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Popular Wireless

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No. 372. Vol. XV.

INCORPORATING "WIRELESS"

July 20th, 1929.



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R.I.



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All about
MAINS-SETS and

UNITS



PHILIPS



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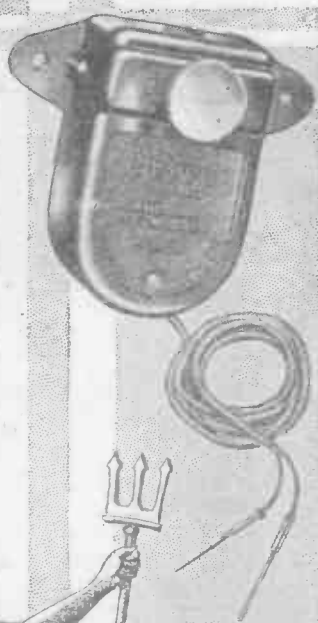
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"TOREADOR SCREEN-GRID FOUR."

This set incorporates the latest developments in Receiver design — full constructional details free on request.

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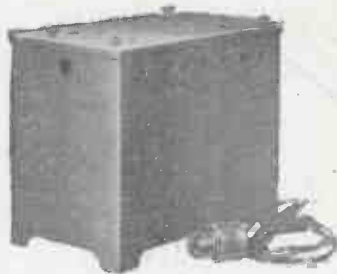


Dubilier Condenser Co. (1925) Ltd., Ducos Works, Victoria Road, N. Acton, London, W.3.

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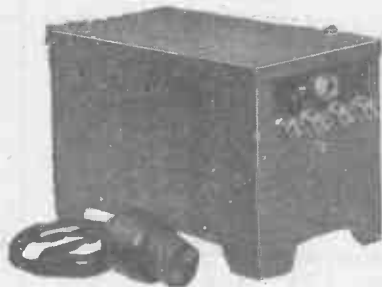
MORE POWER TO YOUR RADIO RECEIVER

with these three
BURNDEPT
Accessories for
use with Mains



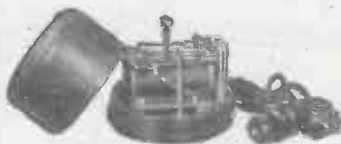
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Unit . . . £6 18 3
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Your modern super-power valve needs a Burndept Ethopower H.T. Unit to bear heavy currents at a high voltage; to eliminate hum, shrillness and "motor-boating"; to overcome variable voltage; and to do it efficiently and economically, consuming only 1 unit of electricity per 60 hours.



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Connect your receiver to the nearest lighting socket with the Burndept Automatic Power Control. With this labour-saving device the H.T. Unit is automatically started when the set is switched on, and the L.T. charger is brought into operation when the set is switched off.

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Write for full particulars of these components.

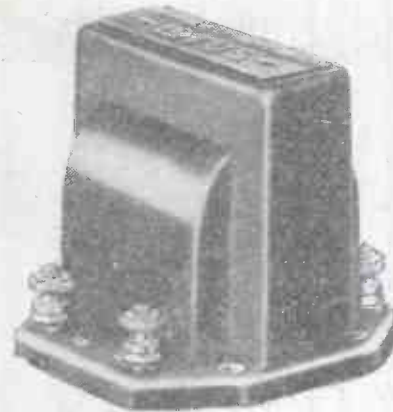
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(1928) LTD.,
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The new Lotus Transformer
gives you an unexcelled
performance—

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12/6



Your set will leap into life when you fit the new Lotus Transformer. For purity, tone and good amplification this transformer is absolutely unequalled at the price and gives as good a performance as you will get from a transformer at a higher figure.

Made with all the care, accuracy and handsome finish typical of every Lotus component, this is the transformer you must get for your next set.

**HAVE YOU SEEN THE
NEW LOTUS 5-PIN
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A.C. VALVES?**

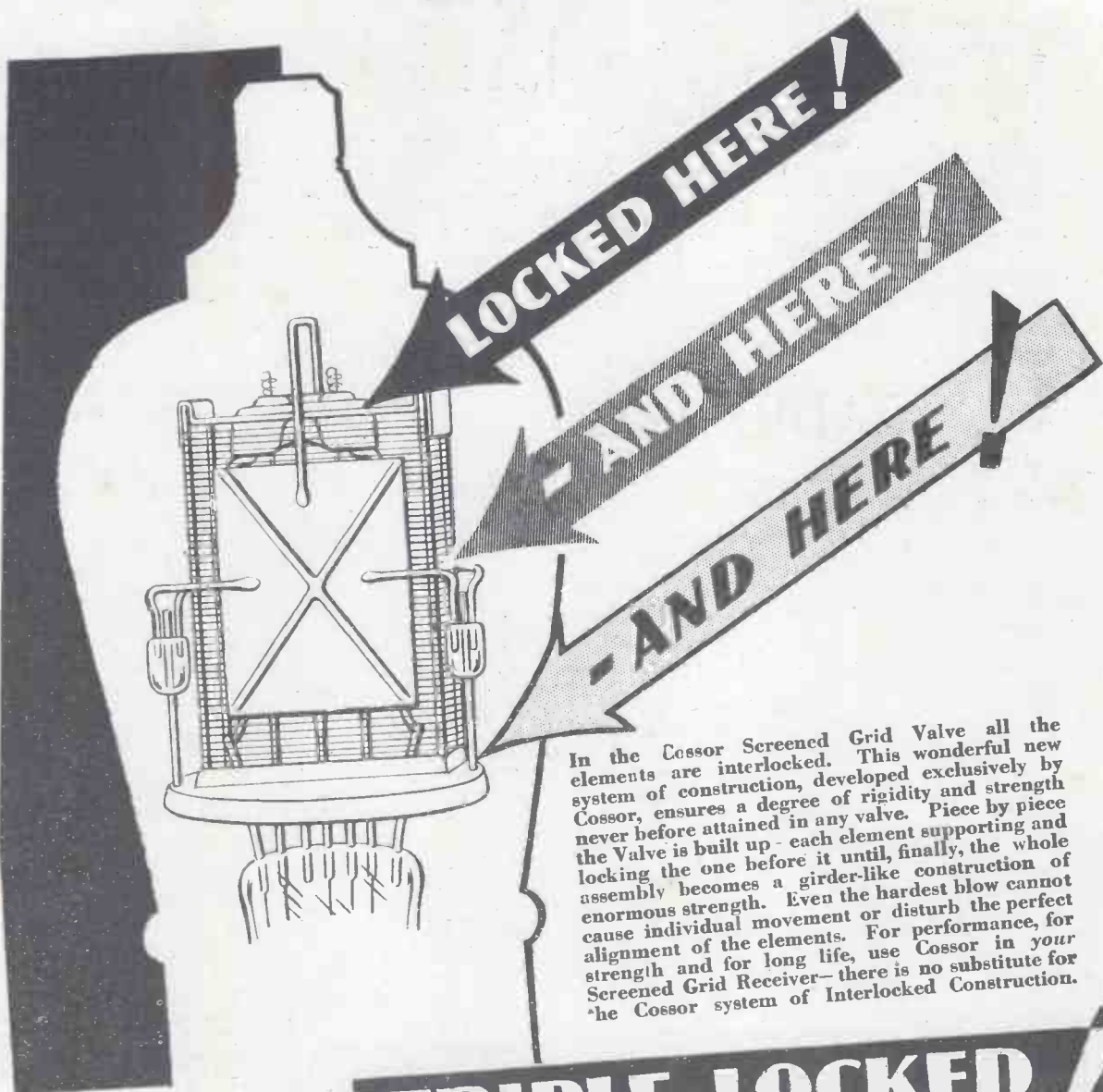
If you are building an All Mains set, this is the valve holder you need. It is rigid—not anti-microphonic; the stronger filament of an A.C. Valve does not demand the anti-microphonic type. Made for 5-pin valves, it will also accept a 4-pin valve and can be used for screened grids and pentodes with equal ease and success. It is only 1 1/2 in. in diameter and is available both with and without nuts.

Price 1/6

From all Radio Dealers.

LOTUS COMPONENTS

GARNETT WHITELEY & CO., LTD., Lotus Works, Liverpool



In the Cossor Screened Grid Valve all the elements are interlocked. This wonderful new system of construction, developed exclusively by Cossor, ensures a degree of rigidity and strength never before attained in any valve. Piece by piece the Valve is built up - each element supporting and locking the one before it until, finally, the whole assembly becomes a girder-like construction of enormous strength. Even the hardest blow cannot cause individual movement or disturb the perfect alignment of the elements. For performance, for strength and for long life, use Cossor in your Screened Grid Receiver - there is no substitute for the Cossor system of Interlocked Construction.

Made in 3 voltages for use with 2, 4 and 6-volt Accumulators.

Technical Data:

Filament Current 2-volt type .2 amp., 4 and 6-volt types .1 amp.
 Max. Anode Volts 150, Impedance 200,000, Amplification Factor 200, Grid Bias 1.5 volts at max. anode
 Volts. Price **22/6**
 (any type)

Get full details of this wonderful Cossor Valve write for leaflet L.10.

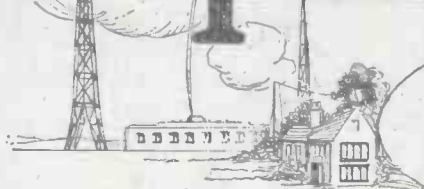
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TRIPLE-LOCKED FOR LONG LIFE

COSSOR
Screened Grid Valve

CA 9567

Popular Wireless



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ARTIFICIAL ATMOSPHERICS
 —TELEVISION NOTES—AN
 L.T. MYSTERY—CHEAP
 LISTENING—

RADIO NOTES & NEWS

THE POPE'S STATION—
 THE NORTH REGIONAL
 STATION—UGANDA CALLING.

Wonderful Telephony.

THAT was a wonderful bit of organisation by the American Telegraph and Telephone Company when it staged and "put over" a telephone conversation—in both directions—between Bush House, London, and an airplane flying over New Jersey some 3,000 miles away. It would be difficult to find a better example of the speed and adaptability of electricity than this performance, beginning and ending with a simple telephone instrument, or a more startling foretaste of this world of ours in 1939.

Says the Marquis.

ACCORDING to an interview reported in the "Sunday Express," the Marquis Marconi, whilst not desiring to be sceptical, likes to keep his imagination under control—which is, in fact, genius. He is of opinion that messages to Mars are of no importance at present; that there is no need for Robots (mechanical men) so long as there are living men; and that we are not yet near the day of the pilotless airplane. Meanwhile, the inventor is bringing his mind to bear on less romantic matters of more utility.

"Home, Sweet Home."

ONE cannot but be touched by the story of the domestic servant who, having been in Canada for one week, was seized with such a severe fit of nostalgia that she got on to the telephone, rang up London by the transatlantic service, and "blued" £20 in five minutes for the sake of a talk with her people. What an argument for lowering the rates!

The Perfect Receiver.

YOU will no doubt agree that a discussion of this by Capt. P. P. Eckersley would in all probability be fascinating. And you would like to hear what Sir Oliver Lodge has to say about "The Mystery of Radio Waves." Very good! You are lucky, for you can find both of these items in the July "Modern Wireless," besides constructional details of four more sets, including a two-valver with a range of 15-3,000 metres.

Transmitting Note.

WILL those interested in picking up amateur stations please note that Mr. H. Osborne, 77, Barrett Road, Walthamstow, London, E.17, is carrying out

tests up to 0100 G.M.T., on 21, 42, and 160 metres. C.W. only is used on 21 and 42 metres, and C.W. and telephony on 160 metres, on which last-mentioned two wavelengths reports are specially desired. All reports will be acknowledged by card.

Artificial "Atmospherics."

MY evening concert, relayed from my neighbour's ultra-violet gadget, continues merrily, and I was therefore interested to see in a U.S.A. paper that Boonville Village, New York State, has passed a by-law prohibiting the maintenance or operation of any electrical device which interferes with wireless reception. U.V. ray machines must not be used between 6 p.m. and 10 p.m.; penalty, £20. Much as I sympathise with people who use such

new process involves no sacrifice of detail, but that the picture is still limited to the size of a postage stamp!

An L.T. Mystery.

W. H. G. (Cambridge) has been the witness of what looks like a miracle. He says that he has been playing with the "Halo" circuit, and, on accidentally removing the L.T. leads from the set, he found that, but for a slight alteration in tuning, the results were excellent and the H.T. battery was giving only 11 volts, too. On fitting a new H.T. battery he found that the miracle would not work. Pity he didn't replace the old one and try again. Well, I give this one up and if anybody can suggest an explanation, I'll be delighted.

BUILDING BRITAIN'S SUPER-STATION.



This photograph shows some of the steel girders for the aerial masts arriving at the new London Regional station, near Potters Bar, Middlesex.

devices for a living, I think that the nuisance will have to be tackled sooner or later.

Television Notes.

DENES VON MIHALY, a Hungarian, has recently exhibited his television receiver in England. It is said to be about as big as a portable gramophone, can be used with any radio receiver capable of L.S. results, and will cost about £2 10s.

The American Telegraph and Telephone Company has given a demonstration of television in colours. It is stated that the

Britain First.

SLOW in self-advertisement, as usual, poor old Britain lets the U.S.A. run away with the honours by sheer publicity time after time. We have heard a lot lately about the great concessions which the Americans have secured in Peru, Colombia and other South American places, for establishing radio services. I am, therefore, glad to be able to point out that a British firm got a radio concession in Peru in 1922, and in Colombia in 1919; and in

(Continued on next page.)

NOTES AND NEWS.

(Continued from previous page.)

Colombia has run a very good radio service to New York and Europe since 1923.

Cheap Listening.

BUDAPEST is not the only place where broadcasting is "laid on" to the ordinary telephone subscribers. Odessa has now adopted the idea and linked its telephone system with the local radio station, serving some 9,000 subscribers. No radio receivers are necessary and suitable amplifiers and loud speakers may be hired at the rate of one rouble per month. Instead of a talk with his girl, the youth of Odessa may get a "talk" on Buddha or Pests—by accident!

Buckshee Battery.

I HAVE just been looking through the attractive illustrated list for smokers which the Sunripe people are announcing in another page of this issue and I notice that the gifts offered therein include an H.T. Battery and a Cabinet Loudspeaker. Seems to be a good idea for these hard times, when you want all your money for ice-cream, skee-ball, and all the other allurements of the seaside holiday!

Hurrah for the "Proms"!

IT is good to learn that the B.B.C. will run the Queen's Hall Promenade Concerts again (opening on August 10th), most of which will be broadcast. Every Thursday evening during the season will be devoted to British composers. Wagnerites will be appeased on Mondays; on Tuesdays and Wednesdays we shall get Handel, Schubert, Mozart, and others; Saturdays will be "popular." Our old friend Honegger gets a look in, but you need not listen. Sir Henry Wood will do most of the conducting.

Telephony to Ships.

THE American Telegraph and Telephone Company, which conducts the U.S.A. end of the transatlantic telephony service, is to begin tests between its experimental station in New Jersey and the S.S. "Leviathan" with the object of establishing a telephone service between any telephone in the U.S.A. and ships at sea. If the tests are successful the service will be opened first with the "Leviathan" in the autumn.

Progress of Radio.

I CONFESS that I am surprised at the way in which the issue of licences increases. At the end of May the total number of licences in force was 2,760,878, showing an increase of 20,000 over the figure for April. Twenty thousand new listeners in one month! Not much wrong with the radio trade, surely. In addition to the total given above, 14,830 free licences have been issued to blind listeners.

Correspondence Invited.

MEET Mr. Fred Easter, 3353 Southside Avenue, Cincinnati, Ohio, U.S.A., who is as keen as mustard on short-wave work and W.L.S.'s notes. He would like to correspond with anyone here or elsewhere and would answer all letters and supply information about U.S.A. stations. Now, lads, snow him under. By the way, as a beginning, he refers to station N R H, Heredia, Costa Rica,

owned by Mr. A. C. Marin; transmits on 30.3 metres, 7.5 watts, between 10.30 p.m. and 11.30 p.m. (Eastern Time). This set has been heard in Canada; has anyone here spotted it?

The Pope's Station.

AFTER much speculation as to what would happen, I now learn that Marconi's are to build the great wireless station for the Vatican. It will be of world-wide range and will operate both short-wave telegraphy and telephony on the broadcast principle. I suppose that this result, which is to make work for English hands, is as much a tribute to the excellence

SHORT WAVES.

RETALIATION.

Mother: "What is your father sputtering about?"

Daughter: "He can't get the radio to stop sputtering." "Radio News."

