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Amateur Wireless

Every
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and
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Vol. XIX. No. 497

Saturday, December 19, 1931

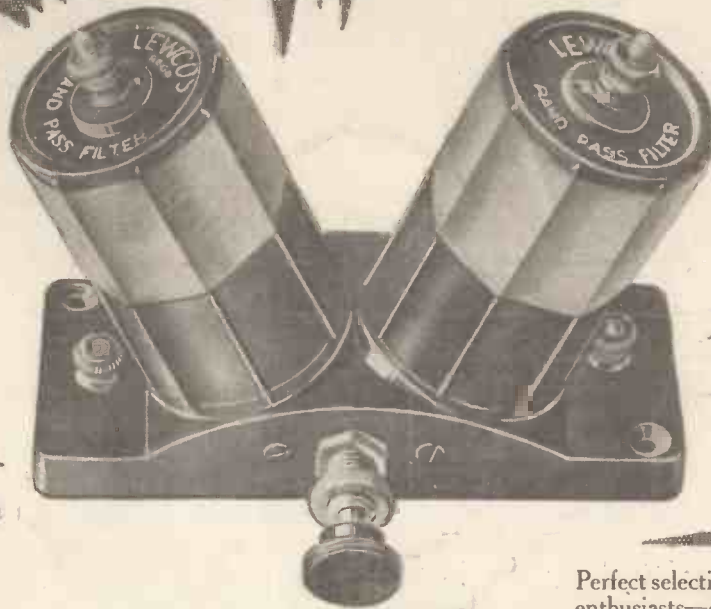
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The Lewcos Band Pass Filter, and the Super Het Coil Kit (No. 1 on page opposite) are specified for the "A.C. BRITAIN'S SUPER."

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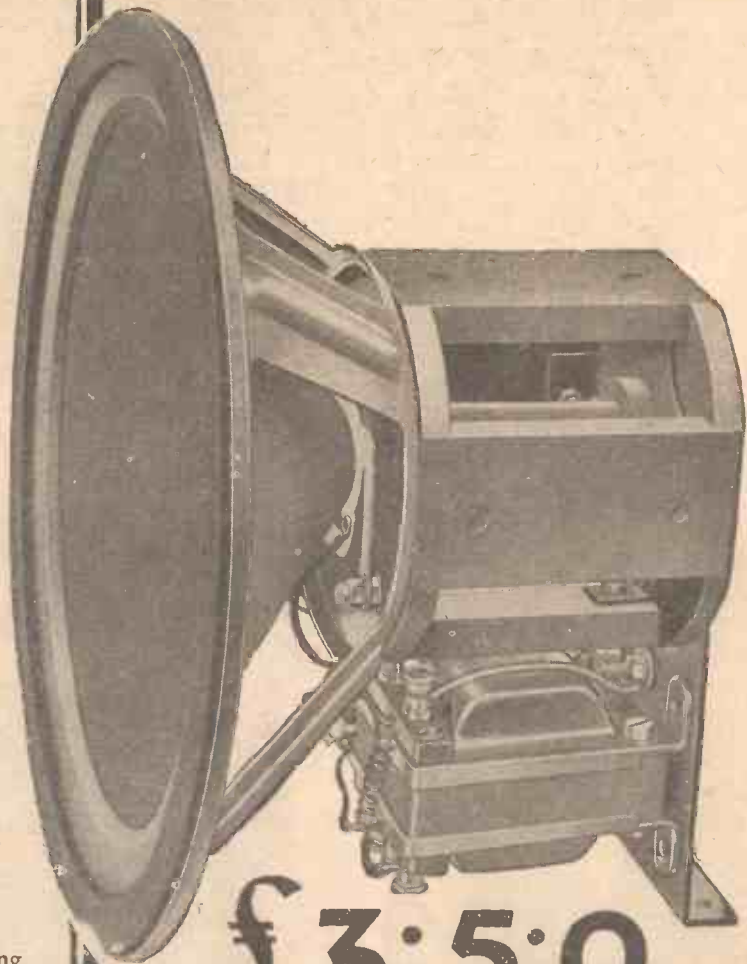
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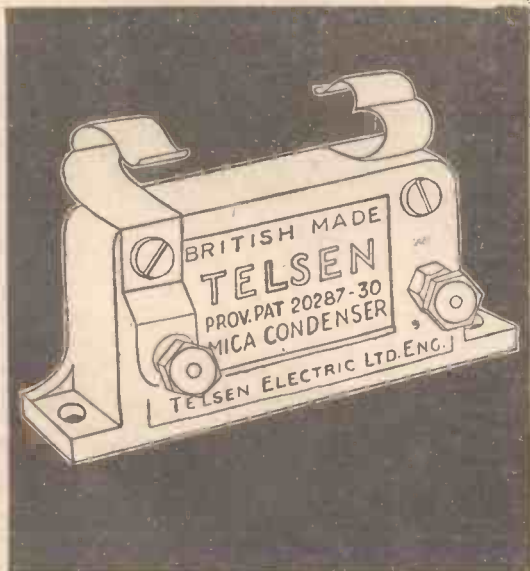
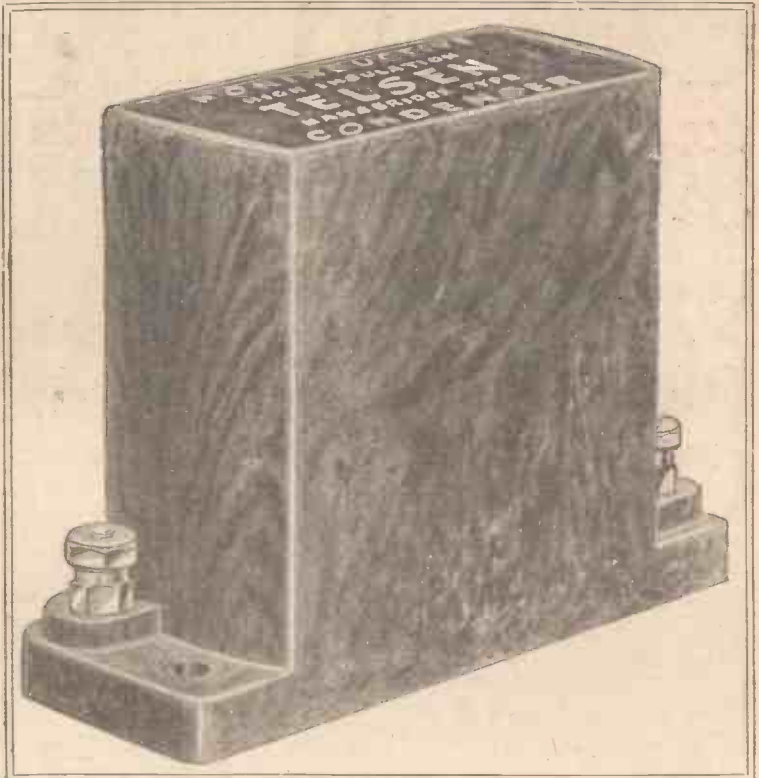
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BRITAIN'S LEADING RADIO WEEKLY
FOR CONSTRUCTOR, LISTENER & EXPERIMENTER

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NEWS & GOSSIP OF THE WEEK

SUPER-HET POPULARITY

THE "A.W." Technical Staff is proud of the fact that it was the first to popularise in a weekly wireless journal the new style of super-hets with band-pass tuning intermediate stages. Don't be over-awed by this technical label! Old super-hets which did not have screen-grid valves, and which employed plain I.F. coupling, were not so successful as they should have been. It was "A.W." which pioneered in producing really successful super-hets like the "Century Super."

FOR MAINS USERS

PREVIOUS super-het designs have nearly all been for battery users and a new development is the "A.C. Britain's Super," introduced in this issue by our Research Consultant, which is designed for working on alternating cur-

rent mains. Read the description on page 1311. It will convince you.

MICROPHONE PRODUCTIONS

B.B.C. STAFF producers are doing good work. *Pantomimicry*, which is to be heard by Regional listeners on January 1 and by National listeners on January 2, is founded on the first full-length show which Gordon McConnel, the B.B.C. producer, wrote for broadcasting at Cardiff five years ago, and was indeed the first entertainment of this nature ever broadcast. It is a satire in which old pantomime characters appear. The cast includes Leslie Sarony, Michael Shaw, and Wynne Ajello.

MORE PARADES

AND, while on the subject of microphone producers, it is understood

that after the sixth "Parade" this week, Philip Ridgeway will make his usual "break" away from broadcasting for a few months. He has been approached by the B.B.C. to broadcast again early in the new year, probably in March. Some listeners are plumping for a revival of the old-time music-hall broadcasts by which Ridgeway has made his radio name. Others are suggesting a continuance of the present modern style "Parades." The choice is not yet definitely made.

IN THE NEW YEAR

AMONG the programmes for the New Year is a relay of the Ceremony of the Keys, which will be relayed from the Tower of London on January 14, and will be followed by a programme from a London studio of military marches, played by the Wireless Military Band.

A DEDICATED PROGRAMME

A PROGRAMME dedicated to the Anglo-American Radio Society will be broadcast from the American station WJAC at 2 a.m. G.M.T., on January 1 (228.9 metres), with a power of 100 watts. It is probable that this concert will be followed by others from this station. Details of reception should be sent to WJAC, Johnstown Automobile Co., Johnstown, Pa., or to the Headquarters of the A.A.R.S., 11 Hawthorn Drive, Willowbank, Uxbridge. Station 4NRH, Heredia, Costa Rica, also broadcasts occasional A.A.R.S. concerts.

HILDA MATHESON

THE most highly paid of the feminine staff at Savoy Hill, Hilda Matheson, has resigned because she does not agree with the latest talks policy. As Talks Director of the B.B.C. for the last five years, Miss Matheson is entitled to her own opinions, and she has certainly done a great deal to make the talks interesting. We believe the truth is that in the New Year the B.B.C. intends to take much of the controversial matter out of the talks, particularly in relation to criticism of books, plays, and films.



Radio-play producing in an American studio. The intimate close-to-the-microphone technique is very different from that of the B.B.C. The American producers have no device corresponding to our dramatic control panel for combining artistes in a number of studios

NEXT WEEK : AN EXCEEDINGLY LOW-PRICED THREE-VALVE SET

NEWS & GOSSIP OF THE WEEK —Continued

HER SUCCESSOR?

SO far, there is no news of a successor to Miss Matheson, but we can discount the suggestion that an outsider will be given the job. There are precious few "plums" among the B.B.C. staff appointments, but that of Talks Director is certainly one. It is thought, therefore, that a deserving member of the existing staff will eventually be offered the Talks Directorship—and judging by present indications it will be no sinecure.

ABOUT ROY FOX

MANY listeners are asking for the name of the haunting "signature tune" played by Roy Fox's band whenever it is broadcast from the Monseigneur restaurant. The tune is really a very old one, as dance tunes go, dating back at least ten years. It is called "Whispering." And it is sweetly played on that very old-fashioned instrument, the celeste. We note that other bands are copying the "signature tune" idea. Very effectively, too.

CONTROL ROOM AT "B.H."

WE are told that the huge control room at Broadcasting House is being fitted out entirely by B.B.C. engineers. Apparently the Chief Engineer is taking no chances with outsiders. This very tricky job, involving much delicate wiring, is now nearing completion, and will be quite finished by Christmas.

STUDIO POSSIBILITY

THE B.B.C. is making no secret of its interest in the great studio recently erected in Abbey Road, North West London, by a prominent gramophone

company. There is a possibility that this new studio may be loaned to the B.B.C. when it moves to Broadcasting House, because it is now certain that the big concert studio will not be ready until several months have elapsed. No. 10 studio will be rather a long way from Portland Place, whereas Abbey Road is quite handy. Yes, the idea may soon take definite shape.

IN BROADCASTING HOUSE

SOME idea of the difficulties to be contended with in studio designs may be gained from the fact that for a concert studio the echo or reverberation time period must be two seconds, whereas for a vaudeville studio only 1.3 seconds is needed and for the debates studio only .6 second. Inch-thick hair-felt is being used on some of the walls, underneath a soft porous wallpaper. For complete "deadness" the B.B.C. engineers are making use of slag wool.

EMPIRE STATIONS

WE are told that the two new Empire stations being built at Daventry will be housed together in an entirely separate building. The new 5XX station will be in another building. It is not yet decided whether 5GB shall be scrapped. Actually, this station is of modern design and the only temporary thing about it is the building in which it is housed.

S. P. B. MAIS

THIS popular broadcaster

is soon to undertake a series of broadcast talks on the "Unknown Isle"—namely, the British Isles. He will be heard every Monday evening on this topic. This is good propaganda for the "See Britain First" movement, and should interest a large number of listeners.

U.S.A. PROGRAMME PAPERS?

AT last the American newspapers are jibbing at giving so much publicity to the sponsored programmes of the broadcasting stations, who are more or less in competition with them for advertising space. We hear that the big broadcasting companies in America will shortly publish their full programmes through their own papers, on the lines of the B.B.C. programme publications.

BELIEVE THEM OR NOT

STATISTICS are said to prove anything. The latest from the U.S.A. Bureau of Standards seek to prove that 41 per cent. of the population of America are now listeners. 12,564,000 radio sets are said to be in use, equivalent to 50,000,000 listeners. In England there is a better check on the probable listening public through the licence figures. Ten per cent. of the population are licensed, so

we may assume that 50 per cent. of the population are listeners, allowing five listeners to every licence—not forgetting the pirates.

A TAME "CONVICT"

VISITORS to Savoy Hill the other day were a little amazed to see a "convict" walking unmolested through the corridors to one of the studios. It was actually Charles Farrell, who is filming at Elstree, in the part of a convict. He had to rush straight from the set at Elstree to get

to the studio in time for the Children's Hour—hence the amazing apparition.

UNEMPLOYED TALKS

FOLLOWING our recent note about the proposed broadcast talks in the mornings to the unemployed, we hear that several towns in Yorkshire have made arrangements to provide the unemployed listeners with soup during the reception of the broadcasts. Judging by some of the sub-titles, the poor men will need something to sustain them.

LORD SNOWDEN

THE first time Lord Snowden will be heard by wireless listeners since being raised to the Peerage will be the occasion of the Wireless for the Blind Appeal, to be broadcast by him on Christmas Day.



Salzburg, Mozart's birthplace, is the home of a well-known relay station of the Vienna programmes. Land-line link is frequently made with the B.B.C. telephone-line system under the Channel. (Circle) The back of one of the transmitter panels at Salzburg





"BRITAIN'S SUPER" for A.C. MAINS

A "SUPER"
SET

Designed by
W. JAMES

Below is the introductory article on the "A.C. Britain's Super." The original battery model was one of the famous sets of the year. This model is a five-valve super-het for use on an outside aerial and employs the new variable-mu valves. Full constructional details will be given in next week's issue

THOSE who have a supply of alternating current in the house for lighting can easily and cheaply provide the power for a set designed to give plenty of volume. If you want volume you must have power. To have excessive volume is foolish. What you ought to have is ample power for every part of the set, in order that the volume desired may be obtained without overloading. Mains valves may usually be given an anode voltage of about 200. It is, therefore, advisable to provide this voltage. Then there is the grid bias. The amount required should be in addition to the 200 volts of high tension. About 250 volts is the

total, and in this receiver the actual voltage available from the mains apparatus is just this. Many amateurs like to use a pentode output valve. In this set we use one. So far as power output is concerned, therefore, the "A.C. Britain's Super" gives all that is required for ordinary purposes. Now it is all very well to have plenty of power. The quality must be good and we do not want to hear more than one station at a time. Quality depends partly upon the loud-speaker used and the power available. In this new set there is plenty of power and a good loud-speaker will naturally be used. I have taken particular care to see that

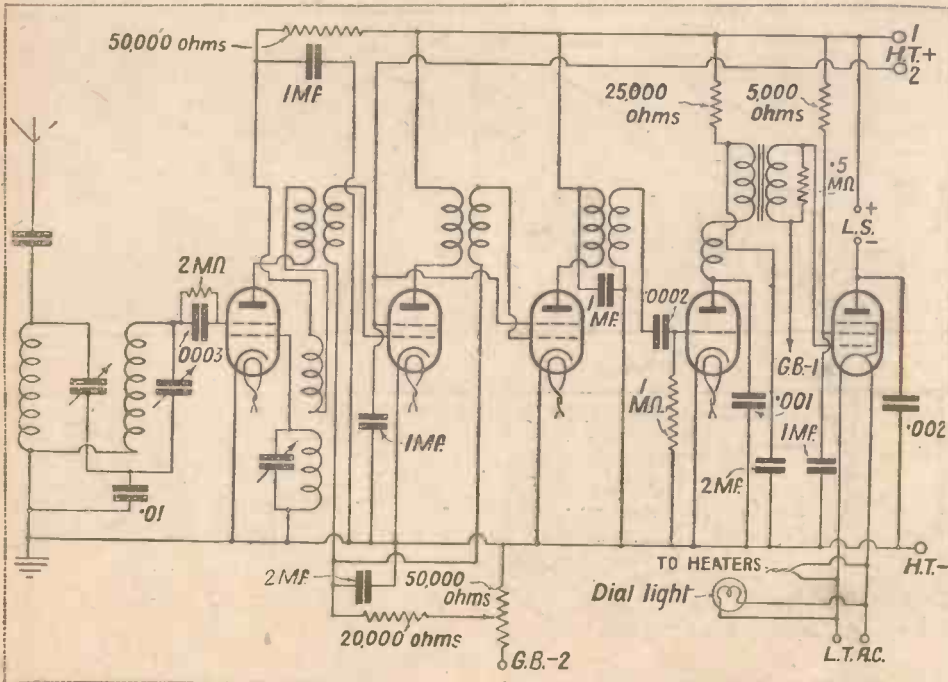
the set will deal as faithfully as possible with the signals collected by the aerial. How many stations will it receive? What is its selectivity like? It will bring in all worth-while stations. The total amplification is much greater than that of "Britain's Super," battery model. There are five A.C. valves. The first is a bi-grid or four-electrode valve having two grids, instead of the usual single grid of the ordinary valve.

The New Variable-mu Valves

One of the grids is joined to the aerial circuit filter. The other grid is connected to a coil in the oscillator. This valve is used as a combined detector and oscillator and it works very well. Then we have two high-frequency stages. These are fitted with the new multi-mu valves. The advantages of the multi-mu valve were dealt with in an article published a few weeks ago. One of the chief is that the amplification can so readily be adjusted by altering the grid bias. The control is particularly nice. There is a snag somewhere with most controls, but this, so far, is easily the best of the lot.

After the two high-frequency stages is the detector. This has ample anode voltage. The current is of the order of 7 milliamperes and in the anode circuit are a high-frequency choke, a transformer of such a size that even amplification is obtained, and a decoupling circuit. The stage magnifies very well, as the valve has a steep slope and the transformer has a high ratio with plenty of inductance.

Then there is the pentode circuit. This gives a good power output for a given input voltage. The amplification of the set is, in fact, about as much as can usefully be employed. Time after time I receive distant stations using only a small amount of power at full strength, and the volume control has to be turned back on most stations using



The circuit of the "A.C. Britain's Super" : note the use of the new variable-mu valves

average power. A short aerial may be used. In most super-heterodynes the volume control is not very satisfactory. The volume can be varied, but the quality may change with variations in the position of the control. Owing to the use of multi-mu valves, we have none of this trouble. Selectivity is exceptionally good. There are no less than eight tuned circuits. Two

trols. One control is that of the condenser tuning the aerial circuit filter and the other is that of the oscillator. There is, of course, a volume control and the wavelength range of the oscillator and the aerial filter are adjusted by switches. The tuning is just as easy as that of other super-heterodyne sets, such as "Britain's Super" and the "Century

new ones will not be needed, as the standard types are used. This set will not quickly go out of date. Being so selective and powerful, it is so far in advance of ordinary sets that you cannot do better than build it. Its field of usefulness is so great. It is not merely a set having extraordinary selectivity or great sensitivity and, therefore, very suited for

COMPONENTS FOR THE "A.C. BRITAIN'S SUPER"

Cabinet (Readi-Rad, Peto-Scott).
Ebonite panel, 18 in. by 7 in. (Danipad, Readi-Rad, Wearite, Peto-Scott, Becol, Permacol).
Baseboard, 21 in. by 10 in. (Camco, Readi-Rad, Peto-Scott).
.0005-mfd. dual gang condenser and disc drive (J.B., type R.2; Lotus, Utility).
.0005-mfd. condenser and disc drive (J.B., type R.1; Lotus, Utility).
Set of super-het coils, types: one O.T.1, two O.T.2, and one special two-range oscillator for bi-grid valve (Wearite, Lewcos).
Band-pass coil (Lewcos, two-range type B.P.F.).
Eight 5-pin valve holders (Telsen, W.B., Benjamin, Lissen, Clix, Bulgin, Wearite, Junit, Lotus, Burton, Graham-Farish).
Three grid-leak holders (Readi-Rad, Telsen, Lissen, Dubilier, Bulgin, Wearite, Graham-Farish).
One .01-mfd. fixed condenser (T.C.C., type S; Dubilier).
One .0002-mfd., one .0003-mfd., one .001-mfd. fixed condensers (Telsen, T.C.C., Dubilier).
One .002-mfd. fixed condenser (T.C.C.).
Four 1-mfd. fixed condensers, 500-volt D.C. working (T.C.C., Ferranti, Dubilier).

Three 2-mfd. fixed condensers (T.C.C., Dubilier, Ferranti, Telsen, Formo).
Super-het choke (Readi-Rad).
Low-frequency transformer, 7 to 1 (Ferranti).
Two 1-meg. and one .5-meg. grid leaks (Telsen, Dubilier, Lissen, Sovereign, Graham-Farish).
50,000-ohm wire-wound potentiometer (Colvern, Bulgin, Wearite, Watmel).
Four spaghetti resistances, 50,000-ohm, 20,000-ohm, 5,000-ohm, 25,000-ohm (Lewcos, Telsen, Bulgin, Sovereign, Readi-Rad, Lissen, Tunewell).
Panel light (Readi-Rad, Bulgin).
Two terminal mounts (Sovereign, Junit).
Four terminals, marked Aerial, Earth, L.S.+ , L.S.— (Belling-Lee, Bulgin, Eelex, Burton).
Connecting wire and sleeving (Lewcos, Jiffilix, Quickwyre).
Five yards thin flex (Lewcoflex).

