although it is but one of many.

Beyond finding a solution to the Mühlacker problem, it is not anticipated that much will be accomplished in the way of dealing with the general ether congestion.

The conference will, by this time, have discussed the wave-length problem as a whole, and patched up one or two of the more glaring defects; but the main discussion will have centred round the preparation of data, viewpoints of delegates, etc., which will be more fully and comprehensively dealt with at the Madrid Conference in 1932.

Authorial Essential.

The delegates at Semmering realise the vital importance of securing authority.

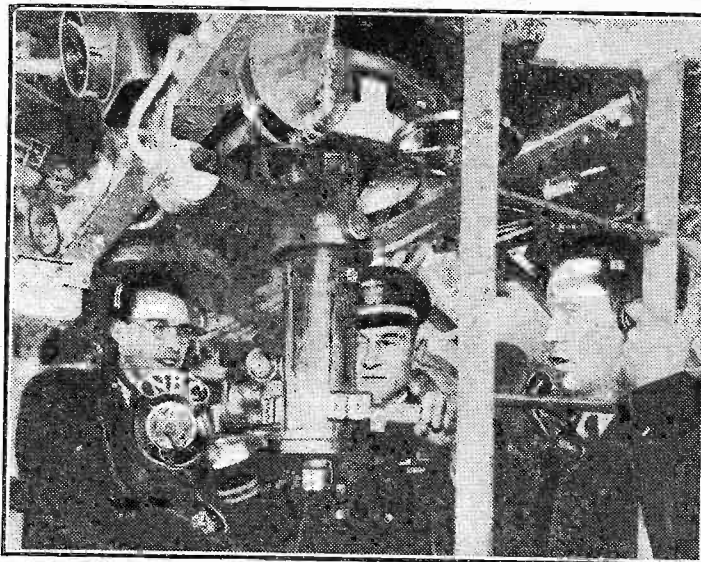
And it seems pretty clear that no real solution to the problem of the ether will be obtained until the Union is backed

by the governments concerned—until it is authorised, in fact, to enforce its decisions.

Sensible recommendations for curing an ever-growing evil are no earthly use unless they are acted upon, so it is to be hoped that during their talks the delegates will have agreed to make a really energetic attempt to get authority from all governments concerned.

After all, these delegates are technical experts—they are especially "ether experts"—and, just as a Minister of Transport has authority to enforce regulations, backed by his government, so an Ether Minister is badly wanted for the same reason.

AN UNDER-SEA BROADCAST



A broadcast from a submarine arranged by the National Broadcasting Co. of America. The naval officer is looking through the periscope. This observation device is twisted round by the handles he is holding.

And each Ether Minister, from each country, should have power to pledge his government to ether rules and regulations decided upon at the conferences held by the Broadcasting Union. The control of ether traffic is not merely a national affair of the highest importance; it is an international affair, and its importance cannot be over-estimated.

International Law Required.

Let us hope, then, that we shall be given full details about the conference at Semmering, and that not only will the Mühlacker trouble be satisfactorily settled, but that plans will have been made to obtain definite authority for the conference when it meets again in Madrid.

The main objects are simple: the conference should be, firstly, backed by international law with, secondly, power to enforce broadcasting stations to keep to specific wave-lengths and to use a specific power.

And the wave-lengths granted, and the

power granted to the stations concerned, should be authorised by the Union, and only the Union.

In this issue of "P.W." we present to you the "Comet" Three. On other pages you will read all about it and, remembering the "Titan" and the "Magic" designs, you will realise that "P.W." does not make a "song about a set" for nothing.

This "Comet" is the third extra-special set we have had the pleasure of presenting to you—a set for all with, of course, our guarantee that it is "the goods."

The "Titan" was a fine set; so was the "Magic." It was better than the "Titan" because progress is inevitable, improvements are always going on. And for that very reason, in the twelve months or so that have passed since we offered you the "Magic," the work carried out by the Research Department has resulted in still further improvements.

They are embodied in our latest design, the "Comet" Three. Build it. We feel absolutely certain you will find it the best three-valver you have ever built.

CORRESPONDENCE.

WE ARE SO MODEST!

THE "P.W." "CLEAR-CUT" CONE

Letters from readers discussing interesting and topical wireless events or recording unusual experiences are always welcomed; but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for any information given.—EDITOR

WE ARE SO MODEST!

The Editor, POPULAR WIRELESS.

Sir,—When I read your first article on the "Clear-cut Cone" I thought your claims for it were very extravagant, and I was a doubting Thomas. I had a double linen cone 24 in. square with a Blue Spot "R" and, although the results were good, they were not nearly so good as you claimed for your cone only 10 in. diameter.

The area of my cones was about 950 square inches, whilst the area of your cones about 170 inches (less than a fifth of mine), for the life of me, I could not see where your cone could give results equal to that I was obtaining.

Still, as the cost was negligible and the trouble very small, I made it up from your details. I was very surprised at the results without the baffle, but now I have the baffle fixed I am delighted; the results both as to tone and volume, high notes and bass are so good that your claims for it are very modest—not extravagant.

One claim you did not make was, the much better pick-up by the set when reaching out. I have got stations clearly the last few evenings that I could only get a chirp from with my old cones.

Thank you for a very delightful speaker.

Wishing every success to "P.W." and your designers.

I remain,

Yours faithfully,

A. W. S.

Wednesbury.

THE "P.W." "CLEAR-CUT" CONE.

The Editor, POPULAR WIRELESS.

Dear Sir,—With reference to your "Clear-Cut" Cone which you published in "P.W." a short time ago; I feel it is only justice to express to you how pleased I am with same.

I had before an ordinary cabinet speaker. When I saw details of your "C.C." Cone, I was tempted to convert my cabinet, but refrained from doing so, thinking that my unit would not suit.

However, I finally made up my mind, taking the name of your popular book for granted that it would be a certain success. The result was marvellous; never before had I heard such clear reproduction. In my opinion, it should be more known. Then I am certain that some wireless enthusiasts would not be so satisfied with their buzzing old speakers. My unit was a 12/6 Ormond unit.

Yours faithfully,

FREDERICK TUGWOOD.

Plymouth, Devon.



Where the Programmes Come From—Savoy Hill.

IF I WERE GOVERNOR of the B.B.C

If you were suddenly appointed Governor of the B.B.C., what changes would you make in the programmes or in the administration? Harold A. Albert put this question to some eminent personalities of the microphone, with the following interesting and surprising results.

J. H. SQUIRE, famous leader of the Celeste Octet.

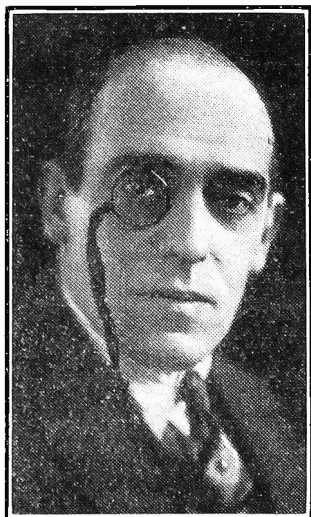
I SHOULD first of all compel those responsible for the accounting at Savoy Hill to pay the Celeste Octet a fee of £10,000 a year, and then I should see to it that every performer before the "mike" had an audience—for none knows better than I that in sympathy lies half the secret of success. The variety artist who broadcasts generally has an audience in the studio who indicate to him how his work goes over, but the poor musician has to play to padded walls.

I am informed that this state of affairs will be remedied when the powers that be move into their new palace in Portland Place, but if I were to become Governor of the B.B.C. to-morrow I should commence the new regime at once.

A Studio Audience.

To get the audience would be an easy matter. In fact, I should probably have more people applying than I could possibly

SECRET OF SUCCESS



The leader of the famous Celeste Octet says that the sympathy of an audience is the secret of success.

seat; to remedy this, I should charge every one a small fee. Then folks would not come to a concert simply in order to be out of the cold!

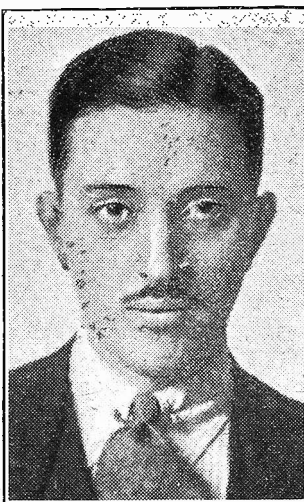
I would also endeavour to reform the wireless licence. I think it obviously unfair that the man with a crystal set should have to pay the same as the

man with an all-electric five-valver. No, I would not lower the fee for the crystal set owner.

Anyone who can afford to pay seven-and-sixpence for a dog licence or even sixpence for a crystal, can afford to pay ten shillings for their wireless entertainment. But I should see to it that the people who could pay twenty or thirty guineas for a super set should pay accordingly for the extra value they received in programmes.

That's about all, I think.

ALBERT DE COURVILLE



"The popular taste is not sufficiently considered."

ALBERT DE COURVILLE, the famous Theatrical Producer.

A broadcast programme should not only be on as high a level as anything offered in the theatre; it should have the same popular appeal. Were I to become a Governor of the B.B.C., I should make this belief my foremost canon for the judgment and construction of broadcast programmes.

Masses, Not Minorities.

At present, the popular taste is not sufficiently considered. The B.B.C. is taking too much interest in that minority who are interested only in chamber music, talks, rarely played—and therefore usually boring—dramatic works, and so on.

I should cut education right out of the programmes. Most people when they seek relaxation want entertainment, not dry-

as-dust lectures, highbrow histrionics, and unmelodious music. They want to laugh, not to learn.

Oh, yes, I know all the platitudes about the wireless audience, and how varied it is. But people who really want education and chamber music, who are sufficiently enthusiastic, seek to satisfy their needs in the lecture hall and concert room, not in the theatre.

We must realise that the wireless audience is largely the same as one meets with in a popular theatre—with the big difference that the great majority of the people are for various reasons unable to visit the theatres, but are wholly dependent on broadcast entertainment.

I should attempt to make radio something for the masses, not for the minority.

LEONARD HENRY, the Wireless Comedian.

"What an extraordinary feeling it would be, To know they'd made me Captain of the B.B.C."—(Untraditional.)

The advantages would be enormous. Fancy being able to sack everybody except yourself.

Think of being able to roam Savoy Hill unchecked with all those lovely little knobs to twiddle. And I daresay one could get one's accumulator charged for almost next to nothing.

What fun it would be to speak into the microphone in Number One Studio, and

"UNCLE" LEONARD



"... the advantages would be enormous."

(Continued on next page.)

IF I WERE GOVERNOR OF THE B.B.C.

(Continued from previous page.)

to rush downstairs into the Control Room to hear how one comes through. What an opportunity to keep oneself waiting for hours in the Waiting Room, knowing all the time that one could see oneself if one wanted to.

Imagine being in a position to sell the air to advertisers, so that plaintive requests to buy Somebody's Safety Sausages would occur in the middle of a Bach Cantata. What a wonderful chance to exercise my errand-boy complex (the love of chalking rude words on garden gates), and to gain the gorgeous satisfaction of saying the most dreadful things into the microphone.

What a chance to have a few uninterrupted words with:

(a) Your golfing friend, who will tell you how he did the third in one and kissed the caddie. (And all the time you know he was at the 19th, with one foot on the brass rail and one hand in the clove-dish.)

(b) Your opposite on the 8.15, whose newly-born is the largest, prettiest, and most wonderful brat in the whole wide world.

(c) That Queen of digestion underminers, your wife—who has made the medical profession what it is to-day.

Think of the great glow of satisfaction one would get from knowing that one could do things so much better than the people already there.

Could one?

I wonder!

PHILIP RIDGEWAY, the Producer of so many popular Wireless Revues.

It is always easier to criticise than to construct, and this applies especially to listeners. Day by day, the B.B.C. is inundated by letters, the great majority of a highly critical nature. I firmly believe that if but one-tenth of these criticisms were to be acted on, the whole structure of the B. B. C. would go to pieces, and the programmes become so bad that everyone would automatically sell their sets.

No, there are small things I might do were I to become governor of the B.B.C., but in the main I should follow the admirable precepts of public entertainment and education set up by Sir John Reith, who ably conducts his staff in the tremendous task of satisfying everybody with something.

Variety programmes, for instance, might



Famous for his "Fly's Home" Stories.

be reorganised so that each individual artist in costume played—with stage lighting and a proper stage—to an invited audience somewhere in front. This would satisfy the temperament of the average artist with an atmosphere to which he is accustomed.

Something of the same kind might be done with speakers. At the moment, they have to sit alone in a little room and talk to themselves.

Hard Job For An Actor!

I should like an apparently interested audience of at least one, and plenty of flowers to supply that nice atmosphere which is not so easily given by bare or draped walls. It would be terrible, I admit, were the studio listener to appear bored, but I should over-come this by engaging a trained actor for the job.

To sum up, I can conscientiously say that I would not interfere very much with the B.B.C. as it is at present. I have seen hundreds of theatres and public institutions, but I have never known such team work as prevails at Savoy Hill. It is little short of marvellous. All flattery aside. Marvellous!

AUTHOR OF "THE WHITE CHATEAU"



Captain Reginald Berkeley says Arnold Bennett would give the programmes a good start.

Captain REGINALD BERKELEY, the famous Radio Playwright, of "White Chateau" and other favourites.

If I were in charge of broadcasting, the first thing I would do would be to appoint a Director of Programmes responsible only to the governing body, and a member of it. It is sheer nonsense to expect an administrative expert like Sir John Reith to initiate imaginative programmes. As well expect a baker to arrange a ballet!

The director of broadcast programmes ought to have the qualities of a Reinhardt. He should have a thorough understanding not only of music both light and serious, and of the various branches of literary and dramatic art, but also of showmanship and public taste.

Why Not Arnold Bennett?

He needs to realise through experience what constitutes good entertainment and to have the quality of remembering that the majority of listeners own their sets at least as much for amusement as for instruction.

A good man to give the thing a start would be a young Arnold Bennett, who should bring the requisite qualities and knowledge plus a profound understanding of human nature and the modern point of view. In default of anyone better equipped, Mr. Bennett himself might be persuaded to make a beginning.

BATTERIES v. MAINS

Comparing the Cost.

By T. P. BLYTHMAN, B.Sc.

IT is proposed in this article to compare the costs of running a three-valve receiver from the mains, and from batteries. A typical three-valve set takes a high tension current of about 10 milliamps at a voltage of 100, and a low-tension current of half an amp. at a voltage of two.

Let us consider the cost of working it from batteries for a period of a year. If we assume that the receiver is used for 800 hours during the year, this averages a little over two hours every day.

A high-tension battery giving 10 milliamps will probably have a life of 200 hours, therefore we shall require four of these in the time. At fifteen shillings each this makes £3.

A Typical Case.

How much energy shall we obtain for this sum? A current of 10 milliamps at a voltage of 100 represents a power of $100 \times .01$, which is one watt, since $\text{amps} \times \text{volts} = \text{watts}$. The energy is a number of watts multiplied by the number of hours, so that for 800 hours the energy consumed is 800 watt-hours.

The unit of energy measured by the house metres is a kilowatt hour or 1,000 watt-hours. In a year we shall, therefore, use four-fifths of a unit, for which we have to pay £3 for batteries.

Turning, now, to the low-tension supply, a two-volt, twenty amp.-hour accumulator costs an average of sixpence to be charged. If the current used by the valves is half an amp. this should last about 40 hours, so that in a year it will have to be re-charged $800 \div 40$, which is 20 times. This, at sixpence a time, comes to ten shillings.

The energy obtained from the accumulator is found by multiplying the volts by the amps. i.e. $2 \times .5$, which equals one watt per hour, or 800 watt-hours per year. This is again equal to four-fifths of a kilowatt-hour or unit. This energy has cost us ten shillings.

Comparative Costs.

Consider, now, what the same amount of energy obtained from the mains would have cost. A unit of electricity from the mains costs an average of 5d. Hence, four-fifths of a unit would cost 4d. The total cost of high tension and low tension energy from the mains would be eightpence. By using batteries we have to pay £3 10s. for the same amount.

These calculations ought to make it clear which is the cheaper.

Of course, to obtain the supply from the mains requires an initial expense for the necessary eliminators, but after these are installed, the cost of operating the set will be practically negligible. There will, of course, be a slight loss in mains transformers, etc., and there might be a rectifying valve to run; but even so, A.C. mains working, even using A.C. valves, is very cheap. (It is slightly different with D.C., owing to the necessity of breaking down the voltage for the valve filaments.)

THE "CRYSTAPHONE"

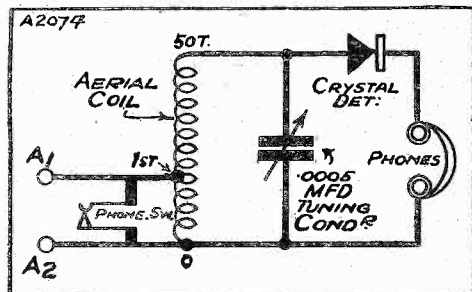
An easily-made sentinel to stand between your set and a breakdown.

HERE is a really interesting little device for the knowing constructor to gloat over. No matter what kind of wireless set you have, or hope to have, you ought to get acquainted with the "Crystaphone."

What is it? Well, if you said it is a crystal set for the valve-set owner you wouldn't be far out, strange as that may seem!

And it is a lot more than that. The photographs show it to be a kind of wall-bracket, on which you can hang your 'phones, with just a couple of knobs and

SIMPLICITY SWITCHING



As soon as you lift the 'phones you bring the test crystal set into action.

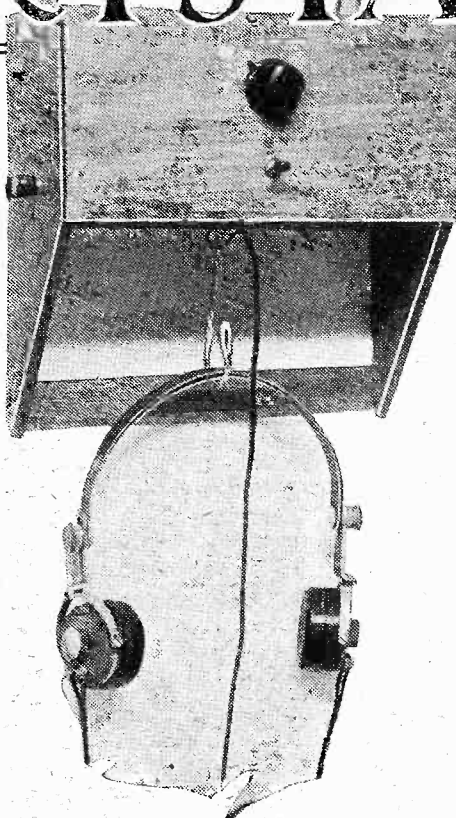
two terminals showing. Let us see how it is used.

If you are a valve-set owner you connect your "Crystaphone" in the lead-in, and you can then carry on receiving on your valve set just the same as formerly. But with this important difference.

You are safeguarded against the loss of programmes. When one day the set suddenly sulk—as it's sure to do some time!—and everybody listens for the loud speaker, and asks "Why has it stopped?" you don't have to fret or fume or worry. You simply consult the "Crystaphone."

Very Simple.

Walk up to your neat little wall-bracket, take down the 'phones, and listen to them. They will tell you instantly if the breakdown is at your end or at the broadcast-



Replacing the telephones cuts the device out of action and lets you listen on your other set in the ordinary way.

ing station; for merely by unhooking the 'phones you bring into action a complete

Designed and described by the "P.W." RESEARCH DEPARTMENT.

crystal set! All that bother of testing the set and trying battery leads to see if something has come adrift there is abolished, for one of the uses of the "Crystaphone" is to always stand by as an emergency test receiver. Then, even if your valve set breaks down you unfailingly have the programme available at an instant's notice.

This way of using the "Crystaphone" has several incidental advantages which

THE PARTS NEEDED.

- 1 .0005-mfd. variable condenser, solid dielectric type (Ready Radio, or Burton).
- 1 Crystal detector (Red Diamond, or Brownie, R.I., etc.).
- 1 3-in. diameter coil former, about 3 in. long (Pirtoid, or other good insulating material).
- 5 Terminals (three very small ones for coil, two ordinary). Wood, screws, wire, etc.

every experienced set owner will appreciate, and which may as well be mentioned here before passing to its other uses. Suppose, for instance, you get "a whistle on the local programme."

It may be your set or it may be some

foreign station's heterodyne. You can tell which in a second if you have a "Crystaphone," which lets you listen to whatever is in the aerial—an invaluable check!

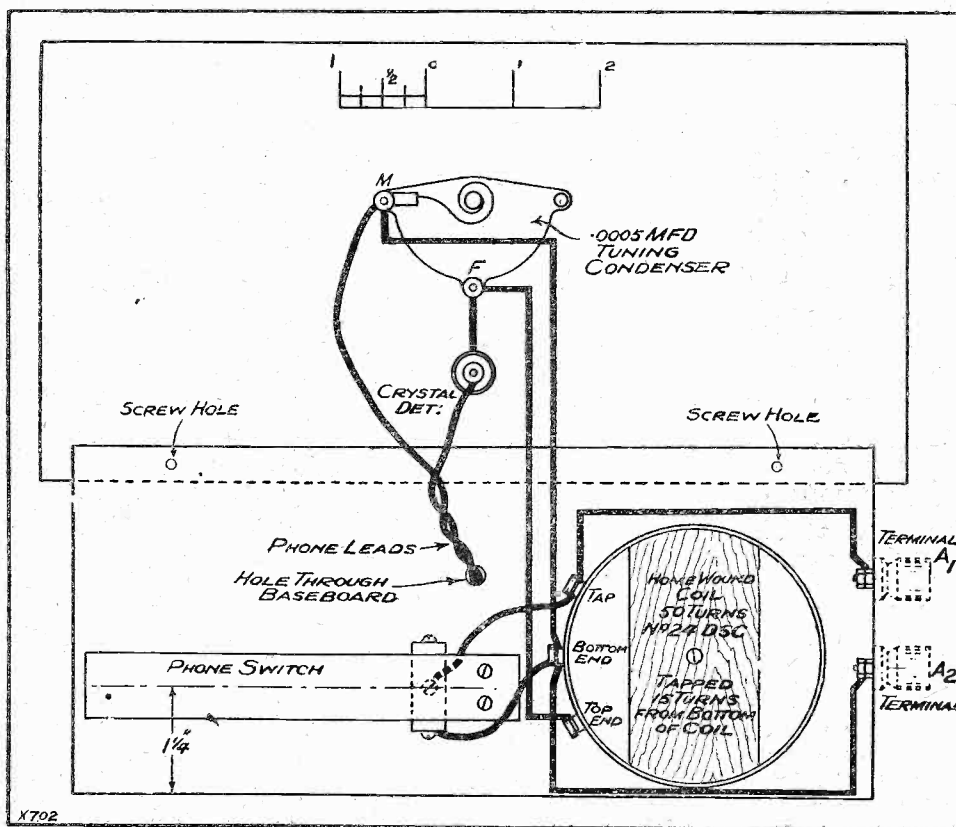
When we say that the little gadget operates not only as a first-class crystal set, but can also be adapted as a mild form of wave-trap in the very simplest manner, you will appreciate how handy it can be.

Low Cost.

Moreover, nearly the whole thing is home made, so the cost is ridiculously low. It is quite independent of the main set (in fact, it doesn't mind if there is no other set!), so we are sure that it will find plenty of enthusiastic admirers.

To make it is a (Continued on page 1029.)

YOU CAN MAKE IT—COIL AND ALL—IN ONE EVENING



The radio part of the "Crystaphone"—coil switch, etc.—is as easy to tackle as the woodwork.

FREE NEXT WEEK

TO ALL READERS OF
Popular Wireless

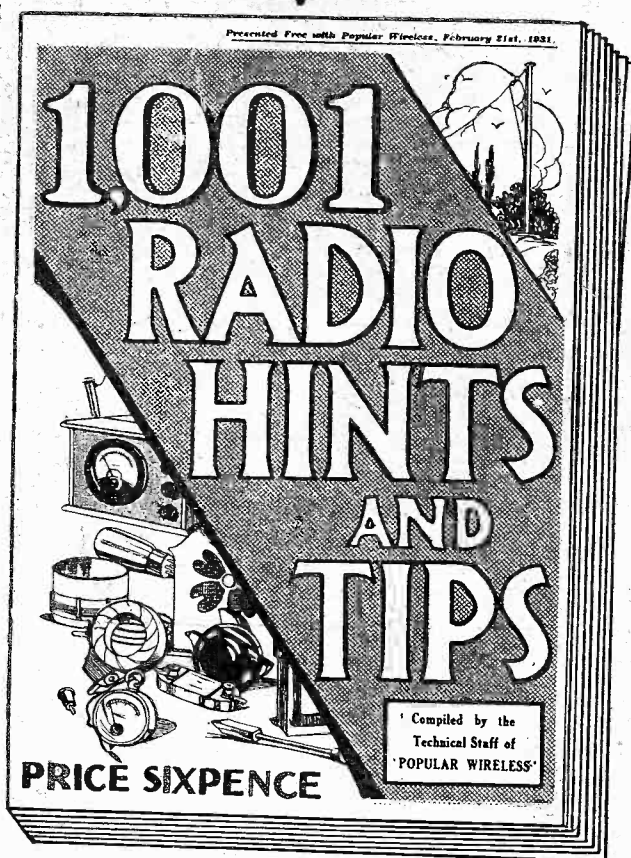
**THIS
MAGNIFICENT
44
PAGE BOOK**

covers all phases of radio reception and provides invaluable information on all branches of the subject.

It is intensely practical and will prove an undoubted boon to every set owner.

Whether you build your own receiver or use a commercial model

**YOU NEED
THIS BOOK.**



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PROBLEM IS
DEALT WITH**

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Full of valuable and interesting notes you will find the

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ALSO

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"FLEXI-COUPPLING THE COMET"

A fully illustrated article describing one of the most valuable, yet simple, refinements that can be added to "P.W.'s" latest set.

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NEXT WEEK**

On Sale February 19th.

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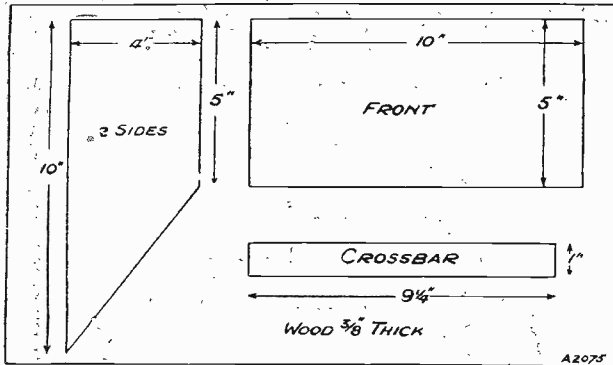
THE "CRYSTAPHONE"

(Continued from page 1027.)

very simple task, the "carpentry" called for being of a very elementary kind. Yet the finished instrument is quite ornamental, and it certainly does not disfigure any wall on which it hangs.

The photographs and diagrams show the constructional details, but first of all there

THE MAIN WOODWORK



In addition there is just a small baseboard and a top shelf, as shown in a photograph.

is the coil to make. A very simple matter.

You wind 50 turns of No. 24 (or thereabouts) D.S.C. wire on a 3-in. diam. "tube" or former, making a "tapping"—i.e. a connecting point—at the fifteenth turn from the bottom.

The two ends and the tapping are each connected to little terminals mounted on the coil former, as shown. A piece of shaped wood screwed across the inside of the coil to enable it to be mounted later to its baseboard completes this part of the work.

Dealing with the Woodwork.

Now for the "cabinet" or wall bracket. The sizes of the front (or "panel") and two sides, as well as of the crossbar which connects the lower corners, are given in one of the diagrams.