"Currants in Wireless Receivers" runs a headline in a provincial paper. Doesn't that take the bun?

SOME TERMS EXPLAINED.

Dry Cells.—The name given to the best bedrooms in the Government compulsory hotels.

Leak.—The plumbers' favourite flower.

By the use of headphones and a specially constructed microphone, an experimenter has listened to the sounds made by grubs while devouring apples. It is understood that the noise they made when spitting out the pips came through at loud-speaker strength.

A LOSER.

Gridd: "Jimpson looks discouraged. Has he received some sort of a setback?"

Leake: "Well, the instalment man did." "Radio News."

TIRELESS "TALKIES."

It is estimated that one house in three in Great Britain has a wireless set.

To several million homes each night,

The B.B.C. dispenses light

In chats on Art, the Arquebus,

Or "How to Eat Asparagus,"

Or "Ways to Renovate a Hat,"

And interesting things like that.

They tell us what to do or use

When in the pink or in the blues;

We learn what littery mulches are,

The distance to the farthest star;

And ere Big Ben booms out his chimes

We're urged to buy the "Radio Times."

But wouldn't it be rather nice

If there could be a small device

Whereby the "Talker" (all alone),

Enscenced before the microphone,

Might see a coloured light—say, red—

When I switch off and go to bed!

—"Bulletin & Scots Pictorial."

of British engineering as it is an honour to that eminent Italian the Marquis Marconi.

About Those "Spirituals."

NEGRO spirituals" are creeping into the programmes too frequently for dischile's taste. They are the jazz of vocal music and I wonder whether anyone besides Americans really cares to hear the broken English of negroes sung to crude and monotonous melodies. The spirituality of these displays is far to seek and the theological conceptions embodied in them are childish and materialistic. I recommend the B.B.C. to let them drop out of its programmes.

The Spies' Rebellion.

ADUBLIN report states that the postmen of the Irish Free State have successfully protested against their being required to act as spies on wireless "pirates." All well and good, though an "inspector" is just about as much a spy

as a postman. However, as their argument was that they wished to remain friendly with householders on their rounds I do not see the force of their suggestion that the police or Civic Guards ought to do the spying. Don't they want to be friendly with householders, too?

Not Guilty.

ACCORDING to a report, Sir James Openshaw, Chairman of the Lancashire Higher Education Committee, criticised the B.B.C.'s talks on "The English Countryside," which, he pointed out, begin at 7.25 p.m., when people are mostly out-of-doors at this season. Further, Sir James suggested that when such talks were next arranged the B.B.C. would perhaps consult people who know something about the countryside. Sounds like Ariel at his naughtiest, does it not? Not guilty this time, though.

The North Regional Station.

THE site for this station is evidently giving the B.B.C. a troublesome hunt. The latest rumour is that they have been investigating a place near Slaithwaite, which is near Huddersfield, and have been testing its possibilities. Supposing that they eventually settle on Slaithwaite, there will remain the problem of what the announcers are to be taught to call it. Something like "Slate" or "Slewit," I presume would be most favoured.

A Useful Handbook.

ONE of the best sixpennyworth of radio reading—apart from two copies of "P.W."—which I have seen for some time is the Manchester "Evening Chronicle's" Wireless Guide. The last edition had over 150 pages covering the description of half a dozen sets, besides a number of most interesting practical articles, the whole being illustrated by photographs and diagrams, and I am told that the next edition (7th) out shortly, will be better than ever.

Uganda Calling.

A WELCOME correspondent (C. P. L.) writes from Uganda in eulogy of his set, a "straight" det. plus three stages of R.C.C. designed as per our White Print No. 15, the output being filtered as described in our issue of March 9th. With this set he has excellent results on 5 S W, heard that nightingale, etc. But he cannot get 7 L O and wants to know why. What is the lie of the land between 7 L O and his house? I notice with amusement from the cutting he encloses that an admirer sent one of my jests to the "Uganda Herald" and had the nerve to sign his letter "Ariel."

The Grandfather Meter.

A SHREWSBURY reader sends me a photograph of a meter (Three in One type) which he has mounted in an attractive and, I believe, an original manner. The meter forms the face of a model of a "grandfather" clock, thirteen and a half inches high, and is connected to the set and loud speaker. Little switches on the side of the model provide the controls and there is a safety key, besides an arrangement for cutting the meter out for use for other purposes. Quite an interesting little addition to the set, and our thanks are due to "W. S."

ARIEL.

SIMPLIFYING MAINS UNITS

A CONSIDERABLE part of the ordinary mains-supply unit, practically the whole in the case of D.C. units, consists of bulky chokes and condensers. The purpose of these is to filter or smooth-out the current as it proceeds from the mains, or from the rectifier, and to supply to the receiving-set direct current free so far as is possible from any pulsations or ripple.

Not only do the smoothing components add to the bulk of the apparatus, but they also contribute largely to its weight and its cost. It is natural, therefore, to enquire whether the smoother or filter portion of the unit is absolutely essential, or whether some more convenient means of eradicating ripple cannot be devised.

So long as no ripple from the mains actually reaches the loud speaker, it is immaterial whether it does, or does not, exist in any other part of the set.

A "Flank Attack."

The use of a filter circuit may be described as a direct or frontal attack on the problem. It puts up ripple barriers in the form of chokes between the mains and the set, and offers the ripple various enticing short cuts in the form of shunt condensers.

By this alliance of barrier and by-pass, the filter circuit succeeds in diverting any

Some ingenious schemes for doing away with bulky smoothing elements are described
By SEXTON O'CONNOR.

mains supply has been solved by Mr. G. M. Wright in the manner illustrated in Fig. 1. Current is supplied from the leads marked +, -, which may either be D.C. mains, or the output leads from a rectifier, in the case of A.C. mains. In either case, a ripple or alternating component will be present in the current flowing through the shunt resistance R, in addition to the direct current.

The filament is connected to a point F on the resistance, whilst the plate and grid leads are taken to points P, G respectively on opposite sides of the point F. The grid lead includes an impedance, such as the secondary coil S of the input transformer, and a biasing battery.

Ignoring the ripple for the moment, it will be seen that the plate voltage can be adjusted to any desired value by adjusting the tapping P, whilst the grid voltage is similarly regulated by means of the tapping G, which, being on the negative side of the filament F, must give a negative bias to the grid.

Ripple Automatically Suppressed.

When a ripple arises in the supply current, the crest of the ripple will cause a slight increase in the voltage gradient along the resistance R. The plate voltage accordingly rises slightly, whilst the grid voltage is thrown more negative. The additional plate voltage naturally tends to increase the plate current. On the other hand, the more negative grid bias simultaneously tends to cut down the plate current.

Alterations of grid bias have, of course, a greater effect on the plate current than alterations of plate potential, being m times more effective, where m is the amplification factor of the valve.

The condition necessary for exact neutralisation is, therefore, that the distance FP shall be m times the distance FG. In practice, however, the amplification factor of the valve may not be known, in which case the tapping G is simply so adjusted until no audible hum is heard in the loud speaker.

Once this condition has been attained, the bias on the grid can be adjusted to any desired working-point on the valve characteristic by means of the grid-bias battery C.

It may, perhaps, be helpful to give some

figures by way of example. Suppose the valve takes 120 volts on the plate, 9 volts negative bias on the grid, and that its amplification factor is 6. The tapping P is first adjusted to give 120 volts between P and F, and the tapping G adjusted to a point giving 120 divided by 6 or 20 volts between G and F. Ripple should then be balanced out.

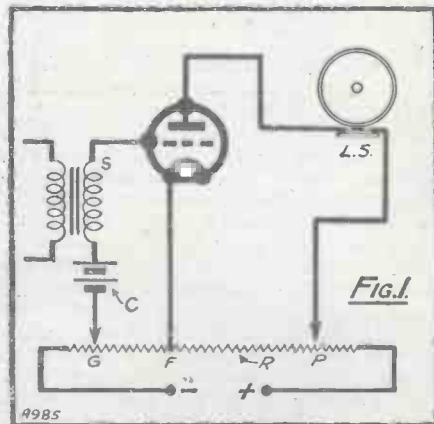
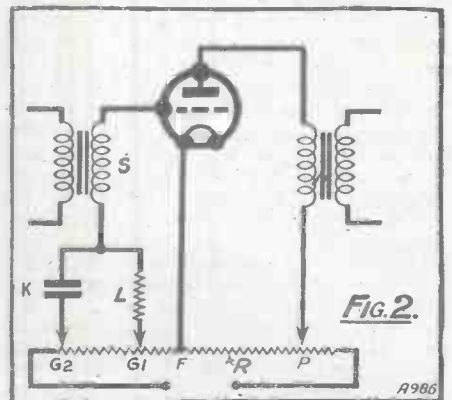
But 20 volts is too large a negative bias for the valve to work properly on the straight part of its characteristic curve. Consequently a battery C, giving about 11 volts (20-9) must be inserted in the grid circuit, with its positive end towards the grid.

A Second Scheme.

Fig. 2 shows a different arrangement, due to two Swedish engineers, in which the grid-bias battery is dispensed with, thus rendering the apparatus more permanent in action.

A second tapping is inserted in the grid circuit in series with a large condenser K. The first tapping G1 applies negative bias to the grid through a resistance L, whilst ripple voltage (being alternating in character) is applied through the condenser K from the second tapping G2.

In operation, taking the valve constants specified above, the tap P is set as before, the tap G1 is set so that the distance G1F



ripple away from the input to the first valve.

On the other hand, it is possible to take no special precautions to prevent ripple from entering the set, so long as it is applied in such a way that it does not affect the loud speaker. That is to say, ripple may reach the set at one point provided it is balanced against ripple applied at another point, the net result being that no ripple exists in the final output. This may be described as a flanking attack on the problem.

The principle of balancing-out ripple in a

represents 9 volts, whilst the distance G2F is adjusted to represent 20 volts.

In both cases it has been assumed that changes in the voltage on the plate take place synchronously with changes in voltage at the point P on the shunt resistance R. This is not strictly true, because the inductive effect of the loud-speaker windings must produce a slight change of phase between the point P and the plate of the valve. The change, however, is not sufficient to prevent an effective balance from being struck.

LATEST BROADCASTING NEWS.

A GREAT JAMBOREE

PENSIONS PROBLEMS — REQUEST PROGRAMMES AT 5 GB—MORE SCHOOL BROADCASTING—NOTABLE BELFAST CONCERT.

THOUSANDS of scouts from all parts of the world are on their way to Arrowe Park, Birkenhead, for the Great Jamboree which is to take place during the early part of next month.

The Jamboree is, of course, the outstanding event in Scout life, and arrangements have been made for no fewer than three relays from the camp to be included in the broadcast programmes. The first will be the opening ceremony which is to take place at 3.45 p.m. on Wednesday, July 31, when listeners to all Northern stations will hear speeches by the Duke of Connaught, and Sir Robert Baden-Powell, the founder of the movement, which goes back almost to the days of the Boer War.

Two days later the Prince of Wales, who as Chief Scout of his own Principality, will spend the previous night in camp, is speaking at a Great Pageant of Nations in which Scouts representing over 40 nations are to take part, and his remarks, which are timed to begin at 3.45 p.m. will be broadcast from London, Daventry (5 X X), and other stations.

The final broadcast is on Sunday morning, August 4, when listeners to almost all stations will be able to hear the great Thanksgiving Service of the Scouts, in which the Archbishop of Canterbury will take part.

Pension Problems.

The recent announcement that the Labour Government intends to give consideration to State Pensions has added considerable importance to the series of talks on Insurance Problems, which for some weeks past has been a feature of the morning programme from 2 LO and other stations.

This is particularly applicable to the last talk of the series which is to be given on Monday, July 29, by Mr. J. A. Newrick, who will offer some advice on the important topic of Widows' and Old Age Pensions. Mr. Newrick has received a large number of letters containing queries on these talks, and it is likely that another series will be arranged.

Request Programmes at 5 GB.

The only opportunity that listeners have to-day of getting their favourite items included in the broadcast programmes is when programme builders put on a "Request Hour." London seldom gives one, but the authorities at the Birmingham studio find they are as popular as ever with 5 GB listeners. Mr. Joseph Lewis, Musical Director there, thinks a good deal of these request hours and he keeps a book in which is recorded every item asked for by listeners.

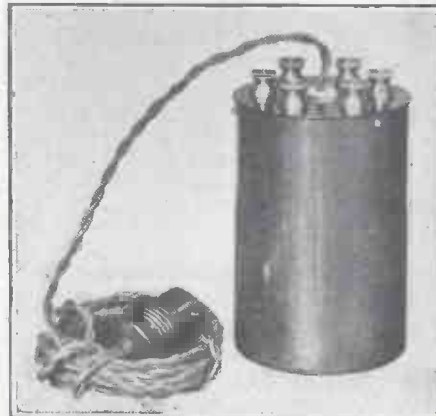
Records show that the public are now

wanting a preponderance of pieces which come in the category known as "high-brow," all of which goes to show that people who take their wireless fare seriously are discriminating, and that good music is appreciated even though with every stupid press agitation the B.B.C. are unjustly accused of seeking to educate rather than to entertain.

The next "request hour" from Birmingham has been arranged for Thursday evening, August 1st, when the studio orchestra will be under the direction of Mr. Joseph Lewis, and vocal items will be by that popular radio artiste, Dale Smith.

More School Broadcasting.

A special series of talks for secondary schools is included in the Schools Broadcasts for the term which begins next September. They will be given by Squadron-Leader W.



Suitable for up to three valves, this H.T. mains unit works from D.C., and has positive H.T. tapings at 60 and 120 volts, and one 6-volt negative grid-bias tapping. (Falk, Stadelmann.)

Helmore, of the Royal Aircraft Establishment, Farnborough, who is broadcasting by special permission of the Air Ministry.

The B.B.C. has just issued a pamphlet dealing with this and other forthcoming talks for schools. The pamphlet is the first to come out under the auspices of the new Central Council for School Broadcasting which is now a responsible body, not merely doing advisory work.

In these circumstances it was only to be expected that the scope of the broadcasts to schools would be extended, and several notable new features are included. One of the most important, perhaps, is a series of talks on athletics which will be given by well known authorities.

The programme covers the period from September, 1929, to June, 1930, thus enabling schools which utilise the "Wireless Teacher" to plan their time tables for a full year's work.

Notable Belfast Concert.

A concert arranged in connection with the Ulster Summer School of Music will be relayed from the Great Hall, Queen's University, to Northern Ireland listeners, on a date to be fixed early in August.

It will be given by the Belfast Station Symphony Orchestra, and the local broadcasting officials are looking forward to a particularly good transmission inasmuch as the acoustic properties of the hall, which contains a large amount of wood, are considered to be peculiarly suitable. No other hall has yet been found to give just the right amount of echo as that in the Grand Hall at Eastborne, where the concerts by Sandler and his Orchestra were so successful. Since Sandler came to London his broadcast concerts have brought no more correspondence from listeners than any other outside broadcasts.

TECHNICAL NOTES.

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

MAINS SETS

AUTOMATIC RE-CHARGING FOR ACCUMULATORS—QUESTIONS OF COST, ETC.

AS special attention is being paid this week by most of the contributors to this journal to the subject of mains units and mains-operated sets, I have been asked to devote these notes also to the same subject.

As a matter of fact, this subject, with its various branches, has been many times referred to in the past, but as it is one upon which I am continually receiving letters from readers and which is clearly of great importance and interest to a large section of radio experimenters, there is good reason for dealing with some of the principal points of interest on this occasion.

Combined Units.

I suppose it is not more than about three or four years ago that the so-called "battery eliminator" began to appear on the United States market. As a matter of fact, the first form of battery "eliminator" consisted of a battery with some form of automatic or semi-automatic charger incorporated with it.

It is only an "eliminator" in the sense that it gets rid of a good deal of the trouble

of keeping the batteries fully charged. With the combined outfit it is only necessary to operate a switch and the battery is either connected to the set or connected to the mains and therefore on charge.

Before leaving this point I should say that whether we are worried about the question of this being strictly an eliminator or not, it certainly has, in my opinion, many advantages, more particularly in the case of the low-tension battery. A low-tension accumulator battery combined with a trickle-charger is, in my view, a perfect source of L.T. current for a radio set and even as regards freedom from trouble and attention is on practically level terms with a true eliminator.

Questions of Cost.