Two 4-mfd. fixed condensers, 500-volt D.C. working (T.C.C., Formo, Ferranti, Dubilier, Helsby, Lissen).
Two 1-mfd. fixed condensers, 500-volt D.C. working (T.C.C., Formo, Ferranti, Dubilier, Lissen, Helsby).
Two .01-mfd. condensers, 800-volt D.C. working (T.C.C., Dubilier).
4-pin valve holder (Telsen, Lissen, Benjamin, Burton, Clix, W.B., Wearite).
Two 20,000, two 30,000, two 1,000, and two 600 spaghetti resistances (Lewcos, Telsen, Lissen, Sovereign).
Baseboards, 10 in. by 11 in. and 3 1/2 in. by 4 1/2 in. (Camco, Peto-Scott, Readi-Rad).
Connecting wire and sleeving (Lewcos, Jiffilix, Quickwyre).
Strip of ebonite, 5 in. by 3 in. (Permacol, Becol, Peto-Scott).
Terminals: H.T.+1, H.T.+2, H.T.—, G.B.—1, G.B.—2, two L.T., A.C. (Belling-Lee, Eelex, Bulgin, Burton).

MAINS PORTION

Smoothing choke (Varley dual L.F. choke, Heayberd, Wearite, Regentone, Telsen, R.I., Parmeko).
Mains transformer, 4 v. 6 a., 4 v. 1 a., 250-0-250 v. (Junit, Wearite, Parmeko).

ACCESSORIES

Five valves: one A.C. bi-grid (Cossor 41MDG), two multi-mu S.G. (Mullard MM4V), one 354V (Mullard), one PM24A (Mullard).
Speaker (Epoch A.2.).

of these circuits form the aerial filter and are tuned with a two-gang condenser. The other six tuned circuits are in the form of three band-pass filters, adjusted and fixed by the makers. These tuned circuits together form a very selective arrangement. Tuning is easy enough, as there are only two con-

Super." Statons are brought in with the greatest of ease. A turn of the dial of the oscillator condenser of one degree is enough to bring in a station or to cut it out. There is no mains hum. The set is compact enough and not expensive to build. If you have the super-heterodyne intermediate frequency coils in a battery or other set,

the reception of distant stations. The set deals properly with the local station, the quality being good. Many readers have asked me to produce a set such as "Britain's Super," but working from the A.C. mains. This is the set built for them and its construction will be described in next week's issue.

FLEX'S SET GIVES HIM SOMETHING TO THINK ABOUT—



—SO DOES MRS. FLEX



HOW MANY VALVES for GOOD SELECTIVITY?



A question raised by Alan Hunter as the result of an interesting comparison between two of the sets in the range of a well-known maker

It was after dinner; perhaps that was why, in an expansive mood, I asked my gentle host how his wireless set was behaving—normally I keep off the eternal topic, knowing full well that my professional services will inevitably be enlisted. As I might have expected, the answer was to the effect that the high-tension accumulator was being charged, but that anyway the set was not worth hearing, because the foreigners would persist in butting in whenever the London National or Regional stations were wanted.

Having committed myself, I could not help avoiding further investigation. I am glad I went on, because a useful experiment was the sequel. The set was good enough in its day; in fact it was the best kit set on the market two years ago: three valves, comprising a high-frequency amplifier, detector, and power output; the aerial circuit a tapped coil, the intervalve coupling

how could it be fitted? In answer to these leading questions the makers replied that unfortunately conditions had greatly changed since the kit set was first put out. In fact they admitted that it would not cope with present conditions. But they could not suggest any alteration to the set.

A Change of Set!

Band-passing would involve a complete re-design of the high-frequency layout and was, therefore, impracticable. In a word, they suggested that my friend had enjoyed a good run for his money and that the time had come to buy a new set and naturally they recommended their latest four-valve kit.

This kit, as I have found on test, is very efficient, for it has two high-frequency amplifying valves, coupled with three tuned circuits.

Now my friend was wondering whether he should buy the four, his argument being that three tuned circuits must be more selective than two tuned circuits. This

obtained with four valves as compared with three. Naturally, there would be a higher degree of sensitivity with the four, owing to its greater amplifying powers, but would there be any real superiority in selectivity?

Two Circuits Compared

Here a reference to the skeleton outline of the two circuits will be of value, for there must be many readers with sets incorporating one or other of them. Let us look first at the three-valver, comprising a stage of screen-grid amplification, a detector, and a transformer-coupled power output valve. There are only two tuning circuits, the aerial tuning circuit and the intervalve coupling circuit.

The aerial tuning comprises a variable condenser in series with a small untuned winding coupled to the main tuning coil. The variable condenser acts as a selectivity-cum-volume control.

The high-frequency valve is coupled to the detector valve by means of the tuned-grid system. This comprises a high-frequency choke in the anode circuit of the high-frequency valve, the anode being taken to the detector grid-tuning coil through a small fixed condenser. To the grid winding in the detector circuit is coupled a reaction coil, and the amount of reaction is controlled by a differential reaction condenser.

Such a circuit arrangement is very flexible, and provides average sensitivity with a variable degree of selectivity, the actual degree of which is controlled by the aerial series condenser.

The Four-valver

Now look at Fig. 2, which shows the main outline of the four-valver used in the tests. Here we have two high-frequency amplifying valves, preceding a power-grid detector. As in the three-valver, the aerial circuit comprises an aperiodic aerial coupling, with a series aerial condenser for volume control.

The couplings between the high-frequency valves consist of transformers with tuned secondaries. Note that the secondary of the transformer between the second high-frequency valve and the detector is tapped, so that the detector damping is reduced, because grid current flows through only a part of the tuned winding. There is no reaction in this circuit, as the two high-frequency valves provide more than enough amplification before detection.

(Continued on next page)

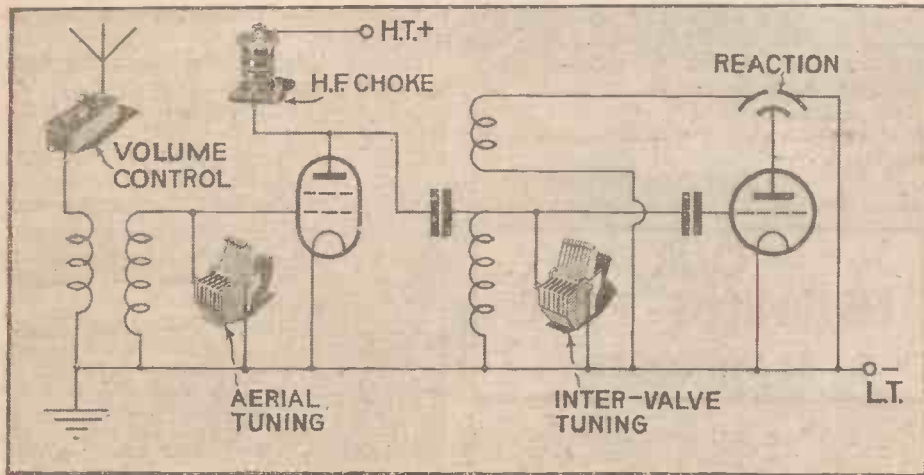


Fig. 1. Showing the outline of the three-valve circuit referred to in the accompanying article. Note the choke-coupled tuned-grid arrangement between the high-frequency and detector valves

a tuned-anode coil. Such a combination was adequate to meet the selectivity needs of two years ago, as I well remember.

Well, to give the gist of the story, my friend had written to the makers, whose name is a household word, and lamented the present state of affairs that prevented his otherwise excellent set from getting the locals clear of the adjacent foreigners. Could they not suggest some form of external tuning device to improve the set's tuning? Would a band-pass help and, if so,

theory seemed quite reasonable, except for one point: might not the extra amplification of the two high-frequency valves counteract the extra selectivity of the three tuned circuits, thus bringing us back to an overall condition not greatly better than that obtained with one high-frequency valve and two tuned circuits?

I happened to have this particular firm's latest three-valver and four-valver on my test bench at home, so I decided to see just what improvement, if any, could be

From a comparison between the two circuits just mentioned, the average listener would naturally conclude that the four was in every way superior to the three, and especially in sensitivity and selectivity. It was to see how far this assumption was justified that I carried out the comparative test.

Both sets were fitted up on my standard aerial, which is about twenty miles from Brookmans Park. I first tuned in the local stations on the four-valver. London National was received at its maximum strength at 24 degrees, and spread to 28 and 19 degrees. At these two limits the

was logged at 26 degrees, and was eliminated at 21 and 32 degrees, again a spread of 11 degrees.

It will be seen that, so far as the elimination of the local regional stations at a distance of twenty miles is concerned, there is nothing to choose between the four-valver, with its three tuned circuits and the three-valver with its two tuned circuits. This conclusion must come as a surprise to many readers, so we had better look into the reason.

The first point to note is that the readings for the spread effect of the locals were based on the assumption that, at the dial

also a very important aid to selectivity. It may be asked why the volume control in the four is not equally valuable. The answer is not obvious. In the three there is reaction. In the four there is not. This difference supplies us with the clue to the value of the volume control in the three.

When the volume control of the four-valver is turned down, all stations are reduced in strength, the local and the foreigner. But in the three, although the volume control reduces all stations, reaction then increases the wanted station and not the unwanted stations.

Thus with the three-valver provided with an aerial control for volume control and reaction in the detector circuit it is easy to alter the ratio of strength of the wanted station to unwanted stations. But in the four, unless the wanted station is already clear of unwanted stations, no amount of volume control will cut out the interfering station, since the ratio of strengths will remain unchanged.

Local Reception

During the tests referred to I noted particularly the reception of the local stations. I cannot claim that the four-valver gave me any clearer reception of these stations than the three-valver.

I am inclined to doubt whether the advice given to the friend with the three-valve kit set was really sound. It looks as though, if you are troubled with interference on the local programme the three will be as good, or as bad, as the four-valver.

We shall have to face this problem. Thousands of listeners are interested in only the local stations and foreign-station interference is often intolerable. If there is no actual programme interference, there is often a high-pitched whistle, caused by the heterodyne effect between the two stations.

Usually this whistle has a frequency between 3,500 and 4,000 cycles. This means that to eliminate it from the final loud-speaker output we must arrange to cut off all frequencies above at least 4,000 cycles. That is another story.

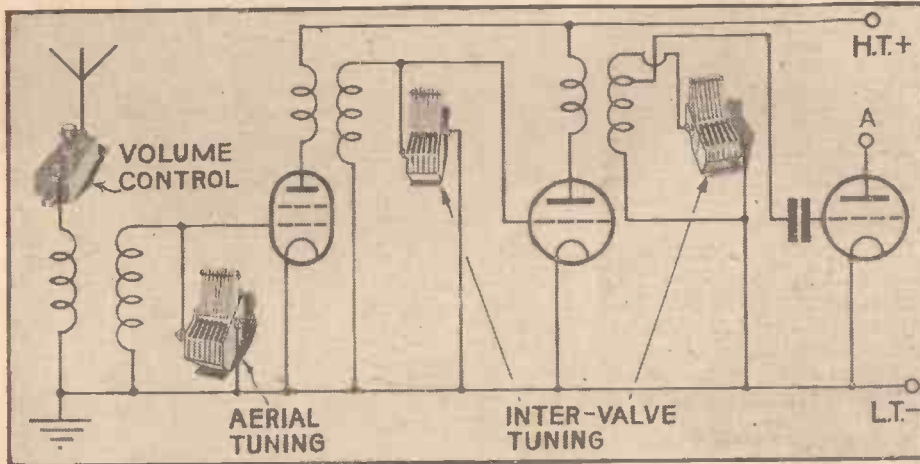


Fig. 2. This is the four-valve circuit, with two high-frequency stages coupled by means of transformers with tuned secondary windings

local was reduced to inaudibility. The spread was thus 9 degrees.

On the same set the London Regional was received at its maximum strength at 56 degrees and was reduced to inaudibility at 60 and 50 degrees. The spread was thus 10 degrees.

Switching over to the three-valver, the two locals were again tuned in. London National was received at 13 degrees and had disappeared at 9 and 20 degrees, a spread of 11 degrees. The London Regional

point marking the end of the station's spread, a foreign station could be heard at good strength. Obviously, it would be easy on the three, for example, to cut out the local in, say, 5 degrees by reducing the volume control to its minimum. But this would not serve any useful purpose, since the main reason for cutting out the local is to get a foreigner, and the foreigner would be too weak with the volume control at its minimum.

In the three-valver the volume control is

IN my notes last week I referred to the increased power of the Hilversum transmitter, a fact which you may possibly have noticed. I hear that, pending authority to erect its own 60-kilowatt station, the A.V.R.O. broadcasting association has come to an arrangement with the N.S.E., the constructors and owners of the Hilversum and Huizen transmitters, whereby the plant of the old PHOHI 16-metre short-waver has been adapted for 298.8 metres. The latter, you may recall, was one of the most powerful short-wavers on the air. The converted plant has been testing frequently in the later hours of the night on recent dates and on one or two evenings has been used for the A.V.R.O. broadcasts.

Apparently, that well-known game of "General Post" is being played by the Italian authorities, for the logging of their stations has become a serious puzzle. On seeking Milan for a special broadcast last week, I found the station working on the Naples wavelength; my next move was to find Naples, which, as you know, exchanges programmes with Rome. After twiddling the dials for a short time I discovered that it had been moved to 318.8 metres, or on a spot my wave list gave me for Sofia—a station, by the way, I never hear. Continuing the search, I carefully logged

OUR LISTENING POST

By JAY COOTE

Trieste and Rome in their usual positions; but, to my surprise, picked up Genoa at full strength, clear of any interference. Now, this Italian is supposed to share an allotment with Cracow, and hitherto it has been difficult to separate them. Has Cracow moved? There is a possibility, for Wilno—perhaps temporarily—has abandoned 244.1 metres for 493.4 metres. You might therefore look for Cracow on the lower wavelength.

At any moment now you may log a test from the new 30-kilowatt Florence transmitter. Don't forget the name: *Fee-ren-zay* (Firenze), preceded by the conventional "*Pronto! Pronto!*"—so favoured by Italian engineers. The Milan 70-kilowatt station will not be ready before next spring.

I notice also that Prague has adopted, as an interval signal, a sound reminiscent of a hooter—just one long-drawn-out note. It was a

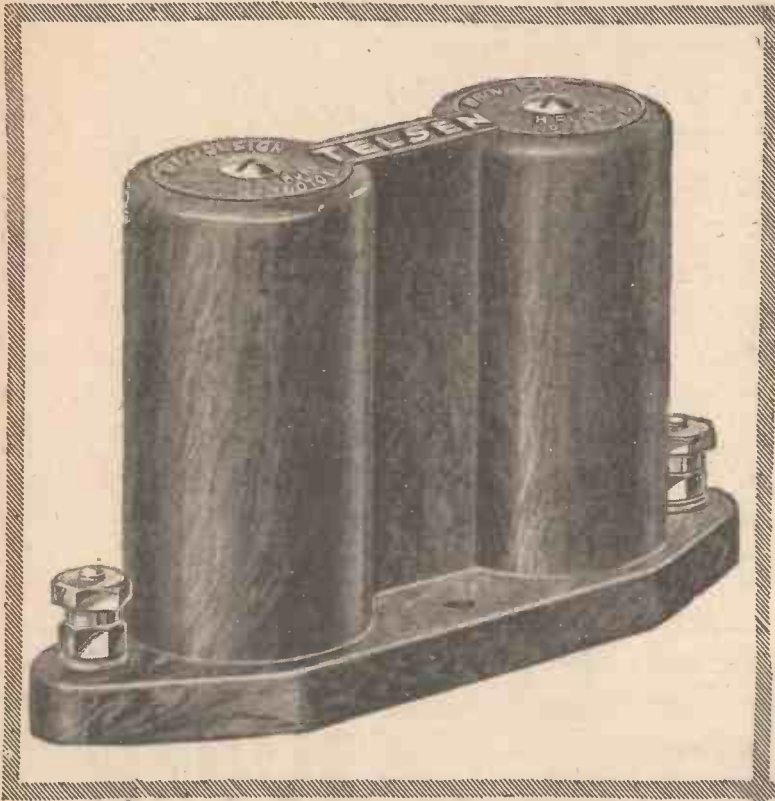
speciality of Brno a year or so ago and represents a perfect A, in the harmonic scale; in fact, a note to which musicians can safely tune their instruments.

Do you ever listen to Radio Alger (*Algiers*)? In its early days it was one of my favourite stations, if only for its wailing singers and instrumentalists. The programmes, of late, have been greatly modernised, and if you tune in on Wednesdays and Fridays towards 9 p.m. G.M.T. you will hear a relay of dance music by the Jack Mill Jazz Orchestra playing in the ballroom of the Municipal Casino.

Listeners have asked me from which station, now and again, on Sunday afternoons, they pick up a running commentary on a football match. Dublin or Cork is the answer, but in the future you may have to check your readings, as Brussels (No. 1) intends to broadcast the same kind of programme.

During what might be termed the "dead" hours on Sundays, Radio Paris is now particularly active. From this station we get three sponsored programmes of gramophone records, namely at 1 p.m. the *Philco* Hour, followed by the *Decca* and *H.M.V.* special broadcasts. In the latter, before each announcement, you are treated to the barking of the little white terrier.

IMPEDANCE . . .



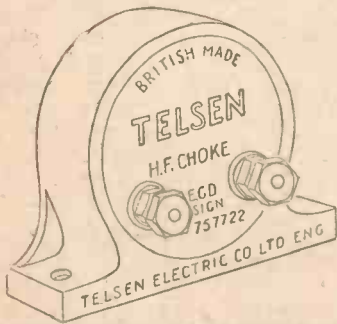
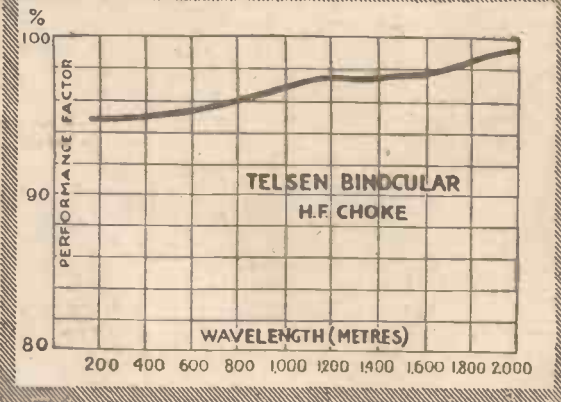
TELSEN BINOCULAR H.F. CHOKES

It is the function of an H.F. Choke to present the highest possible impedance to H.F. currents at all wavelengths. Particularly does this apply to the popular tuned-grid arrangement of screen-grid amplification, where the performance of the whole set is limited by the value of the impedance in the anode circuit of the screen-grid valve. It is equally important that this high efficiency should be maintained over the whole broadcast band.

Telsen Binocular H.F. Choke.
Price 5/-.

The Curve adjoining (published by courtesy of AMATEUR WIRELESS) represents the efficiency over the Broadcast Band, as measured at the Furzehill Laboratories by J. H. Reyner, B.Sc., A.C.G.I., D.I.C., A.M.I.E.E., M.I.R.E., who says: "This curve shows the fine performance of the new Telsen Binocular H.F. Choke . . . the performance factor exceeds 95 per cent. at all points, and there is a distinct freedom from subsidiary resonances. . . . This Choke must be considered as taking its place with the best on the market."

Combined with its "fieldless" properties these figures show that where superlative performance is called for the choice must be the TELSEN Binocular H.F. Choke.



TELSEN STANDARD H.F. CHOKES

utilises the minimum baseboard space. It is designed to cover the whole broadcast band and has an extremely low self-capacity. The inductance is 150,000 microhenries and the resistance 400 ohms.

It has proved very popular and has been incorporated by set designers in many of the leading circuits. Price 2/-



THE SECRET OF PERFECT RADIO RECEPTION

Mullard

THE · MASTER · VALVE

The Mullard 2-volt range, already supreme in performance, now includes the P.M.202, a super-power valve especially designed to economise in low-tension current consumption. With its low filament consumption of only 0.2 amp.—no more than that of an ordinary power valve—it gives large volume and high quality reproduction. It is thus particularly suitable for use in the output stage of portables and small battery-operated sets. Take advantage of the efficiency, and fit one in your receiver to-day.

Price **13/6**

P M · · 2 0 2



SUPER POWER OUTPUT

MADE IN ENGLAND

Advert. The Mullard Wireless Service Co., Ltd., Mullard House, Charing Cross Road, London, W.C.2

Arks:

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

Oh Your Wavelength!

MUM'S THE WORD

THERE is an extraordinary affection in the lay press for adjectives such as "mysterious" and "secret." Any problem which will take a day or two to unravel is a mystery; anything not labelled immediately with a number or a name is a secret. In the latter category fall, I think, the secret wireless wavelengths that are to be used by the police in the course of their sleuth-hound activities. The only way of keeping the wavelength secret is not to transmit upon it. As soon as you start using it you can be sure that some knob-twiddler will light upon it and, though he may not have the apparatus for measuring it in metres or kilocycles, it is ten to one that if he picks up messages full of thrills he will make a note of the condenser reading.