You also need wooden top and bottom "shelves," the latter acting as a baseboard on which the coil is to be mounted,

and the top coming in useful as a shelf for an ornament, or books, or what you like. The dimensions for these shelves are 9 1/4 in. by 4 in.

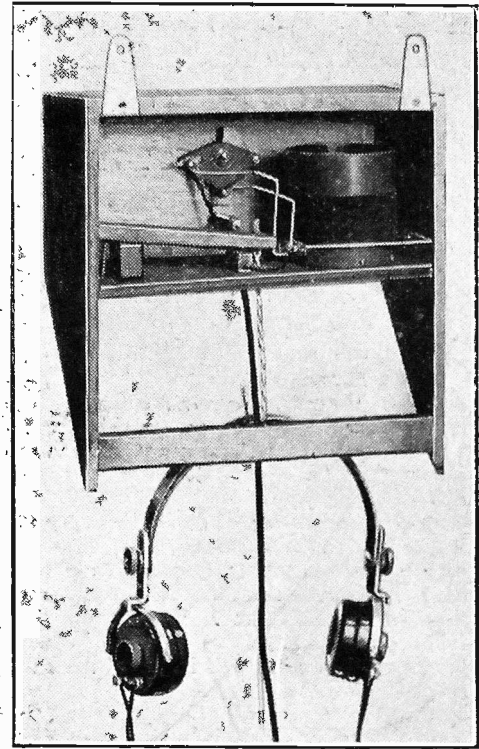
On the "panel" must be mounted the variable condenser and crystal detector, as shown, and in our model we placed the condenser 1 1/2 in. down, and the crystal 2 in. below this, both on the centre line.

With the two terminals screwed in one side, the "Crystaphone" is ready for assembly, except for the switch.

This is mainly of wood and the diagrams make it quite clear. The bottom contact is a block of wood with a strip of copper over it. For those who find them necessary, complete constructional details of this switch will be given under "Radiatorial."

The "switch" being wired across A_1 and A_2 , short-circuits the aerial currents straight through the "Crystaphone" when the 'phones hang on the hook.

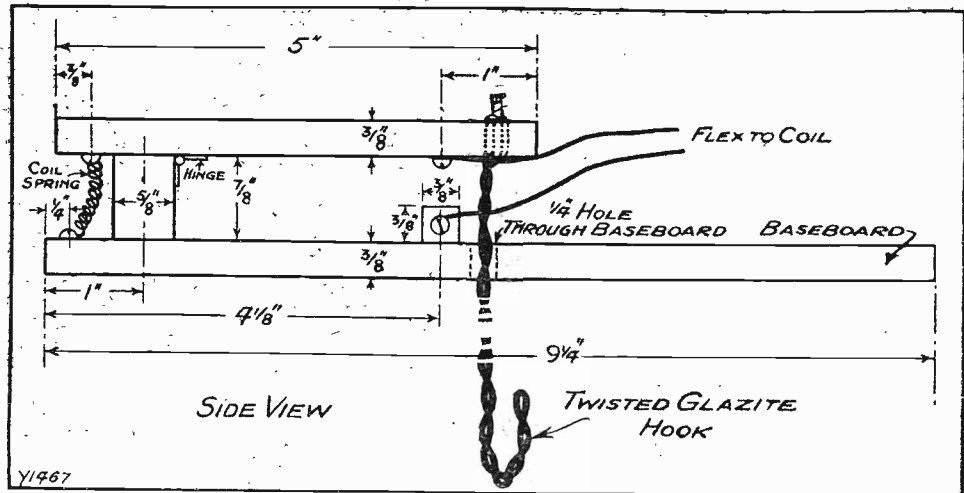
If the hook is lifted the aerial currents will then run through 15 turns of the coil, so after tuning the .0005 condenser you can always pick up the programme in the 'phones. Simplicity itself!



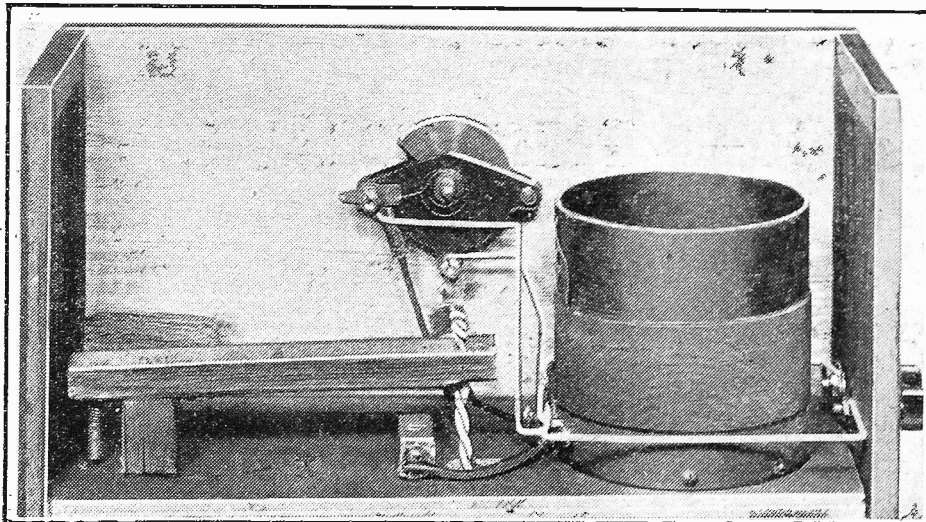
The "Crystaphone" as seen from the back.

The most convenient method of wiring

DETAILS FOR MAKING THE 'PHONE SWITCH



A CLOSE-UP OF THE "CRYSTAPHONE'S" INTERIOR



Here the wiring is completed, but the top shelf has not been fixed.

is to leave the top shelf off till the various connections have been made, as the terminals, etc., are much more accessible this way.

As the 'phones will be joined permanently in circuit in most instances, no 'phone terminals are used, but instead the 'phone leads are taken up through a hole in the bottom shelf to the appropriate connecting points. If preferred a pair of terminals can be used, one connected to the crystal and one to the moving vanes of the condenser, instead of making the connections direct.

This would allow the 'phones to be disconnected easily if required elsewhere. Similarly, it allows the detector circuit to be broken altogether if it is desired to use the "Crystaphone" as a form of wave-trap in conjunction with another set. So if you intend to try this, fit a couple of 'phone terminals to the bottom shelf instead of running the 'phone leads direct.

LATEST BROADCASTING NEWS.

CENTRALISATION SCORES THE INTERNATIONAL SITUATION—EDUCATION CONFLICTS—COMING EVENTS.

THE announcement of the disbanding of the Northern Wireless Orchestra on March 31st is much more significant than appears on the surface. The struggle for the maintenance of this Orchestra has gone on for three years and has not been helped by the exceptionally good work of the Orchestra.

But the argument of economy and ruthless reduction has prevailed. After the end of March there will be in Manchester only nine instrumentalists as the nucleus of local orchestral effort. The B.B.C. has taken pains to point out that the "Studio Orchestra" of nine will be augmented for special occasions.

There was added, however, to the intimation of the end of the Northern Wireless Orchestra the significant remark that the principal B.B.C. Orchestras would be available to Northern listeners through the new Regional Transmitter.

Those who know what is happening behind the scenes at Savoy Hill are in no doubt as to the real meaning of this utterance. It represents a very definite victory for the centralisers. Regional broadcasting is again in serious danger.

The International Situation.

Tests carried out jointly by the B.B.C. and representatives of German Broadcasting in the hope of finding a solution of the Mühlacker-London Regional difficulty have been unsuccessful.

Anxious consultation is now going on at the meeting of the International Union of Broadcasters in Austria whither Admiral Carpendale and Mr. Noel Ashbridge have gone to represent the B.B.C.

Competent opinion sees very little hope of a "political" solution. There is a strong probability that the whole existing distribution of broadcasting channels will have to be revised.

Those who are in a position to know, take the view that the separation between channels will have to be doubled, thereby reducing the number by 50 per cent.

The result to Great Britain would be 5 X X plus four exclusives in the Broadcast Band as against 5 X X plus 9 exclusives now.

This would necessitate the abandonment of the Regional Scheme. On the other hand, it would greatly simplify the organisation of the B.B.C. and would make possible a big reduction of staff.

Education Conflicts.

The creation of three "Talks Directors" at Savoy Hill has been followed by the inevitable internecine conflict. Terrific competition has been created. Miss Matheson, Miss Sommerville and Mr. Siepmann, each with a separate organisation attempts to attract the most important and popular lecturers and speakers. There is manoeuvre and counter-manoeuver.

Pledges are made and broken. Meanwhile much time is wasted, and it remains to be seen whether the programmes will be any better. It is high time that the B.B.C. imported a new super-director for the Talks Department to look after the serried ranks of its directors.

Coming Events.

Here are some "high lights" in forthcoming programmes of interest to listeners throughout the British Isles.

Mr. Val Gielgud, the Production Director at Savoy Hill, is producing, in conjunction with Mr. E. A. Harding, a radio version of "The Tempest" on Sunday afternoon, February 22nd. The actors taking part are Ralph Richardson, Leslie French, George Howe and John Gielgud.

Members of the medical profession seldom appear in the broadcast programmes, except in official talks, and when a doctor, so famous as

Sir James Crichton-Browne consents to speak before the microphone the event assumes outstanding importance. Sir James, who is in his nineties, will broadcast some of his reminiscences on Saturday, February 21st.

Midland Regional listeners will look forward to a concert to be given by the Coventry Silver Band on Tuesday, February 24th. Although founded sixty-three years ago as the Ragged School Band, this combination really owes its existence to a few older members who kept it going during the dark days of the Great War, since when it has "mopped up" prizes right and left. Brahms' "First Symphony," regarded as one of the world's greatest treasures, is one of the principal items in the next Hallé

Concert to be relayed on Thursday, February 26th. The solo artist in the concert is Gaspar Cassado, the famous Catalonian cellist.

A talk on the Welsh Historical Exhibition, which takes place at the City Hall, Cardiff, between February 21st and 28th, will be given for West Regional listeners on Friday, February 27th, by Mr. W. Arthur Evans, Secretary of the National Union of Welsh Societies.

"Macpherson's Lament," a radio play by Andrew P. Wilson and Arthur Geddes, based on the old Banffshire tradition of the robber Macpherson's arrest and public execution, will be broadcast to Scottish listeners on Friday, February 27th.

NEXT WEEK!

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1001

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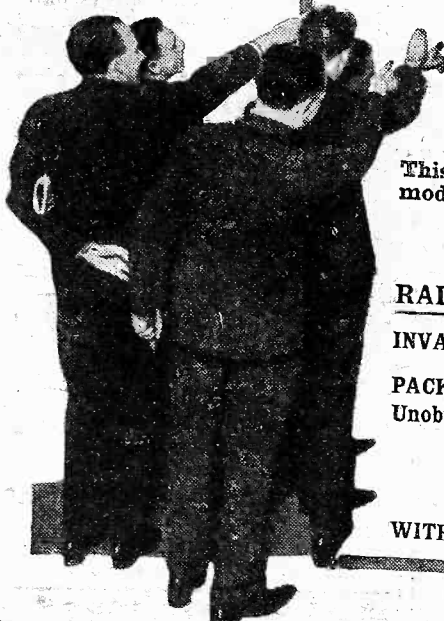
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WITH 'P.W.' NEXT WEEK



FOR THE LISTENER.

By "PHILEMON."

A critical survey of some of the recent programmes, with frank comments on the fare provided and the way it is served up.

"Stop Press."

THERE was plenty of "pep" in this little show, as well as Pepper (Harry S.).

The cleverest part of it was a brilliant little imitation of A. J. Alan singing a vaudeville song. The most amusing part of it was a skit on how things are managed at Savoy Hill, and the number of departments and people concerned was, to say the least, not small.

The requirement was a musical box, price threepence; but do you think it could be got? B.B.C. Exchange got busy; practically every department was involved; everybody was ringing everybody else up; and when at last it had been obtained, the news came through that the programme for which the blessed box had been wanted was cancelled! How much truth was there in it? We shall never know!

Bouquets for Ladies.

I wish to hand bouquets to three women. The first is Miss Gertrude Kingston, who embellished her delightful talk on the theatrical world "yesterday and to-day" with an altogether charming and, as it seemed to me, lifelike imitation of the divine Sara. It was a tour-de-force which in a theatre would have "brought the house down"; and, on the wireless, doubtless brought many houses down.

Nina Tarasova.

The second is Nina Tarasova, whose name I do not remember having seen before in the vaudeville programmes. She calls herself an international diseuse, but she sang four songs—in French, Russian, and English. She has a beautiful voice, and is a great artiste.

(Continued on page 1068.)



Besides the considerable practical advantages to be gained, there is a peculiar fascination in operating a set on a frame aerial, and the following description of a long-wave brother to our recently described frame aerial will be welcomed by a large number of readers.

sloping slots $\frac{1}{4}$ in. deep and $\frac{1}{4}$ in. apart on each side, measure $2\frac{1}{2}$ in. by 2 in. by $\frac{3}{8}$ in.

In winding the long-wave frame 26-gauge D.S.C. wire is employed, and 56 turns are wound on in *one* direction. This latter is important; otherwise the frame will be useless.

Putting on the Winding.

When winding, the best procedure is as follows: Start at one of the terminals and wind round the slots on the side of the frame nearer you. Wind four times round each of the first four slots, then go round four times in the next series, and so on till you have completed the fourth turn in the seventh slot. This completes one side.

Now hitch the wire across the same ebonite corner-piece from the outside slot (where you have just finished) diagonally to the inner one on the other side. Then proceed to wind this side in the same direction as the first.

That is, if with the first side you went round clockwise; when you turn the frame round to wind the second side you must go round anti-clockwise.

How to Connect Up.

On this side you proceed four times round each line of slots until you reach the outside one nearest the remaining terminal. Then take the line across to the terminal and the job is finished.

In use all you have to do is to connect the frame *across* your first tuning condenser, disconnecting any coil you may have there. Then you tune in the usual way, remembering that the tuning will be sharper than when you had an aerial, and that you should not use an earth if the set is stable without one, as the earth tends to reduce the directional properties of the frame.

THE NORTH REGIONAL

Some points in the design.

Nearly 10,000 gallons of water a day are to be used by the North Regional station, so a reservoir capable of holding 200,000 gallons has been arranged for.

Special precautions against frost had to be taken at Moorside Edge owing to the altitude of the station.

The aerials have been so designed that if necessary a strong current can be passed through the wires to melt any ice or snow which may adhere to them.

Given further amplification the frame becomes a very rosy proposition, and we feel that a large number of readers will find this long-wave frame a valuable companion to the medium-wave model recently described.

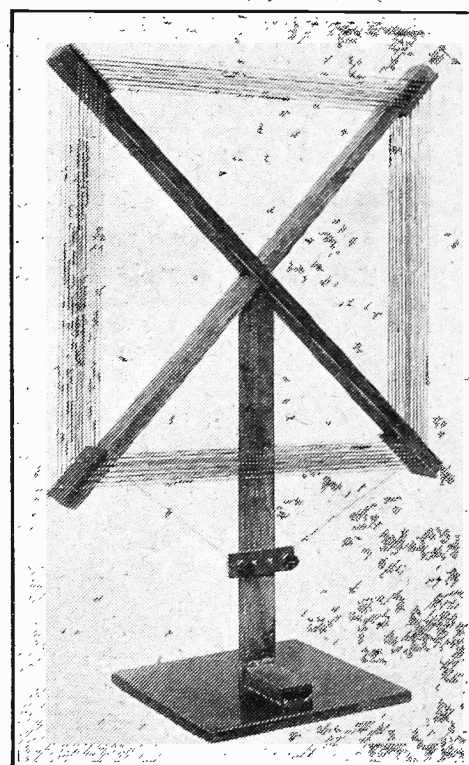
The construction is very similar, the same type of construction being employed. All that is different is the winding, which naturally has to have far more turns.

The illustration shows how the framework is built, and those of our readers who have "P. W." No. 452 will be able to see the exact dimensions from the diagram on page 950. But for those who have not, the following dimensions will be of assistance.

The base is of $\frac{1}{2}$ in. wood and measures 9 in. square. The upright is $4\frac{1}{2}$ in. up to the 3 in. terminal strip, and above this it is about 10 in. The two cross pieces measure 24 in. by $1\frac{1}{8}$ in. and are $\frac{3}{8}$ in. thick.

The ebonite pieces, which have seven

FROM 1,000 to 2,000 METRES



Here is the long-wave frame described in the accompanying article. The aerial will cover the whole of the long-wave broadcast band.

IN the January 31st issue of POPULAR WIRELESS (No. 452) we described the construction of a frame aerial to cover the medium wave-length band. This week we are showing how a long-wave model on the same design can be made.

But before we go into the practical details, let us see how the long-wave frame can help the listener to modern broadcasting.

Though there are many cases where a frame aerial is not necessary, there are still others, especially near the coast, where such an aerial would be a very great boon.

Cut Out That Jamming.

No matter if your set is powerful and selective, in many cases the raucous voices of ships will make themselves heard above the broadcasts you may be trying to listen to.

The National transmitter on long waves does not have its programmes improved by the coarse croak of a destroyer, while the efforts of about a dozen ships to get through the jamming in the Channel does nothing to render more entertaining the concert from Kalundborg or Radio Paris.

But what can one do? Situated fairly near the coast with its flat-tuned land stations and the ever-impatient bursts of "traffic" from passing vessels, the owner of a radio receiver frequently has a very bad time.

The solution is often to be found in the frame aerial which, besides being highly directional, is also more selective than the ordinary average aerial system. It will not be affected even by powerful spark transmissions.

Type of Set to Use.

It is capable of being sharply tuned and will often solve all jamming problems for the man who has a fairly powerful set.

You need one H.F. stage at least if you are to hear the long-wave National satisfactorily over a distance exceeding 100 miles with a frame aerial. Or you can reckon it another way. Listen on a detector and 2 L.F. receiver on an ordinary aerial, and then on a frame. You will find a stage of H.F. necessary before you could reach the same volume of reception as before.

But the frame aerial can be used with detector and 2 L.F. sets quite well in many cases, as witness some of the earlier models of portables which have successfully received 5 X X as far away as Devon and Cornwall.

STATIONS WORTH HEARING

Some practical distant programme notes compiled by a special contributor who nightly searches the ether in order to obtain really practical and up-to-the-minute information.

By R. W. H.

RECETION conditions for distant stations are always to some extent dependent upon the weather. Though the exact relationship between weather and wireless has not been worked out, we can, at any rate, say that sudden large changes of temperature or jumpiness on the part of the barometer are usually accompanied by atmospheric interference and often fading.

It does not seem to matter very much what the reading of the barometer is so long as the glass is steady; in fact, my own experience is that the very best long-distance reception is frequently obtained on thoroughly dirty nights, when the rain is pelting down and the wind is howling round the chimneys.

Good Guides

As we advance from winter-time to spring conditions we must expect a period of fluctuations in both thermometer and barometer readings. It is most likely then that though any week will contain several good nights, it may also have one or two when long-distance work is hardly worth while.

One of the best tips I know for discovering easily and quickly whether long-distance reception is likely to be good or otherwise on any particular night is to make use of what I call reference stations.

These are stations of no great power and situated at considerable distances, whose transmissions are known to come in well on good nights. Since conditions may not be the same over the whole of the medium wave-band, it is just as well to have three of these, one near the lower end, one about the middle, and a third up at the top.

Daylight Reception.

Those that I use myself are Kiel on 232.2 metres, Breslau on 325 metres, and Munich on 533 metres. The settings of these are known exactly, so that they can be tuned in if they are coming through. Five minutes spent with the reference stations will show the reader whether it is worth his while to make an ether trip abroad or whether he can more profitably devote the evening to home reception. On the long waves I can recommend either Huizen or Hilversum (whichever is operating on 1875 metres) and Warsaw on 1411 metres as useful reference stations.

There are many people who believe that long-distance reception is pretty well impossible until after dark. This, however, is not the case, for the long-wave stations can usually be well received, so long as there is some high-frequency amplification available, at any time of day or night when they are operating.

The week-end is an excellent time for hearing them, since 5 X X closes down from 11 a.m. to 2 p.m. on Saturdays and is silent between 11 a.m. and 3 p.m. on Sundays. And these are just the times when many of the long-wave foreign stations are putting out excellent programmes.

Good daylight stations are Radio Paris, Königswusterhausen, Eiffel Tower, Kalundborg and Oslo. The long-wave Dutch transmission is well received in most localities, though not in all, and the same applies to Motala.

Even on the medium waves there are certain stations which are frequently well heard in broad daylight. Chief amongst these are Langenberg, Mühlacker, the medium-wave Dutch transmission on 289.8 metres, and Heilsberg. Mühlacker comes across with such power that his morning programmes can be picked up even on a portable set. I have actually had him on the loud speaker at 9 a.m. with a simple detector plus note-mag. two-valver.

A MAGNIFICENT FORTY-FOUR PAGE BOOK WILL BE GIVEN FREE WITH "P.W." NEXT WEEK, IT IS ENTITLED "1,001 RADIO HINTS & TIPS" AND IS THE BEST AND BIGGEST GIFT BOOK WE'VE EVER PREPARED FOR YOU

Here is the week's medium-wave selection. Stations which are coming in very strongly are printed in Italics. *Budapest, Riga, Vienna, Brussels No. 1, Milan, Prague, Langenberg, Lyons Doua, Rome, Stockholm, Belgrade, Kattowitz, Bucharest, Frankfurt, Toulouse, Hamburg, Mühlacker, Graz, Barcelona, Strasbourg, Brunn, Breslau, Gothenburg, Bordeaux, Lafayette, Kösice, Turin, Bratislava, Leipzig, Hoerby, Gleiwitz, Nuremberg.*

AT the beginning of the year I remarked that the short-wave of the future should be a single-control affair, with one mains plug and a terminal for a small aerial. Although I may be a little slow in practising what I preach, I always do it in the long run, and I have made a start towards it by working hard to get that "single-control" ideal first.

The ganging of two circuits tuned to the same frequency should not present any difficulties, and does not, as we all know, on the broadcast band. On short waves, though, where such a small variation in capacity covers so many kilocycles and shoots through so many stations, we have to use rather more care.

A Practical Scheme.

The best way I have found of solving any small troubles that may arise is this. I have always been in favour of leaving your "D. and L.F." set more or less untouched when using a screened-grid stage; this is, of course, best done by employing "tuned-grid" coupling for the latter. By this I mean that one feeds its anode through a choke and couples down to the top of the existing detector grid coil through a small condenser.

This last is the key to the whole method. This small condenser introduces a certain small amount of damping into that tuned grid circuit. If the damping is of a serious nature it simply means that the condenser is too big.

SHORT-WAVE NOTES

A weekly contribution for short-wave enthusiasts by W. L. S., "P.W.'s" short-wave expert, who operates a very well-known amateur station and is one of the leading experts on the subject.

Now, if we use an exactly similar coil for the grid coil of the screened-grid valve, we can also introduce a similar amount of damping by tapping the aerial on to that coil through a small adjustable condenser.

By experiment one finds the value of capacity that gives this happy state of affairs, and it is quite easily done.

Simply-forget the screened-grid stage for a few moments, having first tuned in some fairly strong and reliable station on the detector tuning. If you now remove the clip coupling the S.G. stage, you will naturally lose the signal.

Definite Proof.

Now, however, you hitch on your small aerial, through a small adjustable condenser, on the same point that the other lead came off. Whether you were tapping the screened-grid stage half-way down the coil or on to the top doesn't affect matters at all, as long as you put the aerial on the same point.

If you adjust the aerial condenser to that, the signal you are testing on comes back to the same dial reading, you have done the trick. It follows that the leading effect upon your detector grid coil is now just the same as it was when the screened-grid stage was coupled up.

If, therefore, you choose an identical coil to this grid coil, and use it for the first grid coil (on the S.G. valve of course) and tap your aerial on to a similar place, through this prepared condenser, you will have, as nearly as possible, similar conditions in the two circuits, and you will find, in practice, that you can tune them quite well with the two halves of a twin-gang condenser.

"Trimmer" Not Necessary.

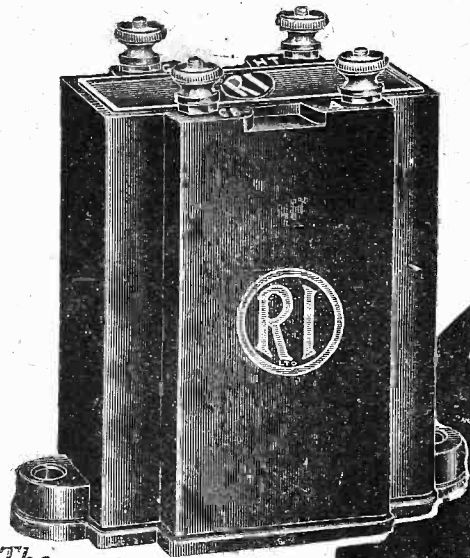
There are, of course, various small inaccuracies in this method, such as those introduced by the grid-filament capacities of the valves. But I have tried it out several times and never have the two circuits been seriously "out of gang" at any part of the scale.

Incidentally, there is no need to provide a "trimmer" across either half of the condenser, since "trimming," when necessary can be achieved by a slight resetting of the adjustable condenser in the aerial circuit.

If your screened-grid stage is behaving as it should, you will find that when the two circuits are ganged in this way the reaction control will hardly need touching from one end of the scale to the other.

The Hub of Radio Progress!

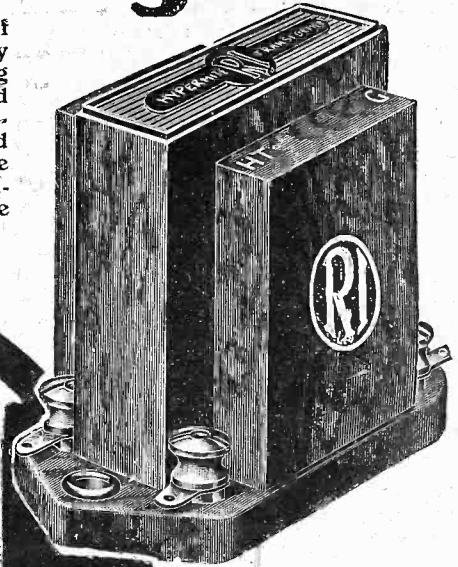
R.I. components cover the whole field of modern radio developments. They satisfy in service, efficiency and price the exacting demands of critical experimenters, and those for whom economy is a big consideration. Their standard of guaranteed excellence is alone possible by virtue of the long years' knowledge, experience and reputation of the manufacturers—one of the oldest in the radio industry.



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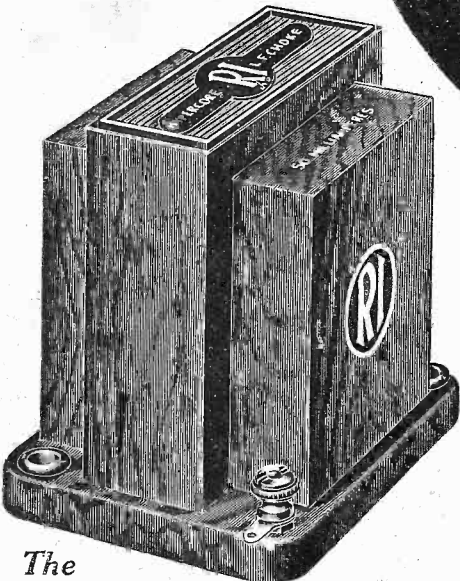
21'.



The HYPERMITE

The lowest priced transformer ensuring absolutely reliable results with modern valves and circuits, and the most efficient in existence for its size and weight. Primary inductance over 50 henries. Ratio $3\frac{1}{2}$ to 1. Weight 7 ozs.