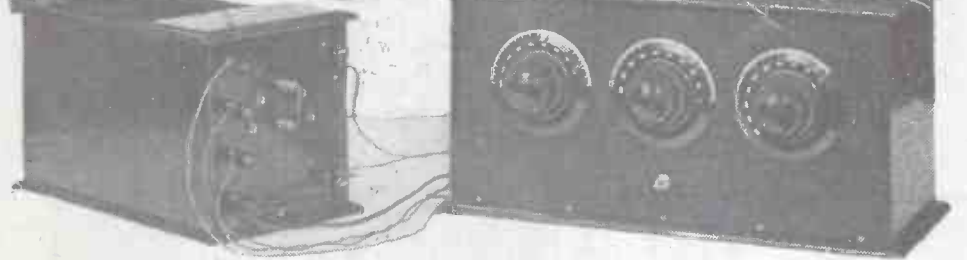
It has the further very important advantage that its cost is only a fraction of that of the eliminator, whilst from the technical point of view it gives a smooth current which is bound to be at least equal to that which is obtained from the eliminator.

(Continued on page 619.)

OVERCOMING HUMMING

An article upon the method of overcoming humming is particularly appropriate in a Special Mains Unit Number. This is not because apparatus driven from the mains is necessarily an offender in this respect, but because such an article is of particular interest to the listener who has electric light in the house.

By A. NIGHTINGALE.



WHATEVER the poets and nature students may say about the pleasant humming of the bees, there is no doubt that from a radio point of view, a hum, or even a faint buzz, is a calamity. In radio the wise remark about silence being golden is particularly applicable, and no set which hums like a hornet's nest can bring its owner the real blessings of radio.

Curiously enough, although we hear a great deal about the difficulties of electrical-interference elimination, most cases of humming interference are easily traced, and

connections, are reversed. (The primary connections may be marked OP and IP, or alternatively H.T. + and P (or A). Similarly the secondary connections are sometimes marked IS and OS (or in other cases G and GB). The primary and secondary are merely continuous windings, so that the reversal of one or the other will not radically affect the performance of the set, although it may do a great deal towards making the hum disappear.

Another and even simpler precaution to take is to make sure that the aerial or earth lead, or the set itself, is not being brought too close to the electric-light mains. Very often the house wiring is concealed in the walls of the house and if an aerial or earth lead runs close to this an irritating hum will be present which the mere shifting of the lead would immediately remove. It is often worth while to pay particular attention to the earth connection, as in many instances this is where the trouble arises.

Very often a large fixed condenser in series with the aerial lead, earth lead, or both, will effect a great improvement, so these can be tried if on hand. A still better plan is to avoid direct connection of the receiving apparatus to the aerial, using instead a magnetic coupling between two

coils which can be varied either by movement or by altering the number of turns in the primary coil. Another easily tried anti-humming stunt which often gives excellent results is to avoid a direct connection to earth altogether and to use instead a well-insulated counterpoise.

Locating the Source.

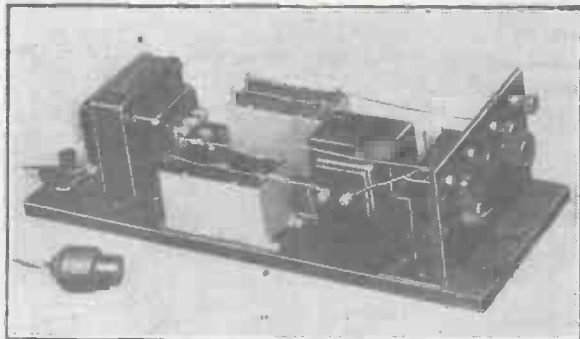
Quite a lot of fun can be got out of the tracing of the hum if it is tackled in a sportsmanlike spirit, for sometimes the source of this trouble is as hard to locate as a tricky foreign station with a secretive announcer. In all cases of hum you have won half the battle if you can find exactly where the interference arises from, and a hum-hunt of this kind can be quite exciting.

The first thing to do, of course, is to disconnect the aerial and to notice whether the hum still persists. If it is unaffected try disconnecting the earth lead also, to make sure that this is not at fault. (The long earth lead is a very frequent source of trouble in this respect.) Failing these two, it is not a bad plan to shift the set out of its corner in the room to another position, to make sure that battery leads, etc., are not picking up anything from the neighbouring walls.

Eliminating an "Eliminator".

When it is certain that either the set itself or else the unit used with it is the cause of the trouble, the process of elimination can be carried a step further. If you can borrow an H.T. battery for a few minutes and connect it up in place of the unit, you may find that the latter — indignantly suspected by you from the first — is quite guiltless, the hum going on as merrily as ever. Finally, you may, by eliminating other factors, run the trouble to earth in a long loud-speaker lead running along a skirting board on the other side of which are leads from the mains, or some similarly apparently innocent part of the installation.

Finally remember the warning and *always* disconnect the mains first.



An H.T. Unit for A.C. mains which is obtainable in the form of a complete kit of parts for home assembly. (Wholesale Wireless Co.)

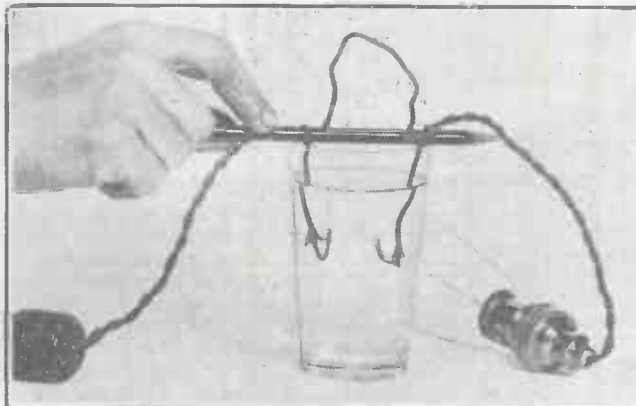
can quite simply and quickly be put right by the listener himself. Before dealing with anything of the kind, it will be in order to remind listeners that no alteration to the wiring of the set should be undertaken, no screwdriver should be introduced, and no other leads should be unconnected, by anyone without good radio knowledge, unless the mains are switched off and the batteries are disconnected at the battery end of the installation.

A Switch Precaution.

Incidentally, an experienced electrician seldom relies upon the switch itself, if a plug is provided. An excellent habit to form is not merely to switch off at the mains, but to pull out the connecting plug at the same time, thus covering the possibility of accident if the switch should be inadvertently moved "on."

One simple alteration of which no listener need be afraid when tackling the removal of a hum, is in connection with low-frequency transformer connections. It very often happens that a small hum will completely disappear if either the primary connections of the transformer, or the secondary

WHICH MAIN IS NEGATIVE?



If a lead from the mains to a lamp is broken and the ends carefully separated and submerged in a glass of water, as shown, the negative lead is indicated by its excess of bubbles rising to the surface.

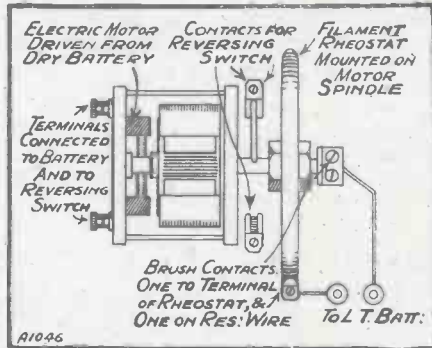
A REMOTE CONTROL L.T. SWITCH.

The Editor, POPULAR WIRELESS.
Dear Sir,—I enclose rough details of a type of L.T. switch which you may consider of interest to "P.W." readers.

I have experimented with several types of switches, including ratchet, electro-magnet switches, mercury and relays, but all have the disadvantage of applying the full load to the filament instantly.

With this, a toy motor had an ordinary old-pattern rheostat fixed to the spindle, brush contacts being arranged, these going to the L.T. terminals. Stops are provided to allow one complete revolution in one direction, the motor in doing this knocking over a switch which reverses the motor connections, so that on pressing the second bell-push it revolves in opposite direction, to extent of one revolution.

Two bell-pushes are mounted in any room in any convenient position, or sets of double pushes mounted in several positions, e.g. dining-room, garden, bedrooms, etc.. In my case I run permanent relay leads, and L.S. extension leads, terminating upon a small terminal board to four rooms, so without moving from the room L.S. can be switched on or off at will.



Added to this, the rheostat takes longer to revolve than other relays and consequently applies the current gradually to the filament.

The motor, if a small toy one, need only be driven from dry batteries. I use four in series-parallel giving 8 volts at double capacity (flashlamp batteries).

In conclusion, I am glad to find in "P.W." lately, more constructional articles, which to the average workshop wireless man are really helpful, for after all, the large number of people who buy a kit of parts, borrow a screwdriver and assemble in 20 min. can hardly be called wireless enthusiasts in the practical form!

Thanking you and wishing "P.W." every success,
Yours faithfully,
A. C. DEVERELL.

Wembley Hill.

THE DOWDING "FILADYNE."

The Editor, POPULAR WIRELESS.
Dear Sir,—In recent correspondence, mention has been made of the Filadyne. Being an old Filadyner from the first, and having an efficient four valver (H.F., pre-feed Det., and 2 L.F. transformer coupling), I was pleased to see it mentioned again.

I have gone through all Mr. Dowding's and Mr. English's versions of the circuit, and noticed long waves were not dealt with, and only once have I noticed in "Questions and Answers" how to wind

CORRESPONDENCE.

A REMOTE CONTROL L.T. SWITCH.

LONG - WAVE COILS FOR THE FILADYNE — SHORT - WAVE INTERFERENCE.

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

the long-wave coils, and I did not find this a success equivalent to the medium wave-lengths for L.S. work.

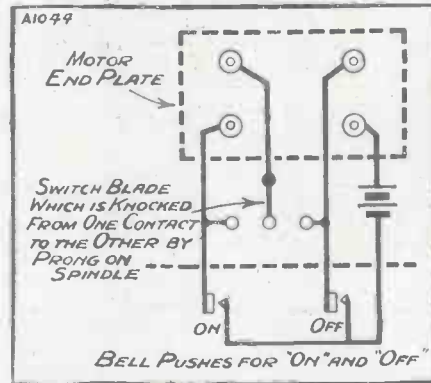
Well, I have spent months on these coils, and can quite understand not seeing the 5 X X in print much.

I find the best way to wind the coils for long waves is similar to the Unidyne H.F. choke in bunches.

The first coil, 3 in. diameter, wind 6½ bunches of 30 turns each with 20 D.C.C., and the second coil 8½ bunches of the same wire, and then the reaction winding ¼ in. higher up the coil, 100 to 150 turns 26 or 28 D.C.C. This can be wound in one bunch to keep length of coil down.

Now as to valves to use. I think you must admit there is not a valve to compare with the D.E.R. In the past three years I have tried about 40 types, including D.E.2, L.F., D.E.3, Dario super, and these do not give one-valve L.S. results. I have just bought another D.E.R. Marconi or Osram with this year's ebonite base by ordering same, and if anyone wishes to hear a Filadyne for volume, a D.E.R. must be used to appreciate what it can give out.

You will notice I have wound the coils with thick wire. This will still allow a 2-volt accumulator to be used, but should the valves vary a shade, as the four I have done, the large coil could be shunted with a .0002, and the other coil .0001 fixed. These can easily



be inserted in the coil, and then take off the necessary wire of each coil to reduce resistance for filament.

The original coils for the 250 to 500 wave-band have not been altered. With these you can afford to lose volume and then be equal to ordinary two-valve Det. and L.F., as a Filadyne using D.E.R. and one good L.F. transformer-coupled stage is an ideal set for reaching out, and for D.X. work a three-valve, Det. and 2 L.F., it is all one can wish for.

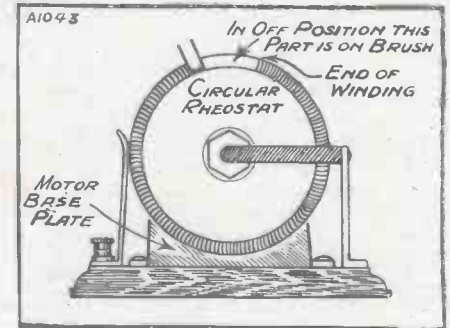
Thanking "P.W." for a real live set, and best wishes.

Yours faithfully,
F. CRAMPORN.
Coventry.

SHORT-WAVE INTERFERENCE.

The Editor, POPULAR WIRELESS.
Dear Sir,—The writer, who conducts quite a deal of work on short-wave lengths down to below 5 metres, is particularly interested in W.L.S.'s reference to a regular form of interference below 20 metres.

In this connection, I might offer the suggestion that it may be due to certain type of electric clock, which can cause identical symptoms to those described.



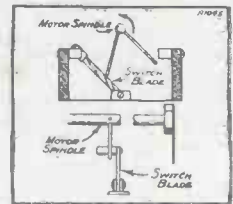
Whilst writing with regard to the subject of the interference met with on ultra-short-wave reception, I would mention that a peculiar form of this was brought to the writer's notice several weeks ago.

It was found that, at odd intervals a peculiar form of rending noise was heard, and it was ultimately found that this coincided with the passing of a train; it was in no wise connected with atmospherics, as is sometimes met with when steam from the funnel impinges on the aerial.

Investigations showed that at a distance of 300-ft. from the aerial, a small electrical contactor was affixed to the rail, which closed a circuit when the first wheel of the engine passed over the sectional rail, thus depressing it slightly. This operated the lock and block system, and released the signal controls in a previous section of the line.

The circuit was operated by lead and earth return, and was, as stated, found to be responsible for a peculiar form of interference, the like of which the writer has never, in his sixteen years of experience, met elsewhere.

Yours faithfully,
R. J. HALL (G 2 N U).
Ilford.



THE bulk of the correspondence this week apparently relates to Drummondville; some people report hearing him on 40 metres, some on 18 metres, others anywhere between 25 and 35 metres, so that I am beginning to suspect that Drummondville is either leading a double life or has several different stations!

One correspondent, however, appears to have got hold of some authoritative information on the subject, as follows: The station is operated by the Canadian Marconi Company, under the call-sign of C F, and has three wave-lengths—32 metres, 26.269 metres, and 16 metres. The power used is 25 kilowatts. This gentleman held the station for four hours during July, 1927, while a special programme was being broadcast to celebrate the Canadian Confederation of Jubilee. Many thanks, "A. E. D."

I think it is the 32-metre station that confines itself in a very business-like way to a routine test and never departs from

SHORT-WAVE NOTES.
By W. L. S.

his somewhat monotonous reading in the early mornings.

Threshold Howl Experiences.

Another very interesting and lengthy letter deals entirely with threshold howl! Like most others, this correspondent finds most definitely that a good transformer is a sure and certain producer of the noise, whereas a cheap and nasty variety will always assist in stopping it, if not effecting a complete cure. At all events, here we have a good test for the "goodness" of L.F. transformers!

Two correspondents also report that series-fed circuits are apparently more

prone to howl than parallel-fed circuits.

"T. F. L." endorses this, and says that he can produce the trouble artificially by wiring up the set with H.T. leads in close proximity to grid leads; this suggests that the howl may be due to a back-coupling effect between the last plate and the first or second grid or between the second plate and a preceding grid circuit.

He suggests that we are making things worse (as far as short waves are concerned) by our habit of using solid chunks of wire for wiring up, whereas No. 40 would be sufficiently heavy for most parts of the circuit provided that good joints were made.

I have never yet had threshold howl trouble in a set employing a screened-grid stage, although I am almost convinced that this can be nothing more than a coincidence.

At all events, reaction troubles in general are helped enormously by the introduction of a stage of S.G., which always appears to be worth while.



The "CROCODILE" CRYSTAL SET

between the two Regional stations which will then be working.

Now let us get down to brass tacks, and see how the little set is made. Looking down the list of components, you will see mentioned a piece of insulating tubing, and this is really the basis on which the whole set is assembled. Upon it there is wound first of all the tuning coil, in its upper edge are mounted four terminals, and also in the

EVERY kind of set seems to be growing more and more highly developed nowadays, and at the same time tends to become more and more complicated, although designers strive to keep up to modern standards without sacrificing simplicity more than they can help. That good old stand-by—the crystal set—is no exception to this rule, and one sees all sorts of highly developed designs giving selectivity which we should have thought impossible with a crystal set a few years ago, high sensitivity, and so on.

Just the Essentials.

Now, that is all very well, but we must not forget that there is a class of crystal user who is not in the least interested in getting high selectivity, but merely wants to hear just one station as loudly as possible; for example, a listener in one of the provincial broadcasting centres where there is only one transmission available with no alternative programme within reach of a crystal set. In such a position it is obviously a sheer waste of time and money to build anything very elaborate in the way of crystal sets, most of the modern refinements, particularly those designed to give selectivity, being quite superfluous.