SORRY TO DISAPPOINT

THE latest intelligence is that a secret wavelength is to be used by the Brighton Police Force when communicating by wireless information from headquarters that will aid sleuths, hot on the trail, in tracking down their quarry. Crime, unfortunately, is not so rampant in Brighton that the "secret" wavelength will be in constant use, and I don't think that those who discover it are likely to find the majority of the messages very thrilling. Detectives and constables, it appears, are to be armed with midget wireless sets of pocket size—or should one say provided with capacious pockets of wireless-set size? But the bulk of the messages sent and received will be concerned with routine matter of no particular interest to the man-in-the-street.



ON THE SPOT

MATTERS are, of course, quite different for the listener in Chicago and other American towns where they average a murder a day and goodness knows how many lesser crimes. There the ether is so filled with thrilling police calls on the local "secret" wavelength that astute manufacturers are marketing special apparatus which enables the ordinary broadcast receiver to pick up the police short-wave transmissions. "Buy an XYZ adaptor," scream advertisements, "and help your local police to hunt down criminals." I imagine that the local police in question would much rather be without this kind of thing, for what probably happens is that the ears of Policeman O'Shaughnessy (all American cops are Irish, according to the movies) are so shattered by the howls of the American equivalent of Ham-handed Henry and Oscillating Oswald that he cannot hear important messages from headquarters.

A BIG SUCCESS

THE long-distance debate between the Universities of Oxford and Harvard was a triumph for wireless, for it was conducted over the transatlantic telephone without a hitch from start to finish. It is a queer sidelight on the mentality of those who run the B.B.C. that the subject—"Should War Debts be Cancelled?"—was felt to be too controversial to be broadcast in this country, though the debate was broadcast by the National Broadcasting Company's huge chain of stations in the United States! What is sauce for the goose is apparently not sauce for the gander.



A BREAKDOWN

THERE was a surprising hitch the other night during the relay of the first act of *Der Rosenkavalier*, whose performance by the Covent Garden Opera Company was being broadcast from the Prince of Wales's Theatre, Birmingham. All was going merrily when suddenly the music fluffed out and thousands of loud-speakers ceased to be speakers at all. Ham-handed Henry and Oscillating Oswald leaped to their reaction knobs and gallantly supplied the want of music by playing scales for us. Presently a voice was heard; it was Colonel Blois, of the Covent Garden Opera Syndicate, telling us what had happened. Apparently a breakdown in the mains supply to the theatre occurred and the relay apparatus was thrown out of action. With great presence of mind, somebody went to the piano and kept us entertained for the twenty minutes that elapsed before the juice came on again.



THE ADVERTISING QUESTION

MORE and more stations in Europe seem to be lending themselves—or, perhaps, lending is not quite the right word—to advertising. Toulouse, of course, has always told us where to buy umbrellas or bird cages or boots. But he has so far confined himself to advertising the shops of Toulouse itself. Radio-Paris is leased on Sunday afternoons, and possibly at other times as well, by the gramophone-record people and by other British companies. Fécamp and Dublin have lately been used for boosting certain wireless sets, and the huge Luxembourg transmitter, now in process of erection, is to pay its way by telling the world about all kinds of goods which are offered for sale. It is, in fact, to become a kind of international advertising medium. The B.B.C. has in theory always set its face strongly against the use of its own stations for advertising purposes, and we think that nothing of the kind will ever happen in this country.

THE THIN END OF THE WEDGE

MYSELF, though, I do not feel quite so sure about it. It seems to me that something of the kind is already happening on a much larger scale than is generally realised. There is the boosting of the B.B.C.'s own publications over the microphone, which we know is of enormous publicity value. But you will hear the most astonishing instances of advertising by those who have so firmly stated that they will have nothing whatever to do with it if you listen in to the instructional programmes conducted during the afternoons for the benefit of schools and to other items of an educational nature. The other day, during a language lesson, it was announced that the lessons could not possibly be followed properly unless a certain book were purchased. The name of the book, its publishers, and its price were then given out with the distinctness reserved usually for S.O.S. messages, and listeners were advised to hurry up if they wanted to be certain of obtaining copies, since the book in question was rapidly selling out.

And what about the cinema theatres whose organists figure so largely in the programmes, or the hotels and restaurants to which is accorded such splendid—dare I use the word?—publicity whenever their orchestras broadcast. I don't think it is possible to avoid advertising by means of the microphone, however careful you are, and it is just as well to realise that you are doing it.



FRIENDS IN NEED

MOST home-constructors acquire the habit of hoarding a miscellaneous assortment of odds and ends salvaged from old jobs, on the sound principle that one never can tell what may come in handy some time or other. A few Sundays ago the rectifying-valve in the eliminator unit of a friend's set suddenly went "phut," and I was called in to render first aid. Unfortunately I had no "spare" rectifier available, but I remembered that there were a couple of bright-emitter valves on my shelves—relics of a dim and distant past. By first joining the grid and plate of each valve together, connecting the two filaments in parallel, and the two plates across the supply transformer, I managed to rig up a very passable substitute for a double-wave rectifier. It worked, at all events; and, in fact, is still doing its duty nobly.



THE NEW SHORT-WAVE SETS

I WAS glancing through some short-wave catalogues the other day and was surprised to see a number of sets using a screen-grid H.F. valve. It almost seems as if the old-fashioned

On Your Wavelength! (continued)

detector and two L.F. type of set was falling out of favour. I began to analyse from my own experience the difference between the two types of set.

Even with the modern screen-grid valve the amplification at wavelengths of 15 to 30 metres is quite small and, of course, the use of a screen-grid valve necessitates the employment of two tuned circuits, and as short-wave tuning is, in any case, a somewhat delicate matter this would presumably give rise to some difficulty in the hands of the unskilled user. Of course, it is possible to use a screen-grid valve with an H.F. choke, instead of a tuned circuit across the grid and filament, but this arrangement does nothing but hand on the voltage without any amplification, its principal function being to remove the aerial load from the tuned circuit, thereby obviating the incidence of flat spots or holes in the tuning.

SHORT-WAVE RECEPTION AND REACTION

I CANNOT help feeling, however, that a really nicely designed three-valve set of the detector 2 L.F. variety is capable of giving just as good results rather more simply. The great thing, of course, is to get a smooth reaction, because if this is done the amplification of the circuit can be built up to an enormous extent. The reaction itself is not the cause but the effect, the point being that with a properly designed circuit an increase of reaction control causes the signal strength to build up progressively until finally the circuit slides into oscillation. I have used such a circuit on many occasions and have obtained excellent results. However, I suppose our technique will advance until in time we are able to obtain a really marked amplification at these high frequencies, in which case we shall use gang-controlled completely screened short-wave sets much the same as a broadcast set of to-day.

A NEW DISCOVERY

PROFESSOR McLENNAN, of Toronto University, is reported to have discovered a conductor which will pass an electric current without resistance. Further details are not yet available, but it is said to be a new kind of alloy which possesses this extraordinary property at ordinary temperatures. If this is so, and it can be manufactured at a cost to compete with copper, it will certainly cause a revolution in electrical engineering. But I'm afraid it sounds rather too good to be true. For instance, physicists have known for a long time that the electrical resistance of any metal decreases as its temperature falls. In fact, at absolute zero, 273 degrees Centigrade below freezing point—where there is no molecular activity—all metals are perfect conductors in this sense. If one could start a current in a closed circuit at this temperature, it would continue to flow for

ever. But as we can't get down to absolute zero—outside the depths of interstellar space—the fact is hardly of much practical importance.

A "PERFECT" CONDUCTOR

BEARING in mind what has already been done with alloys, particularly in connection with the permanent magnets used for loud-speakers, I shouldn't be at all surprised if the learned

CHRISTMAS HOLIDAYS!

Will readers kindly note that, owing to the Christmas Holidays, the issue of

AMATEUR WIRELESS dated December 26, will be on

Sale on

**WEDNESDAY,
DECEMBER 23**

professor has found a new alloy having a much lower resistance—or higher conductivity—even than silver, which at present stands highest on the list. At the same time, it must be admitted that resistance is a very useful property at times. I mean it would not be practicable to use a "no-resistance" metal for, say, a valve filament, or for an electric lamp or heating stove. Then what about impedance? When a current passes through the new material, does it throw out a magnetic field, or is the effect confined in some new way entirely to the substance of the conductor. If it cannot be used as an impedance for tuning, or as a choke or transformer winding, I'm afraid it won't make much of a show in any ordinary wireless circuit.

MARKING OUT THE PANEL

Large holes for condenser escutcheon plates can be marked out with a pencil and a pair of compasses. These are



also useful for marking out the smaller drilling centres, especially if one is not working with a full-size blueprint.

A BIT "HIGHBROW"

A CORRESPONDENT wants to know if there is any relation between the electron—the unit of electricity—and the "quantum," or unit of radiation. Well, this is really a bit above me, but as I understand it, an atom of matter consists of a number of electrons all busily revolving in various orbits around a central proton. When a substance is heated so that its atoms radiate energy, either as light or heat, each pulse of radiation consists of a definite "packet" of energy, which is set free because an electron jumps suddenly from one orbit to another. The "jump" takes place over a definite distance, so that it involves a constant and measurable loss of kinetic energy on the part of the electron. This energy is communicated to the ether, either in the form of a very minute wave or as a projected "parcel" of radiation. I really don't think anybody is quite certain which.

HOW DO YOU FIND HIM?

THE new giant transmitter of Radio-Paris will be in full operation by the time that these notes appear in AMATEUR WIRELESS and I expect that pretty well every reader who has a valve set will have heard him. Radio-Paris has a wonderful wireless history. He began, if you remember, as Radiola right away back in the early years of broadcasting. I forget exactly what his power was in those days, but I think it was 4 kilowatts to begin with.

He has had his little troubles from time to time. He and 5XX bothered one another for a bit at one time and wavelength changes were made. There have, too, been heterodynes, but they never seem to have lasted for very long. Radio-Paris has done a great deal to alleviate the dreadful wireless Sunday from which we should further suffer. His cheerful lunch-time music on Sundays brightens countless homes, and we all owe a big debt of gratitude to him.

WARE CAPACITIES

IT is quite surprising how high the capacity of indoor aerials can be made if one is not careful. I was trying out some time ago one that a friend had rigged up and with whose working he was not satisfied. He found that a certain station came in with a reading of 40 on the condenser tuning the grid of the first valve when the outdoor aerial was in use. On turning over, though, to the indoor aerial that he had rigged up, the same station was brought in with this condenser at just over 20. In other words, far less capacity was required in circuit since so much more was provided by the indoor aerial. You will find that you can keep the capacity low and make the aerial efficient if you don't let its wires come nearer than about one foot to the ceiling or to any wall.

THERMION.

AT THE B.B.C.

WITH THE MICROPHONE TESTERS

Condenser microphones and other microphone novelties for Broadcasting House are dealt with in this "behind-the-scenes" glimpse of a little-known activity of the B.B.C. engineers, by KENNETH ULLYETT

"I SHOULD hardly like to call the microphone the weakest link in the broadcasting chain," said a B.B.C. engineer in Broadcasting House to me last week, while a new microphone was being tried out, "but it certainly is a weak link."

The frequency characteristics of B.B.C. amplifiers are notably better than those of some microphones, good as the new carbon

Each microphone is hung up on five or six strands of aeroplane elastic and the merit of the Reisz job is that it hardly ever goes wrong. There are some forty or fifty microphones at Savoy Hill and Broadcasting House and these are tested from time to time for background noise. They are put on an ordinary type A control room amplifier and the engineers listening on phones can tell if there is too much background hiss. Maybe it is the mica-diaphragm which has gone out of adjustment or perhaps new granules are needed. Faulty microphones go back to the makers. The only snag with carbon microphones is that they are inclined to "blast," which is sometimes heard when a large volume of sound, such as that of a full symphony orchestra, is reproduced.

It is a pity that a microphone which has an excellent frequency response and is very free from hiss, is an awkward job to use in the studio. This is the condenser microphone.

In the condenser "mike" there is a tightly stretched metal diaphragm held very close to the thick metal backplate, thus forming a condenser of very small capacity. As the diaphragm vibrates the capacity varies and this is made to affect the grid voltage of a little one-valve amplifier.

This amplifier must be quite close up to the microphone and here is a snag from the engineer's point of view. It means having valve amplification gear in the studio, where it cannot very easily be got at, if it goes wrong.

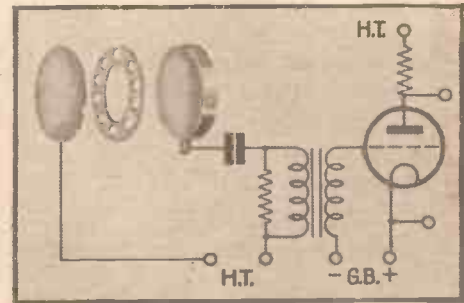
If there are long leads to the amplifier, then the "dead" capacity cuts off the high notes and the wires pick up electrical noises. A little transformer-coupled one-valver has been built and additional leads have to be run up from the accumulators in the control room to the amplifier box.

Other troubles which the microphone testers have had with the condenser "mikes" are ponging of the valve in the amplifier and crackles caused by dampness.

However, when I spoke to the microphone testers in Broadcasting House about further uses for condenser microphones, they seemed much more optimistic than they did a few months back, when they were having trouble with the condenser microphone in studio No. 10.

For some months past, Jack Payne has

been using a condenser microphone. This, of course, is in No. 7 studio at Savoy Hill. Jack was asked to try the microphone and



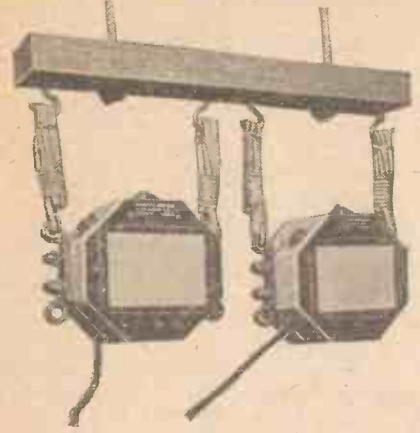
Connections of the condenser microphone across the first-stage amplifier

listen to his band on his own set at home. As a result of the greater clarity he plumped in favour of the condenser apparatus, and that is what he is still using.



One of the Western Electric microphones. This type is generally used with a baffle

It is interesting that while the B.B.C. place greater trust in the carbon microphones, the gramophone recording people have been using condenser microphones for
(Continued in third column of next page)



One of the Reisz microphones in the Talks Studio

and condenser "mikes" can be. The old type of microphone, the Marconi-Sykes magnephone, is now very rarely used, although there are still a few in the Research Department at Clapham.

This is like an energised field moving-coil speaker working "in reverse." The field winding is connected up to large car-starter type batteries and the moving coil is connected to the first stage of the amplifier in the control room. This type of microphone is very satisfactory, so far as background noise goes, but it was difficult to get it giving good reproduction at the extreme top and bottom of the frequency scale.

The Marconi-Sykes gave way to the Marconi-Reisz, which is the little marble tube one sees everywhere, in the Queen's Hall, at sporting events, at St. Martin's-in-the-Fields, and at every O.B. It is not quite so simple as it looks. The little block has grooves cut in the face which are filled with graded granules of a special carbon compound, and a mica diaphragm fits over all the grooves.

THE HOW AND WHY OF TUNING—XV

COUPLINGS USED IN BAND-PASS TUNING

Another of a comprehensive series of articles on tuning, specially written for newcomers to wireless

NOW that we have learned something of coupled circuits we can consider how band-passing circuits are coupled together. Figs. 1 to 4 illustrate the four simplest ways of connecting together by a common coupling component two tuned circuits. Fig. 1 shows the very simplest and least-used method, namely, a resistance coupling. The voltage drop caused by cur-

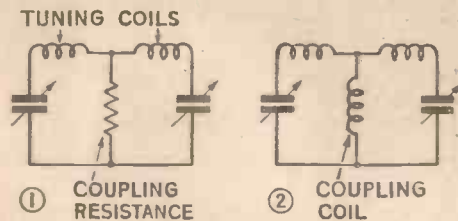


Fig. 1. Coupling two coils by a resistance, and Fig. 2, by a common coil

rent flowing through the resistance from the first tuned circuit will be an applied voltage so far as the second circuit is concerned. The next method, as at Fig. 2, is auto-inductive coupling, and is seldom used.

We must pay more attention to the circuits of Figs. 3 and 4, for here are respectively capacity and inductive couplings. These two forms of coupling have been rivals in the band-pass for some time, but the latest development is to combine both, so that the advantages of each may be obtained, without the disadvantages that result from using either alone. Before discussing the mixed coupling it will be a good plan to see how capacity coupling compares with inductive coupling.

Peak Separation

Our standards of comparison must be carefully chosen. In a band-pass arrangement we want the peak separation between the two sections of the band-pass to remain constant over the whole of the wavelength range. This is not possible with either capacity coupling or inductive coupling. The two couplings produce different effects over the tuning range, but both have the common failing of a varying band width.

At high frequencies, corresponding to the lowest wavelengths on the medium band, the capacity coupling usually loses the double-peak effect and a resonance curve corresponding to a single, sharply tuned circuit is obtained. Although the band-pass action is lost and quality consequently suffers somewhat, the selectivity remains good. At the higher wavelengths capacity coupling becomes unselective and the double-hump effect becomes so great that stations are tuned in at two points on the dial. Not only is the band-pass action lost, but all claim to normal tuning selectivity is abandoned. With a given coupling condenser value, the true band-pass action is possible at only one particular frequency

and efficiency must fall off on both sides of this optimum frequency.

With inductive coupling the reverse effects are obtained. At low wavelengths the selectivity is poor and double tuning may be obtained. At higher wavelengths the two peaks tend to come together and so, although selective tuning is obtained, the band-pass action is lost.

Mixing the Couplings

In view of the above facts, namely, that inductive and capacity couplings each fail to maintain a constant peak separation, could we not combine the two forms of coupling? The widening of the peaks with frequency as obtained with a capacity coupling would be counteracted by the closing up of the peaks as obtained at the higher frequencies with inductive coupling. The same counteracting effect should apply to the lower wavelengths, thus giving us a constant band-pass effect over the whole tuning scale.

Beautifully simple though the idea may sound, it is not very easy to put into practice, as experiments and mathematics readily show. That is to say, we cannot take an inductive band-pass tuning circuit, add to it a capacity band-pass tuning circuit, and so produce the perfect band-pass. But the idea of mixing the couplings is too attractive to give up without a struggle, and several ingenious means have now been adopted whereby two different coupling systems, either of which alone is unsatisfactory, when combined give something approaching perfection.

Probably the simplest of the improved mixed band-pass filters is that which employs the mutual inductance of the two coils, as in the early coupled circuits referred to last week, in conjunction with an externally connected non-inductive coupling condenser. This is the simplest, because the two halves of the band-pass do not have to be screened from one another; in fact screening them would ruin the

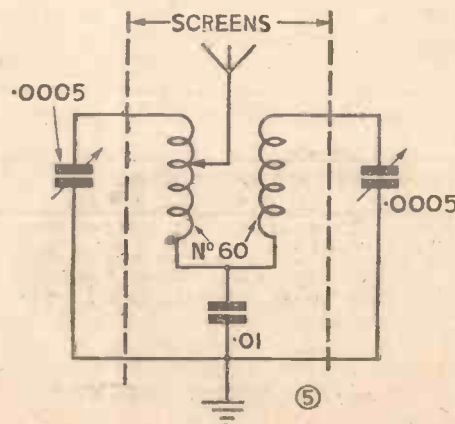


Fig. 5. Simple mixed coupling for two band-pass coils

effect. It is thus possible to install a mutual inductance-cum-capacity band-pass tuner in a set without much structural alteration to the set.

Simple Band-passing

Fig. 5 shows the simplest way of adopting the mixed coupling just described. Two No. 60 coils of the plug-in type can be used with a .01-microfarad coupling condenser (non-inductive type essential). The two coils should be placed nearly at right angles,

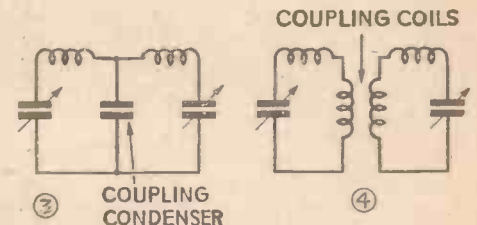


Fig. 3. Capacity coupling
Fig. 4. Inductive coupling

otherwise the coupling will be too great and the old double-hump trouble will crop up. To make sure of the band-pass action it is recommended that the two tuning condensers, both of .0005-microfarad capacity, be screened from the two coils and from each other. Simple aluminium partitions will serve.

Next week I will explain how to use commercial makes of band-pass coils employing this form of mixed coupling.

Horspor.

"WITH THE MICROPHONE TESTERS"

(Continued from preceding page)

over two years. They have a special type in which the microphone is carried at the bottom of a long metal tube and is on a swivel so that it can be faced in the direction of the artiste.