12'6



The HYPERCORE L.F. CHOKE

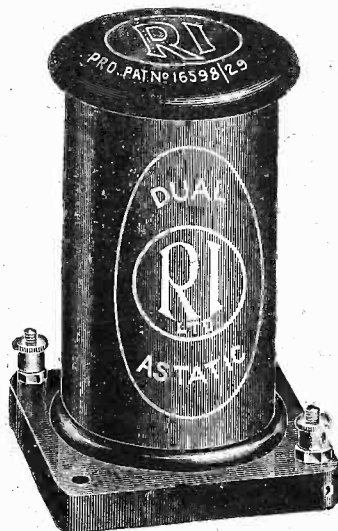
The first nickel iron choke for use as an output filter or smoothing choke. Low self-capacity with high inductance ensures brilliance in reproduction. Inductance 30 henries. Maximum D.C. 80 milliamperes. Weight 18 ozs.

17'6

The New General Purpose SMOOTHING & OUTPUT CHOKE

For output filter smoothing or L.F. coupling (maximum D.C. 60 m.a.). A small general-purpose choke encased in beautiful green bakelite for portables and other receivers where space is limited. D.C. Resistance 400 ohms. Inductance 25 henries. Maximum D.C. 30/60 milliamps. Size 2 x 2½ x 2½ inches high.

12'6

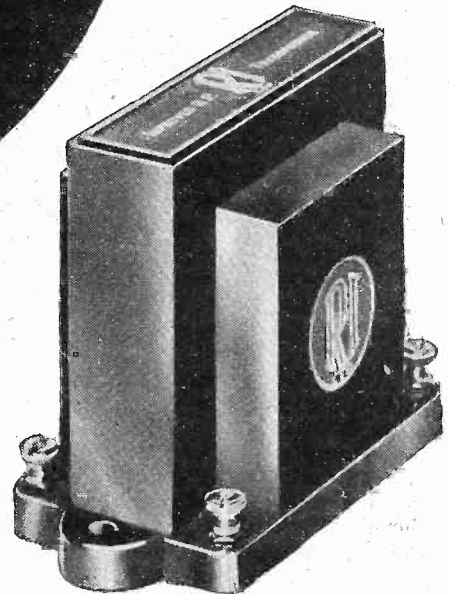


DUAL ASTATIC H.F. CHOKE

Dual Astatic is the "Best Tested Choke." The "Wireless Trader's," reference to R.I. test methods, said "To our mind one of the best Tests (for H.F. Chokes) is that originated by the R.I. Research Dept." Dual Astatic is the only choke that ensures Perfect Amplification from screened-grid valves at all broadcasting wave-lengths. It entirely eliminates blind spots and can be mounted adjacent to other components without fear of inter-action.

Resistance D.C. 630 ohms. Inductance 60,000 microhenries.

7'6



NEW G.P. TRANSFORMER

Latest Improved Model.

A new, larger "general-purpose" transformer for use where considerations of space do not arise. Fitted in a beautiful green bakelite case with an improved iron core, its electrical characteristics show a vast advance on the original G.P. model. Ratio $3\frac{1}{2}$ to 1. Primary inductance 35/40 henries. Weight 18 ozs. The lowest priced transformer with such high primary inductance

10'6

Ask your radio man to show you the new R.I. components and for the new complete R.I. catalogue. If difficult to obtain write direct to the makers.

R.I. LTD., MADRIGAL WORKS.

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Mazda engineers have the longest experience of any in the design and manufacture of A.C. Mains Valves. Sound manufacturing methods ensure robust construction, long life and consistent quality. Their amazingly high efficiency has won for them a reputation as the "World's finest valves." They are standardised in all the leading commercial receivers.

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From all good radio dealers.

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EDISWAN



Politics and Broadcasting

by
Captain
Ian
Fraser

A straightforward talk on a subject of vital interest to us all.

I THINK politicians are generally bad listeners—they prefer talking. This affects their capacity to judge broadcasting, and it must also be conceded, of course, that their work is done mostly in the evenings so that they have not much time to enjoy broadcast programmes.

I am sure that practically every politician would like to broadcast a "talk" and would think that millions ought to hear it; and yet he would probably join in with the rest in denouncing talks, and demanding more music.

Are There Too Many?

How much weight is there in the criticism that there are too many talks? At one time the clamour against talks was great. We do not hear so much of it now. Is this because during the last seven or eight years we have re-learned the lost art of listening? In Dickens' time English people used to listen—we had penny readings and Town Criers. Then came low-priced newspapers and cinemas, and listening became unfashionable.

And when broadcasting arrived we treated it wrongly. Perhaps we turned it on at six or seven o'clock and left it on till we went to bed, regarding it rather like an orchestra in a restaurant—a kind of background to our ordinary conversation. As long as it played music this was not too bad, but when a talk was given it interrupted our talking. We did not give ourselves a chance of listening to it and appreciating it. We merely heard it and were annoyed.

Or else we came in and switched it on and expected it, apart from the magic of bringing anything at all into our homes, to bring the very thing we wanted at the particular moment when we happened to press the button. We switched it off, and said, "Broadcasting is no good; they never send out anything worth hearing."

Political Broadcasts.

Some people still do both these foolish things, but an increasing number, I think, treat broadcasting more reasonably. They look to see what is on, listen if it pleases them, and do something else if it does not. Almost every taste is catered for, and if treated in this way broadcasting will give the most particular listener something that he likes at frequent intervals.

How far ought political matters to be broadcast? There are two ways of looking at this, depending upon whether you are a politician or a listener. I think politicians have not made enough use of broadcasting in England. They complain that the popular

THE AUTHOR

Capt. Ian Fraser has had a distinguished career, both in the Army and as a member of Parliament. He was blinded in the War, and has always been specially interested in Wireless. His name has recently been mentioned as a possible future Governor of the B.B.C.



newspapers distort policy by exaggerating what they like and suppressing what they do not like, and yet they make scant use of the wonderful machine which science has put at their disposal to enable them to talk directly to millions of electors.

For a long time controversy was excluded altogether. The "Morning Post" said that the Englishman's Home was his Castle—that it must not be invaded at night by controversy. No wonder the broadcast spoken word was dull. Imagine how dull the "Morning Post" would be if its splendid leader writers were forbidden to be controversial. The truth is that controversy is the breath of life.

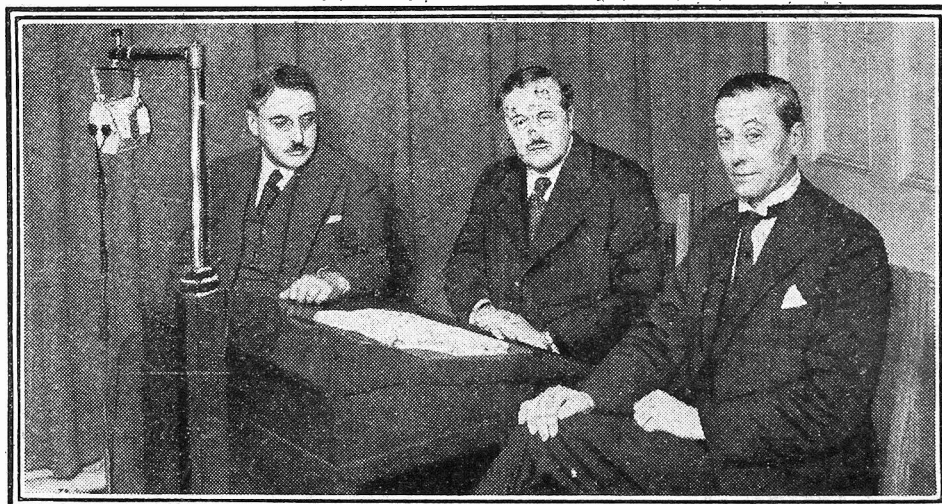
Debates Are Entertaining.

Then there is the point of view of the listener. He certainly does not want too much political talk. But a little argument at nicely-spaced intervals, delivered by men who excel in the art of debate, is not merely interesting to the politically minded but entertaining as well.

It was a Conservative Government which framed the constitution of the British Broadcasting Corporation, supplying it with that measure of public control which a monopolistic service should have, and endowing it at the same time with sufficient freedom from bureaucratic interference to enable it to maintain its commercial management and methods.

It was a Conservative Government which later freed it from its shackles and allowed
(Continued on next page.)

A FAMOUS RADIO DEBATE



This picture, taken in the studio at London, shows—from left to right—Mr. Ramsay Muir, Sir Kingsley Wood, and Mr. Arthur Greenwood at a de-rating discussion before the microphone.

POLITICS AND BROADCASTING

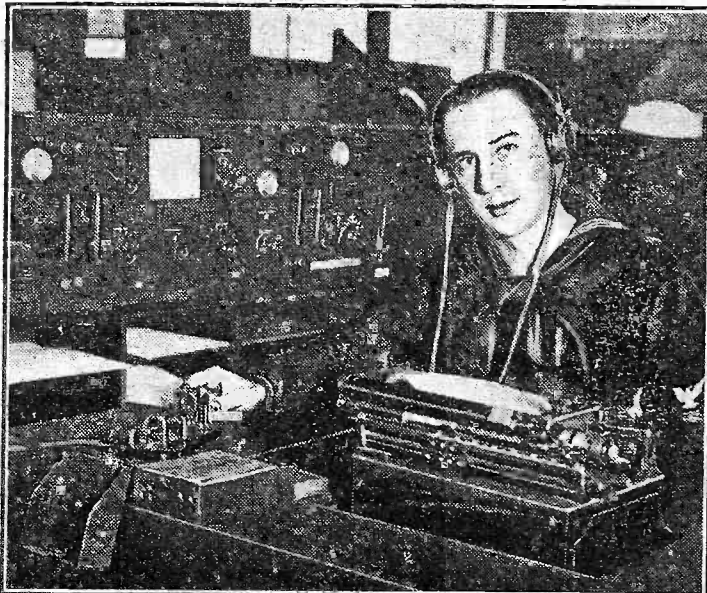
(Continued from previous page.)

it to broadcast controversy. There was a great deal of anxiety in certain Tory circles when this happened. "What will the Socialists do when they get hold of it?" was the question that worried a good many people. It was never, I think, justifiable to hold back freedom from the B.B.C. on the ground that some government some day might abuse this freedom.

What Government Can Do.

Of course, H.M. Government for the time being can, subject to the will of Parliament, and sometimes even in defiance of it, do all manner of dreadful things. They could in theory destroy the Army, the Navy, and the Air Force, or dis-Establish the Church: but in practice they are usually too busy carrying out their promises—or failing to carry them, out and justifying themselves—to do any of these things.

NEWS FOR THE NAVY



This U.S. Telegraphist is well-known to Naval men, because he sends (in Morse) on high power from Arlington the accounts of baseball matches, etc., which are received by U.S. ships in all parts of the world.

I do not think the present Government would wish to interfere with broadcasting, though probably they have not had much time to think about it. Moreover, the framers of the Constitution disassociated the B.B.C. in its day-to-day work from the control of the Post Office. We set up an autonomous body, responsible, of course, ultimately to Parliament, but having a large measure of freedom, power, and initiative. We appointed thereon responsible persons not representing any particular party or parties, but having wide views and broad sympathies, and we made sure that the staff which had built up the service should carry it on.

Give Youth a Chance.

Political partisans tend to become convinced—far too convinced, I think—that their political opponents are not good at anything at all, whereas in fact, all political parties contain persons who are responsible and can be relied upon to carry out a National Trust if it is imposed upon them.

I do not believe the Governors of the B.B.C., provided they are well chosen as individuals, will allow the instrument to be used improperly, no matter to what Party they belong. Nor do I believe that if they did show themselves subservient to a Government which sought to abuse the system, the government would reap any benefit from it. The whole Press of the United Kingdom would be prompt to seize upon any abuse of broadcasting by politicians no matter who they were, and the public are apt to re-act strongly against those who trick and deceive them.

The appointment of the present Governors runs for five years, until the end of this year, when the government of the day will have to re-appoint all or some of them. The best persons, irrespective of party, but including as wide as possible a difference of views and sympathies, should be entrusted with this work, and comparative youth might well be one of the qualifications taken into consideration. We are very apt in England not to trust people until they are old, and not to respect them until they are dead.

As long as we make sure that the right

people guide the B.B.C., and that it is not too closely associated with the Post Office or other Government departments, it will continue to hold its place as one of the most important agencies for the promotion of culture and entertainment in Britain.

TWO USEFUL TIPS

Connecting 'Phones—
For Marking Panels.

Connecting 'Phones.

CRYSTAL-SET Users often desire to connect up two pairs of 'phones temporarily, and in as quick a manner as possible. Even, sometimes, a couple of loud speakers may be required to work together.

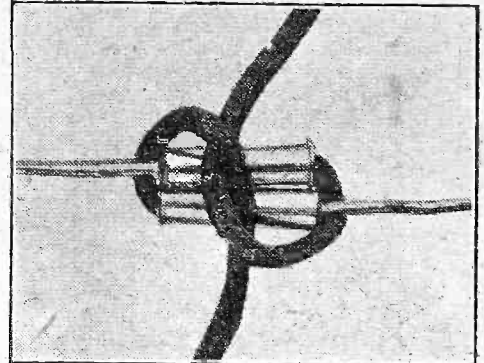
Here is a simple and quick method of effecting the above.

The 'phones or loud speakers are connected up to the set in series, that is to say, one terminal tag of each instrument is connected to the receiver. The two remaining tags are joined together merely by tying them in the manner shown in the photograph.

When tying the terminal tags, see that the metal portions of them are held

together in contact by the loop-knot. Contact will thus be established between the 'phones or loud speakers. If, however, the terminal tags are not held in firm con-

VERY EASILY DONE



A good method of quickly fastening two tags together.

tact together by the knot, "frying" and scraping noises will be heard in the 'phones every time the leads are moved. On the other hand, the knot should not be tied too tightly, or else the wire will tend to be pulled out of the tags.

Very often, however, a small elastic band or two slipped over the knotted area will serve to establish firm contact between the two tags and thus allow the wires to be moved about without setting up unpleasant noises in the 'phones or loud speakers.

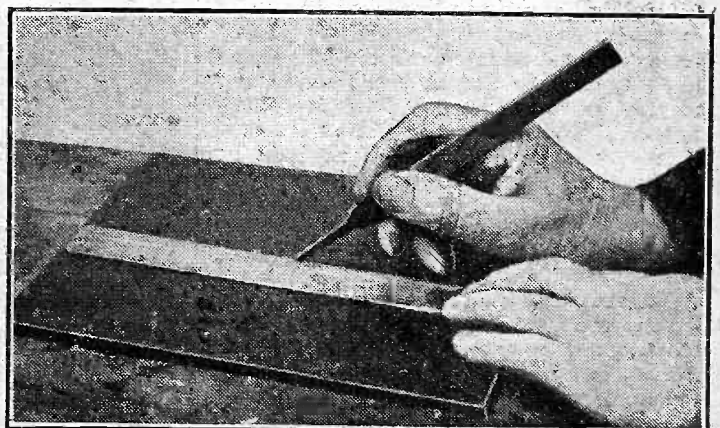
A Useful Scribe.

SOME sort of scribe or marking-out tool is usually required by the constructor when laying out panel assemblies. Many articles, of course, can be used for this purpose, but, to my mind, there is nothing more handy than an ordinary file of smallish size, the pointed end of which has been sharpened up a little by rubbing on a stone.

Such a tool has an excellent balance in the hand, and it can be used to make two varieties of markings—a thin, narrow line, and, when used "broadside on," a wider and rather deeper line. For this purpose, of course, the point of the file has to be sharpened to a semi-chisel shape.

Not only can a file be used in this manner for the scribing of ebonite panels, but, owing to the hardness of the metal, it may successfully be employed for putting any necessary marks on articles of brass, copper, or aluminium.

MARKING OUT THE PANEL



The method of using a file for scribing as mentioned above.

Listening at less cost per hour

Here are low tension batteries specially made for economical sets. You know that with ordinary batteries you do not get the full saving from modern low consumption valves, because the battery has to be recharged every two or

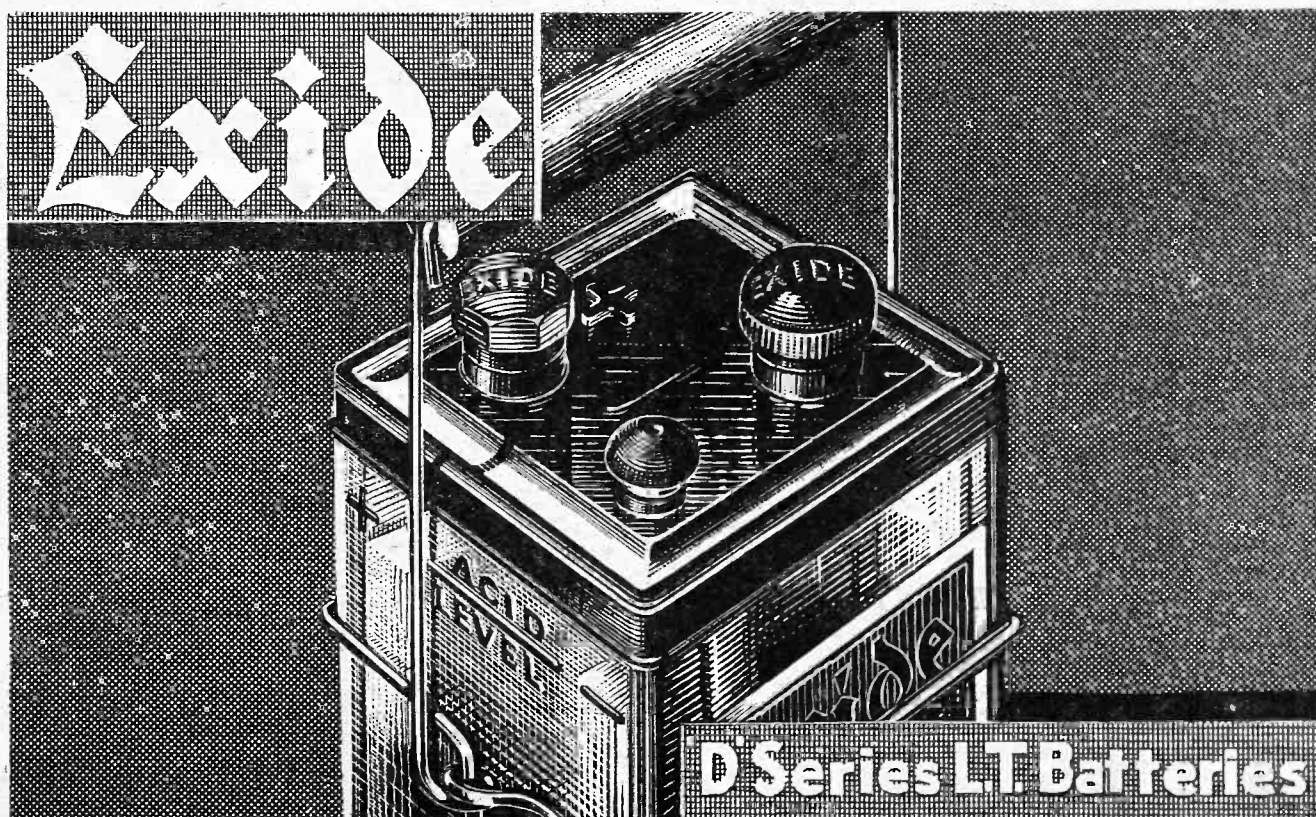
three weeks even if it has not completely run down. This is to prevent it sulphating. Here are batteries that **will not sulphate**. They are made with special "mass" type plates for slow discharges that will stand for months without taking harm. These robust batteries are called the Exide "D" Series.

They mean that you can now use with advantage a battery of a much larger

capacity than before, and so **reduce recharging**.

This, together with their low price, makes them the world's most economical batteries.

Note, too, their **convenience**. Terminals differently coloured and shaped that can be distinguished even in dark corners. Trough to catch acid. Strong metal carrier. All owners of small sets should avail themselves of an Exide "D" Battery.

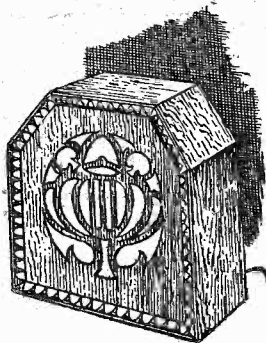


"D" Series L.T. Batteries. Prices per 2-volt cell: DTG, 20 amp. hrs. 4/6 DFG, 45 amp. hrs. 8/6 DMG, 70 amp. hrs. 11/- DHG, 100 amp. hrs. 14/6

From Exide Service Stations or any reputable dealer. Exide Service Stations give service on **every** make of battery

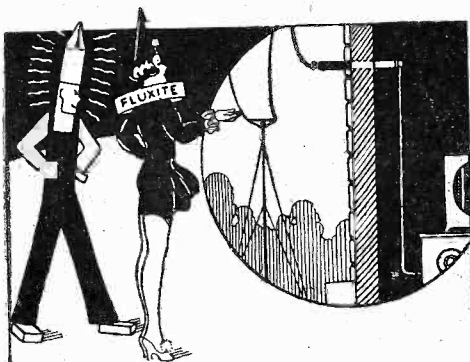
Exide Batteries, Clifton Junction, near Manchester. Branches at London, Manchester, Birmingham, Bristol and Glasgow

M 10



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please*



"We're Fluxite and Solder—
The reliable pair,
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perfection we're seeking;
So we solder the connections
to prevent any leaking."

See that Fluxite and Solder are always by you—in the house, workshop, garage—anywhere where simple, speedy soldering is needed.

They cost so little but will make scores of everyday articles last years longer! For Pots, Pans, Silver and Brassware; Radio; odd jobs in the GARAGE—there's always something useful for Fluxite and Solder to do.

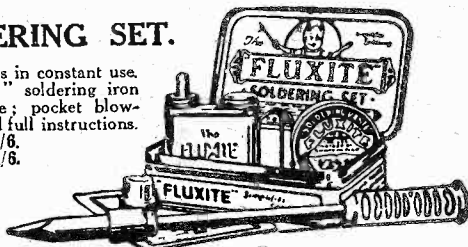
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Stores sell Fluxite in tins.
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FLUXITE SOLDERING SET.

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FLUXITE
IT SIMPLIFIES ALL SOLDERING

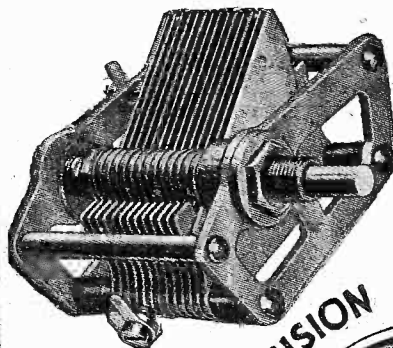


PRECISION INSTRUMENTS for the COMET 3

J.B. Precision Instruments are scientifically designed—they are the work of practical engineers.

J.B. precision ensures accuracy of workmanship and careful finish. J.B. design cuts away all surplus material without in any way impairing strength. The two together combine to give you instruments of high efficiency and unvarying calibration.

Specified for the Comet 3 is a J.B. Junior Log Condenser and a No. 1 Thumb Control.

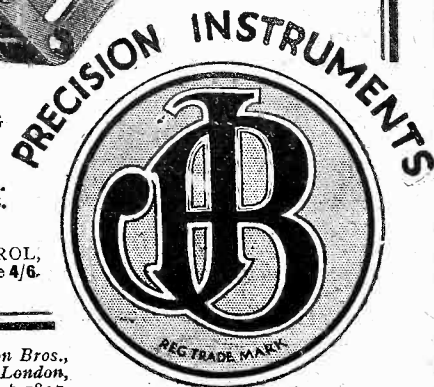


J.B. "JUNIOR" LOG CONDENSER.

(Prices without dial).

'0005 7/-. '0003 6/9.
'00025 6/6. '00015 6/6.

J.B. THUMB CONTROL,
Type No. 1, Plain. Price 4/6.



Advertisement of Jackson Bros.,
72, St. Thomas' Street, London,
S.E.1. Telephone: Hop 1837.

CAPT. ECKERSLEY'S — QUERY CORNER

Some questions and answers of general radio interest that will aid you in your radio reception.



SHORT - WAVES AND HAND CAPACITY—IS IT WORTH IT?
—AUTOMATIC G.B.

Under the above title, week-by week our Chief Radio Consultant comments upon radio queries submitted by "P.W." readers. Don't address your questions to Captain Eckersley however; a selection of those received by the Query Department in the ordinary way will be answered by him.

Short Waves and Hand Capacity.

K. E. S. (Kensington).—"I have in use an all-wave set which gives excellent results on both the medium and long-wave coils. On the short-waves, however, the set suffers badly from hand-capacity troubles.

"Why should the set be quite free from hand-capacity troubles on the normal wave lengths, and yet suffer from hand-capacity troubles on the low waves?"

It is curious that in answering your question I had just replied to another which more or less covered the same ground.

As the wave-length on which you wish to receive becomes shorter, the frequency gets greater. Thus a wave-length of 30 metres has a frequency of ten million alternations per second.

Now a condenser has an effect which is proportional to the frequency, and obviously when you come to this very high frequency the effect of stray capacities is greater than at lower frequencies.

There are several ways of getting over the trouble. Screening is one, and if you are building a detector and 2-note mags, you can easily enclose the high-frequency circuits in an earthed metal box, connecting one side of the condenser to that earthed metal box, when your hand will not make any effect provided the screening is carried out properly.

Some people (not to bother the tinsmith) put a long ebonite handle on to the condenser and carry it right away on a sort of insulated remote control, when the hand need never approach the set nearer than say 1 ft. Of course, the screening method is by far the better.

Is It Worth It?

T. J. R. (Manchester).—"My receiver consists of a detector and 2 L.F., both transformer-coupled. Two valves would, I imagine, be quite adequate for the local

station, since the volume control is always set at the minimum position when receiving from the local.

"Am I likely to reduce my H.T. consumption very much by switching out one of the L.F. stages? L.T. consumption does not matter in my particular case.

"On going into the matter, I find that a suitable switch will cost 7s. 6d., and that is quite a fair proportion of the charge for a new H.T. battery. Unless, therefore,

amps. taken by my set and find out the number of hours working I would expect from my battery.

I would then find out the cost of battery and so work out the high-tension consumption costs per hour. I would next do the same piece of arithmetic assuming that the battery was not asked to supply the current for my penultimate stage of low frequency, and I would again work out the cost per hour.

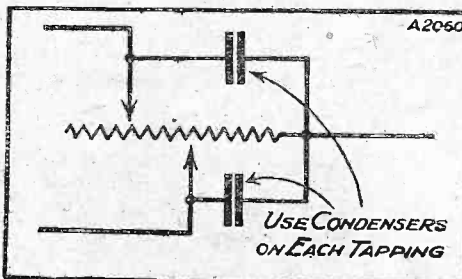
I would then make a calculation as to the probable total length of life of my set and I would write off the 7s. 6d. switch over that time, and I would thereby have a direct comparison between the cost of high-tension consumption without buying the switch, and the cost of high-tension consumption plus the write-off charge of the switch.

I would also be careful to see whether I was not going into details a little bit too much considering that I would have to write off valves and perhaps the whole set itself over a certain period of years, and that this depreciation and maintenance charge of the whole set might be very large compared to the current consumption charge.

Automatic G.B.