Granted such conditions, it is interesting to see just how simply a crystal set can be made, and we spent an hour or so going into the question recently in the "P.W." Research Department. You see the result in the photograph reproduced in this article, and we think you will agree that if anyone desires to make it up for his own use, it will not take him very long. What we have tried to do is to work out just the bare essentials in the actual receiver, and as it happens, the resulting little design can also be strongly recommended to anyone who is looking out for a suitable "first set" to build.

What Will It Do?

It is really a surprisingly simple little affair to make, and although it does not look very impressive you will find that it does its job remarkably well. It is an ideal way of making a start in home construction, since, if you have a fairly respectable outside aerial, it will enable you to get good, clear programmes from your local station at the expenditure of only a few shillings and a little time. If you wish to make it more presentable, it is quite easy to make a neat polished wood case or cover to go right over the set, with three holes drilled in the back for the various leads for aerial and earth, and 'phones, to emerge.

An ideal crystal set for the beginner, easily made, costs only a few shillings, and gives loud, clear signals from the local station. Described by the "P.W." Research Dept.

Now to give you some idea as to what you may expect this apparently crude little receiver to do. Well, it is not intended for really difficult situations, such as those, perhaps, twenty miles out from a station, and where only a poor aerial can be used. In a situation such as that you will require one of the more advanced designs, but it will, on the other hand, give you excellent and clear reception anywhere in the really "local" area up to, say, fifteen miles from a station, provided that a fairly efficient aerial is in use, and under these conditions it will give you a good clear programme, quite as good, indeed, as anything you can obtain with the much more advanced types. Indeed, strange as it may seem, it may quite possibly give you louder signals than some of these specialised designs, where a certain amount of strength has to be sacrificed in order to obtain high selec-

upper end upon a little cross strut of wood is placed the crystal detector. The whole assembly is mounted upon a square piece of wooden board, and you can quite easily complete the whole job and get the set working in one evening.

The Assembly.

For a start, take your piece of tube and see about fitting in each end a small wooden cross-piece, which should be cut to such a length that it is just a nice tight fit inside the tube. Suitable dimensions are—length equal to inner diameter of tube, by 1 in. by 1/2 in., although almost any size round about these figures will serve except, of course, as regards length. One of these is to be fitted into each end of the tube, the lower one serving for attaching the tube to the baseboard. This is done by passing a couple of suitable size screws downwards through the strut into the baseboard. You will find this quite easy to do if you leave the fitting of the upper cross-piece until the tube has been secured to the board.

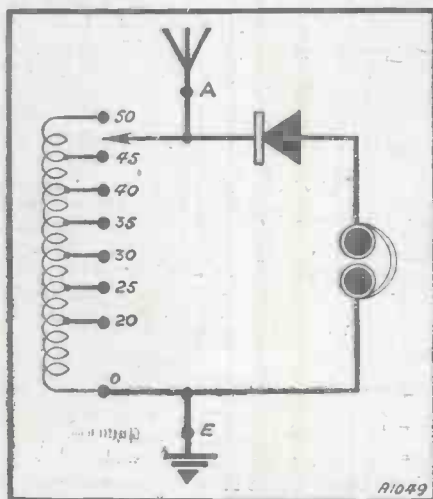
Before you attach the coil former to the base or mount the crystal detector, however, there is the job of winding, and this should be tackled as soon as you have fitted the tube with its cross-pieces of wood and before you finally screw them in place. (This is done, by the way, by means of small round-headed brass screws passing into them through the wall of the tube.) The winding consists of 50 turns of No. 24 D.C.C. or D.S.C. wire, and this has to be wound on in a plain single layer. Secure the end when you start by passing it through three little holes drilled close together in the tube, quite close to the lower end, and leaving about 1/4 in. of wire projecting inside the tube.

How to Make the Tappings.

Now proceed to wind on the wire, pushing it close up with the thumbnail as you go, so that the turns will lie closely side by side, and make tapping points as you proceed at certain fixed positions. These tapping points can simply be loops twisted up in the wire and subsequently scraped bare so that you can make connection upon them with a tapping clip. The positions of these tapping points will vary according to your distance from the local station, for if you are fairly close you do not need to make many tapping points, quite rough tuning being quite sufficient.

If you live up to, say, six miles from the local it will be sufficient to have the taps separated by five turns between each, the first one being placed at 20 turns from the

(Continued on next page.)



Note how the tapping clip varies the number of turns in use.

tivity. Just one word of warning: This set is not meant for use in the London area after the commencement of the Regional scheme, since it does not possess a sufficient degree of selectivity to enable you to tune

THE "CROCODILE" CRYSTAL SET.

(Continued from previous page.)

bottom of the coil. For a coil of this type, therefore, wind on first of all 20 turns with no tappings, then make a tapping, wind on another five turns, make another tapping, and so on until you have put on 50 in all. You will then have six tapping points, at turns Nos. 20, 25, 30, 35, 40, 45. On arriving at the fiftieth turn, secure the wire through two holes in the tube, and leave about half an inch projecting on the outside. This makes also a possible position for the tapping clip.

Fine Adjustments.

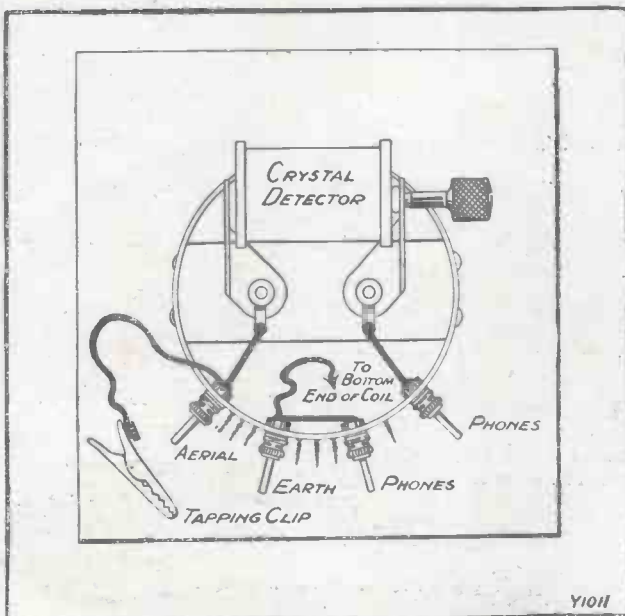
If you live a little further out, say between six and fifteen miles, somewhat closer adjustment is necessary to secure greater

COMPONENTS AND MATERIALS.

- 1 Piece of wood about 4 in. square by $\frac{3}{8}$ in. or $\frac{1}{2}$ in. thick.
- 1 Piece of insulating tube 3 or $3\frac{1}{2}$ in. long and 3 in. diameter (Pirtold, Paxolin, Radion, Becol, etc.).
- 1 Crystal detector.
- 4 Terminals.
- 1 Tapping clip.
- 2 oz. No. 24 D.S.C. wire, screws; flex, small pieces of wood, etc.

strength, and in this case we should make tappings at about every three turns, from the twentieth turn onwards. This will enable you to obtain somewhat closer tuning and to obtain good results even at these greater distances.

Now, having wound the coil, fix the wooden cross-piece in the lower end, and fasten the tube down to the baseboard. Next, insert the cross-piece in the upper end and mount the crystal detector. This



A bird's-eye view of the set, showing how it is fitted together.

latter operation will depend for its method upon the particular type of crystal detector you use, and this is very much a matter for your own choice. Any type you fancy will, of course, work quite well with this set, the original one being of the cat's-whisker and crystal cup variety with a screw motion for adjustment.

Wiring It Up.

Next, proceed to mount four small terminals round the upper edge of the tube, one of the photographs giving a good idea of suitable positions for these. Looking at this photograph, and reading from left to right, the terminals are—aerial and earth, and a pair for the 'phones. Now there are just a very few connections to make, and the set is finished. First of all, from the aerial terminal you require to take a short flex lead, 4 or 5 in. long, and mount upon the further end of this a tapping clip. Then, connect the free end from the lower end of the tuning coil to the earth terminal, and also join this terminal to the nearest telephone terminal. Connect the remaining telephone terminal to one side of the crystal detector. Join the other side of the crystal detector to aerial terminal, and the job is done.

The set being finished, we come to the interesting moment of the first test. Connect up aerial and earth and 'phones, and proceed to adjust the crystal detector until the cat's-whisker lightly touches the surface of the crystal. Next try the tapping clip on each of the tapping points in turn until you find that you are beginning to hear the local station. As soon as you do, leave the tapping clip on that particular point and turn to the crystal detector and adjust it until you find the setting which gives the loudest signals. In doing so, be careful to avoid scratching the surface of the crystal with the cat's-whisker, because in this way you are very apt to injure the surface.

Treat It Kindly.

Try and lift the cat's-whisker straight off the surface of the crystal, and drop it straight on again somewhere else, trying varying degrees of pressure. Immediately you have found a really good setting of the crystal, turn to the tapping clip and proceed to try it on various taps once more, until you find the loudest one, and as soon as that is located your preliminary adjustments are finished, and the set will go on working indefinitely, with just perhaps a slight occasional readjustment of the crystal detector.

Just one concluding point. Although only a single pair of terminals are included for 'phones, you will find this little set will work two or three pairs quite well, since the signals will be fairly strong, if you are not too far from the local station. These extra pairs can be connected in parallel with

the first pair, or in series, and which is the best arrangement must be found out by trial, since this depends upon the resistance of your 'phones and the type of crystal detector. To connect them in parallel, the method is quite obvious. Simply join all the tags from the telephones exactly as you would for a single pair—that is to say, one tag of each pair to each terminal. To connect, say, two pairs in series, proceed as follows: Place one tag of Pair A on the left-hand terminal, and one tag of pair B on to the right-hand terminal. Join the two remaining tags together with a little connector, such as one used by electricians for temporary wiring, etc., and the connections are complete.



Although the set is so simple it looks workmanlike, and a wooden cover to go over the whole assembly can be provided if desired.

RECEPTION WRINKLES.

The effective height of an aerial is not its height from the earth but its height from the nearest large earthed object, so trees, iron roofs, etc., underneath it reduce the effective height considerably.

Do not expect an L.F. transformer secondary to make a good L.F. choke for powerful output work, as it is fundamentally unsuited for such a purpose.

As the value of the detector's grid leak has an important effect upon the sensitivity of the set, it is a good plan to try all the grid leaks you have on hand, especially in a short-wave receiver.

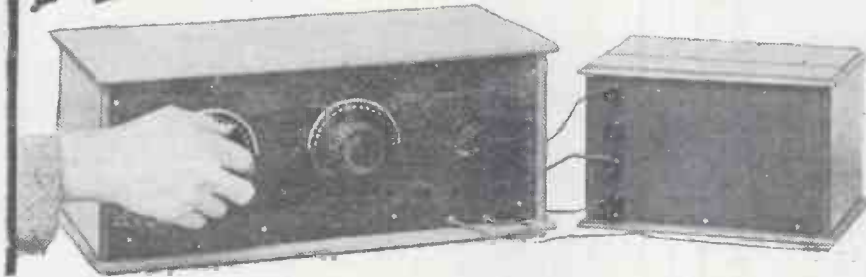
Do not forget that changing over either the primary or the secondary leads of an L.F. transformer will frequently eliminate hum.

If you have a .0005 mfd. or a .001 mfd. fixed condenser on hand, try connecting it across the telephones in your short-waver. It may assist smooth control.

One unexpected effect of the coming of the screened-grid valve has been to popularise frame aerial circuits which formerly were not satisfactory on account of troublesome H.F. amplification.

If a whistle is heard when the tuning condenser is moved to either side of the "silent point," too much reaction is being employed.

How to Use Mains Units



An Article for the Owner or the Prospective Purchaser of a Mains Unit dealing with Adjustment and Methods of Maintenance.
By F. FRIEND.

A MAINS UNIT is generally a trouble-free piece of apparatus, and is such a simple and satisfactory method of deriving power for the radio set that its purchaser thinks little or nothing about its upkeep. This condition of affairs is all very well, and it speaks volumes for the service which can be expected from such a unit; but, nevertheless, as with all other apparatus, there is a right and wrong way of using it.

Abolishing Humming.

Cases are often cropping up where a listener is quite content with a simple H.T. unit because it gives plenty of volume and no trouble, even although at the same time he gets a slight hum, audible in the pauses between programme items.

As this cannot be heard during reception, the owner does not bother about it; but



Two Ward & Goldstone H.T. Units, the smaller being the recently introduced Model C.P., which gives an output of 12 m/a with four H.T. + tappings (35, 80, 120, and 150 volts).

in the vast majority of cases some slight alteration would completely eliminate this trouble and so make a good unit into a perfect one. For this reason, the following article is penned, not because mains units want much looking after, but because, in cases where they fall a little short, they can so very easily be put right.

The Supply Company's Regulations.

In general, if you have a charger, an eliminator, or any other form of mains unit made by a reliable firm, you will find that carefully detailed and explicit instructions are issued with it. Read these directions carefully and preserve them for reference, for, although it only takes a few moments to install a unit, you will have to live with it a long time, so that a little care in putting it into service will be well repaid. If, when it is installed, you find that you do not get the perfect satisfaction from the instrument for which you hoped, it is better to investigate the trouble and, if possible, to correct it, than to put up with some small but irritating defect.

To begin at the beginning, it is a good plan, when installing any apparatus of this kind, to inspect both your electric meter itself and the meter card which usually accompanies it. Upon the latter will be found various regulations and a good deal of information, and these should all be studied. Even if hidden in a dusty cupboard, it really is worth while to investigate this, especially in view of the fact that in a great many districts changes will be made to the electric supply within the next year or so, and consequently compliance with the regulations may affect your dealings with the company if the question of replacing apparatus arises.

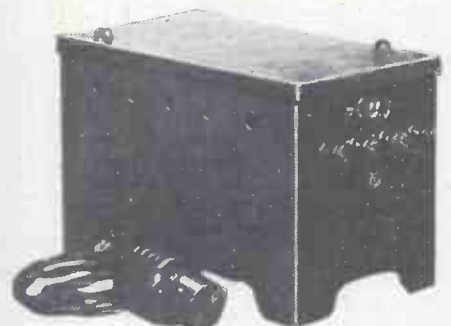
Is It the Unit?

Incidentally, it may be mentioned that in a great many districts the electric-light supply officials are very helpful in the matter of advice regarding extensions to the wiring, etc., co-operation between the consumer on the one hand and the supply company on the other being to the advantage of both.

If a unit of any kind has been installed and, after due precautions have been taken, it proves noisy or in any way unsatisfactory, do not blame the unit before you are sure that the fault lies with it. A case in point that I remember was that of a listener who complained bitterly that his new unit for H.T. supply from the mains was causing distortion on certain notes.

As the unit was a first-class one of a fairly expensive nature, the complaint was investigated very thoroughly. In the end it proved that the mains unit was not to blame in any way, although the trouble arose only when this was used. What had happened in this case was that previous to the installation of a mains H.T. unit the listener had always used an H.T. battery of 90 volts or less, and he had

been obtaining fairly good but not really powerful volume. When the mains unit was fitted it was provided with a tap for 150 volts (as well as variable voltages below this for detector and H.F. stages),



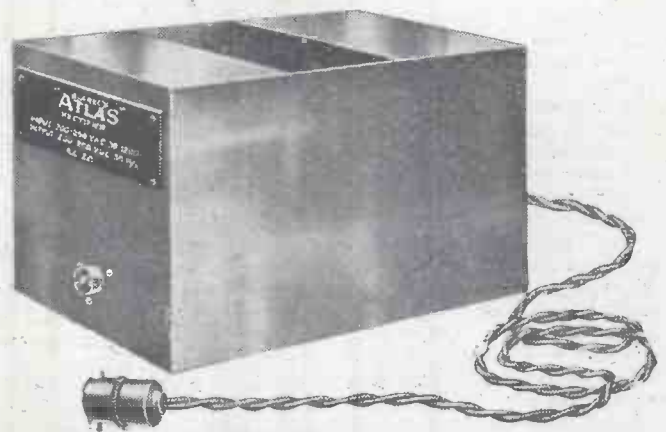
This Burndep L.T. Battery Charger uses a Westinghouse Metal Rectifier.

so that the set started to give enormously greater volume than it had ever done before.

Greater Output Obtained.

In these circumstances, he was able to overload the loud speaker, which, whilst capable of handling the smaller power he had obtained with batteries, was not able to handle the greater output obtained with the mains unit.

An improvement to the output end of the receiver soon proved that, without any alteration to the H.T. unit itself, it was capable of giving perfect results exactly as installed.



Known as the A.C.28 Model, this Atlas Rectifier employs full wave rectification (valve), and gives a D.C. output of 50 m/a at 200/250 volts.