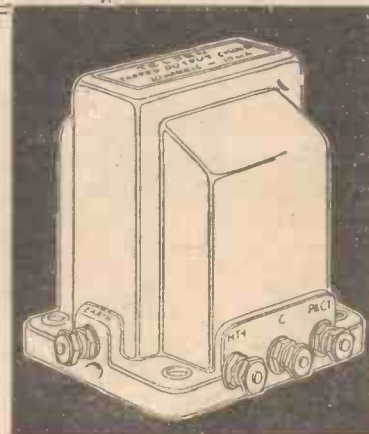
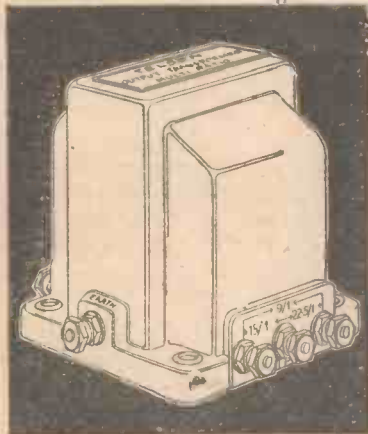
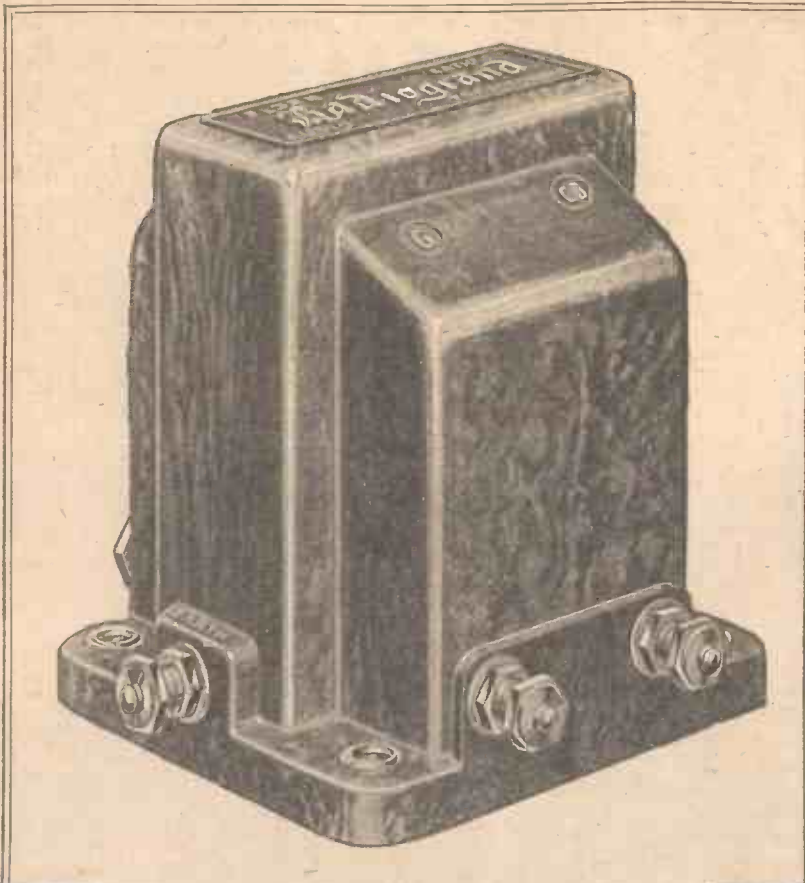
Above the "mike," in the tube, is a single stage of resistance coupling. A multiple rubber cable connects up the high-tension, low-tension, and microphone output to the switchboard. A tone filter is used so that cables nearly 100 ft. long can be used without loss of quality.

No Bass Loss

In spite of the fact that no battery is used, the condenser microphones used for gramophone recording do not appear to suffer in lack of bass. There is just one other difference in microphone technique between broadcasting and the gramophone recorders.

Even in its largest studio, the B.B.C. uses only one microphone. The gramophone people, on the other hand, almost invariably have more than one microphone and a long potentiometer with several tapings is used so that the input from each to the "A" amplifier can be balanced.

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117



102



L.S.7



116



501



11

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Automatic Record Player

(Model 117). In a handsome walnut cabinet of compact design, fitted with the new "His Master's Voice" automatic record-changing mechanism, pick-up and volume control. By connecting it to your radio receiver, eight 10 or 12 inch records (unmixed) may be played at one loading or a single record repeated up to eight times. A unit you have been waiting years for. A.C. or D.C. Price 18 guineas

Armchair Record Player

(Model 116). The new "His Master's Voice" pick-up, volume control, electric turntable motor and automatic start and stop, housed in an oak cabinet of pleasing design. By connecting it to a loudspeaker radio-receiver, records may be played from one's armchair. Interchangeable resistances may be clipped in to the volume control to match the pick-up to any radio receiver. A.C. or D.C. Price 10 guineas

Moving Coil Loudspeaker

(L. S. 7). A permanent magnet moving-coil loudspeaker in an arched walnut cabinet of attractive design. It is extremely sensitive and will handle up to 3 watts without difficulty. A universal input transformer incorporated in the instrument enables it to be matched to receivers with triode, pentode or push pull output. Price 5 guineas

Table Radio - Gramophone

(Model 501) 3-valve all-electric (A.C. or D.C.) Moving Coil Loudspeaker. One operating switch. One tuning knob. One volume control. Illuminated wave-length scale. Mains aerial. New type gramophone pick-up - with reversible head - operating automatic brake. Plugs for two additional loudspeakers. In walnut cabinet. Price 29 guineas

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(Model 102). Entirely new cabinet design. New, all-metal, one piece sound-box. New metal detachable record tray - capacity 14 ten-inch records. New "slip in" winding key. New lid-stay, one hand operated. Chromium plating. Automatic brake works without previous setting, on any record. Fittings include leather carrying handle, new lid lock, pivoted needle container, spring clip for box of "Tungstyle" needles. Black £5.12.6

Pick-up (Model 11).

This pick-up is similar to the one fitted to all our new instruments. It can be attached easily to any type of tone-arm and is supplied complete with a logarithmic volume control and connecting leads. The weight of the pick-up is 5 1/2 ozs.; it has an input of over 1 volt R.M.S., and a D.C. Resistance of 6,000 ohms. Price Complete 2 gns.



The Gramophone Co., Ltd. London, W. 1

"HIS MASTER'S VOICE"



OPERATING The FOUR STAR 4

Constructors of this set, full working details of which were given in last week's issue, will be specially interested in these final notes by the designers on how to work the controls

WHEN the "Four-star 4" set has been constructed along the lines detailed in last week's article, the valves can be inserted ready for preliminary tests. For our tests we used four of the Six Sixty range, an SS215SG (metallised) for the high-frequency stage, an SS210D (metallised) for the detector, an SS210LF for first low-frequency stage, and an SS230P for the power stage.

Alternatives were in the table on page 1278 last week. Whichever make is used, see that they conform to the type specified, and note from the blueprint where each of the valves is inserted. Connect up the

batteries, much of the quality of the results depends on the output power valve and the provision of an adequate power supply for this valve. We have specified an output valve to do justice to the design of the set, but it is open to the reader who constructs the set to use a smaller power valve, with a correspondingly smaller undistorted output and greater economy of working.

The aerial to be used with this set is not critical. There is a sufficient reserve of power to enable full loud-speaker results to be obtained with an indoor aerial. But on the other hand the set has sufficient inherent selectivity to enable quite a long aerial to be

The set is then ready to reproduce gramophone records. For this work the high-frequency valve filament is switched off and the detector valve is negatively biased. Both these changes are effected by the action of the switch.

We have obtained good quality reproduction with the W.B. type PM3 loud-speaker.

For the reception of broadcasting the gramo-radio switch must be pulled out. The first test must include ganging up of the three sections of the tuning condenser. This is quite a simple process if our advice is carefully followed. First tune in a station at about the centre of the tuning dial. Then tackle the three trimmers found on top of the screening case of the condenser. Leave the two outer trimmers almost right out and turn the centre trimmer slowly to maximum-signal strength.

Trimming

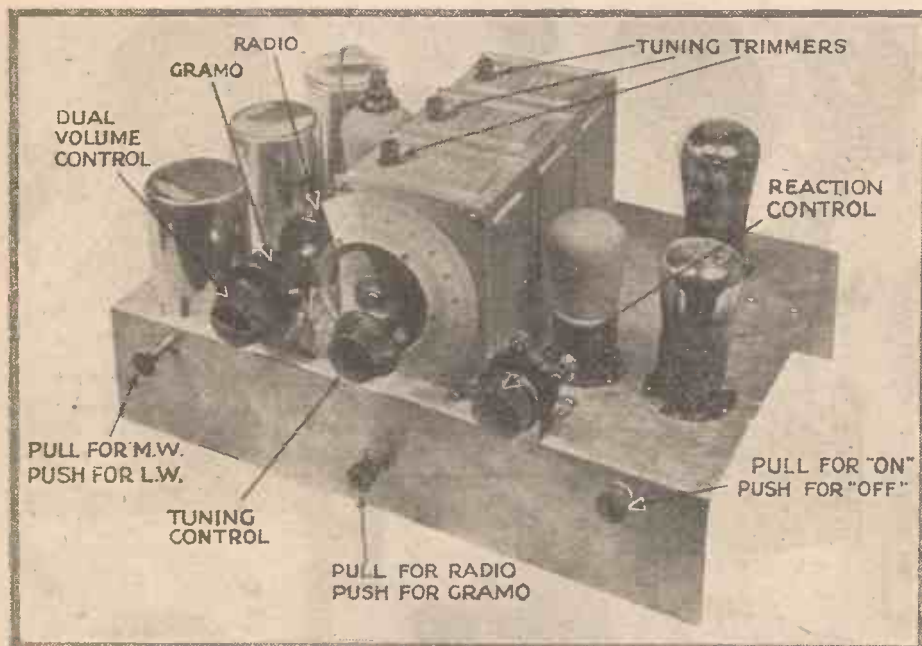
At this point leave the trimmers alone and adjust the pre-set aerial condenser until signals at one particular point will be found to be loudest—not necessarily at the maximum capacity setting. The purpose of the pre-set condenser aerial is to equalise the load on the tuning coils and is most decidedly not to be used as volume control.

Having found the correct pre-set condenser setting, leave this fixed and return to the trimmers. A further adjustment of the centre trimmer may then be needed. Probably the outer trimmers will not need to be touched, but they should be turned in to see if any improvement can be made.

Once the correct trimming adjustments have been made on the middle portion of the medium waveband, as explained, there should be no need to touch anything but the tuning control. The ganging holds good on both wavebands and over most of the 0-to-100-degree rotation of the dial.

In making the trimming adjustments the reader should strive to achieve true band-passing on the reception of a nearby station. The station's signal should spread evenly over 1, 2, or perhaps 3 degrees of the dial and should fall away sharply on each side of the spread limit. Knife-edge tuning is not the aim of this set, which achieves its selectivity without loss of quality, that is, without cutting the side bands carrying the high notes of the musical scale.

If the trimming is not correctly done a
(Continued on page 1344)



The controls of the "Four Star 4" are indicated in this photograph and detailed instructions for their operation are given in the accompanying article

shielded flexible lead coming through the chassis to the top of the screen-grid valve.

We find on test that the total anode-current consumption of the four specified valves is 15 milliamperes, which means that for economical working a treble-capacity high-tension battery will be needed. The set will, of course, work from a smaller battery.

As with all multi-valvers working from

used for the reception of distant stations at full volume and clear of the locals.

We would like to stress the fact that this set is particularly suitable for gramophone reproduction. The pick-up potentiometer volume control in the set works admirably with most of the pick-ups on the market. Simply connect the pick-up leads to the terminals provided on the back of the chassis and push in the gramo-radio switch.

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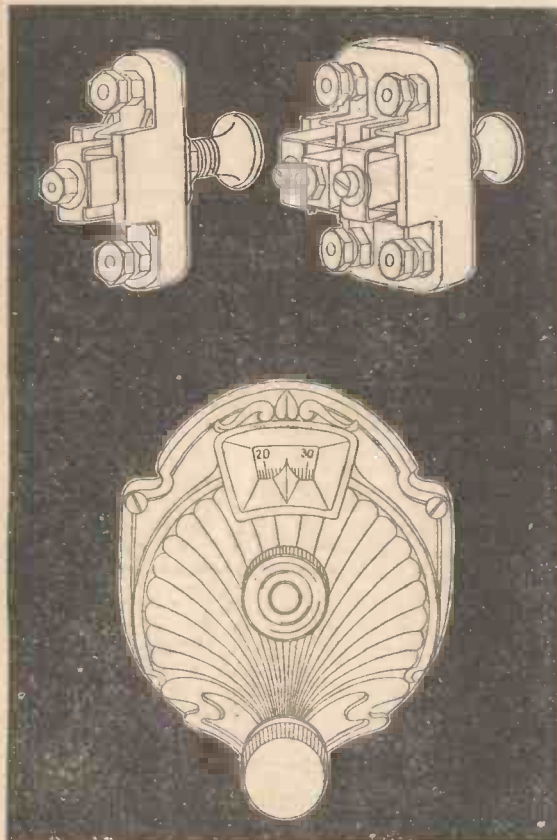
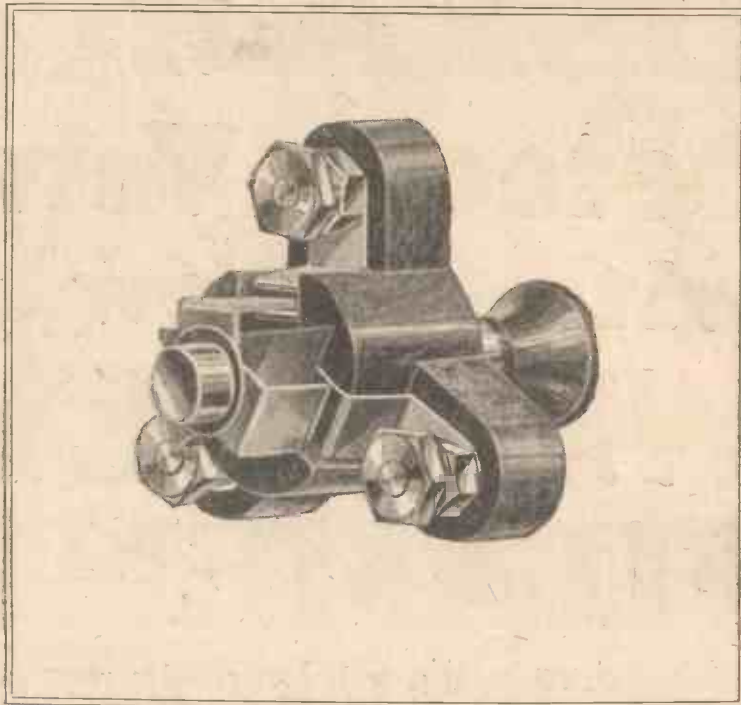
TELSEN SWITCHES & DIALS

PUSH-PULL SWITCHES

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The Telsen Slow-motion Dial has an exceptionally smooth action with an approximate ratio of 8-1. There is no toothed gearing, so that it is impossible to strip the dial. The figures are clear and arranged to provide for right- and left-hand condensers.

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OUR BROADCAST CRITIC

TALKS ABOUT—PIANO BROADCASTS

TO be quite candid, I only heard Acts 2 and 3 of *Tantivy Towers*—quite enough to form an opinion of the work and its general suitability for broadcasting.

In my opinion, these concert versions of comic operas—or even of grand operas, for that matter—are ideal for the microphone. Such versions give producers the opportunity of making suitable cuts and of leaving out unessential matter that is likely to miss-fire unless actually seen by the audience.

In this particular instance the cast was so strong and the general presentation so good that, in any event, the broadcast stands out clearly above anything else I heard during the week.

The music was fresh, English, and thoroughly wholesome. Thomas Dunhill rarely writes unless he has something interesting to say; in this case his music seemed to fit the richness of Herbert's libretto. A very good broadcast; may we have more like it!

While the first act of *Tantivy Towers* was going on I was listening to the other programme—the vaudeville. There was some quite good fun in it, but I feel that there is a deadly sameness about these vaudevilles that should be overcome.

Leslie Weston was decidedly amusing, though not as brilliant as I have heard him; the Two Pairs were very amusing, but very much after their usual style. One tires of "Enid!" "Yes?" "Say good-night." "Good-night, Michael; good-night, Mike," but, one supposes, they do not feel they have done their duty unless they have included it.

The sketch *O.K. with Me* was sufficiently interesting to warrant its inclusion; also, it had the advantage of pointing out the coarseness of American slang. The more I hear of it, the more I feel inclined to uphold standard English.

The Kentucky Singers did not impress me; I thought their voices not individually good enough for the work they were doing.

I imagine that the specimen of syncopation included in that particular vaudeville was definitely bad. I saw no sense in it at all; it was merely a succession of unpleasant noises. I thought the remarks of the comedian-announcer very appropriate when he spoke of the way in which the lady punched the piano. That is just what she did.

Talking about piano-playing, did you hear Myra Hess in the symphony concert?

If you did not, you missed an aesthetic pleasure. When I say I have never heard that Beethoven concerto played as she played it, I am merely echoing what the whole of the London daily press has already said. I feel inclined to ask for it to be repeated in the studio some Sunday evening, and also to ask all the lowbrows, as they call themselves, to listen to it.

Still talking about the piano; Orloff's playing of the Tchaikovsky concerto in the Philharmonic concert left only one impression on my mind; despite its beauty, that concerto is unfit for broadcasting.

There are so many octave passages and effects that may only be obtained by hard hitting, which is always unsatisfactory in the microphone sense. On the other hand, the work is very lovely; I always enjoy it.

I seem to have missed most of the singers this week; I am sure I do not know why. Anyhow, I listened to the performance of the first part of the *Messiah* on the foggy Sunday afternoon.

Some of the principals were late (owing to the fog, of course); that was pardonable, but I do think they need not have taken things at fog speed.

Dora Labette sang "Rejoice Greatly" so slowly that it seemed only "Rejoice Partly" to me. The next time she sings it in a fog perhaps she will look through one

of those yellow glasses they put on cars? We may then get it at the right pace.

Eric Greene, on the other hand, sang "Comfort Ye" and "Every Valley" very nearly perfectly; he is one of the most expressive singers we have. I have not yet forgotten his singing of that Bach aria in the Prom. concert—nor, I imagine, has anyone else who heard it.

Altogether, I must say I think that performance of the imperishable oratorio was not a good one. The band played none too well; mistakes were made and they were not always with the soloists. However, we must put it down to the fog and hope for better luck next time.

I can give you some points from the Ridgeway Parade. I was interested in the following personalities as described therein:

The duke who went to the House of Lords to oppose a Bill that barmaids should be brunettes; the Siberian chess-player who took eighteen days to make a move; the man who, discussing portrait painting and being asked if he had been "done in oils," said he had been done in everything; the man who married his typist and found she now did the dictating.

I feel all of a grumble about the programme for St. Andrew's night. "Frae a' the Airs" could only have interested native listeners. I think I can say that without appearing in any way narrow-minded.

Surely these things are of the blood? Personally, I will run a mile from the sound of the bagpipes, but I have the profoundest respect for the Scot whose blood is fired thereby.

So I (quite reasonably, I think) switched into the Regional and picked up a dramatisation of Gulliver's travels which, I regret to say, missed me rather widely.

I think, possibly, it might have been better in the Children's Hour.

The Saturday-night vaudeville was one of the best for a long time, to my way of thinking.

I enjoyed "Ali Baba's Camel," which I have, of course, heard before. The scene in the French restaurant was so good that I hope Miss Courtneidge will give it again some time.

Louis Hertel's impersonation of an American conjurer, with all its side-effects, was, I thought, extremely clever.

WHITAKER-WILSON.



An impression of Vladimir Zaaloff

THE "Tonality Three" was introduced in last week's issue. This is a special type of three-valver, ideal for average reception purposes. Its special features are simplicity of layout, cheapness of construction, economy in working and good tone.

As the more technical set constructor will realise on examining the circuit diagram, the layout is ideal for pure tone. The circuit is of the type popularly known as "detector, R.C., transformer."

Built for Tone

The detector is coupled to the aerial by a band-pass filter giving 10-kilocycle separation, so that although there is no high-frequency amplification, the utility of the set on distant stations is greater than that of the average three with plain tuning. The "Tonality Three" is not designed for distant-station working, but it is essential to point out that in view of its band-pass tuning it is not restricted only to local stations as would be a "detector R.C., and transformer" outfit with ordinary tuning.



Owing to the special low-frequency coupling employed the quality on foreign

stations—at least, the higher-powered foreigners—is every bit as good as that of the local station and far better than many sets in which excessive high-frequency amplification results in tone distortion.

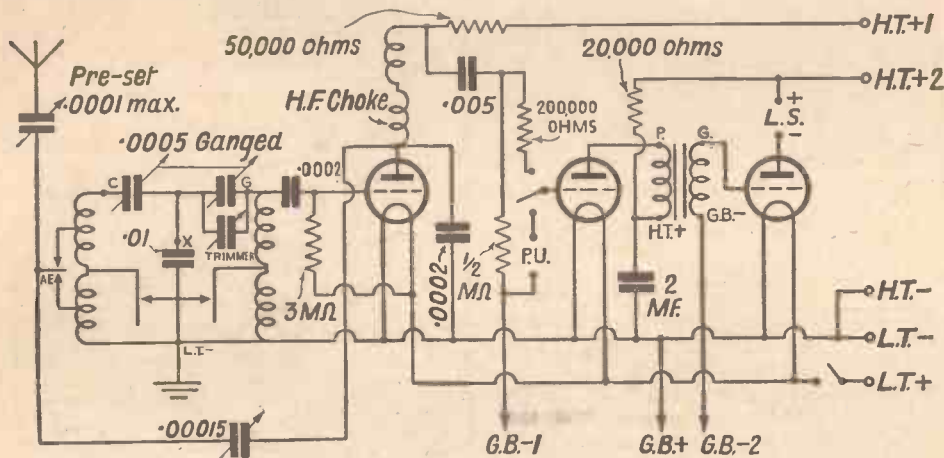
Simple and Cheap

The resistance coupling and the filtered transformer coupling to the power stage result in ideal tone of local stations. This is a fine set for the Christmas programmes because not only will it do justice to your loud-speaker by feeding it with pure tone output at full volume, but its simple one-knob tuning will be welcomed by the family, the least expert of whom can tune in foreign stations with ease.