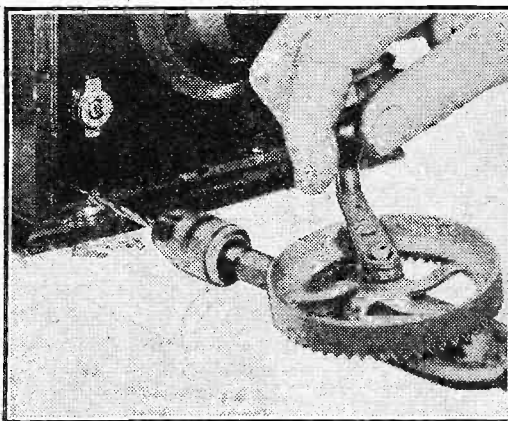
H. J. J. (Harrow).—"I am thinking of obtaining automatic grid bias for my receiver by inserting a resistance between H.T. — and L.T. —. Two grid-bias voltages are required—is there any reason why a tapping should not be taken from each L.F. stage to one resistance?" No, provided you place a condenser between each of the tappings on the biasing potentiometer and earth.

GETTING "FREE" GRID BIAS



This is the method referred to above.

THOSE FIXING SCREWS



To ensure a good fit drill through the panel into the base-board when both are in position in the cabinet.

it is likely to reduce my H.T. consumption to a marked degree, the conversion would hardly be worth while.

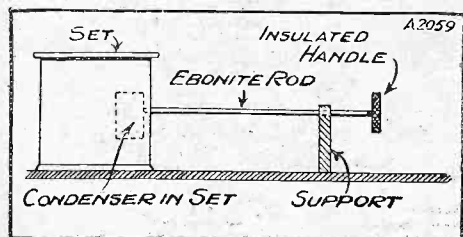
"Would I benefit or otherwise by switching one of the L.F. valves out of circuit?"

This seems to me to be a question of economics, but economics is an exact science (in spite of the books you read on the subject!), and I am at a loss to give you advice without exact knowledge of a fundamental factor, namely, the proportion of the current consumption absorbed in the penultimate stage of your low frequency, the cost of your set, and the length of time you expect it and its other components to last?

This, however, is the way I would go to work if I knew these factors. I would say that my battery had an ampere-hour-capacity of J.

Suppose, for instance, a battery discharges at 5 milliamps for 100 hours, then dies, it has half an ampere-hour-capacity. I would thus divide J by the total number of

USING A TUNING EXTENSION



The old-fashioned method of extension-rod control.

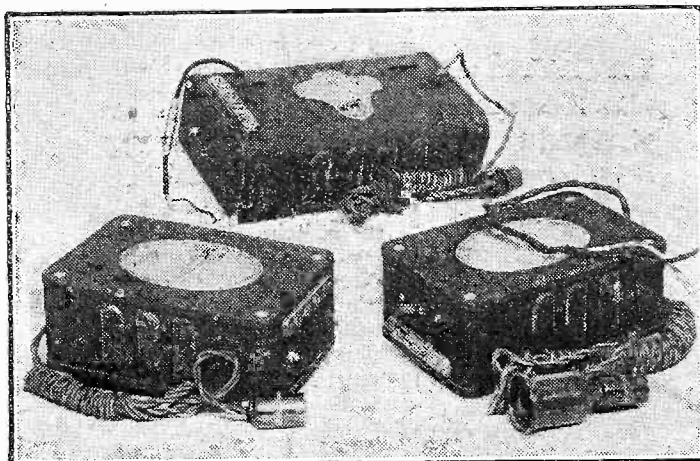
FROM THE TECHNICAL EDITOR'S NOTE BOOK.



CHEAPER ELECTRIC RADIO.

IT'S such a very simple matter nowadays to make your set—any set, any portable—“all-electric” to the extent of obtaining H.T. and accumulator-replenishing current from the mains, that I cannot help believing that there must be a large proportion of our readers who still stick to battery-operated receivers solely because of the question of expense.

Now Regentone have again gone a long



Here are the three “Regentone” Mains Units. Neat little chaps, aren't they?

way towards removing this possible difficulty by introducing three new mains units at prices which I believe are far below anything hitherto available. With these new Regentone Mains Units on the market one can hardly believe that anyone interested in “all-electric” radio will hesitate, on the score of expense, to convert his set to mains operation. It must be remembered with regard to these new units that they fit inside any portable receiver, though they are, of course, equally suitable for all popular two-, three- and four-valve receivers.

There is one D.C. unit (Model II.) and this embodies an L.T. charger ($\frac{1}{2}$ to 1 amp.) as well as giving 120 volts H.T. at 25 milliamps. There are three fixed H.T. tapplings, viz., 60/70 volts, S.G. and power. The price of the excellent little D.C. unit is a mere £2 12s. 6d.

There is an H.T. unit for A.C. mains (Model W1D) with a similar output arrangement, and this is only £3 7s. 6d.

The A.C. combined unit (H.T. with L.T. charger, Model W5A) has a 120-volt 20-m/a H.T. output and an efficient trickle charger, and this costs £4 15s. 0d.

So you see these units are most excellent value for money, and do constitute a distinct challenge to the H.T. battery in point of initial costs—the first time, I believe, the battery has received a real challenge on this ground. In running costs—but you will not require me to tell you how the mains pay in that regard!

Now for our tests with these units. We have a very comprehensive power supply especially installed in our Research Department, and this enables us to take off D.C. and any voltage at any frequency of A.C. So we are well placed for giving practical tests to any kind of mains apparatus.

The little D.C. model was found to give its rated output with a bit to spare, and in regard to both separation and smoothing it can give points to many more expensive instruments. Needless to say we were critical in respect of the qualities in view of the fact that the units are particularly applicable to portables, and portables show up discrepancies of mains-unit design very markedly, as many “P.W.” readers will know.

The A.C. models also gave an excellent showing, and I have no hesitation in saying that these, too, are every bit as good as quite a few more elaborate and more expensive units I have had on the bench.

Regentone are to be congratulated on making available such fine little units at such reasonable prices.

NEW MARCONI VALVES.

I have the pleasure of introducing to you two new Marconi 2-volters. I say pleasure, because I have a very soft spot for the 2-volter and must place on record (for the umpteenth time!) that I reckon 2-volt valve advance is one hundred times as important as that of any other voltage rating. Apart from anything else, I suppose 75 per cent of listeners use 2-volt valves.

Well, the Marconi L.P.2 has the staggering mutual conductance of 3.85. Does that mean anything to you? Maybe it doesn't, but if I mention it means the L.P.2 is a 2-volt valve about four times as good as a good 6-volter of a year or two ago,

you may begin to see that it is a little tube that commands attention.

It is a small power-valve with a 2-volt, 0.2-ampere filament, having an amplification factor of 15 and an impedance of 3,900 ohms. And those figures mean it is capable of sufficient power output for all ordinary purposes, and has an unusually low energy consumption. It is obviously particularly suitable for portable and other receivers where economy, performance, and cost must be considered.

The Marconi P.2 is, in the fullest sense of the term, a super-power valve, and it also

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 guarantee their safe return undamaged, as it is our practice thoroughly to dissect much of the gear in the course of our investigations!

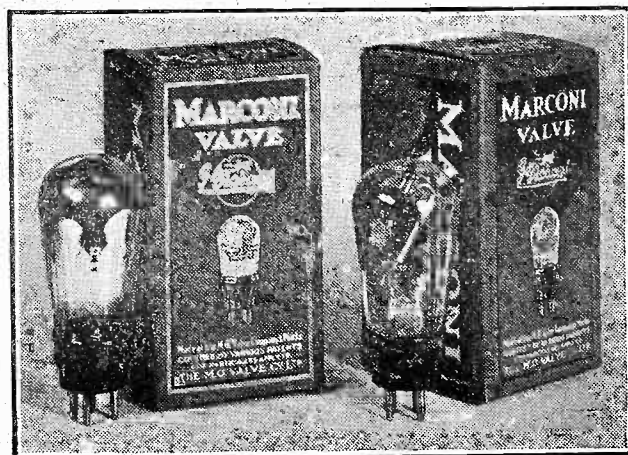
And readers should note that the subsequent reports appearing on this page are intended as guides to buyers, and are therefore framed up in a readily readable manner free from technicalities unnecessary for that immediate purpose.

has a 2-volt 0.2-ampere filament with an amplification factor of 7.5 and impedance 2,150 ohms. It achieves the impressive mutual conductance of 3.5. It is capable of sufficient output properly to drive a large cone or moving-coil speaker, yet is economical and suitable for use in the last stage of portable and other receivers operated from a limited H.T. supply.

I have carefully tried both these new Marconi valves and I find them just as excellent as their characteristics promise they should be.

NEW SIX-SIXTY VALVES.

Six-Sixty Radio Co., Ltd., are producing a new A.C. valve, the SS.4Y.SG, and a new 2-volt power valve known as the SS.220.PA.

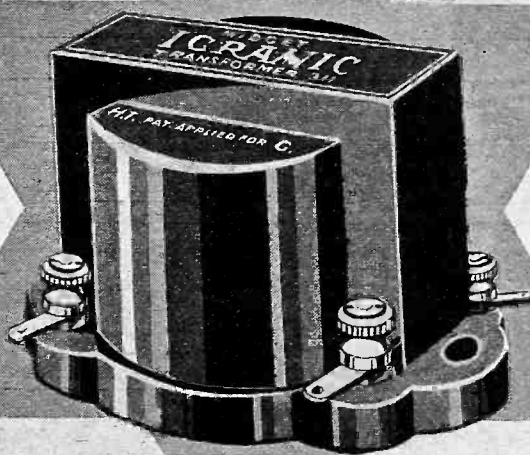
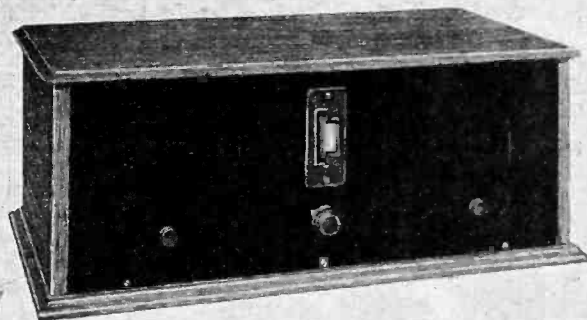


The two new Marconi two-volters step out of their cartons so that you can see them!

IGRANIC

"Midget" L.F. Transformer
is Specified for the
POPULAR WIRELESS
"COMET THREE"

Primary Inductance
of over 60 Henries



PRICE
10/6

If you are unable to obtain Igranic components locally, write direct to us, to Dept. R.170.

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Designed for those who truly appreciate Quality in Radio Reception

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Specified for The 'COMET' & every other set of importance

If any further proof of the high standard of Telsen performance is needed, it is contained in the fact that in every new circuit of note the designer has chosen Telsen Components, thus assuring maximum results. For vivid clarity of tone, purity and volume of reproduction, Telsen Components are absolutely unrivalled. For perfect reception—fit

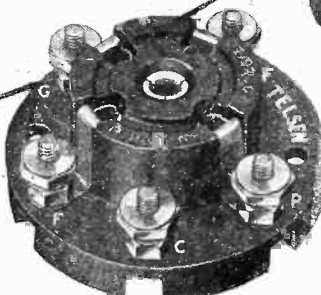
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TELSEN H.F. CHOKES.
Designed to cover the whole wave-band range from 18 to 4,000 metres, extremely low self-capacity, shrouded in Genuine Bakelite. Inductance 150,000 microhenries. Resistance 400 ohms.

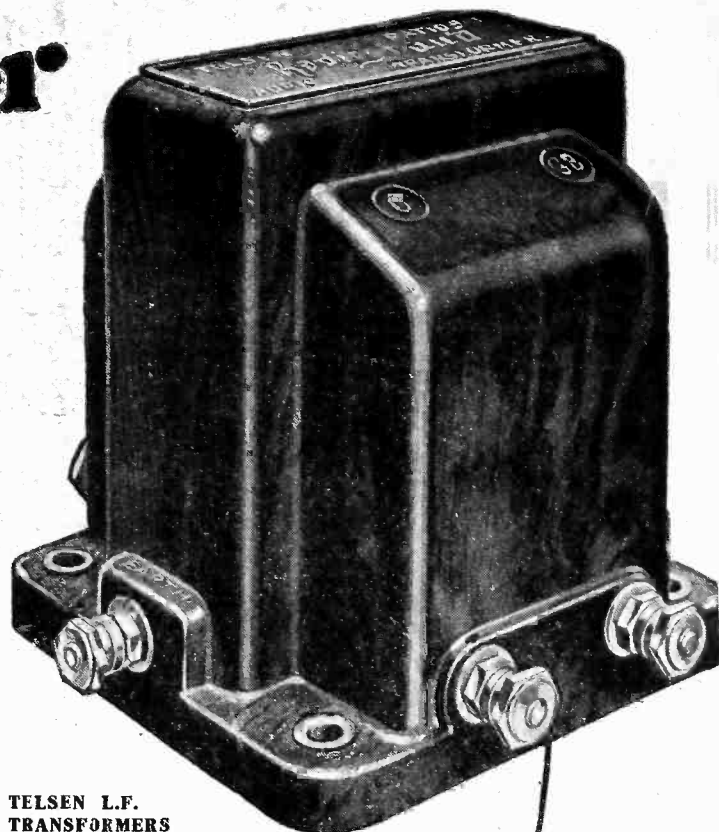
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Pro. Pat. No. 20286/30. An entirely new design in Valve Holders, embodying patent metal spring contacts, which are designed to provide the most efficient contact with the valve legs, whether split or non-split. Low capacity, self-locating, supplied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



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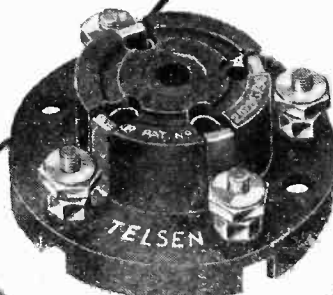
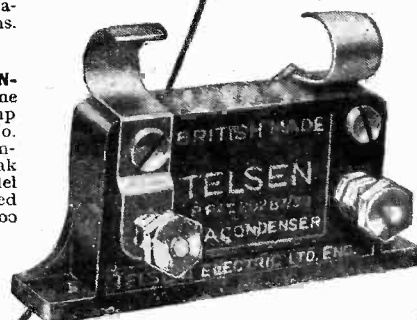
TELSEN L.F. TRANSFORMERS

"ACE" Ratios 3-1 and 5-1	8/6
"RADIOGRAND" 3-1 and 5-1	12/6
(Specially Selected and Specified for the "Comet" 3.)	
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TELSEN GRID LEAKS.—Absolutely silent and non-microphonic, practically unbreakable, cannot be burnt out and are unaffected by atmospheric changes. Not being wire wound there are no capacity effects. Made in capacities 1, 1/2, 1, 2, 3, 4 & 5 megohms. Price 1/- each.



TELSEN FIXED (MICA) CONDENSERS.—Shrouded in Genuine Bakelite, made in capacities up to .002 mfd. Pro. Pat. No. 20287/30. .0003 supplied complete with Patent Grid Leak Clips to facilitate series or parallel connection. Can be mounted upright or flat. Tested on 500 volts. Price 1/- each.



TELSEN FOUR-PIN VALVE HOLDERS
Specially Selected and Specified for the "Comet" 3.
Price 1/- each.

FROM VOLTS TO MILLIAMPS

HOW TO MAKE AN ORDINARY VOLT-METER GIVE H.T. CURRENT READINGS

By
T. P. BLYTHMAN, B.Sc.

MANY listeners possess a pocket voltmeter for measuring the voltage of the accumulator and the high-tension battery. Such an instrument can also be used to measure milliamps if the owner is willing to make a simple calculation first.

The ordinary voltmeter gives a low-tension reading of 6 volts, and it is this scale that we shall use. If we know the resistance of this coil, which should be stated on the dial of all reliable instruments, it is easy to calculate the current flowing through the meter when a voltage of 6 is applied across its terminals. The resistance of the

By connecting the instrument between the negative of the high-tension battery and the accumulator, the reading, when it is multiplied by five, will tell us the total current taken from the battery by all the valves. (See Fig. 1.)

One Valve at a Time.

If the voltmeter is connected in the anode circuit of each valve in turn it will tell us how much current each valve is taking. It will also give us an idea of the correct value of grid bias to give the low-frequency amplifying valves, because if the pointer is not steady it shows that distortion is taking place and the grid bias must be altered.

Another use to which the voltmeter can be put is to find the exact voltage on the plate of the valves. This, we know, will be less than that of the battery because of the drop in voltage across the resistance of the anode circuit.

In the case of a resistance-coupled amplifier the value of the resistance is known, and so we can proceed at once to find the current flowing in the circuit. The voltmeter is connected between the resistance and the high-tension tapping, as in Fig. 2, and the deflection noted.

Suppose this to be .2 volt. By multiplying this by five we have a current of 1 milliamp flowing. Ohm's law gives us the statement that $V = C \times R$, and if the anode resistance is 100,000 ohms, we have $V = 100,000 \times .001$, which equals 100 volts.

Actual Voltage on Anode.

Thus, the fall in voltage across the resistance is 100 volts. If the battery is 120 volts, only $120 - 100$, which is 20 volts, will be applied to the anode. This shows how small a fraction of the voltage actually reaches the anode in a resistance-coupled amplifier.

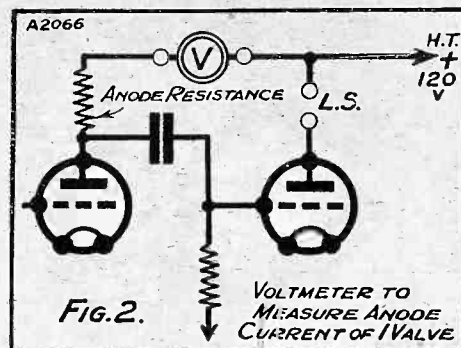
When the primary of a transformer or choke is in the anode circuit the resistance of this must be found before the drop in voltage can be calculated. The valves are removed from the set and the batteries are disconnected while the voltmeter is placed in the same position as before. The negative of the high-tension battery is connected to the vacant socket of the valve holder formerly occupied by the plate of the valve. (See Fig. 3.)

The high-tension tapping is now adjusted so that a deflection of at least 1 volt is obtained on the voltmeter. This corres-

ponds to 5 milliamps. Suppose the voltage which gives this deflection be 10. Then, by applying the law that $V = C R$, we have $10 = .005 \times R$, and therefore $R = 10$ divided by .005, which is 2,000 ohms. This value of R includes the resistance of the voltmeter, as this time it must be taken into account.

Replacing the valves and adjusting the high-tension voltage to the correct amount, we now measure the anode current, and we

CHECKING ONE VALVE



The meter now reads only the H.T. current passing to one valve.

will suppose this to be 2 milliamps—that is, a deflection of .4 volt. Making use of Ohm's law again, we have the drop in voltage equal to $2,000 \times .002$, which is only 4 volts.

The actual voltage on the plate of the valve will this time be $120 - 4$, which is 116 volts. This will explain why it is more difficult to get reaction with a resistance of the order of 100,000 ohms in the anode of the detector valve. It also points out the necessity of using high voltages in resistance-coupled amplifiers.

Useful for Many Purposes

Of course, the uses of the voltmeter employed in this way are not confined simply to the examples given. You will find many other cases where it will be helpful.

For instance, if you wish to verify the value of an anode resistance you can proceed as follows. Measure its value in the same way as you find the resistance of the transformer primary, and after subtracting the resistance of the meter, compare the figure with the nominal rating of the resistance.

These experiments are simple to perform, and only require a cheap voltmeter and the easy calculations outlined above. The enthusiastic amateur will be well repaid by spending a little time in performing them, and will derive a greater knowledge of the working of his receiver from them.

AN INTERESTING TEST

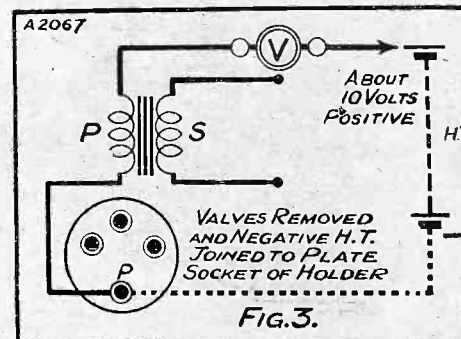
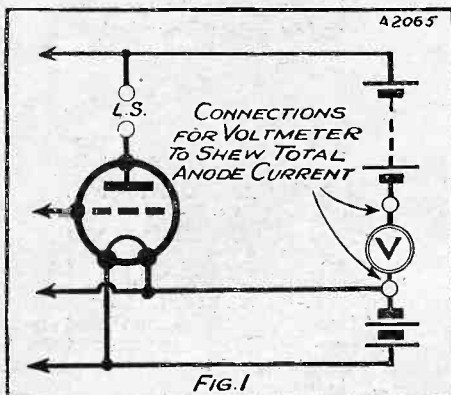


FIG. 3.

Checking the voltage drop across a transformer primary.

READING THE TOTAL



The meter is joined between H.T. and L.T. negative, so that all the H.T. current passes through it.

low-reading coil is usually about 200 ohms, and we shall take this figure for our calculation.

Ohm's law states that the voltage across the ends of a wire is equal to the product of the resistance of the wire in ohms and the current flowing in it measured in amps. In symbols, $V = C R$. If we know two of these values the third can be found by a simple calculation. In this case, $6 = C \times 200$, and therefore $C = 6 \div 200$, which equals .03 amp. or 30 milliamps.

The Scale in Milliamps.

Thus, a scale reading of 6 volts corresponds to a current of 30 milliamps, and so 1 volt deflection on the scale means that 5 milliamps of current are flowing. To change volts to milliamps on the scale we must multiply by five. Having now graduated the scale we can use the voltmeter to measure the high-tension current flowing in different circuits.

If you were to look the word "Comet" up in an encyclopedia you would probably find something to the effect that it was an affair with a brilliantly shining head and a sparkling tail. You will discover ere long that the name is about as appropriate a one as could be chosen for "P.W.'s" "star" set design for 1931.

The brilliant "head" you see this week. The "sparkling tail" will gradually unfold itself week by week in future issues, until

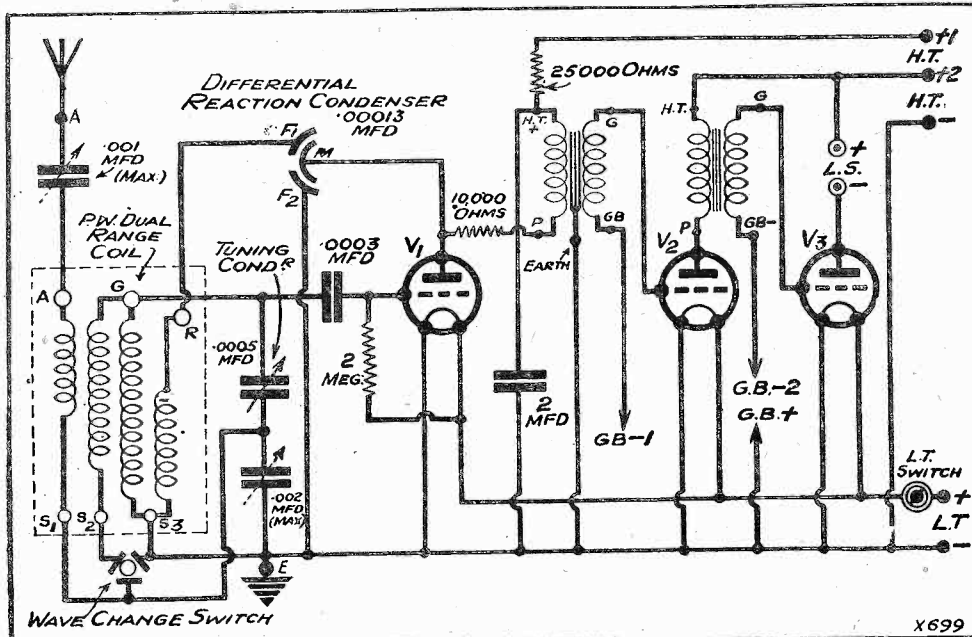
whole of the tail to arrive before you will have much of a set.

On the contrary, what you are seeing this week is the "Foundation" version, and it is absolutely complete in itself.

Definitely New Features.

Just as it stands it is the finest set of its type ever produced. A strong statement, maybe, but one we make with entire confidence. The "Comet" is the outcome

EVERY WORTH-WHILE RADIO REFINEMENT PROVIDED FOR



The theoretical circuit of the "Comet" is shown above. It forms the self-contained foundation for the most "progressive" receiver ever designed.

the whole is disclosed and the set of the year is revealed in all its details and with all its possible refinements.

We have a tremendous lot to tell you about this wonderful receiver, so perhaps we had better start in to explain things at once.

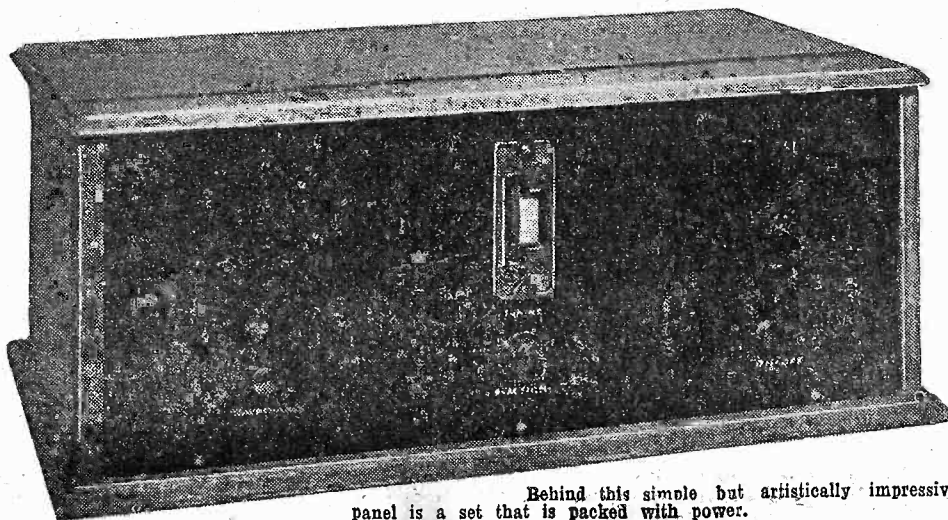
First of all, about that "head and tail" business; don't make the mistake of thinking that the "head" is in any way incomplete and that you must wait for the

of many years of research into the problems involved in receivers of this type, and it embodies every feature we have found worth while.

Many of these have never been presented in combination before, and their total effect is so noteworthy that this fact alone would justify the strong claim we have just made.

That is not all, however. Very far from it, for there are many things in the design which are definitely new.

THE THREE-VALVE RECEIVER WITH A FUTURE



Behind this simple but artistically impressive panel is a set that is packed with power.

The COMET

Here is a set you have been looking for—a "star of stars" embodying all that is best of the most recent radio developments. The Full-Size Blue Print given free with this copy of "P.W." emphasises the extreme simplicity of construction, and you will see at a glance that it is indeed the perfect home constructor's set. But though everything possible has been done to make the "Comet" easy to build, no sacrifice in results has been made as you will find when you try the set out. The purity and power of reproduction will astound you.

The basic idea of the foundation model is a receiver of absolutely top-notch efficiency, of the detector and two L.F. type, extremely simple, yet giving a standard of performance impossible even a few months ago.

Faultless Results.