BROOKMAN'S PARK.

The new 2 L O, the first of the Regionals, will soon be "on the air."

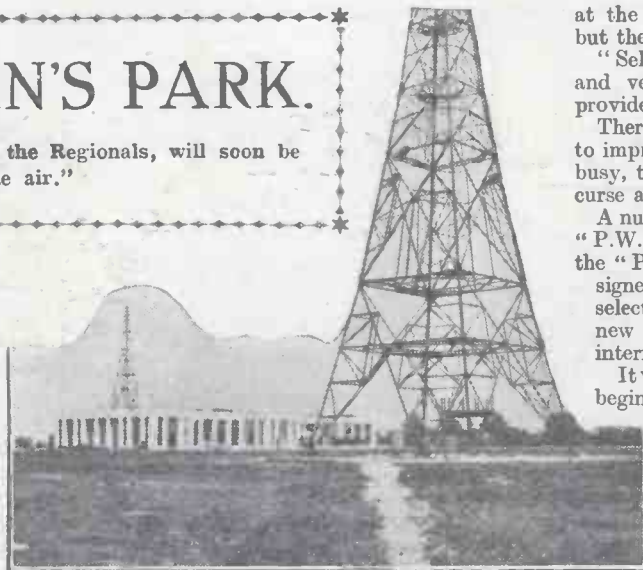
THE time is rapidly approaching when listeners can expect to hear the first signals from 2 L O's new transmitter at Brookman's Park. Preparations to test the station, first on a closed circuit and then on an open aerial, are well in hand, but, as usual, Savoy Hill is keeping the matter as much its own secret as it possibly can.

Everything, of course, depends on the early behaviour of the new apparatus, but if all goes well we can expect to get excited about the end of August. The silent tests will then have been going on for a month or more.

Gradual Change-Over.

The complete change over from the present London transmitter to the new Regional station will not take place for some time. No doubt considerable adjustments will be necessary after the first open aerial experiments are made. It is always like that with all new wireless equipment. The Oxford Street aerial did not completely supersede the first London transmitter at Marconi House for several months after the initial tests were carried out.

All the four masts which will be used at Brookman's Park are in position. One



Two of the four masts at the new London station.

aerial is complete and most of the heavy machinery is installed. The Diesel engines have been started up and battery charging is now going on.

Most listeners know that eventually there will be two transmitters at Brookman's Park, giving different programmes on separate wave-lengths, but at equal strength to get uniform radiation. Only one of these transmitters will be working for some long time. The Regional scheme started very slowly, and nobody is ever likely to hasten unduly its completion.

All sorts of complications are expected when Brookman's Park gets going. Some people whose sets pick up several stations

at the present time may find everything but the new 2 L O is completely lost.

"Selectivity" will again be a big word, and very many sets will be unable to provide it.

There will be new sets, and new gadgets to improve old sets. Manufacturers will be busy, trade will buck up, and listeners will curse and pay.

A number of listeners, notably followers of "P.W.," will not be affected, for recently the "Popular Wireless" sets have been designed with a view to providing sufficient selectivity to deal successfully with the new Regional stations, and to prevent interference.

It would be advisable, before the trouble begins, to overhaul your sets, and make sure that when Brookman's Park "starts up" you will not be "bitten." There is plenty of time to make such alterations as are necessary, and the "P.W." Queries Dept. will tell you what you will have to do in order to meet the new conditions satisfactorily.

Special Pamphlets.

The B.B.C. have foreseen all this and think that a new pamphlet is indicated. One has been prepared. The Selectivity Pamphlet it is called, and enough copies are to be printed for other Regional areas when their transmitters are put into service. Another pamphlet will also be issued for listeners whose signals from the new transmitter will be weaker than those now received from 2 L O. Not so many copies of this pamphlet will be wanted.

So what with one thing and another the engineers and other people in the technical sections at Savoy Hill are in for a lively time, and all because true progress, like true love, never did run smoothly.

MORE ABOUT THE "KUTTEMOUT" TWO.

Further details of the selective set described last week.

By THE "P.W." RESEARCH DEPARTMENT.

THE construction of the "Kuttemout" Two you will find is a very simple job indeed, but we should warn you that it is necessary to follow the layout rather carefully, since stray coupling effects between the two coils may upset the behaviour of the circuit very considerably.

The necessary operating and adjusting details of this circuit are of considerable importance, and we will now go on to them without wasting further time on obvious points such as panel drilling, wiring up, etc. First of all, you want a valve of the high-frequency or resistance-coupling type for the detector, the latter giving somewhat smoother reaction and generally slightly better strength on weak distant stations. The H.F. type, however, is to be recommended for all general all-round use, since it gives slightly better quality on strong signals such as those of the local station.

Valves and Voltages.

In the second stage you want either a low-frequency valve or a small power valve, the latter for preference from the point of view of quality. Separate H.T. positive

terminals are provided for the two valves, and on the one feeding the detector valve (H.T. 1) voltages from 30 to 60 should be tried, noting which gives the smoothest control of reaction after the necessary preliminary adjustments have been made on the reaction and tuning circuits in the manner described later.

On the other positive terminal you should use from 100 to 120 volts, according to the amount of H.T. available. Naturally the more you use the better will be the results provided that you use grid bias to suit, but 100 volts will give you quite good results at a pinch.

Coils to Use.

Coil sizes should be these. You should use the same size in both the tuned circuits, and you will then find that the tuning settings on the dials for a given station are very much the same, provided that the two coils are of the same make, and this simplifies searching somewhat. For the ordinary lower broadcast band the two coils should be No. 60's, while for the long waves they should both be No. 250's. The

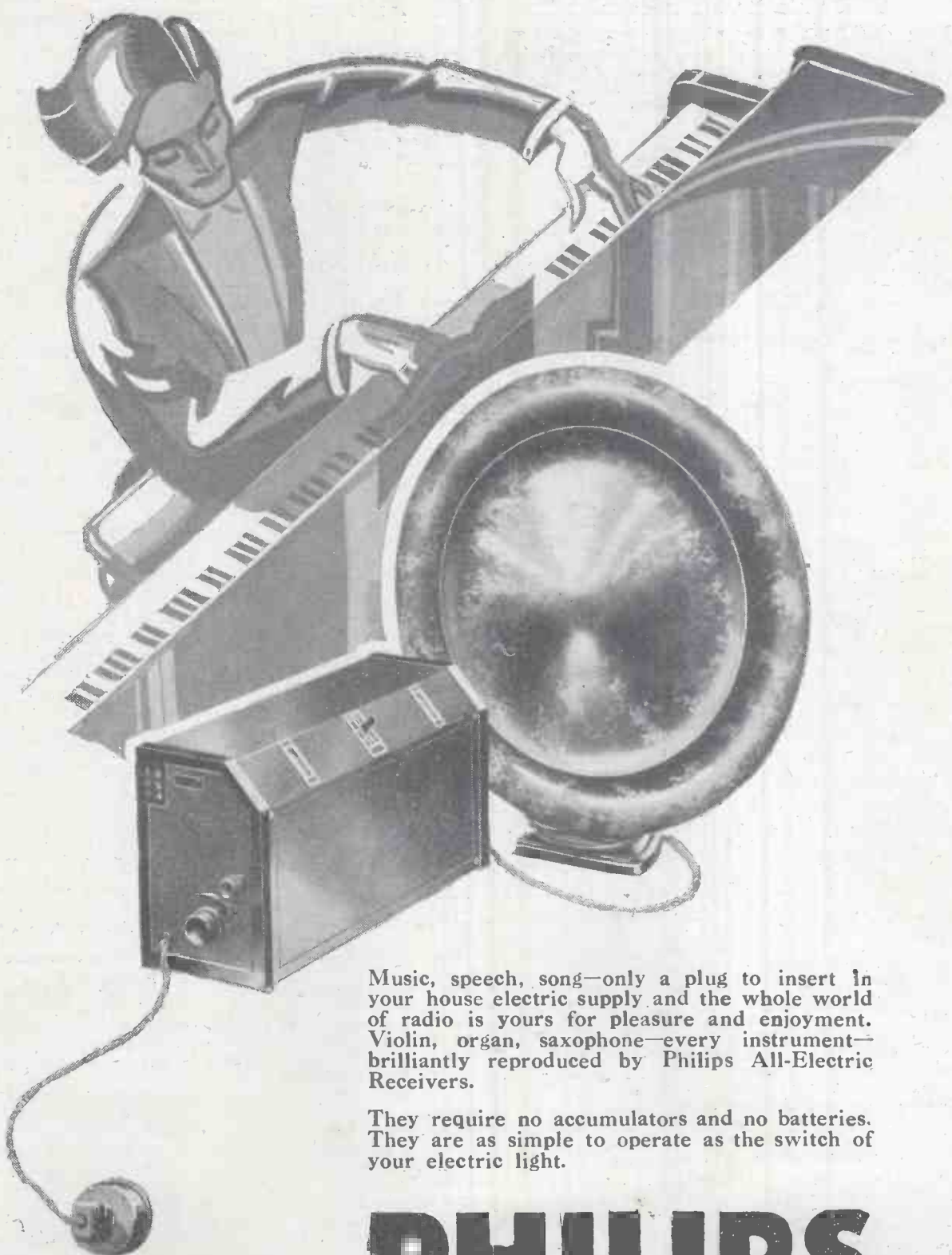
reaction coil for the low waves should be a No. 50, and for the long waves a No. 100 or 150, according to the kind of detector valve you are using, that is to say, whether it oscillates easily or not.

Now about the preliminary reaction adjustment. First of all, set both tuning dials to a point near the middle of their scales. Then, set the Formodensor to its minimum position, that is to say, with the knob fully unscrewed, and note whether the set can be made to oscillate by increasing the setting of the reaction condenser on the panel. If it will not oscillate, place the flex lead on the other tapping point, terminal or socket of the second X coil (L_2).

Reaction Settings.

Having found the connection which enables you to get reaction most easily, set the reaction condenser to minimum and turn the tuning dials round to minimum also. Now gradually screw down the Formodensor until the set just goes into oscillation. Unscrew it slightly until it just ceases, and the preliminary adjustment is finished. You can now leave the Formodensor alone and proceed to tune on the two dials, and control reaction on the small reaction condenser on the panel.

We venture to predict that you will be somewhat surprised at the ease with which you can tune out the local station, and also at the strength with which distant stations come in, remembering the very high selectivity which you will find you are getting.



Music, speech, song—only a plug to insert in your house electric supply and the whole world of radio is yours for pleasure and enjoyment. Violin, organ, saxophone—every instrument—brilliantly reproduced by Philips All-Electric Receivers.

They require no accumulators and no batteries. They are as simple to operate as the switch of your electric light.

Philips All-Electric Receiver, Type 2514	£23
Type 2515	£12 - 10 - 0
Philips Loud Speaker, Type 2007	£5 - 5 - 0
Type 2016	£2 - 10 - 0

PHILIPS *for Radio*

FROM THE TECHNICAL EDITOR'S NOTE BOOK

Tested and Found-?



NEW OSRAM VALVE.

A FURTHER addition has been made to the Osram range of .8 valves, and this, the fifth of the series, is the .8 detector. In the words of the Osram people, the need for a special .8 detector valve arises from the fact that a set which is hum-free in either the high or low frequency amplifying stages, is not necessarily hum-free in the detector stage.



The D .8 Detector.

The detector is, in fact, far more susceptible to hum than any other valve in the receiver. The .8 valve has a thick, short filament, the object being to keep the potential difference between the two ends down so that raw A.C. current can be used. The Osram H.L. .8 valve, until now, has been recommended for the detector stage where it can quite successfully be employed on the anode bend system of rectification.

The increased thickness of the D .8 filament makes leaky grid condenser rectification possible by this system without the slightest hum.

The characteristics of the D .8 are filament volts .8, filament current 1.6 amps., anode volts 150 max.; amplification factor 14, impedance 21,000 ohms. The D .8 can be used for anode bend rectification as well as for leaky grid rectification, and we agree with the G.E.C. people when they say that worked under the recommended conditions, the D .8 now furnishes set designers with a practically fool-proof detector, which, in conjunction with the other .8 valves, can be used in any circuit where a normal moderate impedance valve is now specified.

Great simplification in the design of A.C. sets can be achieved now that the .8 series of valves have been greatly enhanced by the

addition of the D .8. The Osram D .8 valve in common with the whole .8 series has an advantage over the indirectly heated A.C. valves in that the dimensions of the bulb are very much smaller, being not greater than the standard H.L. 210 type.

Set designers can, therefore, produce A.C. sets with a compactness hitherto unobtainable. The D .8 has a special significance for set designers in supplying them with the last link in the .8 chain, since uniformity can now be achieved throughout A.C. circuits.

THE "WYNOT" WAVE-TRAP.

E. Mason, 44a, East Road, City Road, N.1, recently sent us a "Wynot" wave-trap. The price of the device is 6s. 6d. Its construction is simple and straightforward. There is a neat wooden case and an insulating panel on which are mounted two terminals and a Formo-densor. Inside is a small solenoid coil.

The Formo-densor is in parallel with the coil, both being connected across the two terminals. The wave-trap is brought into operation by connecting the aerial to one terminal, and taking a short lead from the other terminal to the aerial terminal of the set. Thus, the "Wynot" comprises an ordinary series form of wave-trap.

This is a successful and certainly one of the simplest kinds, and the "Wynot" does its work as would be expected. I do not quite agree with the statement, "The 'Wynot' Wave-trap is the only possible accessory to cut out your local station and Morse with absolute satisfaction." A degree of optimism is, I suppose, permissible, but neither the "Wynot" nor anything else will cut out the Morse which infests some sections of our tuning dials. And the "Wynot" is perfectly impotent when spark crashes in on Vienna and other stations in that area. However, I find it does its job well in regard to the fining down of a powerful local and it is for this object that most people want wave-traps.

FERRANTI H.T. UNITS.

Ferranti Constructional Charts Nos. 1 and 2 are now ready for those who are interested. These give full details of high-grade H.T. Units using respectively a full-wave metal rectifier and a full-wave valve rectifier.

"GECOPHONE" NEWS.

Important improvements have been made in the "Gecophone" Portable Screen-Grid

Four Receiver. These improvements are not concerned with the excellent circuit and components used, but with the case and its locks and fasteners. Also, a turntable is now fitted. Despite all these improvements this fine set can now be bought for 23 guineas.

DR. NESPER'S H.T. BATTERIES.

Dr. Nesper, Ltd., of Hendon, London, N.W.9, recently sent us one of their triple-capacity H.T. batteries. Of these there are two types available, the 60-volter at 15s. 6d. and the 100-volter at 24s. 6d. They are massive batteries of clean and solid construction.

The question is frequently asked as to whether it is worth while buying these

Traders and manufacturers are invited to submit radio sets, components, and accessories to the "P.W." Technical Department for test. All tests are carried out with strict impartiality under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.

triple-capacity batteries instead of the smaller kind. The answer is, of course, simple. Small capacity cells will not stand up to discharges of the variety encountered if power, let alone super-power valves are employed, and in these circumstances the small capacity batteries are bad investments.

The double- and triple-capacity kinds are bulky and they are moderately expensive, but they are far cheaper in the long run. 24s. 6d. for a 100-volt triple capacity battery is a most reasonable figure, and on test we found the Dr. Nesper indubitably up to standard.

We found the internal resistance of the battery to be low, while it has been standing up to a long discharge test without signs of



The actual Dr. Nesper H.T. Battery tested.

faltering. A constant voltage drop throughout each section of the battery was noticed and this uniformity, while not unique, is distinctly commendable. We can certainly recommend Dr. Nesper H.T. batteries to the attention of "P.W." readers,

Absolutely Amazing!



THE FIRST ALL-ELECTRIC SCREENED GRID TRANSPORTABLE "3"



TO BE RELEASED IN AUGUST

HERE is the supreme achievement of British radio research and R.I. experience, conceived, perfected and produced in the R.I. Laboratories and factories.

Purity of tone and tremendous volume, once a theoretical ideal, is now materialised into reception which is more than mere reproduction of human voice, music and sound—it is the transposition of atmosphere and living personality unsullied by background noises or mains hum.

A feature of the set is the wonderful new "Hypermu" Transformer which alone provides the L.F. coupling for the indirectly heated valves employed in the A.C. Model and for the final pentode stage used in the D.C. Model.

The receiver can be used in any room equipped with electric light and no aerial is generally required. You just plug in and switch on—that's all.

A child can tune it—the single, easy vision synchronised control effects the main tuning and small additional controls give perfect adjustment for long distance stations on adjacent wave-lengths and will be invaluable when the new Regional broadcasting scheme operates.