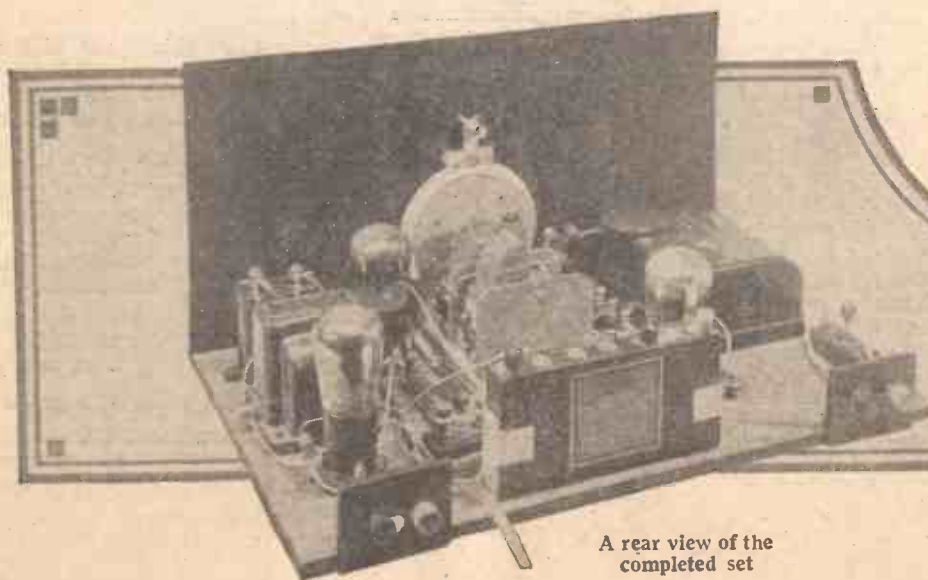
The construction is made clear by the photographs and by the layout diagram given on the next page.

This layout diagram is a reproduction of the full-size blueprint available for the "Tonality Three." While the layout given here is to scale, it is ever so much easier to work from the full-size print. Copies of this can be obtained, price 1s., post free, from the Blueprint Department, AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4.

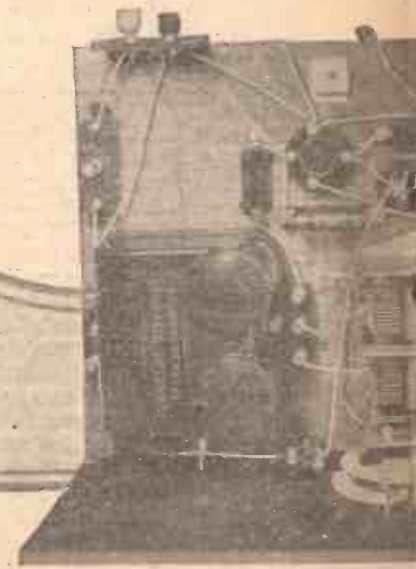
You will find the print handy in many ways when you start the constructional



Whilst the "Tonality Three" has primarily been designed to give pure tone, as the circuit shows, other desirable features have not been omitted; special attention has been paid to selectivity and it is suitable for high-class gramophone reproduction



A rear view of the completed set



It will be helpful to study this plan view

LITY THREE

three-valver, specially designed for tone, and produced in last week's issue, is here described structurally. Helpful operating notes are also given

work. For instance, one of the first jobs is to drill the ebonite panel, unless this has been obtained ready drilled with the kit of parts. The print should be placed on the reverse side of the panel, a spot of adhesive being put on each corner temporarily to keep it in place.

The drilling centres for the main tuning condenser, the on-off switch, gramo-radio switch, reaction condenser and other panel components can then be copied and light punch marks should be made through the blueprint on to the panel.

These will give the point of the drill start and it is a much more satisfactory way of panel drilling than drilling straight through the blueprint, for there is always the possibility of the drill slipping when the drilling is commenced.

The Baseboard

No panel brackets are provided, the panel being supported by the screws along the lower edge and by the cabinet in which the set will fit. The panel does not carry any great weight of the components, the two-gang condenser being supported on the baseboard and only the controls projecting through to the panel front.

Do not make any pencil marks on the panel because unless these are completely wiped off afterwards they will result in high-resistance leaks from the panel mounting bush of one part to another.

The next job in which you can make good use of the blueprint is finding the right places on which to mount the baseboard parts. Here again, one of the simplest ways in which to use the print is to put it down on the top of the baseboard and prick through the screw holes.

Assembly

As you will see, there are not many parts to mount, the major components being the two-gang condenser, the band-pass coil, low-frequency transformer and valve holders. The position for the two-gang condenser will be accurately settled by the holes in the panel for the control shaft and dial aperture. Try to arrange the condenser on the board so that there is no friction against the control shaft of the condenser.

Place the coil in the position shown with the two-terminal spacing to the outer edge of the baseboard and see that the wave-change rod fits easily through its hole in the panel. The coil can then be screwed down. Small parts such as resistance holders, the H.F. choke and the grid-bias battery clips can be mounted later.

There are two terminal blocks at the back, that on the right, looking from the back carrying the aerial and earth, the loud-speaker leads going to the block on the left.

As the grid-bias battery is carried on the baseboard there are only two sets of

twisted flex leads going out to the high-tension and low-tension batteries. It is a good plan to secure these at the baseboard end by an insulated staple so that

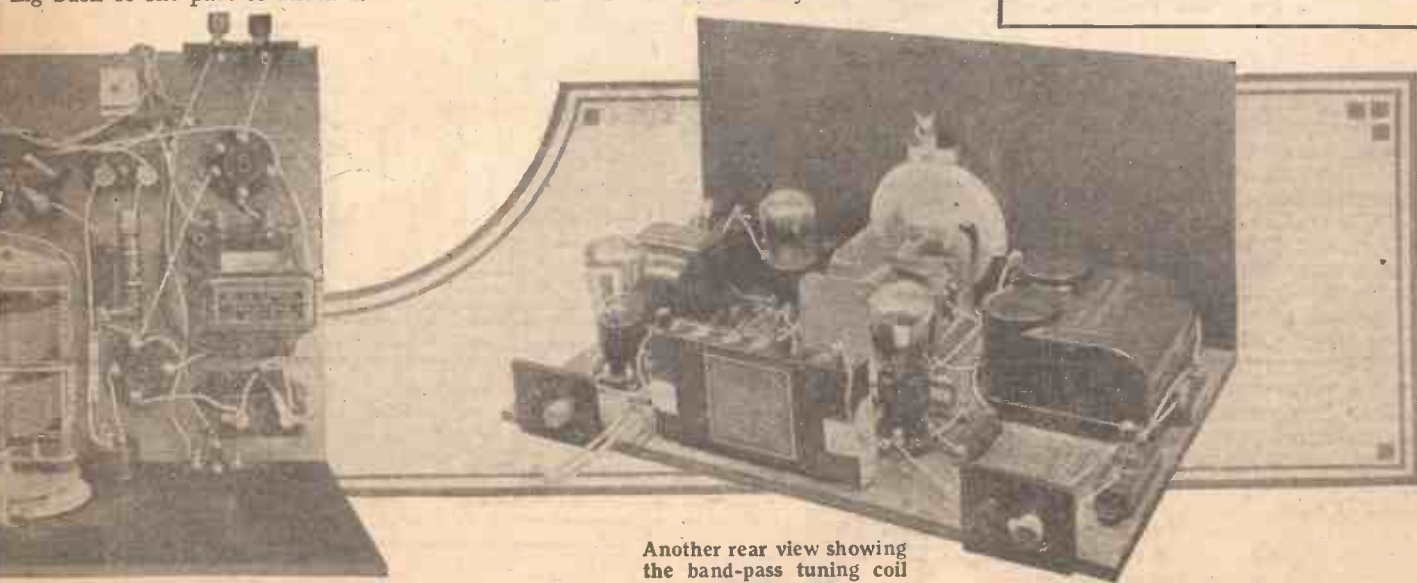
(Continued on next page)

COMPONENTS REQUIRED FOR THE "TONALITY THREE"

- Ebonite panel, 16 in. by 8 in. (Danipad, Becol, Permol, Wearite).
- Baseboard, 16 in. by 10 in. (Camco, Readi-Rad, Peto-Scott).
- Two-gang .0005-mfd. variable condenser (Polar, "Uniknob," J.B., Lotus, Utility).
- Band-pass tuning coil (British General, "Aerial model").
- .00015-mfd. reaction condenser (Telsen, Polar, Readi-Rad).
- Push-pull filament switch (Readi-Rad, Wearite, Lissen, Bulgin).
- Rotary type gramo-radio switch (Bulgin).
- Two .0002-mfd. and one .005-mfd. fixed condensers (Dubilier, type 670; T.C.C., Telsen, Lissen, Formo, Ormond).
- 2-mfd. fixed condenser (Dubilier, T.C.C., Telsen, Lissen, Formo).
- Pre-set series aerial condenser. .0003-mfd. max (Formodenser, Telsen, Lewcos, Lissen, Sovereign).
- One 3-megohm and one $\frac{1}{2}$ -megohm grid leaks (Telsen, Dubilier, Lissen, Sovereign).
- One 200,000-ohm resistance (Dubilier Miniwatt).
- One 50,000-ohm and 20,000-ohm spaghetti resistances (Lewcos, Bulgin, Telsen, Readi-Rad, Lissen).
- Three valve holders (W.B., Junit, Telsen, Lotus, Lissen, Benjamin, Bulgin).
- High-frequency choke (Climax, Telsen, Varley, Readi-Rad, Wearite).
- Low-frequency transformer (Telsen Radiogrand, Super 7 to 1, Brit. General, R.I., Lissen, Ferranti, Varley, Lewcos).
- Two terminal blocks (Junit, Sovereign, Belling-Lee).
- Pair G.B. battery clips (Bulgin).
- Two grid-leak holders (Readi-Rad, Telsen, Dubilier, Lissen, Bulgin).
- Four terminals, marked: Aerial, Earth, L.S.+, L.S.- (Bulgin, Belling-Lee, Burton, Clix, Ealex).
- Connecting wire and sleeving (Lewcos, Jifilinx, Quickwyre).
- Five yards of thin flex (Lewcoflex).
- Six wanders plugs, marked G.B.+, G.B.-1, G.B.-2, H.T.-, H.T.+1, H.T.+2 (Belling-Lee, Clix, Ealex).
- Two spade terminals, marked L.T.+, L.T.- (Belling-Lee, Clix, Ealex).
- One terminal block (Lissen).

ACCESSORIES

- Loud-speaker (H.M.V., Celestion, W.B., Sovereign, Amplion, Tekade).
- 120-volt H.T. battery (Fuller, Ever Ready, Drydex, Lissen, Pertrix, Dubilier).
- 3-volt G.B. battery (Fuller, Ever Ready, Drydex, Lissen, Pertrix, Dubilier).
- 2-volt L.T. accumulator (Fuller, C.A.V., Ever Ready, Exide, Pertrix).



Another rear view showing the band-pass tuning coil on the right

in conjunction with the layout diagram

“THE ‘TONALITY THREE’” (Continued from preceding page)

if the batteries are jolted there will be no strain on the set's wiring.

On the blueprint you will find all the numbers and the easiest way to put in all the connections and to make sure of doing so without a mistake is to wire up in the order indicated. The spaghetti resistances used in the set are numbered as wires on the blueprint and can be treated as such.

They are provided with tags which are merely clamped under the terminal heads.

You will see that one spaghetti resistance, connected to the high-frequency choke in the detector anode circuit has its other end anchored to the baseboard. Here the end of the flexible resistance is clamped by a wood-screw. One of the battery flex-leads is taken to this point also. This is a high-tension point in the wiring, so take care that no other loose wire accidentally touches it.

The rest of the wiring is carried out with tinned copper wire put inside insulated sleeving. The sleeving should first be cut to the exact length required to fit between the terminals and the wire should then be cut about an inch longer in each case so that there will be room to put the little loops which go under the terminal heads. The battery flexes are connected directly to their respective components.

An illuminated type of condenser scale is used and the bulb holder can be connected across the low-tension leads if desired, so that the bulb glows all the time the set is switched on. For this, connect the bulb across the set side of the on-off switch on the panel and not directly across the low-tension input.

It will be seen that the filament of the detector valve is not switched off when the set is used as a gramophone amplifier. With modern dull-emitter valves the consumption is so low that in a simple set it is not worth complicating the wiring by fitting a two-pole grammo-radio switch.

If you want to use the “Tonality Three” for long periods of gramophone working, then you should take the detector valve out of its holder.

Operating Notes

When you have wired up the set and completed all the constructional work the first step is to get the ganging right. One trimmer is provided on the end section of the two-gang condenser and for a first test this should be slacked right off.

Plug in the valves (suitable types are shown in the accompanying panel) and connect up to the high-tension, low-tension, and grid-bias batteries.

The detector tapping should be given about 80 volts, or perhaps a trifle more, depending on the valve used. The power tapping should be given a maximum voltage of 120. The grid-bias tapping of the first stage should be taken to 1½ or 3 volts on the 9-volt battery and the second tapping to the 7½ or 9-volt point.

Unscrew the knob of the pre-set condenser at the extreme right-hand side of the baseboard and tune in a local station. Very probably the strength will not be up to normal, and the trimmer must be adjusted.

Do not use too much reaction for this

first test as it will make the tuning unduly critical. When you feel that you have the right adjustment, try for a station at the other end of the tuning scale. A fairly loud station should be chosen for this

SUITABLE VALVES

Make.	Detector	L.F.	Power
Cossor ...	210 Det. (Met.)	210LF	220P
Mullard ...	PM2DX	PM1LF	PM2A
Osram ...	L2/B	L210	P215
Marconi ...	L2/B	L210	P215
Six-Sixty ...	SS210D	SS210LF	SS220P
Mazda ...	HL210	L210	P220
Fotos... ..	BC9	BC9	B89
Dario... ..	Det.	Det.	SP
Tungsram ...	LG210	LG210	P215
Eta	BY1210	BY2010	BW1304
Triotron	TD2	SD2	YD2

second test, and the trimmer should be readjusted if necessary.

Now you can try for weaker stations, and further adjustments of the trimmer may be necessary. It is not advisable to alter the setting of the pre-set condenser

before you have the ganging right as alteration of this may make some difference to the tuning point and will mislead you in getting the ganging correct.

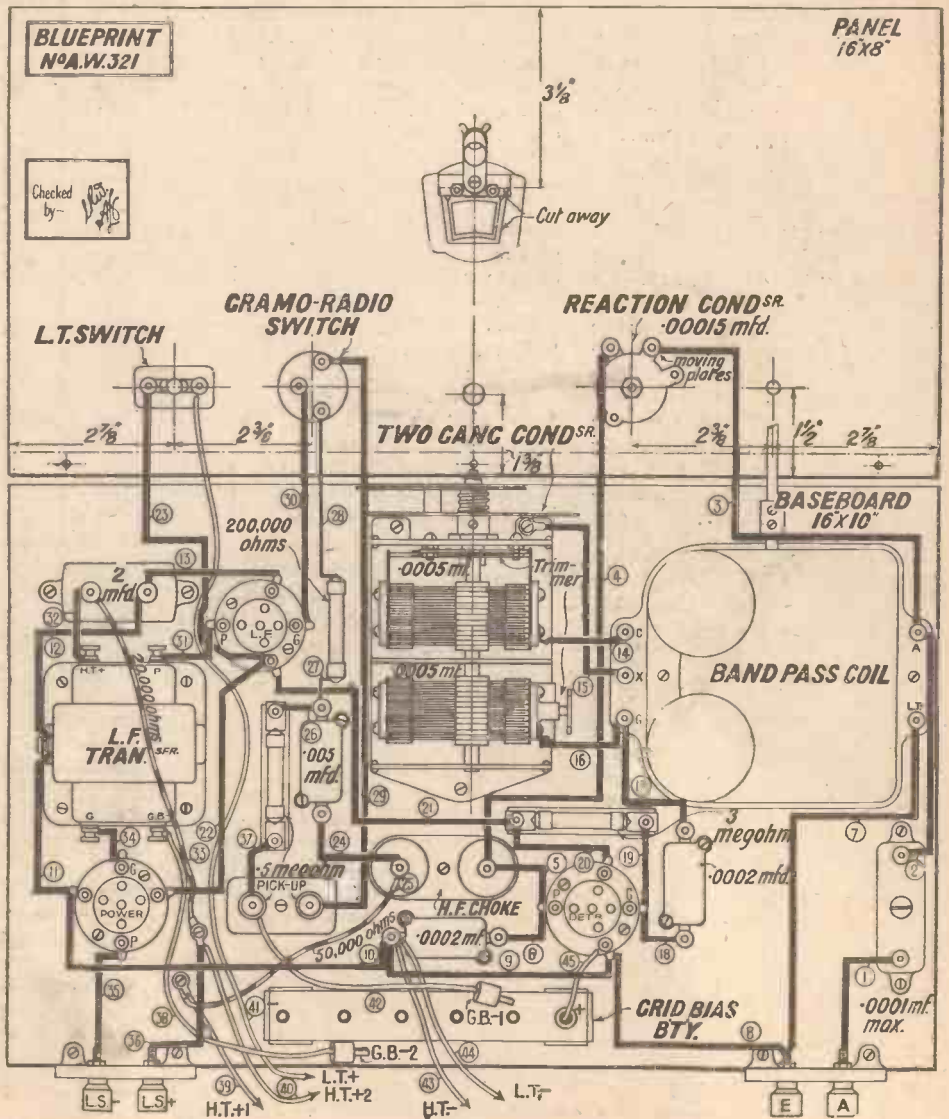
After the correct tuning point on both sections of the two-gang condenser has been found, then the pre-set may be slacked off in the usual way to increase the selectivity.

London readers will be interested to know that the “Tonality Three,” made up from a kit of Readi-Rad parts is on show this week in the Radio Department windows of Messrs. Selfridge & Co., Ltd., of Oxford Street, London, W.1.

AT THE QUEEN'S HALL

THE B.B.C. concert on December 9 was a rather flat affair. Thibaud, the soloist in Bach's 2nd violin concerto and a “poem” of Chausson, was disappointing. I did not like his virtuosity at the end of the Bach concerto. He played the Chausson better: Sir Henry Wood conducted.

L. R. J.



The layout and wiring diagram of the “Tonality Three.” A full-size blueprint is available. Price 1/-.

FREE FULL SIZE 1/- PLAN and complete building instructions

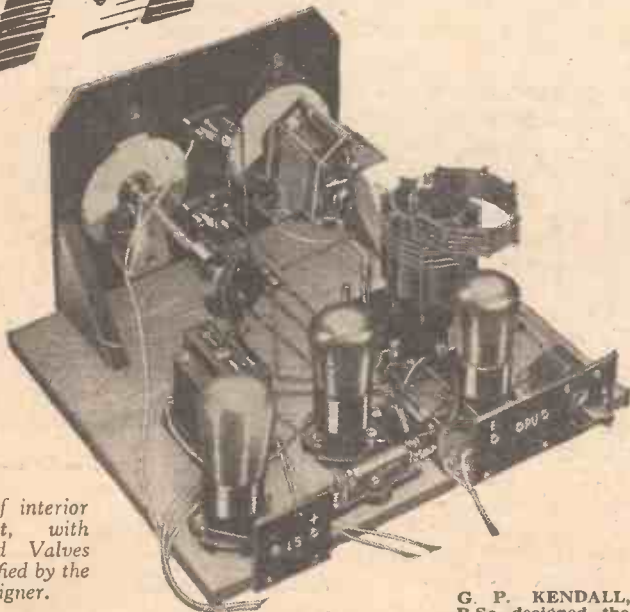
Go to any radio dealer. Ask him for your FREE copy of the Meteor Folder. Read all about this fascinating ALL-WAVE ALL-PURPOSE RECEIVER. No need for you to build a separate receiver for short wave reception. Build the Meteor III and enjoy world-wide reception on ALL wavelengths. With a pick-up connected to the sockets provided, the Meteor becomes an electrical reproducer of your gramophone records. Just a flick of the Radio-gram switch does it!

ASK YOUR RADIO DEALER FOR YOUR FREE METEOR FOLDER

Get the free full size 1/- plan and instructions to-day and read all about the Meteor III.



The METEOR III



View of interior of set, with Mullard Valves as specified by the designer.

If any difficulty in obtaining folder locally, write name and address below and send to Ready Radio Ltd., Eastnor House, Blackheath, S.E.3.

G. P. KENDALL, B.Sc., designed the Meteor III. His name alone is sufficient guarantee that the Meteor is a "Super" receiver in all except price.

METEOR III KIT

75/-

or 9/- down and 7 monthly payments of 10/6
METEOR III STANDARD CABINET MODEL
 (to house Set only)

89/6

or 11/- down and 8 monthly payments of 11/-
METEOR III CONSOLETTA CABINET MODEL
 (to house Set, Speaker and batteries—
 equal in appearance to a 15 Gns. model)

£5.0.0

or 11/- down and 9 monthly payments of 11/-
Choice of Recommended Accessories

Mullard Valves	£ s. d.	Loudspeaker Chassis	£ s. d.
1-PM.2 DX	8 6	R and A type 40	16 6
1-PM.1 LF	8 6	Reproducer	16 6
1-PM.2	10 6	or Celestion Chassis	
Batteries		type M.12	1 15 0
Pertrix 120 v. Super capacity	1 5 6	or Blue Spot Special chassis and 66P. Unit	1 15 0
or Pertrix 120 v. Standard	15 6	Gramophone Pick-Up	
or Ever Ready 120 v. Popular Power	1 4 0	B.T.H. Minor	1 7 6
Pertrix 9 v. G.B.	1 6	or B.T.H. Senior	2 5 0
or Ever Ready 9 v. G.B.	1 0	Volume Control	
Accumulators		ReadiRad 5 meg.	5 9
Fuller 2v.20 amp. type		Gramophone Motor	
S.W.X.H5	8 3	Collaro Type B.30 with Unit Plate and Automatic Stop	1 13 0
or Pertrix 2v.20 amp. type P.X.C.2	9 0		

Daily Demonstrations of this wonder receiver at 159 Borough High Street, London Bridge, S.E.1. (2 minutes from London Bridge Station)



Head Office and Works: Eastnor House, Blackheath, S.E.3.

Name

Address

A.W. 19/12/31 BLOCK LETTERS—IN INK—PLEASE

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



These Cheap Speakers

LATELY I have tested a number of the cheaper loud-speaker movements. They naturally have small magnets, as it is the magnets that cost the money.