Simplification has not been carried too far of course, and even the "Foundation" version has a sufficiency of refinements to satisfy

START TO BUILD NOW

- | | |
|--|---|
| <p>1 Panel, 18in. x 7in. (Peto-Scott, or Goltone, Lissen, Permicoletc.).</p> <p>1 Cabinet to fit, with baseboard 10 in. deep (Cameo, or Pickett, Osborn, Look, Kay, etc.).</p> <p>(NOTE.—If you intend to use the "Comet" as a radio-gram outfit it is suggested that you just build it on panel and baseboard, and defer the purchase of a cabinet until you have seen a later article in the series.)</p> <p>1 .0005-mfd. "thumb control" variable condenser (J.B., or other compact type such as the Cydon, illustrated elsewhere, or the Polar).</p> <p>1 .0001-mfd. or larger, up to .0002-mfd. differential reaction condenser (one in set is of .00013 mfd., and this value, or the similar one of .00015 mfd., is particularly suitable) (Lotus, or Ready Radio, Igranie, Ormond, Polar, J.B., Dubilier, Lissen, Wearite, Magnum, Parex, Burton, etc.).</p> <p>1 L.T. switch (Ready Radio, or Goltone, Lissen, Igranie, Lotus, Benjamin, Bulgin, W.B., Keystone, Magnum, Red Diamond, Wearite, Junit, Ormond, etc.).</p> | <p>1 Three-pole switch, right type over plain three (Ready Radio, Keystone, Diamond).</p> <p>1 "P.W." or Ready stone, G. Tunewell.</p> <p>3 Valve holders (Igranie, Benjamin, Formo, num, etc.).</p> <p>1 .0003-mfd. (Ready T.C.C., lard, etc.).</p> <p>1 2-mfd. sen, Igranie, Hydra.</p> <p>1 2-meg. (Dubilier, Ferranti, lard, etc.).</p> |
|--|---|

A MAGNIFICENT SET AS IT STANDS—AND

THREE

such amazing flexibility and capabilities as has never before been put into the hands of the home constructor.

But you need not make *all* the additions. You can pick out just the one, or whatever combination of refinements, you think you require, and leave out those which do not appeal to you. Our series of articles will make all this perfectly clear and simple, and if you care to follow them right through we can promise you a most fascinating time as the receiver grows week by week in its capabilities.

Have No Misgivings.

The wonderful sensitivity and excellent selectivity of the "Comet" are based very largely upon the remarkable "P.W." high-efficiency dual-range coil in the detector circuit, used in the best modern fashion.

Tests under a wide variety of conditions have shown that here is a receiver which really will bring in a satisfactory string of foreign stations at proper loud-speaker strength so long as it is given a fair chance, with an outdoor aerial of reasonable efficiency and valves of the right types.

On an indoor aerial it will perform better than any other set of its type

have tested, but no great number of foreign stations can be expected, and the volume of those which can be reached will not be very satisfactory. Under such conditions a set with a screened-grid H.F. valve is really required.

Its selectivity is very good, too, and it will be adequate for all situations outside the areas of acute difficulty close to main and Regional broadcasting stations.

Even here much can be done by a suitable setting of the selectivity control, but we are not depending on the standard model to cope with these special conditions.

Next week will be described the remarkable new "P.W." method of coupling the aerial circuit which has been christened "Flexi-Coupling." This imparts an absolutely amazing degree of selectivity and actually increases the volume of the foreign stations.

Have no misgivings on the score of selectivity, therefore. Build the "Comet" and quite likely the standard version will prove adequate to your needs. If you should find you need more selectivity, just add "Flexi-Coupling" and then you are certain of success.

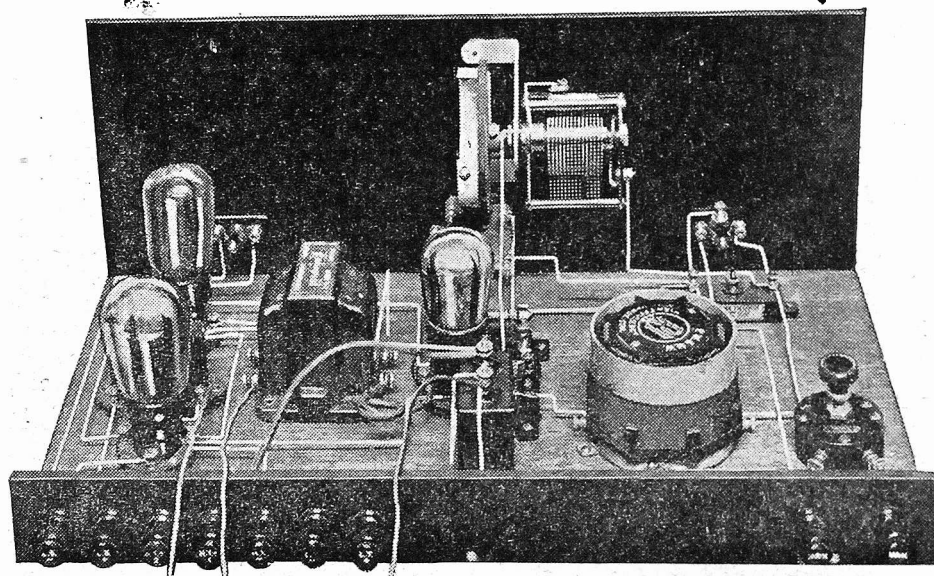
Exceptional Power.

Much of the exceptional power of the "Comet" comes from its remarkable L.F. amplifying circuits. Here we have the modern type of transformer coupling in both stages, with a proper filter in the detector feed to prevent battery coupling, with the addition of an important novel feature, never before used, we believe, in a set without H.F. amplification.

This is an earthing screen underneath the whole set, which has been found to have a truly remarkable effect in ensuring stable and perfect functioning from a high-power L.F. amplifying circuit. It seems ludicrously simple, but it does its job most effectively.

1. EASY TO BUILD
2. PANEL WAVE-CHANGE
3. VIRILE REACTION
4. PERFECTLY PROGRESSIVE
5. COMPLETELY ADAPTABLE
6. NO COMPLICATED COMPONENTS
7. POWERFUL L.F. AMPLIFICATION
8. SPECIAL STABILITY SYSTEM
9. SINGLE DRUM-DIAL TUNING

THE "COMET" IS HERE



Scientific simplification is the keynote of the set. It includes nothing that is unnecessary, but every worthwhile radio refinement has been provided for.

the critical user and ensure faultless results.

That is the "head" of the "Comet," and you can build it with the certainty that you will have an extraordinarily fine set even if you fit none of our later additions. It has been so designed, however, that without any alterations at all to the first lay-out all sorts of valuable refinements can be worked into it.

It is purely a matter of additions of the simplest sort, and if you make them all you will have a receiver of

WITH THESE PARTS

- 1. Wave-change be of the f change-e, but a (motion).
- 2. L.F. transformers, low or medium ratio (Telsen "Radiogrand" and Igranie "Midget" in original set. Other satisfactory pairs can be chosen from the usual good alternative makes, e.g. Varley, Lissen, Ferranti, Lotus, Mullard, R.I., Lewcos, etc. See text).
- 3. Spaghetti resistances, one of 10,000 and one of 25,000 ohms (Ready Radio, or Bulgin, Keystone, Magnum, etc.).
- 4. Compression - type adjustable condenser, .001-mfd. maximum (marked "Selectivity Control" on blue print) (Lewcos, or Lissen, Polar, R.I. Formo, etc.).
- 5. Ditto, .002-mfd. maximum (Formo, etc.).
- 6. Terminal strip, 18 in. x 2 in. (Peto-Scott, or Wearite, Ready Radio, etc.).
- 7. Sheet of copper foil, 18 in. x 10 in., for covering underside of base-board (Ready Radio, or Parex, Keystone, etc.).
- 8. Terminals, markings as on blue print (Belling & Lee, or Ealex, Igranie, Clix, etc.).
- 9. G.B. plugs (Belling & Lee, or Clix, Ealex, etc.). Glazite, screws, etc.

FOUNDATION OF LIMITLESS POSSIBILITIES!

CONSTRUCTING THE "COMET"

To supplement the Blue Print here are some further practical set-building details of the "Comet" Three, which will enable even the most inexperienced to make a good job of it.

THE description you have just read will have given you a pretty clear idea of what the "Comet" is and what it can become if you follow through this series of articles, so now we can get down to business and set about telling you how to build it.

Drilling the Panel.

To begin at the logical point, let us tackle first the question of panel drilling. For the comparatively simple standard version of the receiver this is a very easy and quick business. It will be quite easy to add the holes for extra gadgets, too, for we have devised a special scheme for this which we will tell you about next week.

First of all, you want just three holes for single-hole mounting components, these being the reaction condenser and the L.T. and wave-change switches.

The Reamer.

Having marked out the positions for these on the back of the panel, run a $\frac{1}{8}$ -in. drill through each to provide a pilot hole. Then examine the components, select a drill of the right size for each, and enlarge up the holes correspondingly. Drilling is

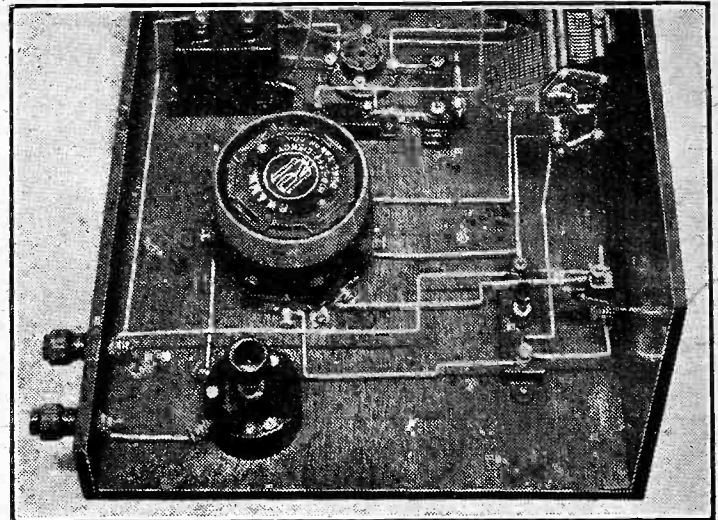
made much easier and more accurate in this way.

If you haven't got a very large selection of drills, by the way, don't forget that you can do the enlarging job very easily and quite quickly with the useful tool known as a reamer.

Mechanics are apt to scoff at this method, but it is a mighty handy one for the man who is not too well equipped with tools.

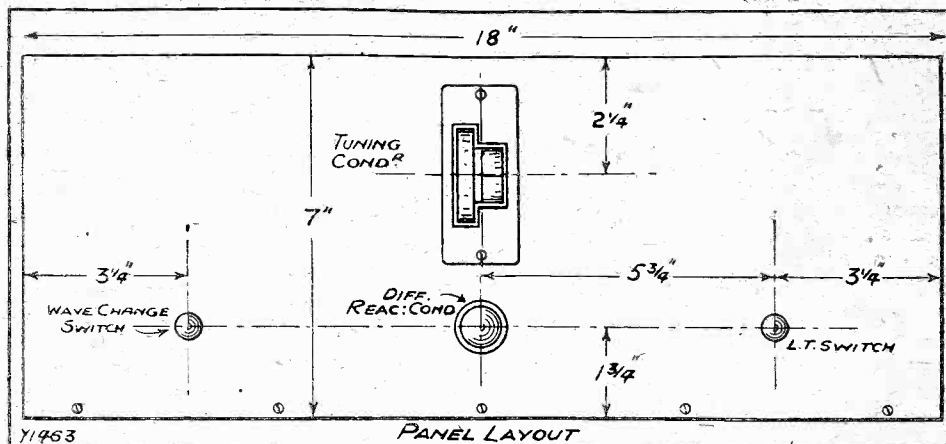
Then comes the hole for the tuning condenser. The drum-control type we used

DUAL-RANGE TUNING



By the mere operation of the switch in the right foreground you can tune in either long- or medium-wave stations without the bother of coil changing.

A PERFECTLY PROPORTIONED PANEL



Very great care was taken in designing the panel, so that it presents a pleasing appearance and provides perfect ease of control.

With the aid of the template mark out the outline of the oblong with a sharp-pointed instrument, then, at each corner, drill a $\frac{1}{8}$ -in. hole. The best way of completing the job is to join up these holes with a fretsaw, and this is the method we advise.

Quite Cheap.

Quite a cheap hand fretsaw will serve, such as you can purchase for perhaps 5s., and it is really worth while to get one, for it will prove a most useful tool. The best

blades to get are the fairly fine-toothed ones intended for metal work, and a few spare ones are advised; they are easily broken in ebonite if you have not used a fretsaw before, and they are very cheap.

As an alternative to the fretsaw there is the drilling and filing method. This takes a bit longer, but, after all, it is worth a little time to make a set like the "Comet," isn't it?

Take your $\frac{1}{8}$ -in. drill and run a series of holes along the outline of the desired oblong cut. Put the holes as close together as you can without their breaking through into each other, and when you have done take a chisel or a strong knife and proceed to join them up.

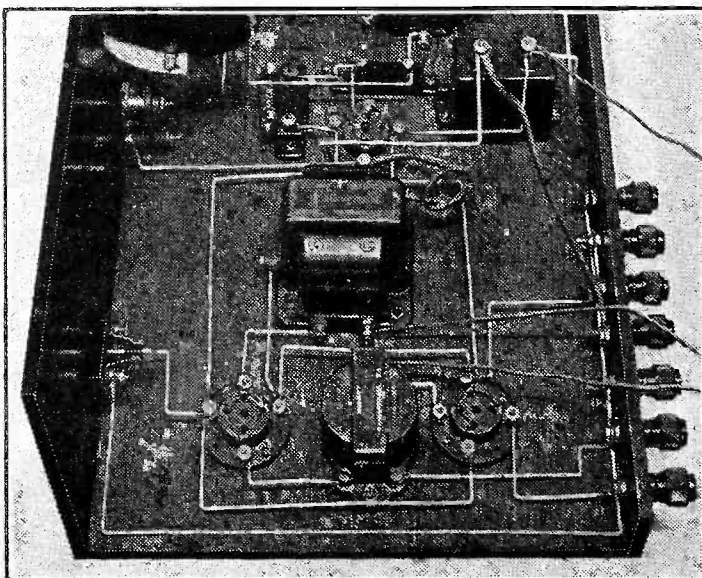
The Panel Finished.

Now knock out the oblong piece of panel thus released, and trim up the ragged edges of the hole with a coarse file. It may look a bit of a job on paper, but it is easy enough in practice, and you needn't worry unduly about making a very accurate job, because the "escutcheon plate" which goes on the panel will cover up any minor mistakes.

So much for the panel. Do not fix any of the components to it yet, but turn your attention to the baseboard. To the underside of this you have to fix the sheet of copper foil which acts as a stabilising

(Continued on next page.)

THE TAIL OF THE COMET



Without straggling, ample space has been left in the layout for the addition of the various refinements which you may care to add to the set later on.

in the original set requires an oblong hole to be cut, and this job takes a little longer.

Of course, you could use an ordinary type of single-hole-mounting condenser if you like, provided that it was compact, and

fit it with a small vernier dial like the Igranic "Junior." The "thumb-control" type, however, gives a set an attractively modern appearance, and it is very pleasant to operate.

Not Difficult

Besides, there is no really serious difficulty about the fitting, for the condenser is accompanied by a "template" which makes the job quite straightforward. This template indicates the outline of the oblong hole to be cut, and also the position of the holes for the two screws which fix both the condenser and the "escutcheon plate" to the panel.

CONSTRUCTING THE "COMET"

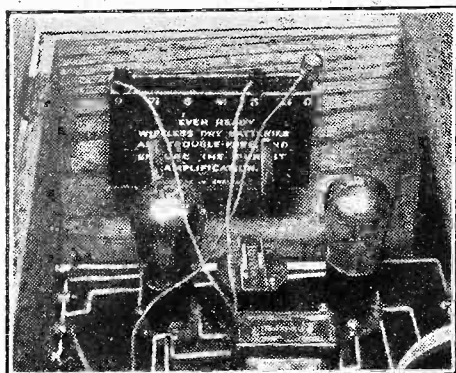
(Continued from previous page.)

screen in a manner you will by now understand.

See that the foil fits the baseboard nicely, and trim it with scissors if it tends to project at the edges anywhere. Next fix it to the baseboard with screws round the edges, and a few dotted about in the middle and elsewhere to hold it close to the wood and prevent it from sagging untidily.

The best screws to use, by the way, are small brass ones (about $\frac{1}{4}$ in.) with counter-sunk heads. Drive them in firmly and their heads will scarcely project at all.

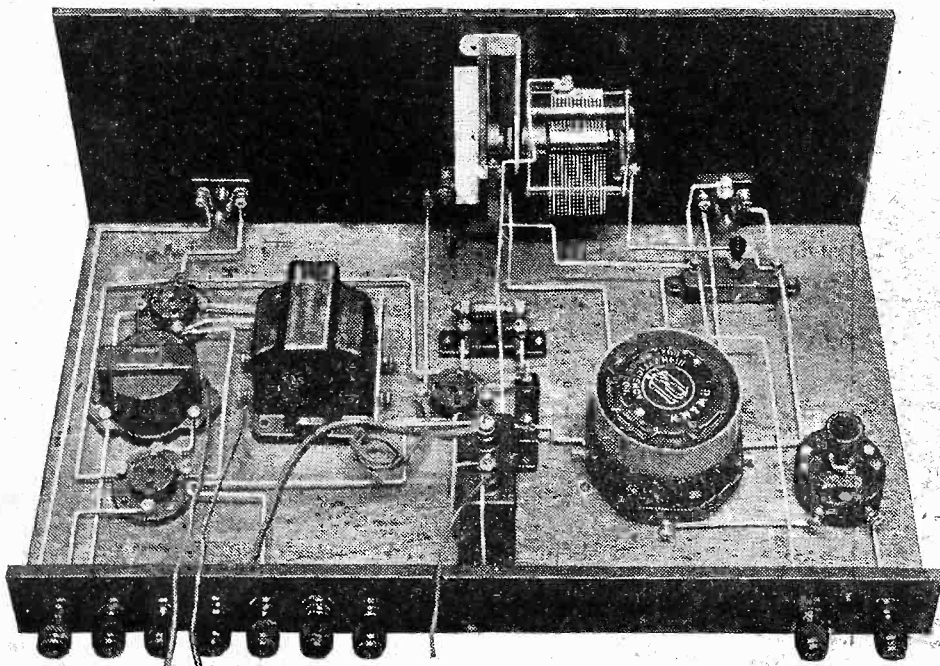
HOW G.B. IS FIXED



The best place for the grid-bias battery is on the side of the cabinet, as shown.

Now a very important point. Provision *must* be made for connecting this copper sheet to earth. We did it by means of a strip of copper foil gripped under the main sheet, i.e. between the sheet and the wood, by one of the fixing screws at the edge.

NO NEED TO SOLDER A SINGLE WIRE



Every lead is taken direct to a terminal. There is absolutely no need for soldering and its attendant mess and bother.

This strip must be so placed that it can be bent round and gripped under the earth terminal, either under the head or, better still, under the nut on the shank of the terminal. It is as well, therefore, next to drill the terminal strip and fit the terminals.

Fixing the Foil.

This done, you will be able to mark where the earth terminal comes, and so fit the copper tab in exactly the right place, with an extra screw to hold it. To make it easy to grip under the earth terminal, by the way, it is as well to cut the end of the tab like a spade terminal (small scissors), although a plain hole will do.

The next step is the fitting of the terminal strip, and the panel to the baseboard. This is done with a few screws through the parts in question into the front and rear edges of the board.

Just one hint here: It is usual to fit panel, strip and baseboard flush at the edges. For the "Comet" it is better to raise the baseboard just a fraction—say $\frac{1}{16}$ in.—up, so that if the heads of the screws

The "Comet" gives you

Loud-speaker Results from Many Stations.

Life-like Reproduction.

Velvety Reaction Control.

Scope for Future Developments.

fixing the copper foil project a trifle they will not scrape on the bottom of the cabinet as the set is put in or drawn out.

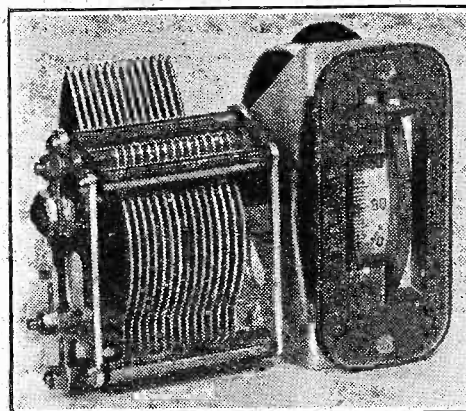
Keep to the Specification.

Now, with the strip, the panel, and the baseboard fitted together, you can proceed to mount the four components on the panel,

and then you are ready to begin the layout and fixing of the parts on the baseboard.

This is the main part of the work, and although there is nothing "critical" about the layout of the "Comet," we must warn

THUMB CONTROL



Here is the special "Cydon" condenser, suitable for use in the "Comet."

you to make a very good copy of the original set.

The reason for this is not an electrical one at all. It is simply that you may want to add the various refinements we shall be describing later, and they won't go in properly unless you copy our spacing, which was carefully worked out to admit them.

Copy the Blue Print.

Take the blue print, therefore, and a ruler, and measure off the positions of the parts with reasonable care before fixing them down. To be sure, a quarter of an inch or so either way won't matter, but try to keep within some such limit as this.

When all the parts are in place, and their positions checked (see that the terminals of the coil come in the right places, too) you are ready to start wiring, and here we have very little to tell you, because the blue print makes it all so clear. It is just a matter of working over it wire by wire, and as each connection is added marking off the corresponding line on the print as a check.

No Soldering Required.

It is particularly to be noted that no soldering is required or advised. The connections all run between points which have nuts or terminals, and again a close copy is recommended, and for the same reason.

There is really only one actual wiring point for us to explain, and that concerns the connection between the L.T. circuit and the fifth terminal on the second L.F. transformer (the Telsen one). This has the effect of earthing the core, but it is not essential, being merely an extra stabilising precaution. If your particular transformer has no fifth terminal, just omit the wire in question.

Mention of transformers, by the way, reminds us to add that it is as well to use the lowest ratio available in any particular type in which a choice is offered.

Now a final point: some types of thumb-control condensers are supplied with a screening plate, but this is not required with the "Comet" and should be omitted in fitting.

THE COIL IN THE "COMET."

Here are full details for making the famous "P.W." Dual-Range Coil used in this remarkable receiver.

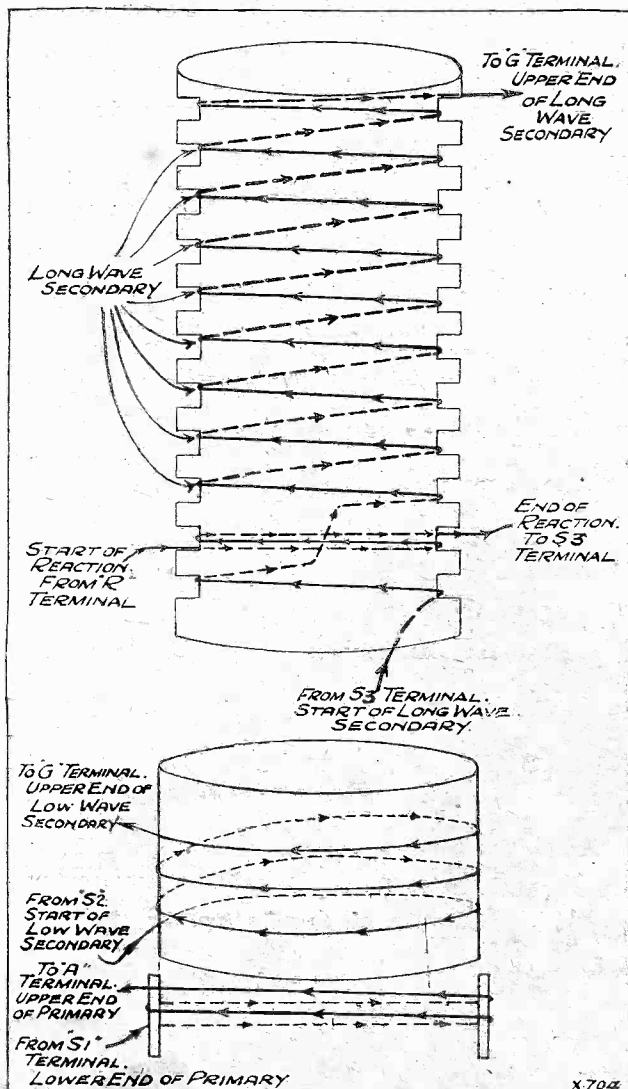
THE coil used in the "Comet," to which the receiver owes a good deal of its phenomenal power, is the new "P.W." high-efficiency dual-range unit. There is no doubt that this coil raises wave-change switching to quite a new standard of efficiency.

It wipes out those losses which many people have thought inevitable with wave-change switching, it is definitely of superlative efficiency judged purely as a coil, and it is scientifically worked out to meet the needs of modern circuits.

A "Flexible" Coil.

Better still, it has been designed with the greatest care to render it what may be termed "flexible," i.e. to make it suitable for use in all sorts of different circuits. Thus it can be used over and over again in all kinds of receivers.

BUILD YOUR OWN COIL



This drawing, although not to scale, contains a great deal of important detail.

It is quite within the powers of a careful constructor to make a satisfactory specimen of the unit for himself if he follows the instructions faithfully and closely, and the specification has been given in "P.W." twice. However, this was some time ago, and in any case our circulation has gone up considerably since then, so we are repeating it briefly for the benefit of new readers.

The windings of the unit are carried on two main formers, which are placed one inside the other. The outer is a tube of some good insulating material, e.g. "Pirtoid," 3 in. diameter and 2½ in. long. This carries the low-wave secondary winding, with the aerial (or primary) winding arranged over the lower end of the secondary on ebonite spacers.

The Long-Wave Former.

The inner former is of the ribbed type, e.g. "Beacol," with 8 or 9 ribs. Length, 2½ in.; diameter over the ribs, 2½ in. The diameters of these formers are most important, and any serious variation in either may upset the working of the unit completely.

The ribbed former carries the long-wave secondary and the reaction winding in a series of slots. These are made by filing with the edge of a small file a series of notches in the ribs. There are eleven of these slots in each rib, and these are about ⅜ in. wide, with ⅜ in. space between each slot and the next. The top slot is ⅜ in. from the top end of the former. Depth to be ⅜ in. (This usually means the full depth of the ribs.)

The inner former is fixed and positioned inside the outer with six brass screws about 1 in. long passing outwards through holes in both formers. To locate the inner one properly in a roughly central position, i.e. with an equal space all round between it and the outer one, use small bushes cut from ebonite tube and slipped on to the screws, or extra nuts and washers.

These screws serve also as terminals. Put double nuts and a washer on the outer end of each (a soldering tag also if you like) and secure the various ends of the windings to the inner ends of the screws, i.e. under their heads.

The Windings.

The screws should be placed round the lower edge of the unit, about ¼ in. therefrom, in positions you will be able to gather from the blue print (wiring diagram) of the "Comet," and marked to agree therewith.

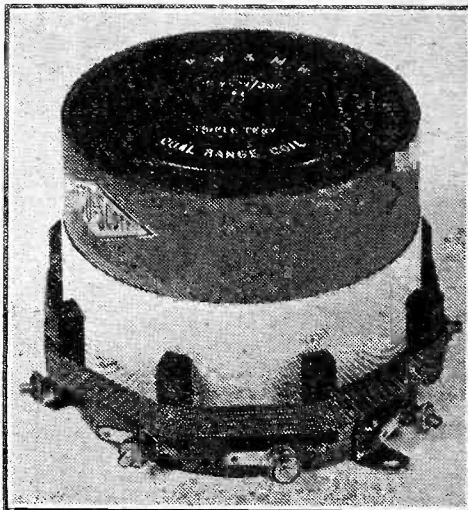
Provision for fixing the unit down is easily made; small brass brackets, or a wooden cross-piece fitted inside the lower end of the ribbed former before the unit is assembled.

Windings: Primary, 12

turns of No. 24 D.S.C. wire, on 8 or 9 "spacers"; these to be about ⅜ × ¼ × ⅜ in. long, of ebonite. Low-wave secondary, 48 turns of same wire in a single layer on the 3-in. tube. Gauge of wire and nature of covering must be as specified.