Running costs are negligible and the receiver is guaranteed shock proof and built in conformity with the latest recommendations issued by the Institute of Electrical Engineers.

RADIO INSTRUMENTS LTD. *Sole Address—Showrooms, Offices, Factories : 12, Hyde St., New Oxford St., London, W.C.1.*

Triumphant Success in Recent Tests made throughout England and Scotland

A series of tests made in England and Scotland with both A.C. and D.C. types of this new R.I. Receiver gave astounding results. No aerial was necessary in most places for either local or Continental reception, whilst with a small aerial in use a wide choice of loud speaker programmes of amazing strength and fidelity were reproduced.

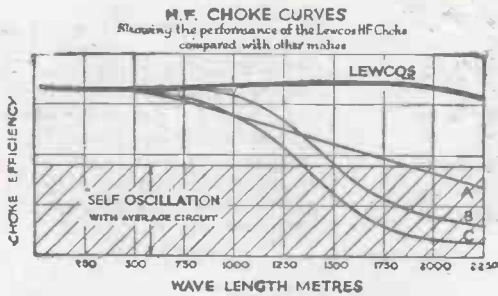
SEASON 1929 - 30
Full particulars and prices will be available shortly.



SPECIALISTS IN SOUND REPRODUCTION

The Secret of successful reception

FROM 20-2,250 METRES



This diagram shows the percentage Choking effect of the LEWCOS H.F. Choke on all wave-lengths from 20 to 2,250 metres, as compared with three other popular makes.

The terminals are arranged one at the top and the other at the base of the coil to eliminate the risk of additional self-capacity in the wiring of the receiver. Equip your set with a LEWCOS H.F. Choke and get maximum efficiency on all wavebands from 20 to 2,250 metres.

LEWCOS RADIO PRODUCTS
 are available at 7, Playhouse Yard,
 Golden Lane, London, E.C.1.

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Player's please

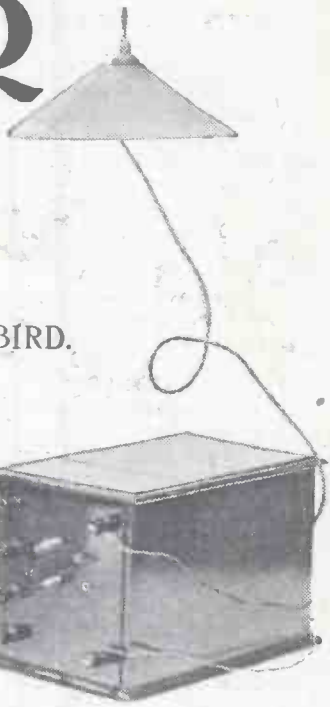


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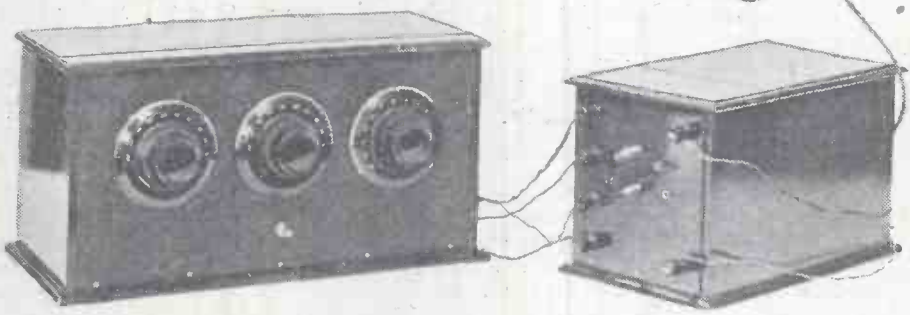
N.O.C 207

RADIO POWER FROM THE MAINS

By P. R. BIRD.



This article briefly outlines the various ways in which the house electricity supply can be used for wireless. It shows that if you have the mains laid on you can run a complete battery-less receiver, or use mains units to obtain either High-Tension, Low-Tension (or both), or charge your own batteries at home.



SOONER or later, and willy-nilly, every owner of a radio valve set comes up against the problem of radio power. Perhaps it is the low tension battery which cannot be delivered from the charging station, or maybe the H.T.B. will start delivering high jinks instead of high tension. Even a little grid bias battery has been known to act more like a snake in the grass than a provider of reliable radio reproduction. And if the listener has electric light or power mains in his house, he will doubtless have asked himself, "Why cannot I abolish these batteries altogether and get my "juice" direct from the mains?"

Rock-Bottom Reliability.

It often happens, however, that when inquiries are made a bewildering array of possibilities is opened up. The purpose of this article is briefly to outline for the non-technical listener the various alternatives which are open to him, and to give practical hints upon the choice of apparatus.

The advantages of deriving your radio power from the mains are many. If, for instance, you are a quality enthusiast (and I hope you are!) you will have been advised by the B.B.C. to use plenty of high tension. When the mains are utilised you can have very high voltages (unlimited in the case of A.C. mains), with absolutely no tendency to that disappointing deterioration which so often occurs with other forms of H.T. supply.

For rock bottom reliability also the mains are hard to beat. Every power station has its emergency gear, and a supply company being under contract with the public is compelled by law to cater for emergencies. This being so, breakdown at the source is practically negligible, and as there is very little in mains apparatus itself to go wrong, the listener with a mains unit can "switch on and forget it."



A well-known D.C. H.T. Unit. On the flex lead a plug is provided which fits a lamp socket. H.T. connections are made from the terminals, and plugs provide the various voltages.

Cheapness of upkeep is another great asset when deriving radio power from the mains, and in the great majority of cases the initial outlay seems to be the only expense, for the running costs are so small as compared with lighting and heating or other domestic appliances, that the actual upkeep cost of radio mains apparatus is literally inconsiderable.

Simplicity the Keynote.

Amongst the other advantages there is a definite constancy of supply, and also the fact that when once it is installed, mains apparatus will serve you at the touch of a switch. In fact, the keynote of radio power from the mains is simplicity, and when once the plug is in, or the switch is on, the apparatus is absolutely trouble-free.

Before we can consider the various

practical applications to which the mains may be put, it will be necessary to say just one or two words about the mains themselves. There are two kinds of mains in use in this country, D.C. and A.C., the former denoting direct current and the latter alternating current. Your meter or contract will tell you which type is installed in your own house.

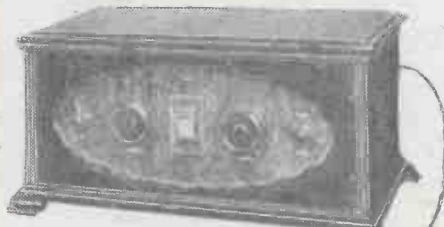
Direct current, you will remember, is the kind that always flows in one direction; so if you have D.C. mains in the house, one of these is always negative and the other is always positive. (Either the negative or positive may be earthed by the supply company, but as this does not affect the consumer in any way except for radio, there will, in general, be no indication on the meter or meter-card as to whether the negative or positive main is earthed.)

D.C. and A.C. Mains.

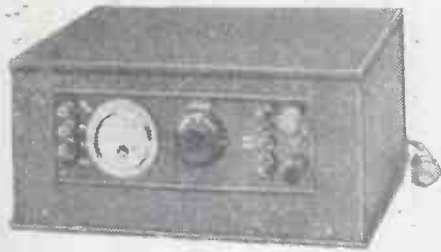
With alternating current-mains there is no positive or negative main, for this class of current is continually changing its direction, flowing first one way and then the other, but giving light and heating effects just as effectively as the direct current.

Not only are there two kinds of mains—D.C. and A.C.—but there are several ways in which these can be used. If you are prepared to pay the price (and several firms will arrange "deferred payments"), you

(Continued on next page.)



The G.E.C. "All-Electric" Three needs no batteries at all, and covers both medium and high wavelengths at the touch of a switch.



This "All-power" EKO Unit for A.C. mains provides three tappings for H.T., up to 5 amp. for L.T., and five tappings for grid bias.

HOW TO GET YOUR RADIO

can obtain a complete receiver which plugs in just like a lamp and afterwards requires no attention whatever. Among the firms supplying this class of set are E. K. Cole, Ltd., Marconiphone, "Gecophone," Burne Jones, Wholesale Wireless, Philips, Pye Radio, Metro-Vick (Cosmos), R.I., Igranice, and Gambrell, Ltd., whilst I understand Ferranti's have an all-electric set on their programme. (The set shown on "P.W.'s" cover this week is an Igranice product.)

Alternating and Direct Currents.

Undoubtedly this all-from-the-mains type is the set of the future. Capable of being switched on or off at a moment's notice, of high quality performance and able to deliver ample power, these sets represent the ideals at which radio design is aiming—simplicity and reliability. Such sets can be designed to work either from D.C. or from A.C. mains, and can generally be adapted easily to gramophone reproduction.

Direct current (D.C.) is what we really require in wireless, the low tension requiring a fairly large current at six volts or less, and the high tension requiring a comparatively small current at 100 volts or more. It might be thought that D.C. mains are, therefore, more handy than A.C. mains, but this is not altogether true.

The trouble with D.C. mains is that the voltage is fixed at a certain figure, and if your mains are of say, 230 volts, all the current that is supplied to the house will be supplied at that voltage. So if you want six-volt current from such mains, they are about forty times too strong, and resistances have to be employed.

Easy and Efficient.

On the other hand D.C. mains are particularly useful for deriving H.T. supply, for here it is high pressure direct current that is required, and consequently the supply needs only slight modification before it can be used on the receiver. This modification takes the form of lowering the

voltage for those valves that need less than the maximum voltage obtainable from the mains, and "smoothing."

Smoothing is necessary because good quality radio reproduction is far more exacting than the other ordinary domestic demands upon the mains. Compared to an electric lamp or to a vacuum cleaner, the radio set is remarkably sensitive and "finicky," and though electricity of about the right voltage is perfectly satisfactory for the former, it has to be *exactly* right for the latter. We cannot expect the supply company to smooth out all the little inequalities just for the sake of people using radio sets, so in mains sets and units it is usual to employ a smoothing circuit between the mains and the set itself. (This simply consists of one or more L.F. chokes and condensers.)



This unit provides L.T. from the A.C. mains for 2-, 4-, or 6-volt valves. No alteration need be made to the set used, and a current of up to 1 amp. can be delivered (E. K. Cole, Ltd.).

It will thus be seen that direct current mains afford us a very easy and efficient means of supplying high tension to a receiver, all that is necessary in such cases being a smoothing circuit, and some form of voltage variation. (This also is easily arranged for.) Direct current mains can be used also for supplying low tension, for grid bias purposes, or for charging H.T. and L.T. batteries.

As we have seen above, D.C. mains have certain advantages—particularly for high tension—and certain disadvantages. How does this compare with the man who is provided with A.C. mains (Alternating current)?

The main general advantage of A.C. mains is that by means of step-up or step-down transformers any desired voltage can be obtained. The only snag is that ultimately it is really direct current that we need for radio work, so that if alternating current is supplied this must eventually be "rectified" and so turned into the one-way direct current we require.

A.C. Requires Rectifier.

There are several ways of rectifying A.C., but the point to remember is that A.C. mains can be made to deliver their current at any required voltage, and this can be rectified and smoothed quite easily and is equally suitable for high and low-tension purposes.

From a radio point of view the difference between D.C. and A.C. mains just boils down to this. It is really D.C. that we need for our wireless set, but the D.C. mains only supply this at high voltage, whereas we require a low voltage as well for our filament supply. A.C. mains, on the other hand,

will give either high-tension, low-tension, or both voltages with equal facility, though this type of mains (A.C.) must always be used in conjunction with a rectifier in order to provide us with the direct current we require.

Now let us suppose that the listener has mains in the house and does not use them at present. How can he decide whether it will be of benefit to change over to a mains unit, or charger? Efficiency from the mains is certain, so the question to be decided is that of comparative cost.

H.T. from D.C.

Radio power requirements take the form of high-tension, low-tension, and grid bias, but we can safely ignore this latter (for it is so small) and for simplicity's sake consider only the low tension current to the filament of the valves and the high-tension supply to the plates. As everyone knows, where no mains are used the use of a valve set means constant recharging of the low-tension battery. And also constant renewals of the high-tension battery after several months.

How much these recharges and renewals cost the listener at present, depends, of course, upon the size of set and the amount of use he gives it. But if his mains are of the D.C. type it can be said right away that he will generally be well advised to finish with high-tension batteries.

Even purity enthusiasts, who use H.T. accumulators on principle, would do well to consider the possibility of charging these accumulators direct from D.C. mains, particularly as such accumulators invariably require careful charging which cannot always be ensured away from home. Alternatively there is the method now used by the G.E.C., by means of which the D.C. mains are utilised to work a combined H.T. accumulator and charger, thus ensuring a constant and easily handled H.T. supply.

The Initial Cost.

In practically all cases, however, it is not a question of charging high-tension accumulators, but of getting either a new series of H.T. batteries, one after the other, or taking the bull by the horns and buying an H.T. unit. The only real drawback to the latter is that the initial expense is often high when compared with batteries. But when



The Gecophone H.T. Power Unit is made in A.C. and D.C. Types, and provision is made for fixed and variable voltages.



The frame aerial and moving-coil loud speaker are embodied in this Radio and Gramophone reproducer (Burne Jones & Co., Ltd.).

POWER FROM THE MAINS (Continued from previous page.)

the unbelievable efficiency and simplicity of the arrangement is realised, and when it is considered that the cost of upkeep is so little as often to be negligible, it will be seen that the listener with D.C. mains should certainly not fail to ask the price and running cost of an H.T. mains unit.

Many kinds are supplied, suitable for all conditions, and full details can be obtained from the makers: Marconiphone, Philips, Ekco, Gecophone, H. Clarke & Co. ("Atlas"), Metro-Vick, Regent Radio, Falk Stadelmann, Ward & Goldstone, Climax Electric Radio, Ltd., etc.

The prices vary considerably, according to the quality and performance demanded, but the listener will easily be able to ascertain or work out examples of cost and upkeep for his own set.

Unit to Match Your Set.

Incidentally it may be mentioned that the firms named in this article can be relied upon to help "P.W." readers in making a choice of apparatus, and very often—owing to their great experience—they know more about your own supply mains than you do!

Experience, too, has taught the better-known manufacturers what particular unit of theirs is best suited to any particular set—say a "Titan Three" or a "Music Magnet." They know that if it is attempted to run a large set with powerful L.F. amplification from a comparatively small H.T. unit, motor-boating is pretty sure to arise, and hum will become troublesome, although neither of these would give the



This 4-valve A.N.F. receiver is a Metro-Vick production, using their all-electric valves.

slightest cause for anxiety on a properly designed unit. (It is, perhaps, well to mention that mains units need never be associated with a hum or ripple audible in the loud speaker, for there is absolutely no need for this when suitable instruments and sets are used.)

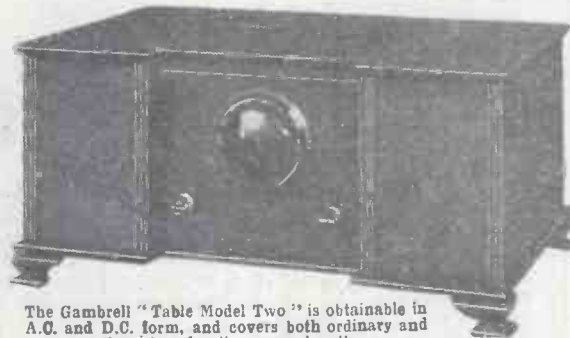
"All from D.C."

Not only does a good D.C. H.T. unit ensure ample voltage and plenty of current for the valves, but by means of variable resistances or tapings, critical intermediate values of voltage are obtainable such as are necessary when working with screened grid valves or with detectors in short-wave receivers. Under such conditions it is often necessary to vary the voltage applied to the valve very accurately, for best results, and one of the great advantages of a good mains unit is that this can be done with a swiftness and sureness that will be a revelation to the listener not familiar with the use of this type of instrument.

Still regarding the possibilities of D.C.

mains, we must admit that as regards the sets low-tension supply the field is much more limited. There is an economic reason for this, but nevertheless several makers provide apparatus for obtaining L.T. and H.T. from D.C. mains, especially suitable for fairly small sets, or where the D.C. supply is at power rates. Examples of "All from D.C." are the Marconiphone range and the Ekco All-Power Unit for 200/250-volt D.C. mains

For L.T. charging from D.C. we must use some form of resistance to cut down the voltage to the degree required for charging. One method is lamp resistances in series with the mains, and obviously the most economical way of doing this is to utilise the house lamps which will simultaneously be employed for lighting. In this way the



The Gambrell "Table Model Two" is obtainable in A.C. and D.C. form, and covers both ordinary and long broadcasting wave-lengths.

charging can be done cost free (if sufficient current to charge the L.T. battery is required for ordinary lighting) but a job of this kind is really a matter for the local electrician, because it involves an alteration to the house wiring, and pre-supposes that an experienced electrician will install the gear, and an experienced person will arrange for the charging.