Some of the units are fairly sensitive. They will usually not deal with strong signals without chattering. The reason is that the gap in which the armature vibrates is made as narrow as possible. In this way the greatest use is made of the magnetic flux available.

Other units have a larger gap, and are in consequence not as sensitive. But they do, on the other hand, handle stronger signals.

If you are mechanically inclined, an interesting evening or two can be spent in touching up a movement. The sensitivity may be much improved by a little adjusting and at the same time the amount of the volume to be obtained may be increased.

It is, in fact, surprising what good results can be obtained from some cheap units that have had a little touching up.

Wiring-up the Heaters

How should the heater circuits of a set be wired?

Some people take the wires straight from the heater terminal of one valve holder to the next.

Others believe in twisting the pair of wires. The object is to reduce the net stray field and so to minimise the chances of hum occurring.

Personally, sometimes I twist the insulated pair of wires and sometimes I don't. I start by wiring from point to point. Then, if when testing there is a slight hum, I take out the heater wires and put in a twisted pair.

The heater wires carry relatively heavy alternating currents. If you have five valves the total current is about 5 amperes. Fairly thick connecting wire must, therefore, be used.

Of course, if you take the wires from the heater transformer to the middle of the heater circuit of the valves, the current flowing in the circuits divides. Thus, if there are six valves and the supply from the heater transformer is taken to the third valve holder, then three amperes will pass to the valves one way and three the other, six amperes flowing through the supply wires. It is worth while doing this.

Rubber-covered flexible wire is satisfactory and convenient, although I generally use No. 16 tinned copper wire and Systoflex insulating sleeving.

Measuring H.F.

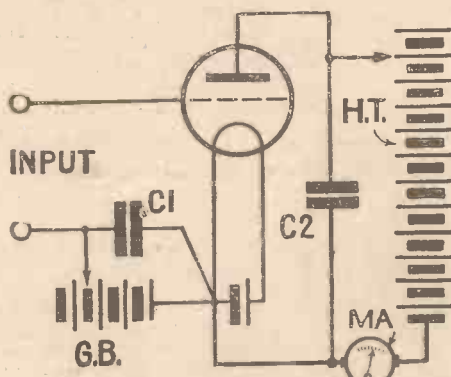
Ordinary voltmeters, with which we measure the voltage of batteries, the mains, and so on, cannot be used for measuring high-frequency voltages.

In high-frequency circuits the current passes backwards and forwards, or oscillates, hundreds of thousands of times per second.

If the wavelength of the circuit is 300 metres, for example, the frequency of the oscillations is 1,000,000 per second.

The actual value of the voltage set up across the ends of the circuit is easily affected by connecting apparatus having resistance, capacity or inductance. If the capacity and inductance are fairly pure, then re-tuning will probably bring the voltage back to its original value.

A simple voltmeter is shown in the accompanying diagram. It consists of a



A simple means of measuring H.F. Details are given in the accompanying paragraph

valve having grid bias and high-tension, with a sensitive meter connected in the anode circuit. Condensers C1 and C2 are used to provide low impedance paths to the filament.

The valve is adjusted with the input terminals connected to act as an anode-bend rectifier; that is, the anode current is reduced to a low value, such as a fraction of a milliampere. When the input terminals are connected to a high-frequency circuit in which there is a signal, the average value of the anode current will increase.

IF YOU ARE CONTEMPLATING BUILDING A SET—STUDY THE BLUEPRINT LIST ON PAGE 1352 THERE IS A SET FOR EVERY NEED

This increase in current will be shown by the meter joined in the anode circuit.

If the arrangement is calibrated, the scale of the meter will show volts, and it is then possible to note the actual value of the high-frequency voltages present in circuits. The grid bias must be enough to prevent the flow of grid current, and even when the instrument is not calibrated, much useful information is to be obtained by comparing results.

Winding Super-het Coils

A few days ago I paid a visit to a factory specialising in the manufacture of super-heterodyne coils as used in various AMATEUR WIRELESS receivers.

If you saw the coils being wound with the latest coil-winding machinery, the accurate matching, and the careful testing of the finished product as I did, you would wonder how they can be turned out for the price. And you would also agree that they not only leave the factory accurately matched, but are likely to remain matched to the original standard.

I wish that all coils were as accurately manufactured as the super-heterodyne band-filters used in recent AMATEUR WIRELESS sets.

Don't Forget G.B.

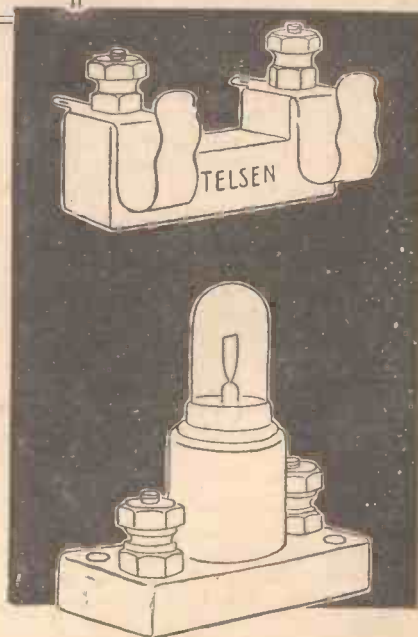
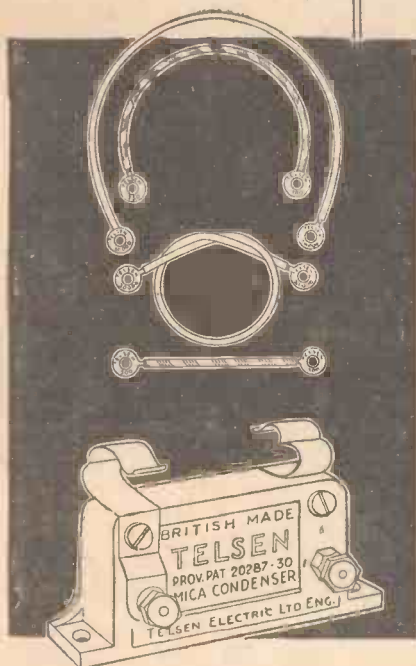
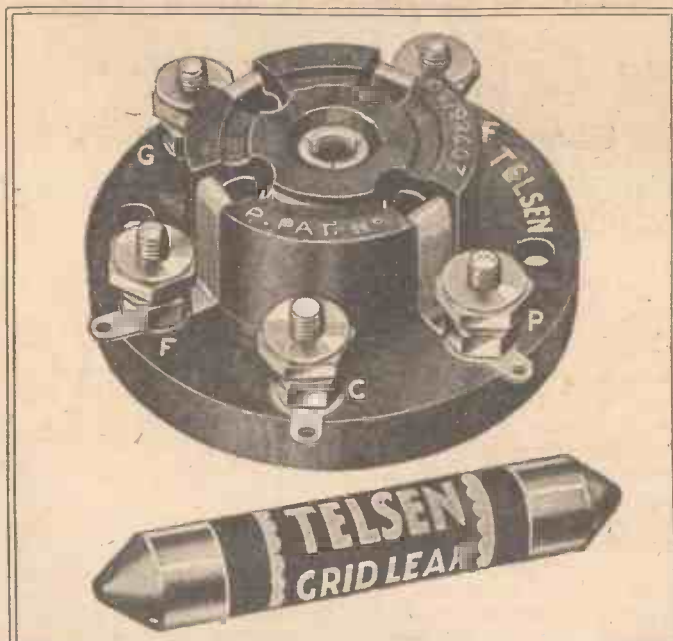
Have you tested your grid-bias battery lately? It is surprising what a long useful life a bias battery often has.

No doubt there are many who have experience of a battery that has functioned satisfactorily for two or three years. There can be no doubt about the long lives of some examples.

But, on the other hand, some batteries have a very short life. The difficulty experienced by those amateurs who are without a voltmeter for testing can well be understood. If the filament battery runs down the signals stop and the volume decreases when the high-tension is failing. The fall in voltage of a bias battery is usually not noticed because it does not often produce a marked effect until it has long passed its useful life. Sometimes distortion is produced when the battery begins to fail, but usually a drop in voltage of from, say, 6 to 5 volts will not produce an effect which is noticeable.

The anode current of the power valve may increase by a fair amount, however, and so the H.T. battery is running to waste. The bias battery should be tested every few months, therefore, and usually a wireless dealer will be pleased to do this.

TELSEN RADIO COMPONENTS



VALVE HOLDERS (Prov. Pat. No. 20286/30).

The Telsen four- and five-pin valve holders embody patent metal spring contacts, which are designed to provide the most efficient contact with split and non-split valve legs, and are extended in one piece to form soldering tags. Low capacity and self-locating.

- 4-Pin Valve Holder Price 6d.
- 5-pin Valve Holder Price 8d.

GRID LEAKS

Telsen Grid Leaks are absolutely silent and non-microphonic, and practically unbreakable. They cannot be burnt out and are unaffected by atmospheric changes. Telsen Grid Leaks are not wire wound, and therefore there are no capacity effects. Their value is not affected by variation in the applied voltage. Made in values ranging from 1/5 megohms. Price 9d.

SPAGHETTI FLEXIBLE RESISTANCES.

These are made in a range of values from 300-200,000 ohms, with a maximum current varying from 42 m/a to 1 1/2 m/a. The terminal tags are firmly fixed to the wire and clearly marked with their respective resistance values; they are impregnated with special insulating compound which renders them proof against corrosion. Spaghetti Flexible Resistances. From 6d.

FIXED CONDENSERS (Prov. Pat. No. 20287/30).

Telsen Fixed Condensers are made in capacities from .0001 microfarad to .002 microfarad. They can be mounted upright or flat, and the .0003 microfarad fixed condenser is supplied complete with patent grid leak clips to facilitate series or parallel connections. Price 6d.



100% BRITISH
RADIO COMPONENTS

GRID LEAK HOLDER

Will hold firmly any standard size or type of Grid Leak. Ample clearance is provided between the terminal screw leads and the baseboard (underneath), preventing any surface leakage upsetting the value of the Grid Leak. The terminals and fixing holes are accessible without removing the Grid Leak. Price 6d.

FUSE HOLDER

This is a neat and inexpensive device which should be incorporated in every set as a precaution against burnt-out valves. The Telsen Fuse Holder firmly grips the standard radio fuse, giving a perfect contact. Price 6d.

TELSEN SCREENS

Price 2/- and 2/6



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

Baker's Moving-coil Speaker

THE design of a moving-coil permanent magnet speaker appears to be a matter of some difficulty, judging from the various samples which we have received from time to time. This is possibly due to the fact that the field strength with a permanent magnet is necessarily considerably less than with the electro-magnetic type of speaker unless one is prepared to pay a good price for the instrument. At any rate, with a reasonably priced component the results are apt to be disappointing.

The defect appears to lie not so much in any lack of sensitivity as in a papery quality and a tendency to shrillness. There are, fortunately, many exceptions to this generalisation, and a particularly good design is the Baker permanent-magnet speaker, which we have just tested.

This is provided with a generous magnet bolted on to a chassis which carries the diaphragm assembly in the normal manner. The magnet, however, is completely enclosed in a sheet-metal housing, which is extended to form a base for the instrument.

An output transformer is bolted into the housing, this being provided with two pairs of terminals, so that either the low-resistance coil or the primary of the step-down transformer may be connected in the output circuit according to requirements. The whole is finished in black crackle enamel, giving a sturdy job of pleasing appearance.

The response of the instrument on test was unusually good. There was a rich bass, which was not unnatural, while at the same time the upper frequencies were well maintained, giving brilliance to relieve the speaker of any suspicion of boominess. It handled a large volume input without distress, so that sudden transient terms were



One of the range of Baker's moving-coil speakers

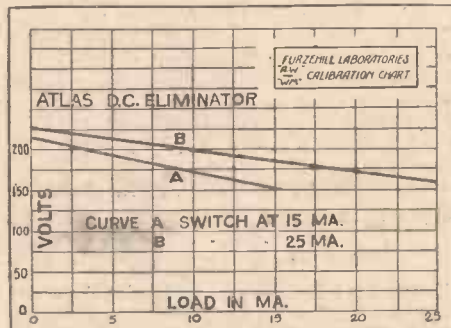
reproduced without any overloading. Our general impression, indeed, was most favourable, and we can recommend this

instrument as an excellent example of its type.

Atlas D.C. Unit

WE were interested to receive for test one of the D.C. eliminators marketed by Messrs. Clarkes Atlas, Ltd.

This eliminator is intended to be used on 200-250-volt mains and to supply high-tension current to receivers of the screen-grid, detector, L.F. type. Three voltage outputs are provided, all being condensed. The two lower voltage outputs are tapped so that the voltage may be adjusted according to load. An interesting point in the circuit is the provision of a series resistance which can be cut in or out of circuit by means of a switch. This is used to drop the voltage on the power tap according to whether the load required is of the order of 10 to 15 milliamperes or 20 to 25 milliamperes.



Two output curves of the D.C. model Atlas unit

The eliminator was tested with an input voltage of 250 volts. With the switch in the 15-milliamper position and with a load of 15 milliamperes the power tap gave 150 volts, while with a load of 1 milliamper the screen-grid tap gave 55 and 30 volts respectively in the maximum and minimum positions. The detector tap gave 110, 70, and 50 volts respectively in the maximum, middle, and minimum positions under a load of 2 milliamperes. With the switch in the 25-milliamper position, the power tap gave 153 volts with a load of 25 milliamperes, the other voltages remaining sensibly the same. The variation of voltage with load on the power tap can be seen from the curve accompanying this report. It must, of course, be remembered that if the eliminator is used on supplies having a voltage lower than 250, the output voltages will be correspondingly less. Tested with a receiver, the eliminator was quite satisfactory, and it should give every satisfaction in practice.

Heyberd Mains Transformer

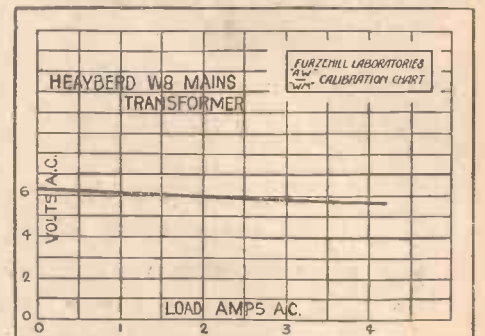
THE Heyberd type W8 mains transformer is one of a very complete range of transformers and mains apparatus, samples of which have been reported on from time to time.



Heyberd W8 mains transformer

This transformer is intended for use with a Westinghouse metal rectifier and to supply currents for accumulator charging. The primary winding is tapped to make the transformer suitable for use on all voltages between 200 and 250 volts at 50 cycles. The secondary winding gives 18 volts at 3.2 amperes, and is also tapped to give 6 and 12 volts. Westinghouse rectifying units, type A4 and R424 are recommended, when outputs of 9 to 12 volts at 2 amperes can be obtained. The transformer is housed in a black metal case which has lugs to enable it to be screwed or bolted to a baseboard. Terminals are provided for the connections, each one being clearly marked, thus making it a simple matter to wire the transformer into circuit.

The transformer was tested by measuring the voltage across the secondary winding with different values of A.C. load current.



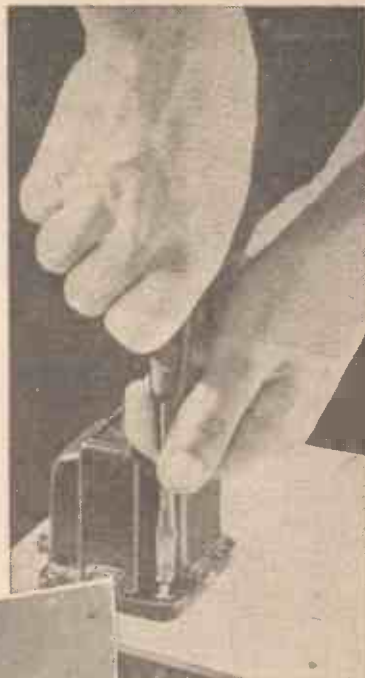
Output curve of the W8 transformer

The results of the test, which can be seen from the curve accompanying this report, show that the regulation of the transformer is good.

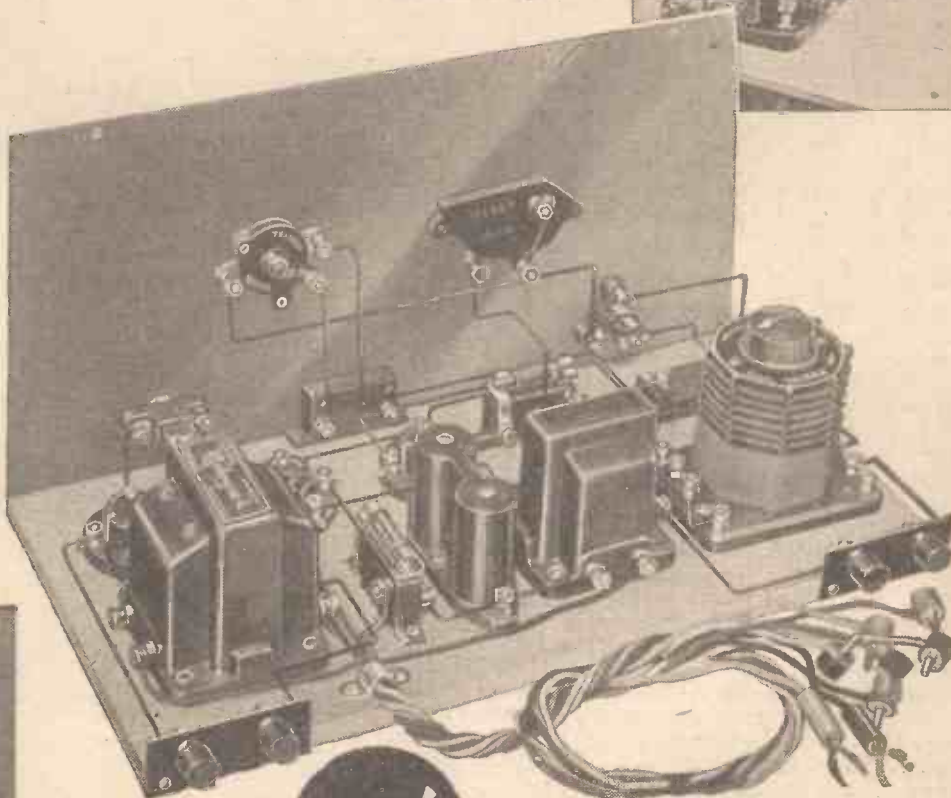
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THE

TELSEN 3 KIT



- Complete with all-British Telsen Components — panel, baseboard, battery cord, battery plugs, terminals, connecting wire, terminal and escutcheon plates, full-size blueprint and point-to-point wiring chart, with full instructions, etc., etc.
- Super 3-valve receiver, built entirely with all-British Telsen Components, matched for efficiency.
- Separation of Regional from National programmes guaranteed by incorporation of Telsen Dual Range Aerial Coil.
- Very simply built and simply operated. Full constructional details with every kit.



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Whether you make it for yourself or as a present for someone else—in either event the building is easy and fascinating, and the results astonishingly good. The Telsen 3 is as simple to operate as it is to build. Have all the thrill this Xmas of listening-in to a radio receiver you have built yourself.

TELSEN

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RADIO COMPONENTS

Send for illustrated folder of "The Telsen 3" to The Telsen Electric Co., Ltd., Aston, Birmingham.

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SETS OF DISTINCTION



LOTUS A.C. THREE-VALVER

Makers: Lotus Radio, Ltd.

Price: £15 15s.

AMONG this season's extensive array of three-valve mains sets the Lotus is outstandingly good value for money. Although one of the cheapest of the console sets available it is strikingly attractive in appearance. My tests show that the set works as well as it looks, which is indeed praise, as every set-buyer will appreciate on seeing the set in the radio store.

Housed in the good-looking cabinet are all the essentials for trouble-free broadcast reception—everything except the aerial and earth. There is a straight three-valver, comprising a high-frequency amplifying valve, a detector and a transformer-coupled super-power output valve. These valves derive their high-tension current from the valve rectifier.

Self-Contained

Suitable for A.C. mains only, this set is provided with a simple and accessible mains-voltage adjustment strip. When the set leaves the factory it is adjusted for 220-230 volts, but a small screw terminal enables this adjustment to be altered for any supplies between 200 and 250 volts. Special models are available for 25-cycle periodicities and for voltages between 110 and 100 volts.

As already indicated, the only externals are the aerial and earth. In addition to the three-valve chassis and power supply the cabinet contains a Magnovox moving-coil loud-speaker, which is excited from the high-tension supply.

The internal construction follows the latest trend in metal-chassis design, with the coils and gang condenser fully screened and the remaining components, except the transformers, sub-chassis mounted and wired. The result is great neatness—and commendable efficiency.

Easy Control

Controls are well planned. There are four knobs on the figured front of the cabinet, the main tuning control being mounted at the centre, just below the tuning escutcheon. The scale behind the escutcheon is illuminated when the set is switched on. It is well calibrated, medium waves being marked in black along the top and long waves in red along the bottom. Between these calibrations are marked degrees, from 0 to 100.

In addition to the main tuning knob below the escutcheon are three subsidiary knobs, arranged in a line. The left-hand

knob works the switch giving medium or long wavelength tuning and the option of gramophone reproduction. The centre of these knobs is the pre-detector volume control, called the selector, and the knob on the right is reaction, called volume by the makers.

Most of my readers know that a set tends to be judged by how it works when

tuned circuits coupled by a stage of efficient high-frequency amplification, depends to a great extent on the proper use of the pre-detector volume control. With a moderately short aerial such a combination will enable the locals to be restricted to some 10 or 15 degrees on a 100-degree dial, and will separate adjacent high-power foreign stations.

Quality

Knife-edge selectivity cannot be expected, nor is this desirable, with only two tuned circuits, which, if made too low in resistance, will mutilate the quality by cutting top notes.