For directions of these (and the other) windings, see special diagram. This makes

CONCENTRATED EFFICIENCY



The "P.W." Dual-Range Coil is already famous as an aid to simplified tuning. This is a well-known commercial version made according to "P.W." specification.

the point clear, and also indicates to which terminals the ends of the windings are to be connected.

The long-wave secondary has 250 turns of No. 26 D.S.C. wire, occupying 10 of the slots, i.e. there are 25 in each slot. These slots are: No. 1 from the bottom, then No. 3, No. 4 and so on up to the top, i.e. all the slots except the second one up from the bottom. This is left for the reaction winding, which is 30 turns of No. 30 D.S.C. wire.

Check Your Windings.

To get the long-wave secondary winding across from slot No. 1 to No. 3 might seem difficult, with the reaction coil in No. 2 in between, but it is easy enough really. Put the reaction in first, and then take the secondary wire across the top with a bit of paper between, or put the secondary on first and take the wire across from slot 1 to slot 3 flat on the surface of the former. Put a bit of paper over it where it crosses before putting on the reaction winding.

The positioning of the windings is very important. The lower edge of the primary must be over the lower edge (i.e. the bottom turn) of the low-wave secondary, and this in turn must come over the bottom slot in the ribbed former.

That really completes the instructions you need, and if you follow out the specification conscientiously you cannot fail to turn out a coil of very high efficiency indeed.

Above all, see that your formers are of the correct sizes and that your windings are in the correct directions.

The connections of the windings to the terminals should be checked over very carefully indeed from the special diagram on this page. To identify the start of the reaction coil you might tie a knot in it. We have labelled the "start" and "end" differently this time, by the way, but the final result is just the same as that produced by the original instructions.



THE "COMET" THREE

START RIGHT with the "COMET"

The "Comet" Three is just the set to appeal to every "P.W." reader. Powerful, sensitive, selective, with splendid quality yet extremely easy to build and very inexpensive. A receiver which will give you wonderful results, providing you use Components which you know are the best obtainable.

From time to time "Popular Wireless" will tell you of additions and alterations which you can make to your "Comet" if you wish. Whether you do or not, you must START RIGHT.

Start right with Ready Radio. Build your "Comet" with a Ready Radio Kit and you have our guarantee that every Component is of the highest possible efficiency and thoroughly tested before dispatch.

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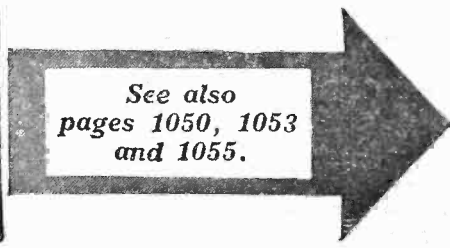
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See also
pages 1050, 1053
and 1055.

THE "COMET" THREE

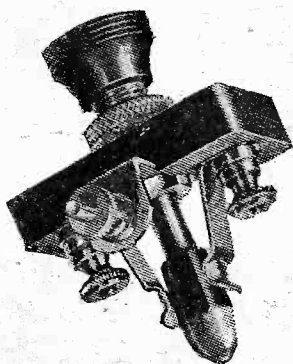
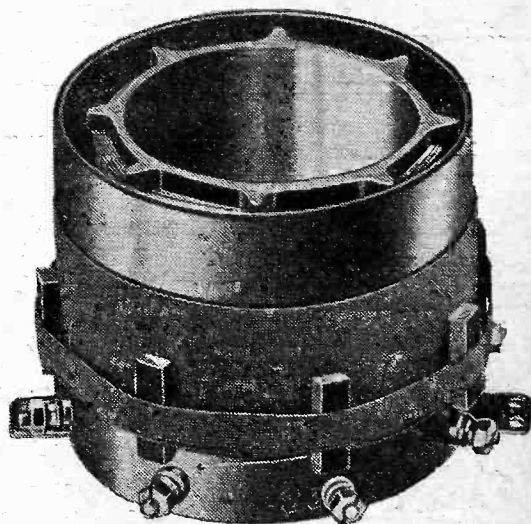
START RIGHT with READY RADIO.

"P.W." DUAL-RANGE COIL

The Coil which is so largely responsible for the wonderful sensitivity and excellent selectivity of the "Comet" Three. Covers medium and long wavelengths with an entire absence of the usual dead-end losses. Incorporates reaction winding. Made strictly in accordance with "Popular Wireless" specification with the highest grade materials. Fitted with easily accessible terminals and brackets for baseboard mounting.

Price 12/6

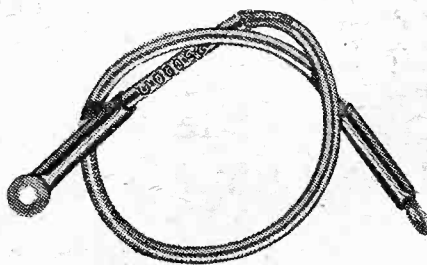
No Ready Radio Coil leaves our test-room until it satisfies the conditions laid down by "Popular Wireless" and has received an actual broadcast test.



READY RADIO WAVE-CHANGE SWITCH

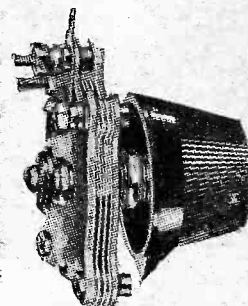
A special three-point Switch, specially designed for this type of circuit. Designed on low-loss principles, giving certain contact, smooth action and long, reliable service. One hole fixing. Attractive knob.

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READY RADIO DIFFERENTIAL REACTION CONDENSER

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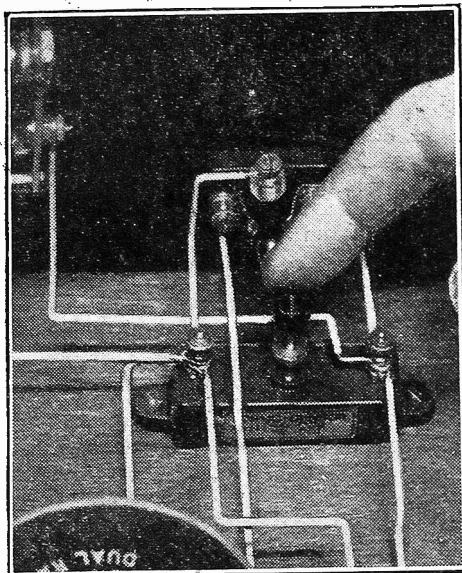
Telegrams: READIRAD, SEDIST

See also pages
1049, 1050 & 1053

WHEN you arrive at the exciting moment when your newly-built "Comet" is ready to go on test you can demonstrate the truth of the claims that have been made for it. To help you to get the very best possible results from it we have prepared some operating notes and general hints in rather greater detail than usual, because we expect quite a number of new readers will be making the "Comet" as their first set.

First comes the choice of a trio of valves, and this is rather important. Even the "Comet" cannot give good results if you give it unsuitable valves, or valves of poor efficiency.

BROOKMANS COUPLING



To this scheme of condenser coupling is due the remarkable long-wave efficiency achieved in the "Comet."

For the detector you want a valve of either the "H.F." or "special detector" type. Examples of the first are the Cossor 210H.F., Mullard P.M.2.H.F., Osram or Marconi H.L.210, Mazda H.F.210, Six-Sixty 210 H.F.

Suitable "special detector" types are the Mullard P.M.2.DX., Dario "Super Detector," Six-Sixty 217D, Cossor 210 Det., etc. We have found that slightly better results are usually obtained with one of these valves, but there is not very much difference to be observed.

The L.F. Valves.

For the first L.F. stage you should use a valve of the L.F. type, a few examples being these: Mazda L.210, Mullard P.M.1 L.F., Cossor 210L.F., Marconi or Osram L.210, Six-Sixty 210 L.F.

OPERATING the "COMET"

How you get the last ounce out of this remarkable receiver.



Plenty of foreign programmes are waiting to be pulled in. Get your share!

In the third socket you have to decide between the "power" and "super-power" types. The latter is much to be preferred, because in so extremely powerful a set the ordinary power valve is very easily overloaded.

The super-power type, however, runs away with a pretty heavy H.T. current, and really requires a battery of the "triple-capacity" size, and not less than 100 volts. With a mains H.T. unit, of course, the matter is simple. Choose a super-power valve, by all means, so long as your unit is rated to deliver, say, 30 milliamps or more.

Avoid Overloading.

Where the H.T. supply is limited and economy must be practised the ordinary power type is to be preferred. Be careful to avoid overloading on strong stations, however, and limit the volume to the level the valve will handle nicely without distortion.

This is a most important point. You simply cannot get good quality if you just tune in the local fully and take no steps to keep the volume within reasonable bounds. This is absolutely essential with so powerful a set unless you have a most enormous super-power valve and very high voltage H.T. supply.

The simplest method of volume control in the standard model "Comet" is the following procedure: Set reaction to minimum, and reduce the setting of the "selectivity control" to minimum; in other words, unscrew the knob to the limit of its effective travel. If the volume is still too great, just detune a little on the tuning drum.

High H.T. Not Essential.

A special feature of the "Comet" is that it does not absolutely demand a high voltage H.T. battery, such as must be used with a screened-grid set. It will definitely work with only about 60 or 70 volts, so far as bringing in the distant stations is concerned. Of course, a higher voltage is needed to handle strong signals properly, and to get good quality from the local you really want 100 volts, or so.

The adjustment is simple: To terminal H.T. + 1 apply from 40 to 60 or 70 volts, adjusting it for the smoothest possible

reaction control. On H.T. + 2 just apply all the voltage you have available, as much as 150 being permissible with modern valves. Of course, such a figure will only be possible for those with mains H.T. units. About 100 or 120 volts will serve admirably for general purposes.

Now the controls in brief. Push the wave-changeswitch inwards for long waves, pull

outwards for medium waves. Adjust selectivity control thus: First screw down fully, then gradually unscrew until just sufficient selectivity is obtained. Reaction is increased by turning to the right; use it to keep the set nearly, but not quite, oscillating when searching.

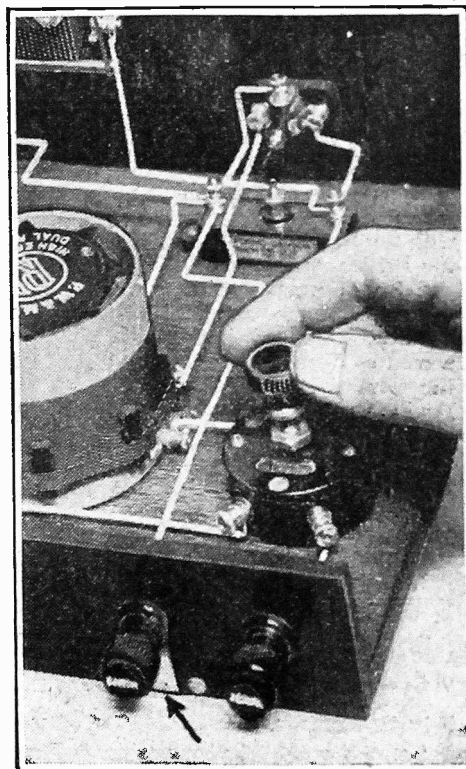
Aerial Coupling Adjustments.

Aerial coupling on long waves: Set .002-mfd. compression type condenser to a midway adjustment, then try varying either way a little and re-tune. A little experimenting will soon find the setting which best suits your aerial.

By the way, on some aerials you will occasionally find you can get better volume on long waves by screwing the selectivity control knob fully down. You are not likely to need to do this often, but the tip is worth remembering if ever you come across a very weak long-wave station.

With the grid-bias adjustment it is a little difficult to deal helpfully, because valves vary so much in their requirements. You should really be guided by the data slip you will receive with the valves.

VARYING SELECTIVITY



The adjustment of the aerial-series condenser sharpens your tuning to the required degree for your aerial. The arrow indicates the earthing tab of the copper screen.

ALTERNATIVE MAKES OF L.F. TRANSFORMERS.

The following pairs of L.F. transformers (in addition to those seen in the photos) have been tested in the original receiver and found to give satisfactory results:

Varley "Nicore I" and Ferranti A.F.3.	Varley "Nicore II" and Lotus.
Ferranti A.F.3 and Igranic "Midget."	Telsen "Ace" and Lissen "Tonex."
Lissen "Super" and Lissen "Tonex."	R.I. "Hypermite" and Lotus.
Telsen "Radiogrand" and Lewcos.	

INTERNATIONAL RADIO



In view of the ever-increasing congestion in the ether, this special "P.W." interview with Mr. Burrows, Secretary-General of the International Radio Union, is of particular interest, for it gives you an insight into the way attempts are made pacifically to arrange Europe's broadcasting.

MR. A. R. BURROWS, former Director of Programmes of the B.B.C. and now Secretary General of the Union Internationale de Radiodiffusion at Geneva, was kind enough to give me, on behalf of "P.W.," some of his ideas on the influence of the Union's work on broadcasting in Europe.

"Apart from the fact that people are realising more and more that radio has come to stay, that it is taking up a definite place in our lives and in the lives of the nations, we must all realise that without some interchange or exchange of ideas, such as is promoted by the International Broadcasting Union, European broadcasting might have been very different.

International Courtesy.

"Take, for instance, a recent happening," Mr. Burrows went on to say, "the catastrophe of R101. Well, the moment news of it had come through, the Stuttgart station (in whose district the home of the Zepelin lies) closed down for five minutes as a sign of sympathy with the loss to aircraft and to the British nation.

"Other German stations cut out their dance music that evening. Then I have witnessed at Vienna the relay of the memorial service from St. Paul's, a broadcast which was also relayed by many other European stations, including Budapest, by wireless link.

"After all, not so very many years ago, all these countries were enemy countries. And it is my firm belief that it is the work of broadcasting, and also of the Union, that has paved the way for similar spontaneous demonstrations of international sympathy.

Friendly Meetings.

"Now that the telephone cables in Europe have been vastly improved and largely adapted to broadcasting frequencies, regular international broadcasts are planned and will be carried out, and these again, will

help us in our understanding of other nations."

And here Mr. Burrows stressed the spirit of friendliness which pervades their meetings, and the very fact that they are not delegates of governments that are

HE WAS "UNCLE ARTHUR"



Mr. Arthur Burrows may be doing radio work of the most vitally important international character at Geneva, but it is dubious whether he'll there gain such a direct grip on the affection of listeners as he did when, as you see him above, he was golden-voiced "Uncle Arthur" of 2 L O, one of the most popular microphone personalities broadcasting "has heard" "on the air." His "fan mail" must have been prodigious in those days.

meeting, but that more or less private organisations send representatives. There is an unofficiality at the Union meetings that makes it possible for things to be discussed and solutions arrived at which otherwise might require very different handling.

On the question of wave-lengths, Mr. Burrows was extremely reticent. "Generally speaking, wave-length allocation is very often a question of a compromise between

local considerations and international requirements," he said. "And, after all, the local man is the most important.

"It is he who pays for the station, and he certainly is entitled to the best possible service from his local transmitter.

"And if one views all wave-length allocations from these angles one will see that very often geographical formations make it essential for a station to have as long a wave as possible for good service, and in many other instances other local conditions have had to be considered."

Very Active Organisation.

The Union is at present very active in the collection and exchange among its members of data concerning radio drama. I understand, from what Mr. Burrows told me, that the Union finds ways and means for suitable translation of radio plays specially written for the microphone, and that the experiences of each broadcaster is being collected by means of questionnaires, and circulated to all members, thus enabling one to benefit by the experiences of others.

The next meeting of the Union will probably take place next February in Vienna, when the technical committee will have to complete the preparations for the last meeting of the C.C.I.R. before the 1932 Madrid conference in May at Copenhagen.

AT BROOKMANS PARK

Interesting details of the Twin Transmitters.

The Brookmans Park station is fifteen miles from Charing Cross, and stands about 400 feet above sea level.

The actual site of the Brookmans Park station is a single field, of some 34 acres in extent.

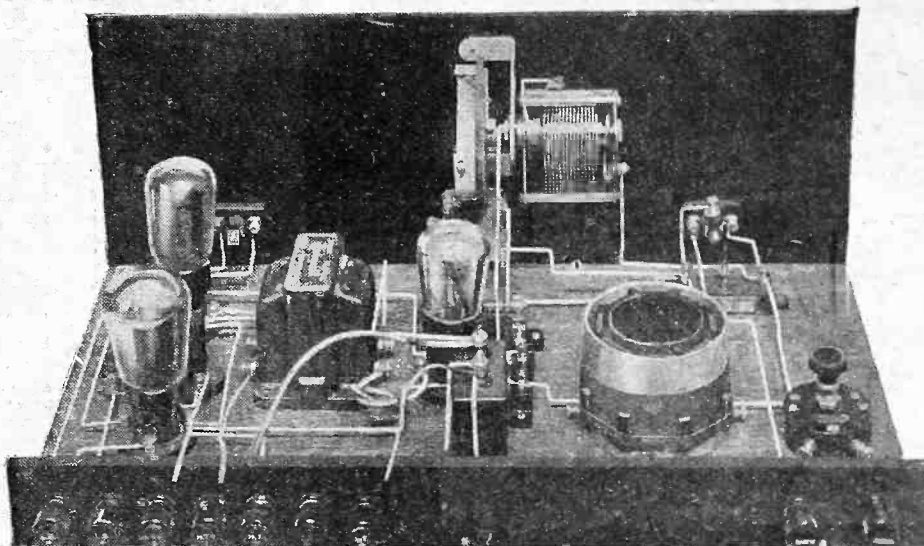
The power of the Brookmans Park station is derived from four 6-cylinder Diesel engines driving D.C. generators, each capable of an output of 200 k.w.

The capacity of the B.C.C.'s accumulator at Brookmans Park is about 2,000 ampere hours!

Owing to the dangerously high voltages used on parts of the B.B.C.'s transmitting plant, doors are arranged which cannot be opened without shutting off the current.

THE "COMET" THREE

START RIGHT with READY RADIO



	s.	d.
1 Ebonite panel, 18 in. by 7 in. (drilled to specification)	6	0
1 J.B. or Cyldon '0005-mfd "thumb-control" variable condenser	11	6
1 ReadiRad '00015 differential reaction condenser	5	0
1 ReadiRad L.T. Switch		10
1 ReadiRad 3-point on and off wave-change switch	1	6
1 ReadiRad "P.W." dual-range coil	12	6
3 Telsen valve holders	3	0
1 ReadiRad '0003-mfd. fixed condenser		10
1 T.C.C. 2-mfd. condenser	3	10
1 ReadiRad 2-meg. grid leak and holder	1	4
2 L.F. Transformers: Telsen "Radiogrand" and Igranic "Midget"	12	6
1 ReadiRad 10,000-ohms spaghetti resistance	10	6
1 ReadiRad 25,000-ohms spaghetti resistance	1	0
1 Lewcos '001-mfd. maximum compression type adjustable condenser	1	6
1 Formo '002-mfd. maximum compression type adjustable condenser	2	6
1 ReadiRad drilled terminal strip, 18 in. x 2 in.	2	3
1 ReadiRad sheet of copper foil, 18 in. x 10 in.	1	9
9 Belling-Lee terminals Type "R"	1	6
3 Belling-Lee G.B. plugs	2	3
1 Packet of Jiffilix, for "wiring-up"		6
	2	6
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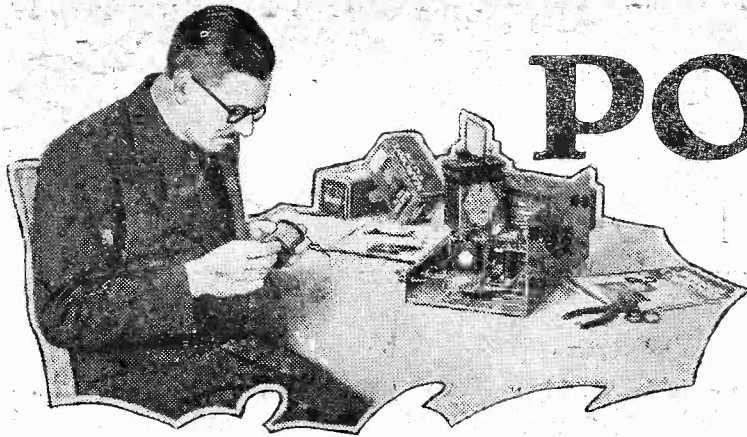
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See also pages
1049, 1050 &
1055

MORE COMPONENT POINTERS



By Victor King.

SOME few months ago I contributed an article to "P.W." in which I pointed out some minor faults frequently encountered in radio components. I explained that these faults were to be seen in the most modern designs due to the best and most conscientious of our manufacturers.

You see, they were mostly little things that would not worry a set maker, but which prove irritating to the home-constructor not equipped with everything in the way of tools, and who has not very much mechanical knowledge.

Still a Few.

Maybe my article had something to do with it—maybe not—but it is a fact that many, if not all of the points I mentioned, have now been rectified in a large number of makes of components.

But there are still quite a few annoying trifles encountered, and these I propose to bring forward here and now. Constructors would do well to look out for them in components they intend buying, and manufacturers who steer clear of them will assuredly increase their popularity in no small measure.

I cannot help thinking that it would pay any radio concern making components for home-constructors to do a little home-construction themselves, using their own products and building a "P. W." or other set with no other tools than a screwdriver and a pair of pliers. They'd gather some mighty useful tips!

An Apt Illustration.

In this connection, I am reminded of a quite well-known car. The first models of this were made with the gear lever far too short for comfortable driving, and two or three firms did a roaring trade selling extension pieces to make good the deficiency! If the designer of that car had been an owner-driver he would never have made such a mistake, and he would also have placed the accumulator in a more accessible position, and done a few other things to make the maintenance more easy for the ordinary non-mechanical buyer!

Forgive me if I have told you that on a previous occasion, but it is so apt an example of the wide gap there is often between the designer's drawing office and the man-in-the-street, that I simply cannot help repeating it—if indeed this is repetition.

A well-known set designer has some trenchant remarks to make concerning some component failings that may seem of little consequence in theory but which in practice cause so much annoyance to home constructors.

However, to return to the immediate matter in hand. Have you noticed how many components are supplied with slotted terminal nuts these days? The nuts are sometimes hexagonal and sometimes square. Theoretically, they make it possible for you to tighten them up with a spanner, pliers, or with a screwdriver.

Those Split Terminal Nuts!

But the last must, in cases, be of the split variety, otherwise it can be employed only with difficulty. For that slotted terminal nut to be of real value to the home-con-

structor it should be deep, so that it extends well above the shank of the screw when it is driven down as far as it will go.

And while we are on the subject of terminals, I would urge all amateurs to make sure that the terminals on the components they intend buying are accessibly placed. There is a tendency to place terminals well down towards the bases of components nowadays. Such a practice certainly makes for neat connecting-up, although in a rather compacted outfit it also introduces difficulties into the wiring at times.

Especially is this the case when the terminals project horizontally from the sides. I consider that it should be the aim of all component designers to place their terminals vertically wherever possible.

Horizontal mountings on a device such as the "P.W." dual-range coil aren't going to matter much for an article of this kind, figuring as it does in the H.F. sections of a set, it will invariably be well spaced from other items, and so enable complete access to be obtained pretty well all round it.

There is yet another thing in regard to terminals that is worth considerable prominence. I refer to the soldering tags that are usually fitted. How often are these so dimensioned, and the terminals so situated, that one tag can easily foul another tag and cause a short circuit or strike a contact with something else!

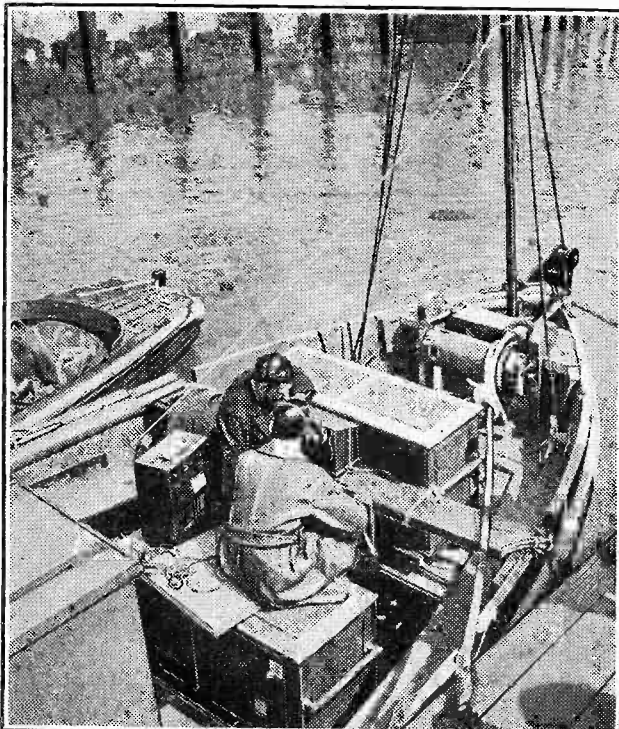
Soldering Tags.

Personally, I loathe soldering tags—when I am not soldering. But that reminds me of a useful hint. If you snip off the projecting tab of a soldering tag with a pair of scissors or with tin snips, the result is a metal washer of handy size.

While I write, other terminal failings occur to mind. For instance, I wish to goodness there were a universal provision of terminals of really adequate dimensions. High marks must be given to a number of manufacturers for this, but many do not deserve any marks at all! They give you tiny little affairs that will hardly hold a wire of any respectable gauge.

(Continued on page 1056.)

BROADCASTING THE BOAT-RACE



The B.B.C. motor-boat "Magician" that usually figures in the yearly boat-race broadcasts. The vessel is fitted with a special short-wave transmitter.

THE "COMET"

START RIGHT with the "COMET"

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Complete Kit of Components as specified.

Price

£4.5.0

or 12 monthly payments of

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KIT B

Complete Kit of Components as specified, with set of three MULLARD valves.

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£5.12.6

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Complete Kit of Components as specified, with set of three MULLARD valves and attractive Oak Cabinet.

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P.W. C.T.R.

PRE-H.F. VOLUME CONTROL

A novel scheme that has several important advantages.

By C. P. ALLINSON, A.M.I.E.E.

THERE are several forms of pre-detector volume control, all of which work very well in practice, though some of them are really compromises between theory and practice.

The three most common methods are variable screen-grid potential, variable grid bias (in a negative direction only), and varying the input to one of the H.F. valves by means of a potentiometer connected across the tuned circuit.

When using battery-heated valves there is, of course, also, the method of using a resistance in series with the filament to give a control of volume. Unfortunately, this method cannot be used with indirectly-heated cathode valves, which are being used so much to-day.

Affecting the Characteristics.

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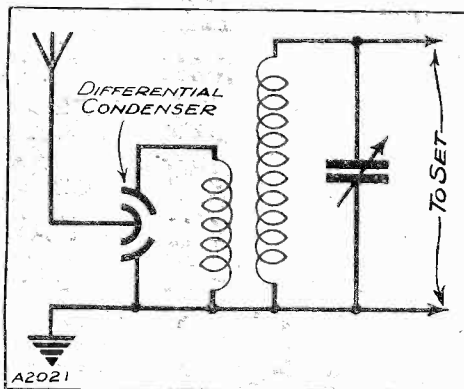
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Every Pertrix Dry Battery that leaves our factory at Redditch tells us that somebody is going to get better radio. Why shouldn't it be you?

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Advt. of Pertrix, Limited, Britannia House, 233, Shaftesbury Avenue, London, W.C. 2. Works: Redditch.
Telephone: Temple Bar 7971 (4 lines). Telegrams: Britanicus, Westcent, London. P104

PRE-H.F. VOLUME CONTROL

A novel scheme that has several important advantages.

By C. P. ALLINSON, A.M.I.E.E.

THERE are several forms of pre-detector volume control, all of which work very well in practice, though some of them are really compromises between theory and practice.

The three most common methods are variable screen-grid potential, variable grid bias (in a negative direction only), and varying the input to one of the H.F. valves by means of a potentiometer connected across the tuned circuit.