Now as regards the man with A.C. mains (alternating current). Suitable apparatus will enable him to do almost anything from a radio point of view. He can have an All-from-the-mains set, or a combined unit giving H.T. and L.T. (and grid bias), or separate units giving either, or a charger for attending to his own batteries.

Examples of power units which eliminate both L.T. and H.T. batteries altogether are those marketed by E. K. Cole & Co., R.I., and the Marconiphone Co. Whilst the makers of H.T. units for A.C. mains are legion—including such well-known names as Ferranti*, Philips, Metro-Vick*, Regent Radio, Igranic, Gecophone*, Burndept. "Ekco," Ediswan, "Efesca," Clarke's "Atlas," Ward & Goldstone*, Wholesale Wireless,* "Climax," and Marconiphone.

Building Your Own Unit.

Several of the foregoing—all those marked with a * for instance—supply kits of parts for building your own H.T. units at home. These are supplied with self-explanatory charts and full directions, so that those who enjoy the "made-it-myself" feeling can have the pleasure of building a unit and saving money at the same time.

It will be remembered that alternating current has to be rectified before it can be used for charging, or for low-tension or

high-tension supply. There are several forms of rectifier available for this purpose, the commonest being the valve rectifier, (ordinary receiving valves can be used with some instruments, and others employ special gas-filled valves) and the recently introduced dry rectifiers.

Methods of Rectifying.

Practically all the modern power devices for A.C. mains use either valve- or dry-rectifiers, the latter having supplanted the old-fashioned electrolytic rectifier. For charging accumulators from A.C. mains, at one time it was customary to use a vibratory rectifier, and although these instruments are still obtainable and are capable of giving good service under the correct conditions, they in turn have, to a great extent, been superseded by the trickle charger.

When using a trickle charger the low-tension battery need never run down, for when it is not in use on the set a small current from the A.C. mains is continually keeping it "up to scratch"; the whole arrangement being singularly trouble-free and efficient.

As already indicated there is a wide variety of chargers available, covering both L.T. and H.T. accumulators. Many of them incorporate the new dry rectifiers, introduced into this country by the Westinghouse Brake & Saxby Signal Co., from whom interesting details of the type can be obtained.

Charging from A.C.

Among the firms now specialising in chargers are Ferranti, Burndept, Marconiphone, Falk Stadelmann, Philips, R.I., Igranic, Regent Radio, Heayberd, Ward & Goldstone, and Ediswan. (The last-named firm also markets a combined H.T. battery eliminator and L.T. charger.)

(Continued on next page.)



A Trickle Charger can be used where A.C. mains are installed, to keep the accumulator "always up to scratch." The one shown here is a Dr. Nesper product.

RADIO POWER FROM THE MAINS.

(Continued from previous page.)

Not only can the alternating current mains be used to supply low-tension, high-tension, and grid bias to a radio set, but recent radio valve technique has provided yet another triumph—the mains operated valve. This type of valve (generally employed with A.C.) has a filament or an indirectly-heated electrode specially designed for use with electric mains. Extremely good characteristics are obtainable, and in many quarters it is thought that this type of valve will eventually oust the battery-run valve from public favour. Details were given in the recent special Valve Number of "P.W."

Components for Mains Use.

Another instance of radio power from the mains is the "pot-winding" current for a moving coil loud speaker. It is generally conceded that results with a main's-driven instrument are superior to those from a battery drive, whilst convenience and low cost are other factors in its favour.

Another comparatively recent advance in technique is the electrolytic condenser—a device based upon chemical action, giving enormous capacity in comparatively small space. By taking advantage of this method, low-tension supplies—which have to be very effectively smoothed—can be drawn from the mains very easily.

In conjunction with the new metal dry rectifiers the method is extremely simple, and has been popularised by Mr. P. W. Harris in "The Wireless Constructor," in the articles dealing with the "Stedipower" L.T. Units.

A point worth noting is that though mains sets and units are singularly trouble-

free in operation, they require particularly robust and suitable components, and consequently parts which are O.K. in "battery sets" may not be satisfactory for mains work. Realising this, several firms have specialised on mains components—chokes, condensers, transformers, etc.—and have become specially well-known for their efforts in this direction. The R. I. heavy-duty chokes are an example, and other firms which have become well-known for such service are Ferranti, T.C.C., Marconiphone, Gecophone, Ward & Goldstone Heyberd, Wholesale Wireless Philips, Igranic, Met-Vick, and Climax.

Using Units.

The question is often asked as to whether mains apparatus is dangerous. The reply is that there need be, and should be, no more danger in using the electric power for a wireless set than for lighting or any other domestic purposes. But, to make assurance doubly sure, especially if there are children in the house, it is a good plan to rely not merely upon the switches, but actually to disconnect the apparatus when it is not in use. Usually this merely means pulling out a plug and placing it in a safe position, and if the habit is formed from the first any potential dangers due to mishandling are obviated right at the source.

An Important Point.

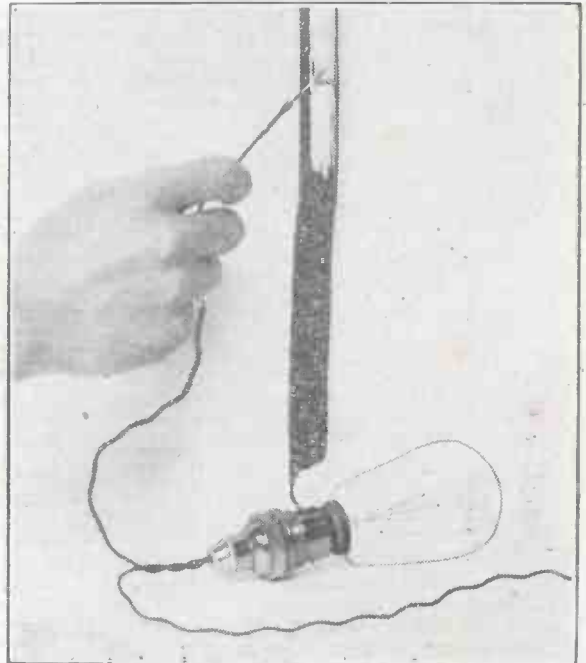
Regarding the use of switches, the question is often asked whether it is best to switch L.T. or H.T. first. No general rule can be laid down with absolute confidence, because installations and apparatus vary, so that any hints by the makers or designers of the units in question should be followed carefully. It will be found that in most cases the L.T. should be on first and off last, the idea being that when the L.T. is on there is a conductive path across the inside of the valve which protects the condensers, and other associated apparatus, against voltages from the mains which otherwise would expose them to a risk of strain.

In view of the fact that supply voltages are generally fairly high, with consequent risk of shock, etc., it need hardly be said that alterations to the house wiring should not be carried out by inexperienced persons, but should be put into the hands of an electrician. Usually, any wiring in connection with radio power is very easily carried out, so that little, if any, would be

saved by the householder doing it for himself—a policy which might prove penny wise and pound foolish.

An important point to remember when power is being supplied from the mains, is that under no circumstances should alterations be carried out to the wiring of a set, nor any leads changed before switching off at the mains. Another point to bear in mind is that where H.T. is derived from an A.C. eliminator or mains unit a trans-

WHICH MAIN IS EARTHED?



To find which D.C. main is earthed a lamp is connected to the main, and the other side of the lamp joined to a flex lead, which is touched on a water-pipe or other earth. The lamp will not light if the main is earthed.

former is usually interposed between the mains supply and the receiver; but if D.C. mains are adapted the full voltage of the mains may be applied between certain parts or terminals of the set and anything which is earthed. Consequently the listener standing upon a carpet or bearded floor and touching certain wires or terminals might feel little or no shock until, by accidentally touching a water-pipe or other earthed object, he receives an unpleasant reminder of the risk of improperly-wired circuits.

Ensuring Safety.

The Institute of Electrical Engineers has formulated certain rules and regulations governing the supply of units to be worked from the mains, and consequently the listener who deals with a reputable firm can be sure that the various precautions recommended have been borne in mind in the design of his apparatus. In any case of doubt, expert advice should be obtained, and it is hardly necessary to add that frayed wires or loose terminals should not be tolerated for a moment. Whilst nothing could be more satisfactory than properly installed mains apparatus, the householder should provide against even the possibility of accident and, by attention to the regulations regarding protective fuses, etc., ensure that his radio power is not only reliable, cheap, and constant, but is absolutely safe.



This self-contained Marconiphone set (2-valve) can be used with their A.C.4 model for all-mains operation from A.C. mains. The only external connections are aerial and earth.

**"EKCO-LECTRIC
STRAIGHT THREE"**

*The modern radio receiver that
works entirely from the mains.*

D.C. £16.10.0

A.C. £18.10.0

COMPLETE.

**ALL-POWER UNITS
for A.C. or D.C. Mains**

*Eliminate batteries, accumu-
lators and grid bias.*

D.C. from £5.17.6

A.C. from £10.17.6

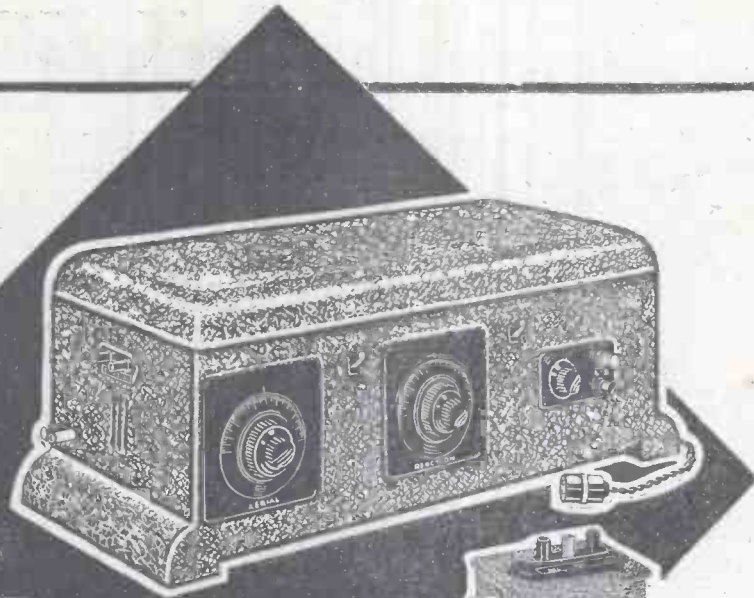
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Eliminate High-Tension batteries.

D.C. from 17/6 compl. to

A.C. from 52/6 complete



If

you have

Electricity . . .

Whether you have A.C. or D.C. Mains, there is an "Ekco-Lectric" Set or Unit for your needs. The "Ekco-Lectric" Straight Three receiver is the most up-to-date set of its kind. No accumulators. No batteries. No mess. It has a super-power valve giving sufficient volume to operate a Moving Coil Loud-Speaker—a switch to change from high to low waveband and sockets for the attachment of a gramophone pick-up. You can also electrify your present set, with no alterations to the valves or wiring with an "EKCO" All-Power Unit (eliminating batteries, accumulators and grid bias) or partly electrify it with an "EKCO" H.T. Unit (eliminating H.T. Batteries). An "EKCO" L.T. Unit, for A.C. Mains only, will eliminate the Accumulator.

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JUST PLUG-IN—
THAT'S ALL!

RADIO

ALL "EKCO" PRODUCTS ARE
OBTAINABLE ON EASY PAYMENTS

YOUR UNIT



A brief and interesting account of how mains units replace radio batteries.

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

The two most popular types of rectifier are the valve and the metal or "dry" rectifier. Both are designed to do the same thing—that is, allow current to flow in one direction only.

There are what are known as full-wave and half-wave rectification. Half-wave rectification necessitates the use of only one rectifying arrangement (valve or other device), while two valves (or a special type of valve having multi-electrodes) or two other types of rectifier are needed for full-wave working.

In the half-wave scheme you suppress the current when it flows in the one direction and use it only when it is flowing in the correct direction for your purpose—this is also what you do in the case of a crystal detector set.

But whereas, I believe, no one has got double current results by using two crystal detectors in a crystal set, you can very successfully accomplish full-wave rectification in the case of a mains unit.

Full Wave Rectification.

The two rectifiers are arranged so that the current is passed to both, but can only get through the one at each half-wave. Nevertheless, the outputs are arranged so that the current which passes through either of them always goes the same way along the output towards the smoothing circuit.

By means of a transformer any voltage required can be developed. Thus, even if your mains are only 105 volts you can, providing they are A.C., get 150 or even 250 volts for a super-power valve. This you cannot do with D.C. You are limited by the voltage of the mains.

The amount of current that a unit will pass depends upon the capabilities of the

Using an ordinary receiving valve for rectifier, this H.T. unit (Marconiphone A.C.3) supplies a 2- or 3-valve set with up to 2 m/amps. at 60 volts.



rectifier in the A.C. type, and the resistance of the elements in the smoothing and voltage regulating circuit.

No practical limitation is set by any of these factors, but it requires a high-class

assembly to provide, say, 100 milliampres of current at 150 or 200 volts. The average receiver does not necessitate more than a tenth of this amount, but a margin of a wide nature is to be recommended.

H.F. on the Mains.

It is an interesting fact that a fair proportion of the "ripple" accompanying the current from the supply main is of high-frequency. Therefore, L.F. chokes alone cannot accomplish complete smoothing, although for most purposes they do all that is necessary.

But with powerful multi-valves such H.F. must at all costs be excluded if perfectly "silent" H.T. feeds are to be achieved. In order to suppress this possible source of interference, H.F. chokes are inserted in series with the supply.

Chokes and condensers are used for smoothing in practically all mains units, but when we come to the L.T., a nasty



A popular D.C. H.T. model (Clarke's "Atlas," D.C. 18) giving 60 and 120 volt tapings and a maximum output of 15 m/a.

series of problems concerning these components confronts us. The L.F. chokes, for instance, have to handle much more current and therefore have to be wound with thicker wire. Further, they need far superior magnetic qualities.

Owing to the low resistances of the various circuits concerned, the fixed condensers have to have enormous capacities, as otherwise they would not act as alternative paths. However, electrolytic condensers (with capacities up to thousands of mfd.) save the situation in this respect.

"All-Power" Units.

The alternative to an L.T. unit is the indirectly-heated valve, and this is a proposition that has many attractions. This was discussed in detail in our recent special valve number.

And as you will see from the other articles appearing in this issue, there are mains units which give you both H.T. and L.T. Further, there are models that, in addition, supply grid-bias voltages.

And these wonderful combinations are available for D.C. and A.C. mains, so that we can truthfully say that the power problem is completely solved where electric power mains are laid on. Batteries in these instances are superfluous!

AN H.T. mains unit replaces the H.T. battery and supplies a steady current just as long as the house-lighting supply (and, of course, the unit) remains in good order.

The D.C. type embodies nothing much more than a smoothing circuit. If you have D.C. mains, these could be taken direct to the set, but there would be two things against your getting good results.

First of all you would find that a terrific hum would accompany the speech and music. Such a hum is due to ripples and roughnesses which are present in all power supplies.

Secondly, you would have to accept the voltage of the mains for working your set.



This Marconiphone Trickle Charger gives up to half an amp. for charging 2-, 4- or 6-volt accumulators.

The object of a mains unit is to regulate the voltage and smooth out all the irregularities in the supply.

The voltage is sometimes regulated by a potentiometer arrangement. A resistance is connected right across the mains and tapings are taken to the resistance at varying points in accordance with the voltages required.

Another method is to place resistances directly in series with the mains, and in this way the voltage is dropped to various values across the valve circuits to which the unit is connected.

Smoothing Away Ripples.

The smoothing is accomplished by using L.F. chokes and high-capacity fixed condensers. An L.F. choke is inserted in one of the output supply leads and this tends to prevent the passage of ripples and irregularities. An alternative path back to the mains is provided for these in the form of a large fixed condenser.

That more or less disposes of the D.C. H.T. mains unit. A unit for use with A.C. mains is practically a D.C. unit with the addition of a transformer and rectifier.

A.C. is no good for the anode circuits of a valve set. You want a steady current flowing in one direction, and not a current that alternately flows in both directions.