The two tuned circuits in the Lotus set are well ganged, as my tests clearly showed. With the volume control near its minimum setting and reaction near its maximum, I found the selectivity well up to standard. Using my 60-foot aerial and a good earth, some 20 miles from Brookmans Park, I obtained the National at 19 degrees. This powerful local spread to 12 and 29 degrees, a total of 18 degrees, corresponding to about 20 metres. This is quite satisfactory.

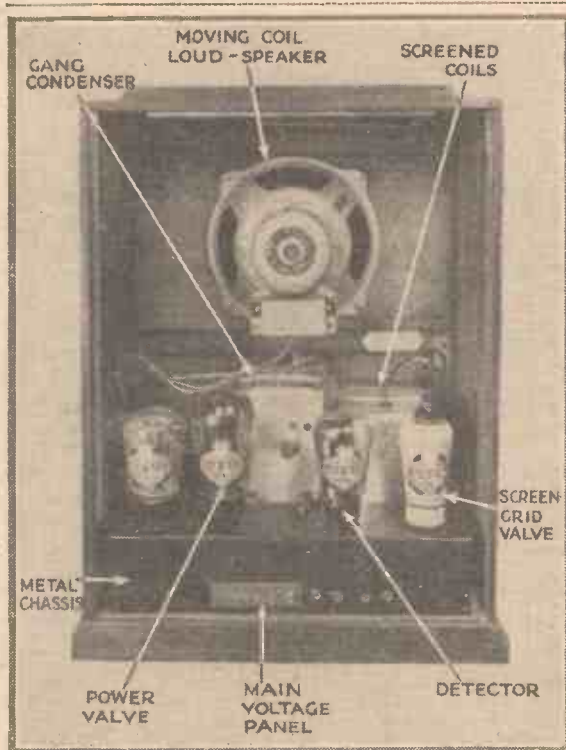
A Selective Set

Selectivity seems to be better higher up the tuning scale. The London Regional came in at 61 degrees and spread to 55 and 68 degrees, a total of only 13 degrees. I ought to mention that the setting of the so-called selector knob or volume control very materially affected the selectivity. A slight turn was sufficient to lose the local when the tuning was adjusted to some near-by foreigner.

Having passed its local-station selectivity tests with credit, the Lotus set went on to gain fresh laurels in the separation of adjacent high-power stations. I got Hilversum at 40 degrees, North National at 41.5 degrees, and Bordeaux at 42.5 degrees, all clear of each other.

Prague was clear of North Regional, and so was Langenberg. Sötens was clear of Midland Regional. These are examples of how the Lotus set will separate stations that sometimes overlap on unselective sets.

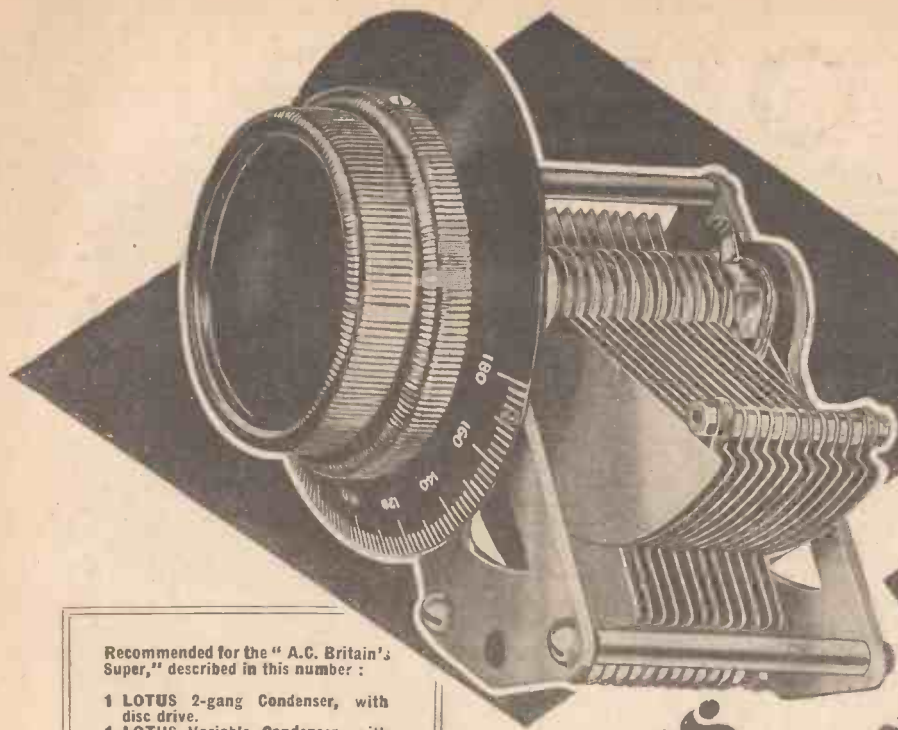
SET TESTER.



A rear view of the Lotus A.C. three-valver: note the accessibility of the valves

first put into operation. Judged in this way the Lotus set is fine. I could tell as soon as the valves had warmed up that the controls were responding admirably. Reaction worked very smoothly, without any "plop" at any part of the scale. Volume worked as it should, giving a complete variation of output from a considerable maximum to absolute inaudibility. Tuning was delightfully easy, stations rolling in as the knob was slowly rotated. A good start!

The selectivity of the Lotus set, like the selectivity of any three-valver with two



Recommended for the "A.C. Britain's Super," described in this number:

- 1 LOTUS 2-gang Condenser, with disc drive.
- 1 LOTUS Variable Condenser, with disc drive.
- 8 LOTUS 5-pin Valve Holders.

**MODERN SETS DEMAND
PRECISION TUNING**

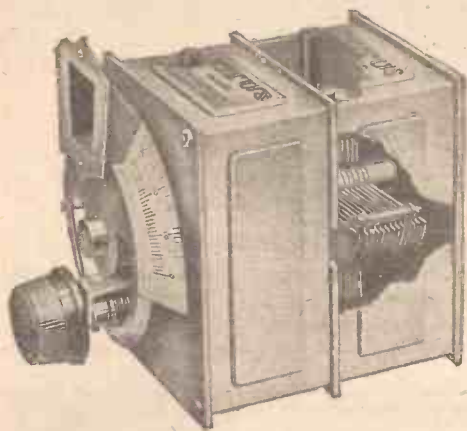
SLOW MOTION LOG CONDENSER

6/6

.0003 & .0005 CAP.

LOTUS Condensers afford the last word in precision tuning. Control is delightfully smooth and absolutely silent, while sturdy construction ensures lasting accuracy and unfailing reliability.

Ask or send coupon to-day for your copy of the LOTUS Component Catalogue. It is full of interest to the home-constructor.



GANGED CONDENSERS

Specially heavy vanes and end plates ensure a permanent accuracy of matching of 1 per cent. between units. Trimmers are accessibly placed and are easily adjusted by fingers or screwdriver. Each unit is completely screened from the others, and pressed aluminium covers also protect the condensers from dust. These assemblies are smaller than most other gang condensers and are simple to assemble in all types of receivers.

2-Gang, with disc drive. Type DS/CH2 .. 25/-

SLOW MOTION LOG CONDENSERS

Constructed throughout of aluminium, this component is highly efficient, perfectly smooth and noiseless in operation. A ball-drive integral vernier device is concealed in the spindle and both direct and slow drives are controlled by the double knob dial supplied with the Condenser. With braided pigtail connection to rotor. Specially suitable for super-hets. The reduction gear is 7 to 1.

Capacities: .0003, type SM 3, and 6/6
.0005, type SM/5. Each

FREE CATALOGUE

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Please send me free copy of your Component Catalogue, giving full details of the full Lotus range.

Name

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RADIO COMPONENTS

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

THE PROBLEMS OF USING D.C. SUPPLY

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

UNTIL comparatively recently the production of a set to operate off D.C. mains was a matter of considerable difficulty. The trouble lay not so much in the design of the circuit and apparatus, as in the numerous alternatives which had to be tried. With an A.C. receiver an arrangement conforming to certain standard conditions is reasonably sure to be satisfactory in any locality. It can be designed and tested in the laboratory with the assurance that the results will be satisfactory in 95 per cent. of the cases under which the set will be used in practice.

No such state of affairs as this has existed in the past with D.C. supply. The very term D.C. (direct current) covers a multiplicity of supplies. In a large number of cases the voltage is generated by dynamos, but beyond the fact that the voltage may be the same, there is no uniformity between one dynamo and another, even in the same locality. To appreciate this it is necessary to understand how a dynamo works.

How the Current is Generated

In its essentials a dynamo consists of a coil of wire rotating in a magnetic field. If the coil is moving across the field, as in Fig. 1 (a), then the maximum voltage is generated, while if the coil is moving parallel to the field, as in Fig. 1 (b), no voltage is generated. As the coil is rotated we get continuous variation of the voltage generated, starting with a maximum when in position (a), gradually falling to zero, rising to a maximum again in the opposite direction, and falling to zero again. This is, in fact, the customary alternating current or voltage with which we are so familiar and which is gradually becoming used throughout the whole country.

In a D.C. machine, however, we mount on the same shaft as the coil a rotary switch or commutator. The two ends of the coil are brought to segments on this commutator, and brushes are arranged to make contact with these two segments at the particular instant when the coil is passing through its position of maximum voltage. In addition to this we mount a number of other coils spaced around the armature and all connected in turn to the commutator so that when the first coil has passed out of the position of maximum voltage the connections are automatically changed to the second coil, which is just entering the maximum position. The connections remain on this coil until it is just leaving, when a further coil is brought into use, and so on.

Ripple

Consequently we always obtain from the machine the maximum voltage, which is thus always more or less steady in value. In an actual machine the various coils are all cross-connected so that they are not completely wasted when not in use, but the principle is practically the same as the simple outline just given. The particular point to be noted is that the voltage

delivered by the machine is not really absolutely steady. There is a slight rise and fall of the voltage as the coil passes through the maximum position, so that there is a very slight undulation or ripple of the voltage.

This is known as commutator ripple, and it depends upon the number of segments on the commutator and the length of time which any one coil is used. Clearly

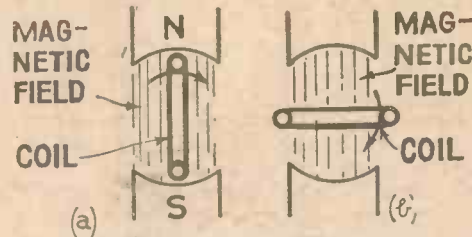


Fig. 1. Diagram showing how current is generated in a dynamo

the larger the number of coils and the closer together they are the less will be this commutator ripple.

D.C. Supplies and Earths

The second point is the question of the earth. It is customary in most D.C. supplies to generate twice the normal supply voltage and to split this into two, as shown in Fig. 2. There are now two circuits, one of which runs between the positive outer, as it is called, and the earth lead. The second of these flows along the earth lead out through the load and back along the negative outer. It will be observed that the currents in the earth lead are in opposite directions and, therefore, if the load on the two halves can be made more or less equal, practically no current flows in the earth wire, which can, therefore, be of much smaller gauge than the main cables.

This system is adopted because it is much more economical to generate at a higher

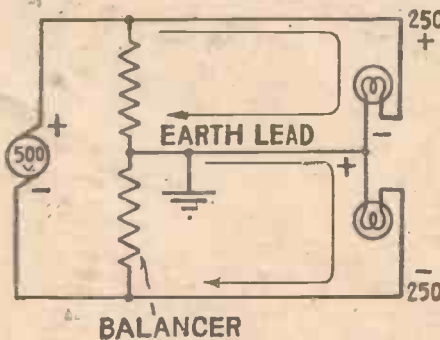


Fig. 2. Distribution system of D.C. Supply

voltage, and yet with this arrangement the live wire in any one consumer's premises is never more than 250 volts different from earth. From a radio point of view, however, it will be seen that some consumers may have earth on their negative lead and others on the positive lead. It is customary to connect H.T.—to earth in a wireless set, and if such a set is operated off mains

having a positive earth, there will be a complete short-circuit on the mains.

Therefore, the earth connections on a D.C. set should never be taken direct to H.T.—but always through a condenser. In the case of a D.C. receiver, provision of this sort is automatically made inside the set; where one is using a D.C. eliminator the earth lead must be taken off the set and either connected to a special terminal provided on the eliminator itself, or, if such is not available, it should be connected through a 1-microfarad condenser to the earth terminal of the set.

The possibility of having either the positive or negative main earthed adds to the difficulties of the designer, because it causes further possibilities of variation. Smoothing circuits have to be introduced into the set to eliminate the commutator ripple already discussed, and it is usually found that the chokes must be in the live lead for satisfactory results. Some manufacturers are overcoming this difficulty by the provision of a small plug, which is capable of being inserted into a socket in two ways. The changing round of this plug automatically changes over the connections of the choke from the positive to the negative lead and the user on first connecting the set up tries both connections to see which gives the least hum. Once this choice has been made, the plug does not have to be touched again.

Other forms of supply are obtained by rectifying alternating currents by the use of mercury-arc rectifiers, which are similar in the general operation to that of the ordinary valve rectifier, the only difference being that it is not considered necessary to provide large banks of smoothing condensers, since for ordinary purposes uni-directional currents are quite as satisfactory as smooth D.C. There is a certain amount of smoothing due to the capacity of the cables, but this is by no means adequate from the radio point of view, so that one is liable to encounter what amounts to practically raw A.C. This, in conjunction with the variety of generators at work, has made the D.C. problem one for the individual rather than the mass producer.

The New Indirectly-heated Valves

The introduction of indirectly-heated valves for D.C. supply has considerably eased the problem, however, and it is now possible to make a D.C. set which will operate with the same expectation of satisfactory performance as an A.C. set. By the provision of a reasonably small amount of smoothing within the set, the arrangement can be made to work either on generators or mercury-arc rectifier-supply with equal satisfaction. The inclusion of a device to change over the choke may be necessary, as already discussed, but special treatment for every case is no longer necessary.

There are a number of these valves on the market. The Mazda range takes half an ampere, and has proved very successful in use. The Osram range takes only a

(Continued on page 1344)

RADIO TIMES

(Cont)

PROGRAMME

THE DAY

- 5 The Children
- 'Frightfulness at the (S. G. Hulne
- Another Toytown
- With Incidents
- THE GERSHOM P.
- 'The F
- WEATHER FORECAST
- BULLETIN: London
- and Bulletin for
- Time Sig

- 6.30 The F
- BEETHOVEN'S
- Played
- Sonata in A
- Andante
- Marcia f

- 6.50 Mr.
- Sparrow

- 7.20 L.
- 'The

- 7.30 Mr.
- Spirit of
- duction to

MR. DESMOND
the most popular
over the wireless.
literary criticisms and
every fortnight since
dramatic and literary criticism
of that enterprising month
Letters, now in its fourth year
He will introduce the
'Literature and
of the



For a merry Christmas, give

and get a Drydex ...!

- ORCHEST.
- Song of t
- HAROLD W
- Song of the
- SOLOMON and Orchestra
- Concerto, No. 2, in C Minor, for Pianoforte and
-Rachmaninov
-Talla, marcia)

MOSSOLOV, though he
y-one, has already made a name
for even in that land of shattering
artistic revolutions, he has found a method
revolting which is all his own. This work, com
posed in 1928, is in the form of an overture
and its programme is simply the steady rhythm
of a factory working at full pressure; though
behind the mere picture there is conveyed
sense of awe and exaltation which cannot
to possess the man of imagination confront
with the powerful weapons of attack and defence
man has set up under the very nose of an
onistic nature.

Symphony, No. 4, in F Minor (Op. 36)
Moderato con a
Tchaik

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

he has
unction,
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sanity,
nd small
is Rach-
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9.55 Shipping Forecast; New York Stock Market
Report Time Signal, Greenwich, at 10.0

'MOSAIC'—I

10.0
It seems possible—to judge from the vio-
criticism of past broadcasts of poe
readings—that wireless is not a suitable med
for poetry, or at least that some other for
presentation might be more successful. A
from any question of the destruction of
intimate quality of poetry or of the difficul
finding suitable readers, it is doubtful wh
fifteen or twenty minutes of continuous poet
likely to appeal to any but confirmed
of poetry. It has, therefore, been decided
a new variation in the form in
poetry is broadcast. "Mosaic"
title of which is suggested by Mr
definition of music as 'mosaic
air'—is an experiment in which
and poetry are to be combi
express and interpret various.
Lyric poems or short excerpts.
by unity of subject or feeling.
with pieces of music o
al appeal into a single v.

.. Mossolov

which follows,
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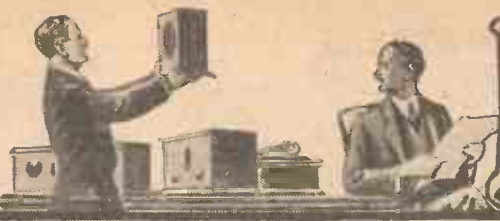
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Dx 59

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READERS IDEAS



AND QUESTIONS

Screening and Damping

SIR,—I have constructed the "Olympian Three" and am far from satisfied with the results. This may be due to the slight deviations I have made in the construction. Thinking that perhaps further screening would be an advantage to eliminate interference from the local stations, I completely screened the H.F. and detector circuit components. I also lined my cabinet with copper foil and connected all screening to earth. The receiver suffers from total instability and there is a terrible amount of mush. I should have thought that the extra screening would have eliminated these forms of trouble. I would mention I have matched up the tuning of the band-pass coils by using a milliammeter in the plate circuit of the detector valve. Can you suggest what is likely to be causing the trouble?
B. C. (London).

It appears that you have arranged your screening too near to the aerial band-pass coil with the result that the tuning and stability of this coil have been upset. It is essential that no screening be placed nearer than about two to three inches from this particular coil otherwise trouble will be experienced. If you will cut out the screening, following the construction exactly as published, you will over-

come your difficulty and at the same time obtain complete freedom from interference from the local stations.—ED.

Gramophone Needles—Steel v. Fibre

SIR,—I beg to refer to the letter from Messrs. William Hall & Co., Ltd., (Studley) published on page 1,016 of AMATEUR WIRELESS dated November 14.

Your correspondent has raised a number of points of interest and controversy and I feel that some further information would prove of considerable value to the rapidly growing numbers of radio-gram users and indeed to many acoustic gramophiles.

In the first place, perhaps your correspondent will indicate with greater precision, the type of records "for which fibre needles cannot be beaten," and also give examples of records which, when played with a fibre needle cause the result to be "dull and uninteresting." The suggestion that a fibre needle is incapable of properly reproducing a note of 4,100 cycles is open to considerable doubt and the somewhat sketchy explanation seems inconclusive. Has your correspondent made an experiment with a treated fibre or other hard vegetable needle in a pick-up or acoustic

sound-box *specially made for fibre needles?*

Having regard to record wear I think that there cannot be the least doubt that the steel needle causes more record wear than a fibre needle.

The shape of a gramophone needle is important—a thin (soft tone) needle will ride "easily" in the bottom of the groove and the reproduction will suffer from lack of definition and wave distortion. To remedy this, modern commercial sound-boxes and pick-ups are, as a general rule, designed for the use of thick (loud tone) or comparatively thick (medium tone) needles. In accordance with the best modern practice the needle should rest not on the bottom of the groove, but equally and snugly on each side of the groove; in the course of playing shoulders will be worn by the friction between the needle and the sides of the groove.

It is clear from the third paragraph of your correspondent's letter that, even assuming that the gramophone is operated under conditions for the prevention of record wear from the many other causes, e.g., faulty alignment, and incorrect dynamic levelling, etc., the wear of the needle

(Continued on page 1342)

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BRITISH GENERAL

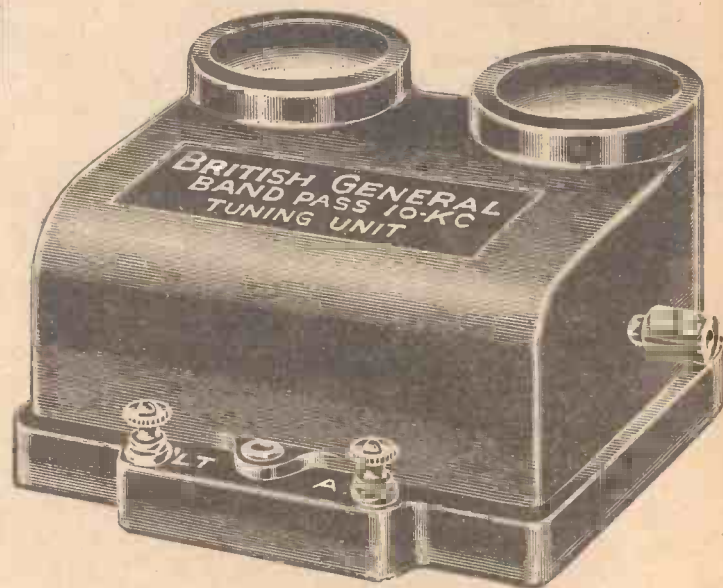
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Three Valves (Screened Grid, Detector, and Power). One-knob Tuning, Illuminated Dial in actual wavelengths, Moving-coil Speaker. All self-contained in a luxurious walnut cabinet. For A.C. and D.C. Mains.

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"READERS' IDEAS AND QUESTIONS"

(Continued from page 1340)

is smaller in the case of steel than in the case of fibre; it must follow, therefore, that the wear on the record is greater.

With a sound-box specially designed for fibre needles, properly weighted and with a gramophone dynamically level I have played heavy orchestral recordings, piano solos and operatic sopranos many hundreds of times, and am still satisfied not only with the all-round excellence of the reproduction, but also in the knowledge that a microscopic examination of the record grooves proves them still to be in the condition of a newly-pressed disc.

J. L. C. (London, S.E.).

Signal Strength in Suffolk

SIR,—I read with interest "Thermion's" comments on the strength of the various National and Regional programmes in his district.