When using battery-heated valves there is, of course, also, the method of using a resistance in series with the filament to give a control of volume. Unfortunately, this method cannot be used with indirectly-heated cathode valves, which are being used so much to-day.

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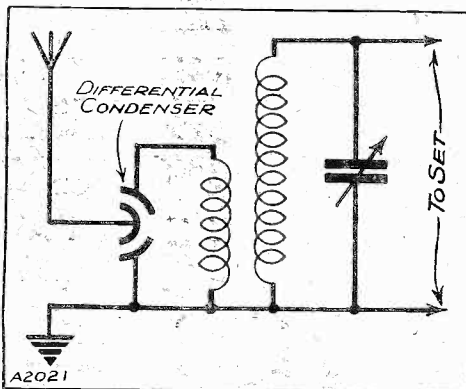
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"POPULAR WIRELESS"
SAYS . . .

"results obtained fully
up to standard set by
original instrument"

"COMET 3"



- Read this wonderful Test Report received from "POPULAR WIRELESS". . . it endorses every claim we make for the "Comet 3" Pilot Radio Kit of Parts.

3rd February, 1931

Messrs. Peto Scott Ltd. City Road, LONDON, E.C.

Dear Sirs, We have completed our tests on a model of the Popular Wireless "Comet Three" Receiver made up from your kit of parts, and have pleasure in informing you that the results obtained were fully up to the standard set by the original instrument.

Yours faithfully,

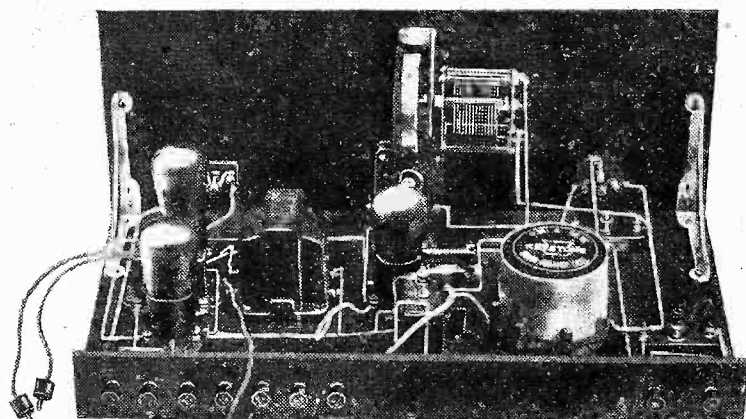
(Signed) G. P. Kendall,

GPK/MC

Research and Constructional Department.

ILLUSTRATION OF "COMET 3"

built with an approved Pilot Kit of Parts and wired up with the Konecterkit which is supplied FREE.



The Pilot Radio Kit comprises an approved P.W. Dual Range Coil and a Red Triangle Ebonite Panel.

Why you are assured of complete success with a Pilot Radio Kit for this P.W. Super-Star Set

FREE

Every "Comet 3" Pilot Radio Kit contains a FREE KONECTERKIT, comprising Panel Brackets (Key-stone Die-cast Aluminium Brackets with patent slots), wire for connecting, wood screws, G.B. plugs, etc. Worth 5/-

and 4 other great features . . .

- No other firm can offer you the service of Test Rooms with 10 years' practical experience of "Popular Wireless" Sets. When you build with a Pilot Radio Kit, the skill of our Technical Staff is at your disposal.
- The panel is the genuine Red Triangle Ebonite as specified by "Popular Wireless"—Ebonite with the jet black mirror finish. Delivered ready drilled and slotted to take the drum drive.
- Any items selected from the detailed list of parts supplied separately. Cash, H.P., or sent C.O.D. (if over 10/-) where desired.
- Our C.O.D. Postal Service Department saves all the time, trouble and cost of postal charges, etc., etc. Just send a postcard stating your requirements (i.e. items (a), (b), (c), (d) on order form) and be ready to pay the postman within 36 hours. We pay all charges. No other firm is large enough to give this express return-of-post delivery.

FOR TEN YEARS PILOT RADIO KITS

FIRST WITH THE "COMET 3" IN 1931

SENT C.O.D., CASH OR H.P.

IMMEDIATE DELIVERY OF
OFFICIALLY APPROVED
PILOT RADIO KIT FOR THE

"COMET 3"



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FOR READERS OF "P.W."

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1 Red Triangle ebonite panel, 18" x 7", ready drilled and slotted to specification	6	0	0
1 Baseboard, 10" deep	1	6	0
1 Cydon .0005-mfd. "tumb control" variable condenser	11	6	0
1 .00013-mfd. differential reaction condenser, J.B.	4	6	0
1 Keystone 3-point wave-change switch	1	3	0
1 Keystone L.T. switch	1	3	0
1 Keystone P.W. dual-range coil	12	6	0
1 Telsens valve holders	3	0	0
1 Sovereign .0003-mfd. fixed condenser	2	8	0
1 Franklin 2-mfd. fixed condenser	1	6	0
1 Lissen 2-meg. grid leak and holder	1	3	0
2 L.F. transformers (Telsens "Radiogrand" and Igranico "Midget")	1	3	0
1 Keystone spaghetti resistances, 10,000 and 25,000 ohms	3	0	0
1 Formio or Sovereign .001-mfd. (max.) compression type condenser	1	6	0
1 Formio or Sovereign .002-mfd. (max.) compression type condenser	2	0	0
1 Terminal strip, 18" x 2"	2	0	0
1 Sheet of aluminium foil, 18" x 10", for covering underside of baseboard	1	0	0
9 Belling-Lee terminals	2	0	0
1 Koneciterkit, comprising Keystone angle brackets, wire for connecting, wood screws, G.B. plugs, etc.	1	0	0
3 Mullard valves—P.M.1 H.P. or P.M.2DX, P.M.1 L.F. and P.M.2 or P.M.2A	1	7	6
Total	6	7	6

Any of the above items supplied separately.
If over 10/-, sent C.O.D.

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BATTERIES. 120 volt Per-	ELIMINATORS. A.C. Mains, Regentone W.5,	SPEAKER. Pilot Double
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KIT B £5-7-6

Complete with Valves but less Cabinet,
or 12 monthly payments of 9/10

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French-polished Oak Cabinet, Aerial

Tested and fitted
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Send 12/9	LISSEN S.G. THREE KIT , S.G., detector and power. Cash Price £6 19 0
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All above Kit Prices include valves and cabinet.

Send 10/9	REGENTONE W.5 COMBINED H.T. ELIMINATOR AND TRICKLE CHARGER , One S.G., 1 variable, and 1 fixed tapping for H.T. L.T. charging for 2, 4, and 6 volts. For A.C. mains. Cash Price £5 17 6
Only	Balance in 11 monthly payments of 10/9
Send 8/6	EXIDE 120-VOLT WH. TYPE ACCUMULATOR , in crates. Cash Price £4 13 0
Only	Balance in 11 monthly payments of 8/6
Send 6/5	LAMPLUGH or FARRAND INDUCTOR SPEAKER , for perfect reproduction. Unit and chassis complete, ready mounted. Cash Price £3 10 0
Only	Balance in 11 monthly payments of 8/5
Send 7/9	BLUE SPOT MODEL 51R CABINET SPEAKER . Cash Price £4 4 0
Only	Balance in 11 monthly payments of 7/9
Send 7/9	EPOCH PERMANENT MAGNET SPEAKER , with type B4 unit only. Cash Price £4 4 0
Only	Balance in 11 monthly payments of 7/9
Send 9/2	CELESTION D.12 LOUD SPEAKER . An entirely new model in oak. Cash Price £5 0 0
Only	Balance in 11 monthly payments of 9/2

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Please send me, as advertised, for Cash/H.P. (Cross out that which does not apply).

- (a) 1 "Comet 3" Kit A at £4.0.0 or 12 monthly payments of 7/4 (b) 1 "Comet 3" Kit B at £5.7.6 or 12 monthly payments of 9/10
(c) 1 "Comet 3" Kit C at £6.7.6 or 12 monthly payments of 11/8 (d) 1 "Comet 3" Finished Instrument £7.15.0 or 12 monthly payments of 14/3

In addition also send me a copy of your Easy Way Catalogue and Pilot Radio Chart.

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ADDRESS.....

P.W. 14/2/31

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POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

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The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the subject 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

ADJUSTING SELECTIVITY ON THE "3-COIL" THREE.

N. A. (Jedburgh).—"How is the '3-coil Three adjusted for a different degree of selectivity?"

First there are the flex leads to the tapping points on the X-coils, these giving you a very good first control according to where they are fixed.

In general it is best to put the one for the second coil (L2) on the tapping which gives greatest volume, and get your selectivity by the tapping on L1.

NOTE.—The compression type-condenser connected in the aerial lead is meant entirely as a supplementary control. Keep it set at maximum normally, with the knob screwed right down, and reduce it from this setting only if you must.

AUTOMATIC GRID BIAS.

R. J. W. (Leytonstone).—"I am interested in this stunt of getting grid bias for an A.C. valve without the use of a grid battery.

"So far as I can see it consists simply in placing a resistance shunted by a suitable condenser between the cathode of the valve

and that side of the grid circuit which normally goes to the cathode, including H.T.—. What I do NOT see is how to alter this resistance for different values of grid bias, or calculate what it should be for a known value of bias. Must it be worked out by the makers, or can you tell me a rule by which the value may be ascertained?"

The only rule you need in such a case is our old friend Ohm's Law, which in one of its forms says that $V = R \times C$, V is the voltage, R and C being respectively resistance (ohms) and current (amps.).

The current under consideration is that in the anode circuit of the A.C. valve in question, all of which must flow via the cathode and the resistance which is connected between this and H.T.—. With such an arrangement the value of the current in amperes multiplied by the value of the resistance in

(Continued on page 1062.)

HOW IS THE SET GOING NOW?

Perhaps some mysterious noise has appeared, and is spoiling your radio reception?—Or one of the batteries seems to run down much faster than formerly?—Or you want a Blue Print?

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

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Cut out coupon and paste on postcard, or enclose in unsealed envelope. Halfpenny postage in either case. I.W.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1060.)

ohms will give you the number of volts grid bias obtainable, by the connections you mention.

The plate current can be measured by a milliammeter, or can be taken from the valve maker's data showing what current flows under given conditions. Then the value of the resistance necessary to give the required voltage bias to the grid can easily be calculated from $R = \frac{V}{C}$.

Usually 1,000 ohms is correct, giving 1 volt bias per 1 milliamper anode current.

ON THE TICK.

S. G. (Halesowen, Birmingham).—"We find the time signals from the Regional and the other one from Daventry (5 X X) very handy, particularly now that my boy has been apprenticed to a watchmaker—a position which prompts him to doubt the veracity of every clock in the neighbourhood!

"What with Big Ben and the dots there are plenty of signals going out from these stations, but I am not sure that I have got the hang of them yet. Why do they sometimes drop one, and what times are the recognised signals from these two stations sent out?"

The recognised times for the Midland Regional (479.2 metres) are: Big Ben at 12 noon, and the six dots at 6.30 p.m. and again at 10.15 p.m. on weekdays. On Sundays the six dots go out at 3.30 p.m. and 9 p.m.

A much better time signal service is given on the Daventry National station (1,554.4 metres), where time signals are compulsory and will *always* be broadcast, even if this means superimposing them on the programmes.

The full Daventry (5 X X) time signal service is given below:

10.15 a.m.—Big Ben.	4.45 p.m.—Six dots.
10.30 a.m.—Six dots.	6.30 p.m.—Six dots.
12 noon.—Big Ben.	9 p.m.—Six dots.
1 p.m.—Six dots.	11.30 p.m.—Six dots.

As a general rule, Big Ben is broadcast also at the beginning of any programme emanating from London, and it is the rule to close a weekday programme with Big Ben whenever possible.

To conform with the requirements of shipping and other services relying on the broadcast time signal, the six dots are sent out on 1,554.4 metres at the times named without fail. Similarly on Sundays, when they go out at 10.30 a.m., 3 p.m., and 9 p.m. again without fail.

WHY NOT MORE WAVE-LENGTHS FOR BROADCASTING?

D. B. (Norwich).—"Why is it that all the important British and foreign stations are either between 200-600 metres or between 1,000-2,000 metres? Surely a greater wave-length could be used and stations placed at

least ten to twenty, or even more, metres apart? Would this not be better than the inadequate system used to-day?"

You appear to forget, D. B., that broadcasting is only one side of radio. Those wave-lengths you covet are needed by other people, who believe that listeners to broadcasting have far too many wave-lengths already!

First and foremost, there are the world's ships. Remember that wireless is a ship's *only* means of keeping in touch with the world, and so their radio is not only of great importance from a business point of view, but may give warning of disaster.

There have been several occasions on which nearly a thousand lives at a time have been saved by a ship's S.O.S. And nearly every day smaller rescues are carried out by the aid of wireless!

So obviously you can't have all the wave-lengths for B.B.C. wireless—which is just entertainment for us stay-at-homes—at the expense of people whose lives may depend on it.

How about aeroplanes, too? Round about 900 metres you can hear Croydon telling the cross-Channel planes what weather to look for, etc. We can't ask the pilots to do without wireless help because we want easier tuning, can we?

Air Force, Navy, Mercantile Marine, and Empire communications all depend to a greater or less degree on wireless communications, and that is why European listeners have only a limited band of wave-lengths allotted to their broadcasting stations.

USING A.C.

D. K. (Watford).—"I have recently converted my set (three-valver, det. and two L.F., one stage R.C. and one transformer) for A.C. valves, and at first I had a great deal of trouble with motor-boating. I have now managed to stop this, and the set is working pretty well, except that the amplification is so great that I have a lot of trouble to prevent overloading. The reaction control is not too good, either. Can you help me to get rid of these remaining difficulties?"

If you haven't used A.C. valves of the indirectly-heated type before this kind of trouble is apt to be puzzling, but it is natural enough really. These valves give so much more "mag." than their opposite numbers in the battery range that over loading is very prone to occur with two L.F. stages.

(Continued on page 1064)

TECHNICAL TWISTERS

No. 48.—L.F. COUPLINGS. CAN YOU FILL IN THE MISSING LETTERS?

Methods of L.F. coupling can be divided into three main types—R.C. and

Of these the is easily the most common.

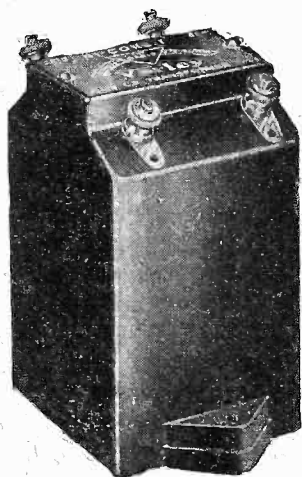
Modifications of the transformer method are the parallel-fed transformer and the scheme.

Besides being used between all valves, L.F. coupling is used between the first L.F. valve and the

Last week's missing words (in order) were Diode. Triode. Four, tetrode. Pentode.

NICORE—

The TRANSFORMERS for the COMET 3



Nicore I L.F. Intervalve
Transformer. Ratio 4-1

£1

Nicore II L.F. Intervalve
Transformer. Ratio 4-1
15/-.

You can't have better than two of the best. Put a pair of Varley Nicore L.F. Transformers into your Comet 3. The National Physical Laboratory have tested Nicore I. Their test shows it to have a frequency response curve which is practically a straight line over the whole musical range. The reproduction of Nicore I needs no correction. Nicore I treats every note alike. It doesn't over-emphasise any portion of the treble or weaken the bass. That is why there is no better transformer for a single stage; no better transformer to follow that stage where greater amplification is needed.

Write for Section D of the Varley Catalogue.

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Extract from "Popular Wireless," January 31st, 1931.
GOLSTONE DUAL RANGE COILS.
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Type S.T.4 illustrated here takes a mains voltage of 200/250v. and has an output of 250-250v.—40 m.a.; 2+2 v.—1 amp.; 2+2 v.—3 amp. For best results it should be used with Triotron Valve G.A.24 and Stal Choke C.K.

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is fitted with two variable Tappings of 0/100 and 0/120 Volts respectively, and one fixed of 150 Volts, and the output of 150 Volts at 25 m.a. is twice that of any other Unit at the price. The combined L.T. Trickle Charger automatically charges either 2-, 4- or 6-Volt Accumulators from the Mains. A.C. 188 is guaranteed for 12 months and is built to conform with all necessary regulations.

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CASH PRICE £6
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1062.)

The remedy is simple: cut down the amplification a little. This will generally make the set far more pleasant to handle and also more stable. In your set a good way to do it is to reduce the value of the anode resistance in the R.C. stage to 25,000 or perhaps 50,000 ohms.

This change is sometimes advisable when going over from battery valves. Incidentally, it should correct your reaction trouble as well.

VOLUME CONTROL CONNECTIONS.

M. A. A. (Cheshunt).—"To keep the input to the S.G. valve at the required value I propose to use a 400-ohm potentiometer with slider connected to the negative grid-bias battery (H.F.) and one other end to the tuning coil. The bottom of the tuning condenser will go to L.T.—thus placing the potentiometer in the tuned circuit. The remaining terminal of the potentiometer is left unconnected. Would the 400-ohm potentiometer be O.K., or do you think that for steady control conditions the value should be higher?"

Four hundred ohms is quite a usual value to employ in such circumstances, and is, in fact, we believe, used by the B.B.C. where such a control of volume is necessary. You would notice some difference in selectivity according to the position of the slider with such an arrangement.

TESTING 'PHONES.

"SHORT-WAVE WILLIE" (Bournemouth).—"What is the best way to tell if 'phones are O.K.?"

Place the earpieces over the ears in the ordinary manner, and then put one of the tags at the end of the cord into the mouth, holding it firmly between the

lips. Now, in one hand take the other tag of the telephones, and in the other hand take a key, a nail, or a similar piece of metal, and rub this gently on the second tag.

If the telephones are in good order you will hear noises corresponding with this rubbing in the telephones.

The noises, of course, will not be very loud, for in the absence of an external battery you are working the telephones by a kind of human electricity generated in your own body. But so sensitive are a good pair of telephones that if they are O.K. the noise will be absolutely distinct and unmistakable.

If you wish to test each earpiece separately, you can do so by removing one of the earpieces from the

ear and listening only with the other. Or, alternatively, you can place a pad between the ear itself and the adjacent earpiece, so as to cut off the sound from the latter.

In this way you can compare the loudness of the two sounds, but do not forget that most people hear better with one ear than the other, so before definitely pronouncing one earpiece less sensitive than the other, turn the telephones round and try both earpieces on one ear.

MEASURING A VALVE'S IMPEDANCE.

R. O. W. (Winchester).—"Is it possible for the ordinary experimenter actually to measure a valve's impedance without laboratory testing gear, and, if so, how?"

What is generally known as the impedance of the valve is the resistance that it offers to the flow of alternating current in the plate circuit, and this can be measured with a milliammeter in conjunction with known plate voltages. The valve should be set to its ordinary working conditions, and then its plate resistance or impedance can be found by ascertaining the ratio between the change in plate voltage and the consequent change in plate current. Suppose, for instance, you were measuring the impedance of an L.F. valve for which the makers recommend a grid bias of 4½ volts in conjunction with a plate voltage of 90 as well as corresponding higher and lower values. With the milliammeter in circuit and no signals on the grid, but simply the correct grid bias, increase the plate voltage by, say, 10 volts, and note the milliammeter reading for this value, which may be, perhaps, 3 milliamps.

Then reset the plate voltage to a corresponding value below the normal, in this case 80 volts, and note the effect on plate current as shown by the milliammeter. We will presume that it has dropped to 1 milliamper, indicating that with its normal grid bias the valve will pass 3 milliamps. at 100 volts and 1 milliamper. at 80 volts.

We now know that a 20-volt change in plate voltage (100-80=20) results in a drop of plate current from 3 milliamps. to 1 milliamper. = 2 milliamps. Expressing

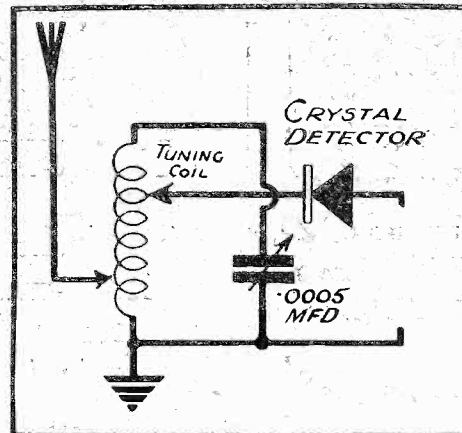
this as a ratio we have $\frac{20 \text{ volts}}{2 \text{ milliamps.}}$ or

$\frac{20}{0002} = 10,000 \text{ ohms.}$

This, then, is the average plate resistance between the working points selected.

(Continued on page 1066.)

MISSING LINKS No. 1



This week we are commencing a new series of Radio Puzzles called "Missing Links." There is no prize attached to the solution, but as we go on you will find it great fun trying to fill in the components and connections that are omitted from the diagrams.

In order that you may "get the idea," No. 1 is a very simple "Missing Link," and if you should get "stuck," you will find the solution on page 1073, under "Radio Symbols."

H.F. CHOKE

A first-class component. Covers 10 to 2,000 metres without resonance. Self-capacity extremely low.

Price 6/6

Also supplied Centre Tapped.

QUICK MAKE AND BREAK SWITCHES

Supplied in Single and Double Pole Make-and-Break Change-over, with delayed action for indirectly-heated valves.

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THE TOP SECTION. Size 4½ in.
high by 18 in. wide by 14 in. deep,
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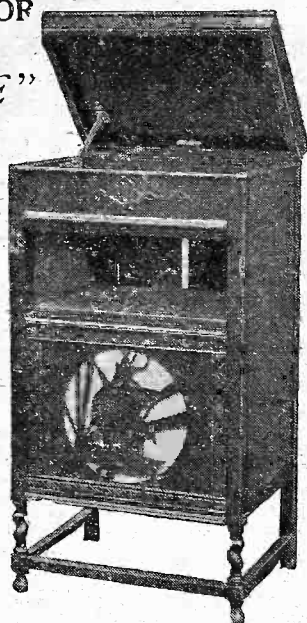
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deep, is for the Wireless Set, to take
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machine before him, the startled company little
realised they were witnessing a revolution in the
pleasures of mankind. They could not see in
Edison's phonograph the gramophone or the talking
film which have come from it. Yet if its inventor
had not dreamed of things greater than selling news-

papers and had not devoted
his life to doing one thing
and doing it well, these things
would not have been given
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It is this same spirit of "doing one
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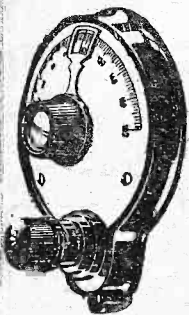
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A condenser exactly suited to
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All brass. Sturdily yet lightly
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For a test report on this condenser,
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WIRELESS," January 31st.



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ASTRA CATALOGUE ON REQUEST.

EMKABE RADIO CO., LTD., 47, FARRINGTON RD., E.C.1

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1064.)

A SIMPLE CIRCUIT PUZZLE.

J. L. (New Barnet).—"Just as a matter of interest, and not because I cannot afford it, I have been puzzling over a circuit using two tapped coils and two tuning condensers. One coil and condenser has a crystal and telephones across and acts as my Regional set receiver, the other coil and condenser being set to wave-trap the National programme. Aerial and earth are fixed on clips which go on to the coils, but my idea was that if, as I can do, I cut out the National programme wave-trap when I am listening to the Regional, I ought also to be able to listen to the National and cut out the Regional with the other coil and condenser."

"I suppose really it would be a simple arrangement, and yet I cannot see how it could be done so that by just switching the telephones over from one to the other pair of terminals, I could receive either programme, using the other coil and condenser to trap the unwanted one. What would be the connections for such a set?"

It could very easily be arranged. One tapped coil with its condenser socket we will call the Regional circuit, and the other tapped coil with its tuning condenser socket we will call the National circuit. Ignoring the aerial and earth leads for a moment, join the junction of one coil and its variable condenser to the junction between the other coil and its variable condenser, and also run a wire from this point to the crystal detector. You must have two pairs of phone terminals, one for Regional and one for National, and one of the Regional and one of the National terminals must be joined together and taken to the remaining side of the crystal detector. Now join the remaining National phone terminal to the other side of the National tuning coil and condenser and the remaining Regional phone terminal to the other side of the Regional coil and condenser, and your alterations are complete. The aerial and the earth leads

are tapped in at appropriate places along either coil, and you will hear either the National or the Regional according to which pair of terminals are being used, the other circuit acting as a wave-trap to cut out the unwanted programme; but in order to get good results in the rejection and the reception a little judgment may be necessary in juggling the aerial and earth wires, which, however, should give quite good reception if placed respectively on the centre taps of the two circuits.

USING THE DETECTOR WITH A GRAMOPHONE PICK-UP.

T. M. (Redlands, Bristol).—"The B.B.C. say 'For use with a gramophone pick-up the detector can be used as an extra L.F. stage.' How can this be arranged?"

There is hardly any arranging to be done, for all that is meant by the above is that instead of inserting the pick-up across the grid and filament of the first L.F. amplifying valve it can be inserted across the grid and filament of the detector valve, all other connections remaining as before. So if you use a pick-up adaptor of the type that plugs into a valve holder, all you have to do is to plug it into the detector valve holder instead of to the first L.F. Or, alternatively, if some form of switching is contemplated to switch in at the detector instead of the L.F. valve, it takes advantage of the low-frequency coupling between the detector and its succeeding stage.

X-COIL SELECTIVITY.

L. J. (Ipswich).—"My aerial comes to the tapping on an X coil much after the style of the 'Popular Wirelet' No. 28, January 24th issue; but although we are far enough away from a broadcasting station, goodness knows, my selectivity can only be called rotten! I

get the London Regional over about eleven degrees of the condenser; but, to my surprise, I saw a similar-looking X-coil arrangement that was as sharp as a knife. Why is mine so punk?"

Probably your X-coil holder is wired the wrong way round, this being a common cause of non-selectivity with X coils. For most coils the pin of the coil holder needs to go to earth, L.T., etc.; but some X coils require the socket and not the pin to do so.

Try the effect of simply changing over the connections to your X-coil holder. This simply means all external wiring to the socket must now go to the pin, and vice-versa. Probably that will cure your trouble.

THE 1,200-METRE MYSTERY.

B. F. H. (Belfast).—"On several occasions I heard the Stamboul station (Constantinople), but lately there appears to be a different station on this wave-length. Who is it?"

The situation on 1,200 metres is a little puzzling at the moment, for this wave-length has been officially allotted to Istamboul (Turkey), Boden (Sweden), and to Kharkov (Russia). The latter is the most powerful of these stations; Istamboul being next; and Boden, with a power of 75 kw., being the smallest station, from the power point of view.

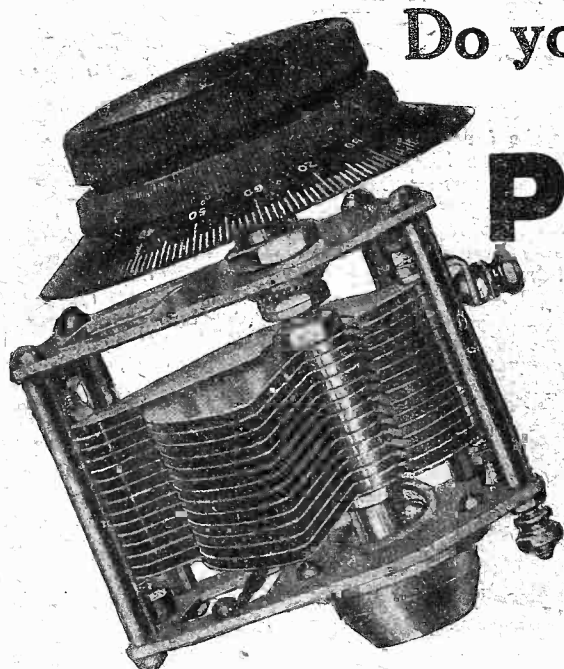
Recent reports, however, show that the new Iceland station at Reykjavik has been testing on a wave-length of 1,200 metres, while another "P.W." reader reports having heard what he believes to be Warsaw on this wave-length. To make confusion worse compounded, both Boden and Istamboul appear to have been "wobbling" their wave-lengths (to get away from the interference caused by the newcomers, apparently), so that just Who is doing What upon the 1,200 metres is something of a mystery at the moment.