It may interest you to know of some of my experiences. First of all, distances which are as follows: Southwold to Brookmans Park, 110 miles; Southwold to Daventry, 100 miles; and Southwold to Moorside Edge (about) 200 miles.

Firstly, the only really strong and reliable station on the medium-wave band is London Regional. London and Northern National are both subject to excessive fading and are not strong enough to be listened to comfortably. Midland Regional is the next best after London Regional, and can usually be relied on, but Daventry National is rather weak (this is, I think, due to a fault in the set) while

Northern Regional is at all times practically inaudible.

May I congratulate you on your most interesting articles every week in AMATEUR WIRELESS which never fail to entertain me.

J. G. D. (Southwold, Suffolk).

Adding Pick-up to the "£3 3s. Four"

SIR,—I have built the "£3 3s. Four" receiver and am so satisfied with results that I would like to make use of the receiver as my standard radio gramophone set for the home. As I am uncertain of the connections for a pick-up and volume control, I should be glad if you would give me some assistance in connection with the necessary wiring and modifications.

G. W. (Hull).

You should arrange a two-pole change-over switch as near to the detector valve as possible and then put a 100,000-ohms potentiometer volume control on the panel between the 4-point wave-change switch and the L.T. switch. Now disconnect wire No. 24 from the grid of the detector valve and take it to the lower centre terminal of the switch. The left-hand lower terminal of the switch should be joined to the grid of the detector valve and the

right-hand lower terminal of the switch connected to the centre terminal of the volume control. Wire No. 15 should be disconnected from the terminal of the detector valve and taken to the left-hand upper terminal of the switch. The centre upper terminal of the switch should then be wired to the L.T. switch terminal nearest to the detector valve holder. The two terminals of the pick-up should now be connected to the two outer terminals of the volume control and a flexible wire taken from one of the terminals of the pick-up to a socket in the grid-bias battery giving about 1½ volts negative bias.—ED.

Those interested in the technical side of gramophone-record making should note that the H.M.V. process of using several turntables to make up a composite record, as described on page 1266 of AMATEUR WIRELESS, No. 496, does not introduce any "faked" effects. Records such as those of the Aldershot Tattoo, which are made by condensing a number of records of the whole event into one twelve-inch disc, are entirely genuine, and no artificial effects noises are included.

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

The designing of apparatus or receivers cannot be undertaken.

Modifications of a straightforward nature can be made to blueprints, but we reserve to ourselves the right to determine the extent of an alteration to come within the scope of a query. Modifications

to proprietary receivers and designs published by contemporary journals cannot be undertaken.

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

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

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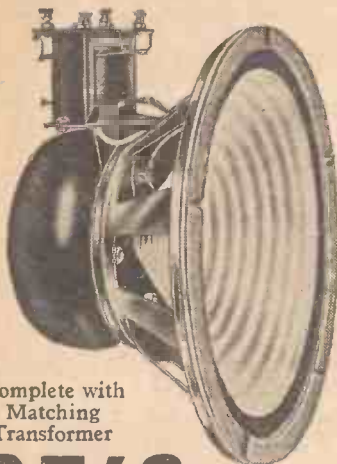
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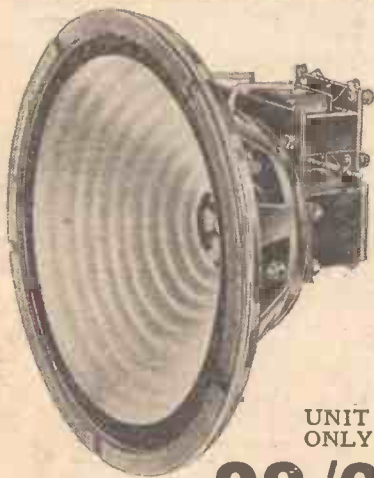
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Note.—4 volts 6 amps, for A.C. valves, 8/- extra. Full constructional leaflet with each kit.

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**“OPERATING THE
‘FOUR-STAR 4’”**

(Continued from page 1323)

double tuning effect may be obtained. This double-humping is a sure sign that the trimming is out.

Altogether there are six controls on the “Four-star 4,” three main controls and three subsidiaries. The centre knob for tuning is the most important, of course, but almost equally important are the volume and reaction control knobs on the left and right respectively. For many of the stations received the volume control will have to be turned down. For the very weak stations full volume should be obtained by setting the volume control to its maximum position and increasing the reaction.

Sometimes troublesome interference between adjacent stations can be eliminated by a careful co-operative action between the volume and tuning controls. Assuming the station wanted is being received quite strongly, but with interference from another station, turn down the volume control and increase the reaction to make up for the loss of volume. This compensating action between the volume and reaction controls is often most effective in clearing interference.

Our tests indicate that at least forty stations can be tuned in with ease on any normal night. We should mention that to change over from medium to long waves it is only necessary to push in the wave-change switch on the left. This knob is ganged up with the three coils, which are very efficient on both wavebands.

When the preliminary adjustments to the trimming have been satisfactorily completed, the chassis can be fitted into the Peto-Scott cabinet specified.—A.H.R.W.

**“THE PROBLEMS OF USING
D.C. SUPPLY”**

(Continued from page 1338)

quarter of an ampere, the voltage drop being rather more, 16 volts to be precise, in order to obtain the same heating as on the A.C. valves, namely, 4 watts. These valves are equally successful and have the great advantage that they do not require so much heat dissipation in the breaking-down resistances. Development, however, on this subject is proceeding, and there is every indication that valves taking still smaller current will be produced in the near future.

The older method of using directly-heated battery valves with their filaments in series is being entirely superseded by the indirectly heated type owing to the greater ease of smoothing and the distinctly better performance obtained.

Time will show where the current figure is finally standardised, and in this direction the possibility of the change over of supply to A.C. will have to be considered. If the current is a quarter of an ampere or less it is possible to construct a small rectifying unit delivering 200 to 250 volts at 300 milli-amperes, which is, of course, ample both for the supply of the filament and the H.T. In the event of a supply being changed over to A.C., therefore, it is not necessary to scrap one's receiver, but merely to obtain a small rectifying unit of this type.

**YOU CAN'T BE DISAPPOINTED IF YOU
BUILD IT WITH**

Components are built to a purpose—not to a price, although they cost less than others, efficiency considered. To buy R.I. components is not experimental, it is the sensible choice of set builders who utilise the best that Radio Service can give to determine absolutely certain results.

G.P. CHOKE

Quite essential for efficient H.T. smoothing and for choke filter output coupling. The high permeability core gives the inductance which is necessary for choke components in modern receivers. The inductance is 25 henries. Encased in green bakelite.

12/6

QUAD ASTATIC Choke

A thoroughly good dependable choke for all suitable circuits. Absolutely the best for parallel feed amplification. Maintains high impedance without loss of H.F. voltage. Gives entire freedom from blind spots and acts efficiently over the whole of the broadcasting wavelengths. Its astatic winding prevents H.F. interference with adjacent components.

3/6

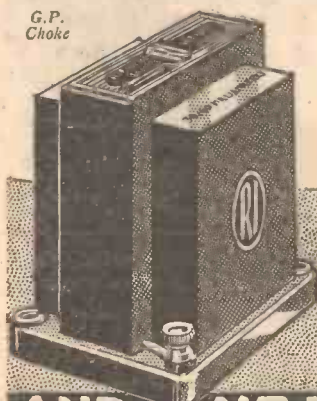
“DUX”

The Dux is the foremost British Transformer, built to give highest efficiency at lowest cost and to prevent the imposition of inferior foreign and other dubious transformers upon the British radio public.

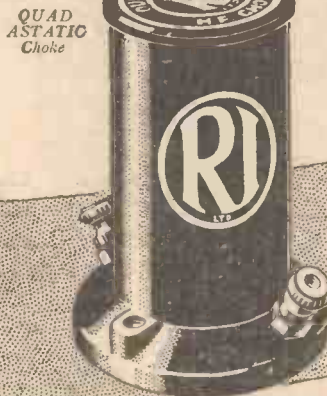
30 HENRIES

is its inductance—a truly remarkable qualification giving a performance described in the test reports of reputable Wireless Journals as equal to transformers at many times the price. The published technical data is your guarantee of performance. Ratio 1: 3½ (standard) or 1: 4½ (auto-connection).

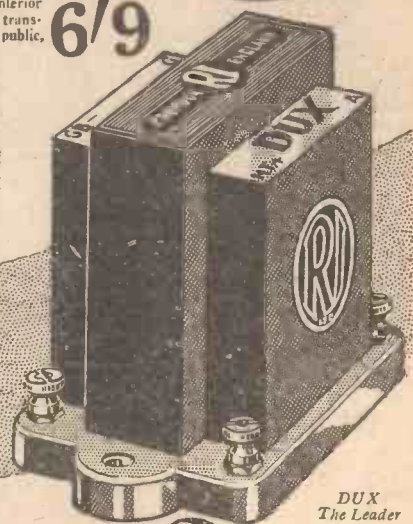
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G.P. Choke



QUAD ASTATIC Choke

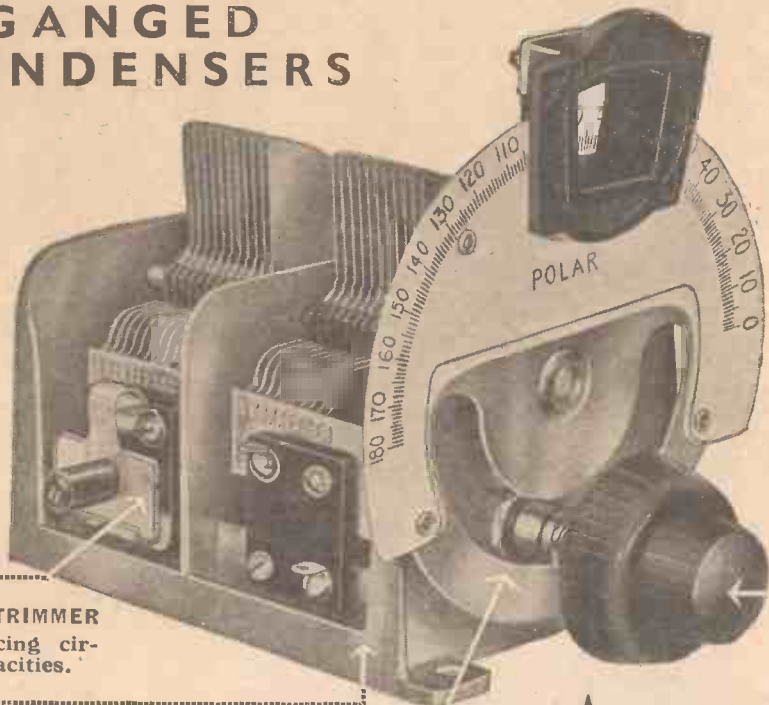


DUX The Leader

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For balancing circuit capacities.

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★ **AIR DI-ELECTRIC TRIMMER**
Controlled by centre knob ensuring the same degree of accuracy as that obtained by two single tuning condensers, but with greater ease and simplicity of operation.

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GANGED CONDENSERS
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P4100, one of the new Tungram range of high-power output valves, will be found extremely useful in gramophone or radio amplifiers, or where a very large output is required. Using the P4100 the undistorted output of the amplifier is 3,000 milliwatts or more. By connecting two or more valves in push-pull or parallel an even greater output can be obtained. The filament can be operated from a 4-volt accumulator, or from the secondary winding of a suitable transformer. At an anode voltage of 400 volts, at which the P4100 can be operated, the grid-bias required is 35 volts and it consumes 35 m.a. Price 17/-.

Write for further particulars of the complete new range to Dept. A.W. Prices from 5/6 to 19/-.

P4100 A NEW TUNGSRAM HIGH POWER OUTPUT VALVE

TUNGSRAM

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THE REV. "DICK" SHEPPARD is to speak to National programme listeners at a studio service on December 27.

Lord Burnham and the Lord Mayor of London will be heard on December 30, when they speak at the thirty-eighth annual banquet to Little Londoners at the Guildhall. The relay will include community singing.

Two concerts will be broadcast from the North Regional on December 20. At 3 p.m. the Northern Studio Orchestra will play. At 4 o'clock chamber music will be played by the Yorkshire Trio from Leeds.

In his series of talks on Historic Houses of the North, Mr. G. J. M. Fitzjohn will deal with Cumberland and Westmorland on December 21.

The Merseyside Military Band will be heard in a concert on December 21.

On December 22, a discussion between Mr. L. du Garde Peach and Mr. Gerald Barry will take place in a Manchester studio.

The subject will be "Northern and Southern Manners."

That was Funny! Wasn't it? is the title of a revue which will be broadcast in the North Regional programme on December 22.

The period from 6.30 to 8 p.m. on December 23 will be given over to relays from the Paramount and Palace Theatres in Manchester and the Argyle Theatre in Birkenhead to sample things prepared for Christmas week.

An original story by Alan Griff will be read by the author from the Midland Regional studio on December 31. "The Tavern" is the story of a strange inn and its old innkeeper, who at Christmas time comes under mysterious influences. This story was read in London six years ago for Christmas.

A character sketch from Dickens' *Scrooge* by Edgar Lane, and Michael Mullinar playing Gershwin's "Rhapsody in Blue" are novel features of a vaudeville programme to be broadcast from the Birmingham studio on December 23.

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Amazing Tone-Purity

The extraordinary purity of tone, combined with brilliant clear-cut reproduction of voice and music, will satisfy the most critical ear.

Size of Cone 10" dia.
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Prices, too, have been greatly reduced so that to-day when you buy a Lissen H.T. Battery you get much longer lasting battery for much less money than before.

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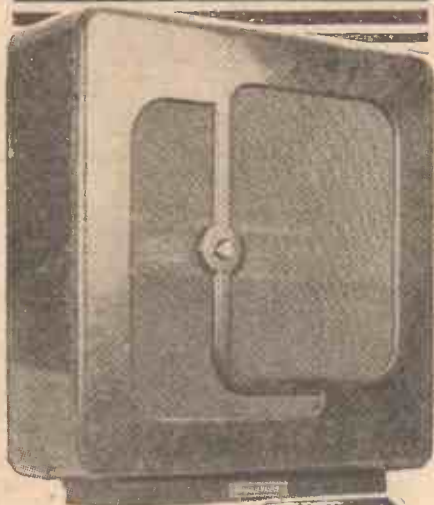
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Think of the pleasure you give with a "SNAP" Speaker! Nothing could be more welcome to a radio enthusiast. Better and purer reproduction—clear tone; undistorted volume—year in and year out! Know the satisfaction of giving something worth while? Adjustable Unit in handsome Bakelite Cabinet. In Walnut, Mahogany and Oak style.

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Write for complete catalogue of Accessories and Components.

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"AN EMPIRE KEEPS CHRISTMAS"

THIS is the title of the B.B.C.'s ambitious programme timed to be broadcast on Christmas Day, starting at 9.49 p.m. Commander King-Hall, seated in a Savoy Hill studio, will tour the Empire for listeners, getting into touch with the Dominions through short-wave beam and other means. This is the time-table: 9.49, Tower of London; 9.53, St. Mary's Light-house, on the north-east coast of England; 9.56, Gibraltar; 9.59, Cape Town; 10.2, Sydney; 10.6, Vancouver; 10.10, Edmonton; 10.14, Niagara Falls; 10.18 Montreal; 10.22, *Majestic* in mid-Atlantic; 10.26, Dublin; and home again at 10.30. In spite of the high cost of the above Empire relay, we think the B.B.C. is to be congratulated on its enterprise. We have to thank Lionel Fielden for the idea, and the short-wave beam services for making the programme possible.

DANCING AT CHRISTMAS

MARIUS B. WINTER'S band is among those down on the list for Christmas broadcasting. This band will be heard on Christmas Eve from 4.45 p.m. till 6 p.m. Suitable "Christmassy" numbers will be included.

Contemporary Scottish affairs are the subject of regular comments broadcast over the Scottish region. The next of these comments will take the form of a talk given on December 30, by Mr. Thomas Henderson.



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The Formo Bank Condenser is fitted with coloured leads of the correct length for immediate wiring up. Only one mounting and a saving of space are two other features of this latest Formo achievement.

The Condenser illustrated above embodies the Formo "Vacuum Process" condensers as specified in the "A.W." circuit and is specially designed for this super-efficient set.

Formo Mains Condensers have set a new standard of high working and test voltages with a high insulation resistance that ensures long life and great reliability.

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THE BEST receiver is only as good as its speaker. The Best Speaker has the name of Edison Bell behind it. Therefore, the Best Wireless Receiving-Set is that equipped with one of

The new EDISON BELL Permanent Magnet Moving Coil Models

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Two types are available—Power or Pentode (as illustrated) or in grained walnut cabinet. Model 456 with tapped transformer to which the connections may be adjusted in order to match various power-valves, and Model 456a fitted with transformer suitable for use with Pentode and small power-valves.

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Prices:

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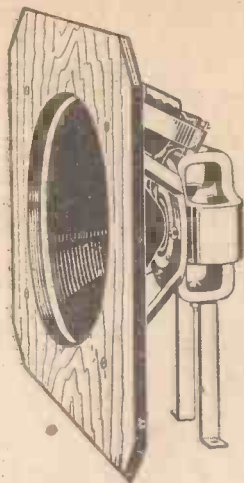
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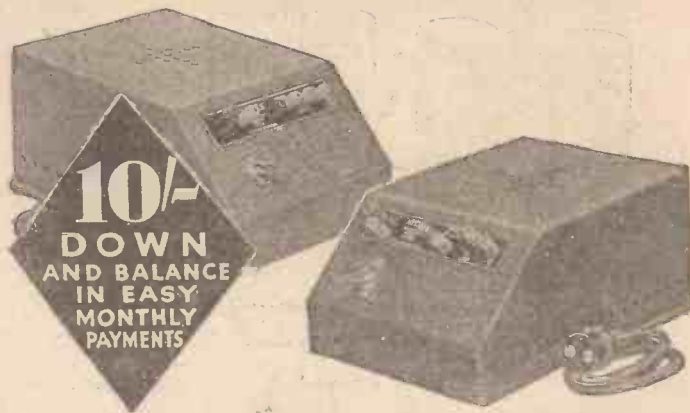
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MAKE YOUR FRIENDS' AND YOUR OWN RADIO ALL-MAINS

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Give your friends and your own family an "ATLAS" All-British Mains Unit this Christmas. Nothing could be easier to install, nothing simpler, or more reliable in operation.

Ask your dealer to demonstrate, and be sure to insist on "ATLAS," the winners of the "Wireless World" Olympia Ballot in 1930 and 1931.

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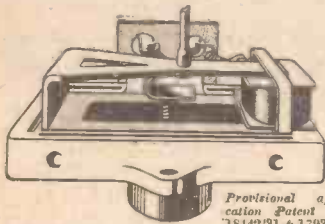
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THERE is something for everybody in the new Lissen 34-page catalogue of components, which is a thoroughly well illustrated production, giving the fullest possible technical details. Copies may be had free. 647

"Magnet" Accumulators

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If you have not already taken advantage of the Hustler, Simpson & Webb, Ltd., offer to get free details of the "Britain's Super Two," an amazingly cheap two-valver, then why not drop a line through my free Catalogue Service? The cash price is only 8s. for the complete set, and it may be had for 10s. down! What could be cheaper? 649

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I am greatly attracted by the appearance of the "Windsor" cabinets by the Carrington Manufacturing Co., Ltd. These are typical of the Camco "boxes"—thoroughly well-made cabinets of a size suitable for most of the popular sets at the moment, such as the Telsen "Victor 3." 650

A Battery Booklet

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I have just received the new Goltone catalogue R/126. In its 48 pages all the leading components are described and this book should be on the work-bench of every keen amateur. 652

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The Sovereign transportable "three," which uses an external aerial and earth, and costs only £3 10s. complete without valves and batteries, is described in a new folder, copies of which you can have free. Sovereign resistances, condensers, coils switches, and volume controls are described in separate folders. OBSERVER. 653

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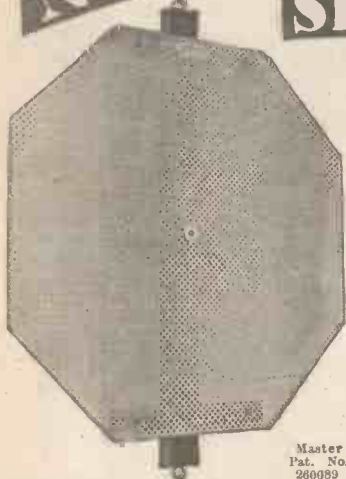
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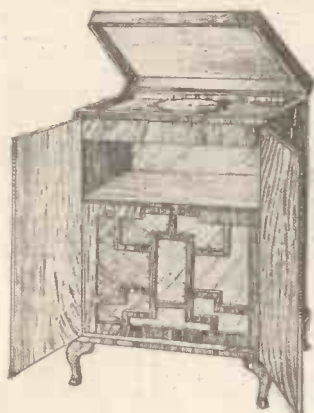
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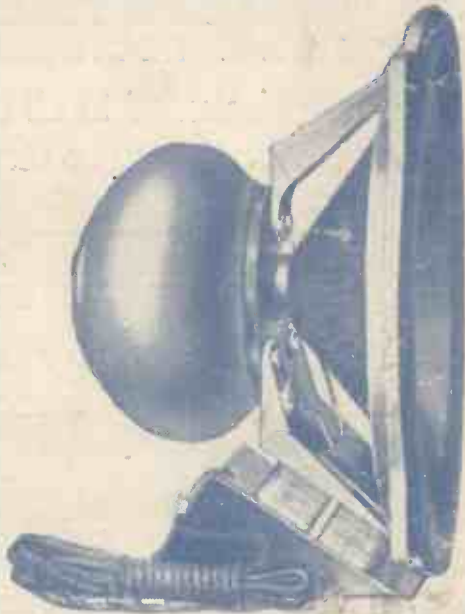
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PERMANENT MAGNET SPEAKER



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