"P.W." PANELS No. 6. HIGH-FREQUENCY CHOKES

Are mainly used either for reaction purposes, or for providing aperiodic coupling for H.F. valves. Almost any choke will do for the former purpose, but a really efficient one is necessary in the latter case.

Ordinary broadcast H.F. chokes are not suitable for short-waves, unless they are specifically stated to be of "universal" range.

A No. 60 plug-in coil makes a good H.F. choke for the short waves.



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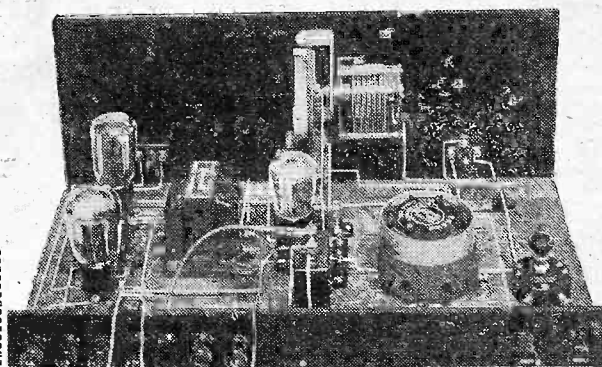
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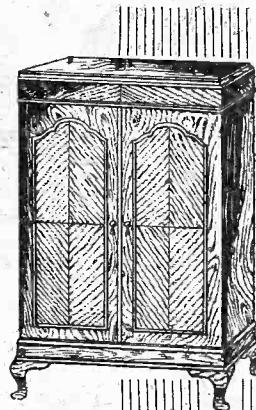
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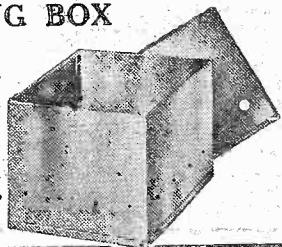
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FOR THE LISTENER

(Continued from page 1030.)

Megan.

The third is Miss Megan Lloyd George. She was supposed to speak about "The Month in Wales," and really I did not feel very keenly interested in the month in Wales. Nor, I think, did she.

What she really spoke about was Wales, its people, language, art, drama. She must, I think, be a very clever young lady, on whom her father's muffler has fallen like a shawl; with an engaging voice, without the slightest trace of a Welsh accent. Which was hardly fair to her country-people, look you!

Radio Saying of the Week.

"A little knowledge may be a dangerous thing, but great knowledge is fatal."—Harold Nicolson.

"Edward the Second."

Now that Mr. Gielgud knows that the radio-drama fans are comparatively few in number, there is every reason why he should go for high game like this great play by Christopher Marlowe, Gent.

I could pick holes in the production if I had a mind to; there was too much shouting for one thing, and at times I had no clue as to who was speaking; but to me at least it was a great pleasure to be reminded of the outlines of this stirring drama and to hear again some of Marlowe's magnificent lines. Some of Marlowe's lines are finer than Shakespeare at his best; but William has more of them!

Athene Seyler.

Athene Seyler took the part of Queen Isabella, and was obviously in a class by herself; as, indeed, her fellow-actors would be the first to admit. You felt the difference as soon as she spoke. I am rather against the introduction of these distinguished outsiders to stiffen the B.B.C. Repertory Company.

It is bad production, and bad art, to have one personality in a company far outstanding the rest. No doubt listeners are interested to hear these renowned voices; but the play is the thing, and an outstanding player among second-raters makes the texture of the production uneven.

Soccer.

I am one of those old-fashioned diehards who believes that Rugger is a better game than Soccer, but I am equally persuaded that a Soccer broadcast is much better than a Rugger one.

This is partly because of the nature of the game, and partly because there is only one Allison. Captain Wakelam, good as he is, always seems to me to be reporting the game from the neighbourhood of the Royal box, while Mr. Allison is at the ring-side with a favour in his coat. Indeed, sometimes I believe he has been known in an exciting moment to bash Derek McCulloch's hat in!

Stravinsky.

Well, now you know the best and the worst about this musical composer, for Mr. Ernest Newman has spoken. Besides, you have heard Stravinsky playing his own music and conducting it; and Mr. Newman says it is simple enough for the ordinary musician to understand.

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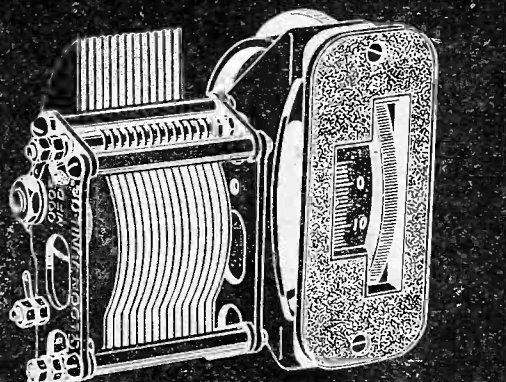
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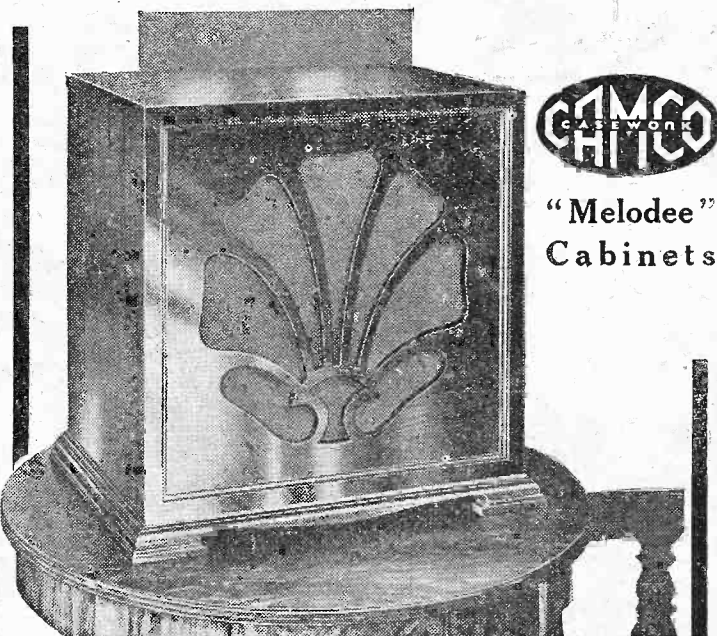
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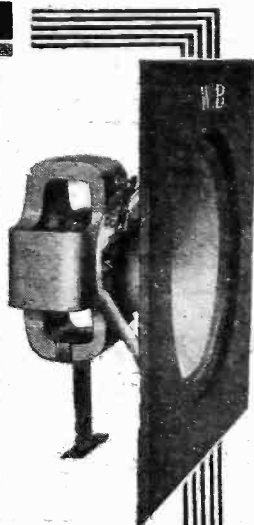
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THE PICTURE PAPER WITH THE
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—SUNDAY GRAPHIC—

USING A PENTODE

Some interesting correspondence
on the subject.

IN his "Query Corner" a few weeks ago, Captain Eckersley in a reply to "J. L. (Balham)," discussed the use of the Pentode valve and said: "A loud speaker, as such, has an impedance which varies over the frequency range: at 10,000 cycles it may have an impedance of 20,000 ohms, at 50 cycles it may have an impedance of only 1,000 ohms.

"At 10,000 cycles, therefore, the pentode valve has achieved something like its theoretical magnification. At 50 cycles it has achieved hardly any magnification at all.

"Thus the Pentode valve with the loud speaker connected straight in its anode circuit magnifies the high notes but not the low. And as the high notes as radiated are very much more feeble than the low notes, the volume would not appear to increase in proportion to the theoretical magnification of the valve if the loud speaker is connected straight in the anode circuit."

"I Quite Disagree."

We have received the following letter from Dr. F. W. Lanchester, F.R.S., M.Inst. C.E., M.I.Mech.E., etc., director of Lanchester's Laboratories, in which he says: "I notice in your current issue the question under the letters 'J. L. (Balham),' relating to the use of the Pentode valve and the unsatisfactory results achieved, also the reply by Captain Eckersley to this letter.

"I believe that 'J. L. (Balham)' is not alone in having experienced the trouble in question. In fact, it is one that I have been at great pains to investigate and in which I quite disagree with Captain Eckersley's reply. At the outset I will say that the speaker used by me is one having a minimum measured impedance at about 100 cycles of 15 ohms, and a maximum in the region of 3,000 cycles of 19 ohms.

"I mention this to clear the air in view of Captain Eckersley's remarks on this point. In an explanation of the Pentode valve and its use, which my Company will shortly be issuing and which is now in the Press, I quote the following paragraphs:

"Another Aspect."

"The Pentode valve gives serious distortion if associated with an impedance comparable to that of the valve itself. Otherwise expressed, if so associated or coupled, the swing permissible without distortion has to be kept so small as to destroy the utility of the valve. By 'comparable to' it is meant that the impedance of the speaker circuit must be kept below, say, one-fifth or one-sixth of the published valve impedance.

"If the impedance is fixed in accordance with (1) above, the amplification factor of the valve is in the region of 12 or 18 (instead of 80 or 100) certainly no more. That is to say, only three times the effective amplification factor of a triode, such as Osram (P.610).

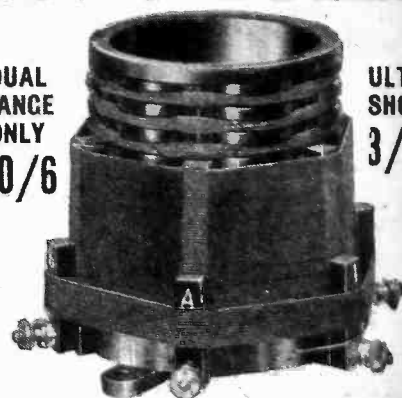
"There is another aspect of the Pentode valve to which we have given most careful consideration. The bass frequency which a power valve will pass without serious loss depends upon the relation between the

(Continued on page 1072.)

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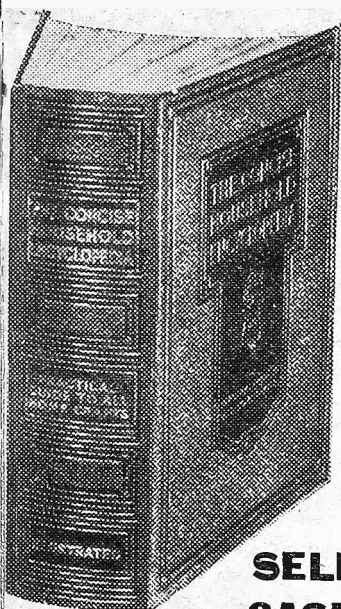
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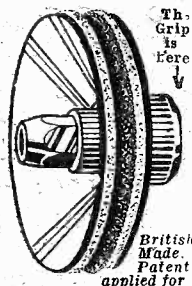
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USING A PENTODE.

(Continued from page 1070.)

inductance (henries) of the transformer, and the effective resistances of the valve and speaker circuits. Owing to the high impedance of the Pentode valve, which is some ten or twenty times that of an ordinary power valve, the effective combined resistance or impedance depends mainly upon the impedance of the speaker circuit, and the only possibility of maintaining the necessary relation between inductance and resistance as above is by keeping the speaker circuit resistance even lower than that recommended from other considerations by the makers of the Pentode valve.

"The Alternative."

"The alternative would be to supply a transformer of such large dimensions that the cost would be prohibitive. The user of a Pentode valve, therefore, is between the 'devil and the deep sea,' and commonly a set with a Pentode valve is bass deficient. No speaker can give a full bass emission if the set has cut it out.

"If due attention be paid to the foregoing it will be easily understood that the amplification factor of 12 or 18 which remains credited to the Pentode valve in the second paragraph above, is whittled down to about half that value if the impedance of the speaker be so adjusted (by the use of an appropriate transformer ratio) as to pass the bass in adequate volume."

We passed a copy of the letter to our Chief Radio Consultant, Capt. P. P. Eckersley, M.I.E.E., who replies hereunder:

"I have read Dr. Lanchester's letter with great interest. I think we both are perfectly in agreement, but if there is any argument, it is rather on premises than upon an interpretation of facts.

"Most people use a Pentode valve because they want to get the maximum volume from it with reasonable quality. If this is their ideal, they can, by making the anode impedance high, get a greater output from a pentode valve by a given expenditure of energy than they are liable to get with the more common type of power output valve.

"Power Producing Possibilities."

"If, however, they try and realise the power producing possibilities of the Pentode valve, and do not take care that at low frequencies the anode impedance is of the same order as the valve, then they will get a distortion of the frequency spectrum. That is, they will get less bass reproduction. Throughout the whole gamut they will get a 10 per cent distortion, but throughout the whole gamut they will get a greater power than normally associated with a power output stage.

"If the Pentode valve is to be used to get distortionless reproduction, it is essential to cut down its magnification to a very considerable extent, and it would appear that it would be wiser in this case to use an ordinary valve.

"In sum, one cannot have everything, and if one will put up with a little bit of a compromise on distortion, one can get more volume and the Pentode is a very good way of doing it. I do not see the necessity to use a Pentode if one is not after efficiency as measured by the ratio of volts output to volts input. It was on the basis of this argument, with this implication, that I answered 'J. L.' (Balham)."

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TECHNICAL NOTES

By J. H. T. ROBERTS, D.Sc.

Bandpass Filters.

THE bandpass-filter is the subject of a good deal of interest to experimenters and constructors lately, although improved tuning circuits, based on the "bandpass" were introduced in sets described by our monthly contemporary "Modern Wireless," nearly two years ago!

Resonant Circuits.

The bandpass-filter, as most of my readers are well aware, is based simply upon the principle of a resonant circuit. For the greatest selectivity, what we want is a circuit which will give a sufficient response to the particular frequency which we desire to receive, but will give only a very small response when the incoming frequency is a little bit removed from the desired one.

Expressing it in a popular, rather than a scientific way, it comes to this: How much difference must there

be between the desired frequency and a neighbouring frequency in order that the response of a circuit to the neighbouring frequency will be only a fraction—one-fifth or one-tenth—of the desired frequency?

Response Curve.

The clearest and simplest way to understand the behaviour of the circuit is to draw its response curve, or resonance

curve, as it is sometimes called. This shows the response—which may be in millivolts generated—as against the frequency.

If the voltage generated is plotted vertically and the frequency is plotted horizontally, we will get a curve having a peak, and the sharpness of this peak is a measure of the sharpness of the selectivity of the circuit.

If there were nothing more in the problem than this it would be a comparatively simple matter to arrange a circuit having an exceedingly sharp response curve so that adjacent wave-lengths, even very close to the desired one, would be cut out.

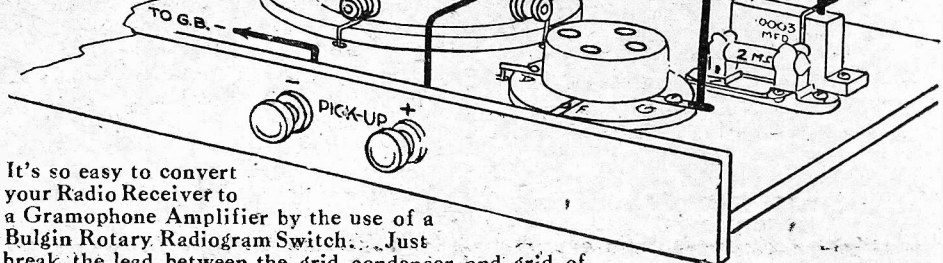
Frequency Band.

But unfortunately there is more in it than this, for a signal, as is well known, comprises a certain band of frequencies, generally computed to be about 5,000 cycles on each side of the actual resonance point. Perhaps we should interpose the remark here, that the question of the frequency band and its influence upon the reception of signals has lately become the subject of a great deal of discussion and experiment, and opinions at the point differ considerably between radio experts.

However, we need not concern ourselves with these more detailed enquiries for the moment, and it will be sufficient to assume,

(Continued on next page.)

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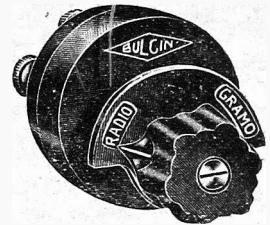
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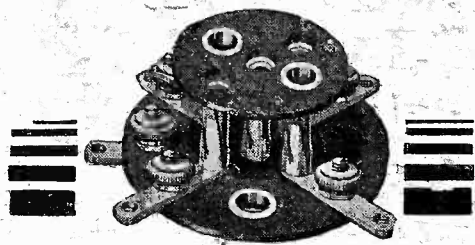
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TECHNICAL NOTES

(Continued from previous page.)

as has generally been done, that a band of about 5,000 cycles on each side of the resonance point is necessary.

Now if the resonance curve is so sharp that it seriously cuts out frequencies within this band, the reproduction will be distorted.

Coupled Circuits.

This, however, is where the bandpass-filter comes in. Suppose that two tuned circuits are being used, the energy being transferred from one to another, we can obtain very sharp selectivity.

Generally there will be a tendency, however, for the two circuits not to be tuned at precisely the same point and the result is that we get a resonance curve for the combination of the two circuits which, looked at from a distance, appears like an ordinary single-circuit resonance curve lopped off at about the middle, leaving a flat or approximately flat top.

On closer inspection it will be found that the top of the curve has two small peaks side by side, but that does not affect the general argument. The result of all this is that we get a sharp cut-off at the sides, that is to say, a steeply-falling curve, but this curve covers a reasonably wide band and is not confined to an exceedingly narrow band as each of the individual curves, of which it is composed, would be.

The breadth of the resonance region or band gives us what is needed for getting good quality, whilst the very steep fall of the curve on either side gives us the necessary selectivity, in the sense that it excludes wave-lengths very closely adjacent to the desired band.

Common Tuning.

In actual practice the two-tuned circuits of the bandpass-filter may be tuned by a common condenser so that—after the system has been balanced up—there is no extra tuning control.

It turns out, however, that this is not all beer and skittles, because if the arrangement is very selective the signal strength of the desired frequency is liable to be much reduced, whilst if the two peaks are separated out you may get double-tuning, that is, tuning at two different points on the dial.

L.F. Shielding.

A point which is sometimes overlooked with regard to indirectly heated valves is that the wiring which carries the heating current can often with advantage be shielded. This may be done by using lead-covered wire, with the lead covering connected to earth.

Alternatively, twin-flex wire may be used without specific shielding, but this should be kept as far away as possible from the other wiring of the circuit, especially from the leads connected to the anodes.

With A.C. operation of the receiver it is naturally desirable to reduce the A.C. hum as much as possible, and although this can be reduced to a very small amount, so small as to be virtually negligible, according to my experience of such receivers there is always at least a trace (sometimes a good deal more than a trace) of A.C. background remaining.

(Continued on next page.)

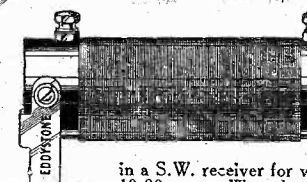
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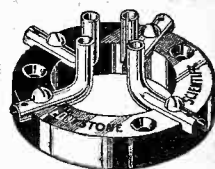
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TECHNICAL NOTES

(Continued from previous page.)

I know people often claim that in their receivers the A.C. hum is entirely eliminated, but I do not think there is ever quite the same freedom from background as with a battery-operated set. At any rate, as I say, it does not matter very much, because with careful screening and wiring the hum can be reduced to such a small amount as to be entirely negligible for all ordinary purposes; indeed, it is only when there is nothing coming through that the hum can be heard at all.

Special Screens.

Incidentally, talking about the screening of the A.C. leads, you will often find that it is better to use soft iron sheet for the screening. In the case of H.F. screening, owing to the high-frequency and the eddy-currents, any metallic sheet will serve the purpose, since the magnetic effects are produced by the eddy-currents themselves, and the metal sheet does not need to have any normal magnetic properties. But with the screening of the heating current of a mains receiver you will find that iron sheet, say about 1/4 in. thick (connected to earth, of course), will be much more satisfactory.

A Practical Point.

A reader asks me whether there is any way of preventing screws—ordinary wood screws—from becoming stuck in the wood so that it is impossible to get them out after they have been there for some time.

I presume, although he does not say so, that he refers to steel screws, because with brass screws this trouble does not usually occur. With steel screws, especially in fairly soft wood, the screw becomes rusty and, if it has been left there for any length of time, the rust binds it very tightly indeed; so much so that either the head of the screw twists off when you are attempting to withdraw it or the neck in the screw is destroyed by the driver.

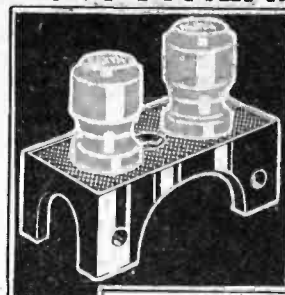
Useful to Know.

There is one very simple dodge for obviating this, and that is to oil or grease the screw liberally before inserting it. This is a trick sometimes used by carpenters, but it is not entirely satisfactory, and for wireless work the oil or grease is generally objectionable.

There is, however, a much better solution, since copper-plated screws have been introduced. These are electrically copper-plated and the copper covering forms a permanent protection, whilst the steel screw beneath is much stronger than a corresponding brass one.

(Continued on next page.)

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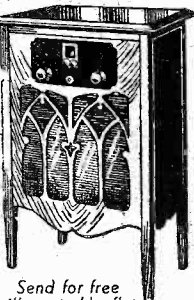
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TECHNICAL NOTES

(Continued from previous page.)

Copper coated steel screws form, in my experience, a complete solution of the rusting difficulty with ordinary steel screws. They can be obtained at practically any ordinary stores which supply screws.

L.S. Extensions Leads.

I have had several letters lately on the question of using loud speakers in different rooms. You will remember that I made some reference to this a short while back. One reader in particular wants to know whether, when using loud speakers in different rooms, it is essential to have an output filter and also what type of wiring should be used for connecting up to the distant speakers.

The question of the output filter is one which depends partly upon the loud speakers themselves and partly upon the distance from the set to the speakers. Generally it is a good plan to use an output filter in any case, even when the loud speaker is adjacent to the set, as I have previously pointed out.

Points to Remember:

When the loud speaker is at a distance from the receiver, the use of an output filter becomes doubly important, because in this case the high-tension current (if no output filter is used) has to go the entire length of the loud speaker leads and back again, and this is not only dangerous, but also wasteful, since there is certain to be some amount of leakage of the H.T. current. In addition to this, the resistance of the long leads may be a disadvantage, especially if these consist of thin wire.

Output Filter.

So from every point of view, it is advantageous to have an output filter. The filter may consist of a large L.F. choke and a large condenser. The choke should have a high inductance, even 30 henries not being too much, whilst the capacity should be at least a couple of microfarads. An alternative to the filter is an output transformer.

As regards the leads to the loud speaker, these, if they are to be loose, will have to be of the double flex type, but if they are to be permanently wired they should preferably be two separate wires spaced a small distance apart throughout their entire length. Ordinary bell wire is quite suitable for this purpose, and is much cheaper than electric-light flex.

Series and Parallel.

If a number of plugs are to be fitted in different rooms so that the loud speaker may be moved about from one place to another and just plugged in, obviously the plugs must all be connected in parallel with one another.

On the other hand, loud speakers, as I mentioned a week or two back, may sometimes with advantage be connected in series, but in this case obviously they must all be in circuit at the same time.

If you wish to cut out one of the loud speakers when using the series arrangement, it is not necessary to disconnect it from the circuit; you can use a short-circuiting switch connected across the terminals of the loud speaker, which will have the same effect with the minimum of trouble in its operation.

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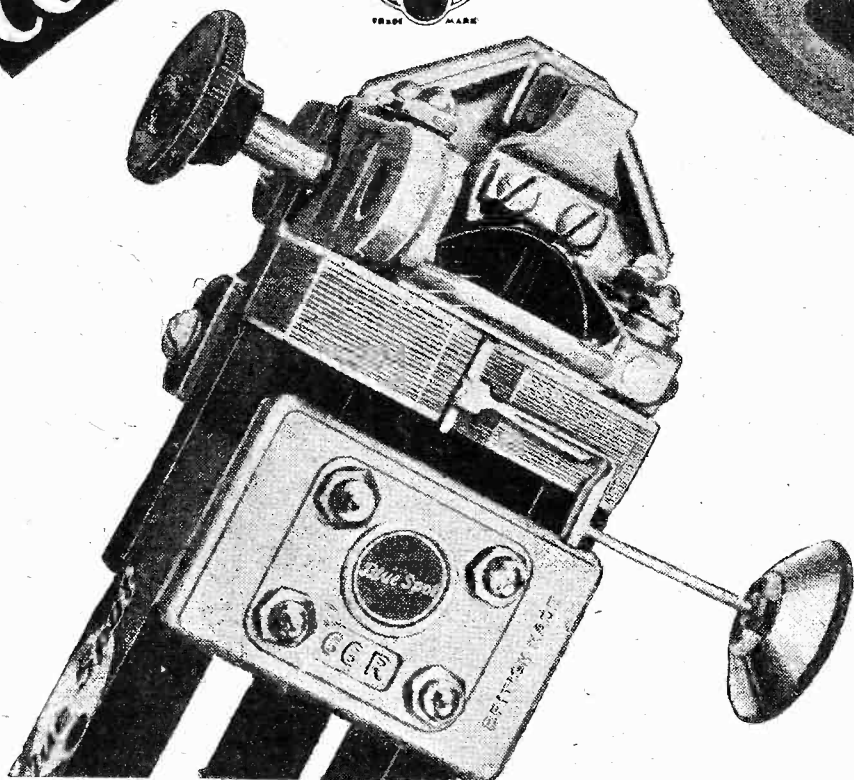
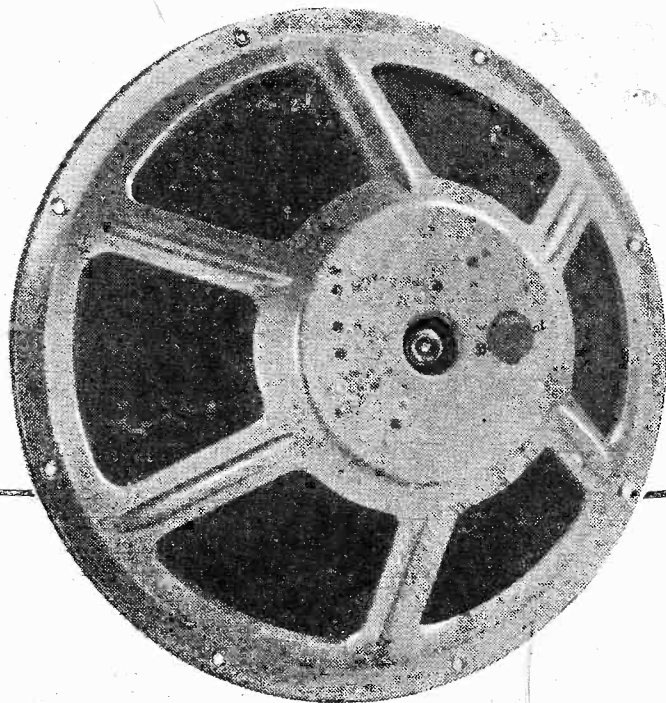
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