OF THE 'TWINS' FREE GIFTS

Why not have a shot at this interesting competition? All you have to do is to send us your ideas of the simplest and best methods by which the "Twins" Free Gifts Offer can be brought prominently to the notice of the great Smoking public.

Send as many ideas as you like, each complete Scheme to be accompanied by 25 "SUNRIPE" 10's empty packets or 25 Coupons from the 10z. "SUNRIPE" Mixture packets (or any quantity of both, making 25 in all).

You have until September 16th next to send your ideas, which must be addressed to R. & J. Hill, Ltd., "S" Dept., 175, Shoreditch, London, E.1.

All entries become the absolute property of R. & J. Hill, Ltd. whose Directors will judge them on their merits, and award the prizes. Their decision will be final and the awards will be advertised in this paper on October 26th.

Illustrated List of the "SUNRIPE TWINS" Gifts will help you in this competition. Copy of the List, together with FIVE FREE COUPONS, sent Post Free on application to "SUNRIPE TWINS," c/o. R. & J. Hill, Ltd., 175, Shoreditch, London, E.1.

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

QUESTIONS AND ANSWERS.

EVIDENTLY NOT THE EARS!

H. A. (Exmouth, Devon).—"I have been reading your paper, the POPULAR WIRELESS, for some time past, and take great pleasure in doing so, especially the "Radiatorial" section.

"Can you give me the solution to the fact that when I put on my pair of earphones

there is a rasping, scraping sound in my ears? I have tried touching the two tags of the earphones together, but still the sound persists. I assure you that my ears are in perfect order. Also, I have thoroughly cleaned them and put them together again correctly."

Honestly, H. A., we don't know how to account for this, especially if the circumstances are *exactly* as you say!

Usually the listener will get no sound from telephones which are disconnected, the recognised exception being where there is powerful electrical machinery in or very near to the house capable of causing inductive effects. If this trouble is suspected, the 'phones will be found to be quite O.K. if taken

out of the range of interference (say, into the next house or street), but the trouble will return every time they are brought too close to the machinery again.

Another possible (though very rare) cause of rasping noises in 'phones is a loose diaphragm. In some makes of 'phones it is possible for incorrectly assembled or broken parts to cause scraping noises when the 'phones are moved, and it may help you to diagnose the trouble if you remember that practically all mechanical faults will be powerless to cause noise if the phones and head are held perfectly still. But though slight shaking movements are necessary to set up sounds when the fault is a mechanical one, the moving of the head, leads, or earpieces will have no effect upon noises induced by adjacent electrical machinery. This difference may help you in tracking the trouble, but if the fault persists and you cannot trace the cause, we advise you to get the 'phones overhauled by an expert electrician, or by the makers.

TRANSFORMER FOR THE "TITAN" TWO.

C. M. (Paisley).—"Would a two-and-a-half to one ratio L.F. transformer be O.K. for use in the 'Titan' Two?"

Yes, the ratio named is quite suitable for the "Titan" Two.

A SUMMER SYMPTOM.

L. T. M. (Lymington, Hants).—"What surprises me is that sometimes Bournemouth comes in at 27 on the dial and sometimes it unaccountably gets up to 46. I have made inquiries, and found out that the Bournemouth wave-length does not alter; but, nevertheless, the tuning on my set alters, although nothing else is touched. Why is that?"

At this time of the year a number of readers complain that dial readings are dodging about, and in most of the cases we have investigated we find that this is due to the earth connection.

Unless a really good earth connection is made with damp soil, the contact at this point is apt to be intermittent during the summer and the drier weather, and we expect that you are experiencing this, or some variation of this effect. If the earth-plate cannot be buried in a naturally damp situation, try the effect of a bucket of water every day or so

(Continued on page 614.)



Power Valves need Power Batteries.

SILENT
POWER
to **YOUR** Set

POPULAR POWER
H.T. BATTERIES

E.M.F. volts 60 Price 13/6. E.M.F. volts 64 Price 14/6.
E.M.F. volts 99 Price 22/-. E.M.F. volts 105 Price 24/-.
E.M.F. volts 120 Price 27/-.



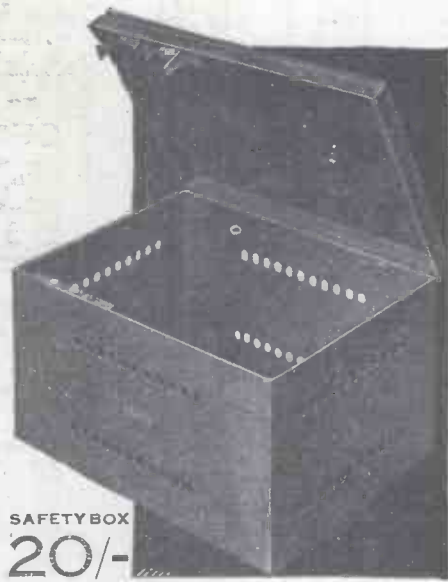
BRITAIN'S BEST BATTERIES

WHEN YOU BUILD THAT H.T. UNIT—SPECIFY FERRANTI THROUGHOUT

See the FERRANTI name on the Condensers, Chokes, Resistances, Mains Transformers, or Metal Rectifying units (incorporating the Westinghouse Metal Rectifier). It is your guarantee of safety and satisfaction.

Designed by Engineers who have long and unrivalled experience in mains work and a just appreciation of the importance of the safety factor in such apparatus.

The unique Ferranti fireproof Safety Box is a masterpiece of "Safety First" ingenuity. It incorporates fuses and automatic switch. The opening of the lid cuts off the unit from the Mains supply. No wonder it is so widely recommended.



SAFETY BOX
20/-

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INVALUABLE TO EVERY AMATEUR & CONSTRUCTOR "POPULAR WIRELESS" BLUE PRINTS of Tested Circuits

The following is a list of the "P.W." 6d. Blue Prints for Constructors in stock, showing the different circuits available.

P.W. BLUE PRINT Number.

1. DETECTOR VALVE WITH REACTION.
2. OUT OF PRINT.
3. 1-VALVE L.F. AMPLIFIER.
4. CRYSTAL DETECTOR WITH L.F. AMPLIFIER.
5. H.F. (Tuned Anode) AND CRYSTAL WITH REACTION.
6. H.F. & CRYSTAL (Transformer Coupled, without Reaction).
7. 1-VALVE REFLEX AND CRYSTAL DETECTOR (Tuned Anode).
8. 1-VALVE REFLEX AND CRYSTAL DETECTOR (Employing H.F. Transformer, without Reaction).
9. H.F. AND DETECTOR (Tuned Anode Coupling with Reaction on Anode).
10. H.F. & DETECTOR (Transformer Coupled, with Reaction).
11. OUT OF PRINT.
12. OUT OF PRINT.
13. 2-VALVE REFLEX (Employing Valve Detector).
14. OUT OF PRINT.
15. OUT OF PRINT.
16. H.F. (Tuned Anode), CRYSTAL DETECTOR AND L.F. (With Switch for Last Valve).
17. CRYSTAL DETECTOR WITH TWO L.F. AMPLIFIERS (With Switching).
18. 1-VALVE REFLEX AND CRYSTAL DETECTOR, with 1-VALVE L.F. AMPLIFIER Controlled by Switch.
19. OUT OF PRINT.
20. OUT OF PRINT.
21. THE 2-VALVE LODGE "N."
22. "THE GUARANTEED REFLEX."
23. THE 1-VALVE "CHITOS."
24. THE "SPANSACE THREE." Three-Valve Receiver employing 1 Neutralised H.F. Valve, Detector with Non-radiating Reaction Control and 1 L.F. Valve.

P.W. BLUE PRINT Number.

25. OUT OF PRINT.
26. A "STRAIGHT" 4-VALVER (H.F., Det. and 2 L.F. with Switching).
27. OUT OF PRINT.
28. A "MODERN WIRELESS" 5-VALVER (H.F. Det. and 3 L.F.).
29. AN H.T. UNIT FOR DIRECT CURRENT MAINS.
30. A REINARTZ ONE-VALVER.
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 612.)

over it, so as to keep it reasonably moist, and we think you will find that this will effectively get rid of your trouble.

NEG. AND POS.

"STUDENT" (Bombay).—"Is 'negative' the opposite to 'positive'? (Please give succinct answer.)

Yes.

PUSH-PULL OR PARALLEL?

"OUTPUT" (Chester).—"Is it correct to wire grid to grid and plate to plate for paralleling two output valves (filament connections as usual)? And is this the same as push-pull?"

When two valves are to be worked in parallel for an output stage, it is correct to join the grid of one to that of the other, and its plate to plate, as suggested.

But this does not give "push-pull" amplification, nor anything like it. When two similar valves are paralleled hardly any difference is noticed in reception; but when two valves are joined for push-pull amplification a very large volume can be handled without distortion. In fact, two small power valves can be made to work like a super-power valve under such conditions.

When valves are paralleled, no extra apparatus is required; but to obtain the benefits of push-pull amplification the two output valves have to be used in conjunction with two special "push-pull" transformers.

FIXING A POTENTIOMETER TO THE "THROTTLE" THREE.

"THROTTLE" (Chichester).—"The set is so good that I thought I should like to get the last ounce out of it by fitting a potentiometer to the detector. (This dodge was mentioned in one of your articles not long ago.)

"I asked for instructions, but did not mention the name of the set; so these direc-

tions are a bit difficult to apply to my particular case, as it's my first valve set. You say:

"Examine the grid of the first valve. You will see that it is connected to one side of a coil and one side of a variable condenser. The other sides of these two components are joined together and connected either to

"P.W." TECHNICAL QUERY DEPARTMENT

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

LONDON READERS PLEASE NOTE: Applications should NOT be made in person at Fleetway House or Tallis House.

earth or to the filament circuit. Disconnect the wire making this connection and, instead, still keeping the condenser joined to the coil, take a lead to the centre or moving arm of potentiometer. The remaining two contacts on the latter must now be connected across the filament terminals of the valve holder.

"Does this mean I undo the grid-coil to aerial-coil connection, and that from the moving vanes, and take these two to the moving arm? And, if so, can I join one end of the potentiometer to the nearest panel filament wire (which goes to the switch), and the other end of the pot-meter to the nearest side of the aerial coil, which goes to the L.T. plus terminal eventually?"

Yes, you have interpreted the instructions correctly, and you will be O.K. if you wire up as you suggest. We should fix the potentiometer to the baseboard in the corner near to the grid leak, and as you may find it does not seem to make much difference, we should put an on-off switch on the panel, and join it in the lead from the potentiometer to low-tension filament, so that if the switch is turned "off" the potentiometer will not be taking any current from your accumulator.

QUESTIONS ABOUT MAINS UNITS AND CHARGING.

WHEN POSITIVE IS EARTHED.

N. E. S. (Cranbrook Park).—"I have been using a D.C. mains unit for over six months now, and although it is absolutely satisfactory in use so far as reproduction goes, there is one little point about which I am rather troubled. An electrical engineer friend of mine tells me that it is due to the fact that my positive main is earthed, but, whatever the cause, the effect is the following:

"If the aerial is accidentally touched or the earthing switch is touched, there is generally a very faint tingling on the fingers, apparently due to the aerial being charged. You may think that this does not matter, but I am a careful soul and was rather nervous the other day because the gardener whom I

(Continued on page 616.)

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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 614.)

had-in to cut some trees down, etc., was attending to a bush near the aerial when he clasped this with one hand, and was so surprised at the tingling sensation that he nearly fell from his steps.

"It does not sound much, I know; but I am careful, and I cannot help feeling that I should like to put a condenser in so as to stop this tingling effect. I worked out a scheme for putting it in the earth lead, but my electrical friend points out that this would allow charges to accumulate on the aerial from thunderstorms, etc. He suggested I should write to you for connections to a switch which would disconnect the aerial from the set when not in use and connect it direct to earth, but place a 2-mfd. fixed condenser in series with the earth lead when the set is being used in conjunction with the eliminator. Can this be done?"

You can employ one of the ordinary double-pole double-throw switches for this purpose, proceeding as follows: Mark one of the centre contacts on the switch A and the other centre contact 1.

Now place the switch in the "up" position. Here the centre arms will make contact with two other switch points, and that which is now joined to 1 you should mark 2. The other contact joined by the switch blade to A should be marked B.

Now turn the switch in the downward position, when the 2 and the B will be disconnected from 1 and A, two fresh switch points being joined up. The one that is joined to 1 by the switch blade should be marked 3, and the one which is joined to A should be marked C. Then connect up as follows:

The aerial lead-in should go to 1; 2 should go to the buried earth connection and to one side of the 2-mfd. condenser; 3 should go to the aerial terminal on the set. The B contact is not connected up at all.

The contact marked A is joined to the remaining side of the 2 mfd. condenser. Finally, the contact marked C is taken to the earth terminal on the set.

Now, when the aerial is in use, the 2-mfd. condenser is connected between the buried earth and the set. To obviate the aerial tingling, connect a good quality '001 fixed condenser between the set's aerial terminal and the wiring to this. When the set is not in use, the aerial itself is connected direct to earth.

CONVERTING THE "TITAN" FOR USE AS A CRYSTAL SET WHILST BATTERIES ARE BEING CHARGED.

W. G. S. (Hall Green, Birmingham)—
"Would it be possible to use the 'Titan' as a crystal receiver while the batteries are away being charged? Will you kindly state which

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is
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side of the screen the crystal detector should be mounted, and what are the connections?"

The plan is a good one and quite easily arranged for. The best plan would be to mount the crystal detector and two extra 'phone terminals near to S1. Join one of these new 'phone terminals to one side of this new detector.

This leaves you with one vacant 'phone terminal and one vacant detector terminal. All you have to do is to join the E terminal of the "Titan" unit (or any wire attached to it) to the vacant 'phone terminal, and then finally run a wire from the G

terminal of the valve holder or G on the coil unit to the vacant terminal on the new crystal detector.

After the batteries have been disconnected (or even whilst they are still attached, if you wish) you can receive crystal-set signals by connecting a pair of 'phones to the new 'phone terminals. Disconnect them when not required, and you will be able to use the set exactly as before, with the added convenience that crystal reception is possible whilst the batteries are being charged.

H.F. INTERFERENCE FROM D.C. MAINS.

J. S. (Gt. Yarmouth).—"After extensive experimenting, I have come to the conclusion that H.F. interference is being picked up by the eliminator from the D.C. mains. Some time last year I saw in 'P.W.' a method of inserting a unit in series between the mains and the plug from a D.C. H.T. unit, the idea being to join up two H.F. chokes, one in each main.

"What are the parts and connections of such an H.F. 'smoother,' and how big should the containing case for it be?"

You will need a box about 3 in. by 5 in. by 5 in., two H.F. chokes, one fixed, condenser (1 mfd.), and a lamp-holder to take the plug from your H.T. unit.

Since the condenser is to be connected right across the mains it must be of good make and of the high voltage type. (NOTE.—Its working voltage should be well above that of the mains.)

Except for very large "purity" sets or exceptional circumstances, two ordinary H.F. chokes will be found O.K.

(For large currents, as required by super-power valves, the specially-designed heavy-current H.F. chokes may be required to avoid over-heating.)

The dimensions of the box necessary may vary a little if large components are used, but the size given above is O.K. for ordinary use. The connections are as follows:

Each H.F. choke is connected to its respective flex lead from the mains. Then the remaining lead from one choke goes to one side of the 1 mfd. condenser and to one side of the lamp-holder. The other choke is joined to the remaining side of this condenser and to the remaining side of the lamp-holder.

It will be seen that when the plug from the H.T. unit is placed in the lamp-holder, each main is carried through an H.F. choke, and across these there is a smoothing path via the 1 mfd. fixed condenser.

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Test Report
on page 602

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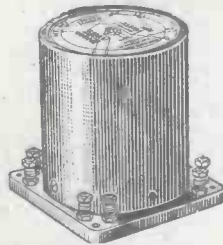
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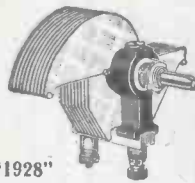


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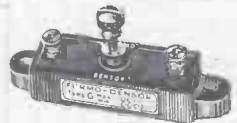
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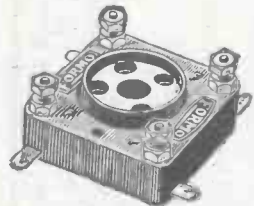
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	GPR 10	3.5-4	.09	10,000	9	L.F.
	GPR 11	3.5-4	.09	44,000	41	R.C.
	GPR 17	5-6	.14	20,000	17.5	H.F. Det.
	GPR 18	5-6	.14	11,000	9.5	L.F.
	GPR 19	5-6	.14	75,000	41	R.C.
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	PR 3	2	.095	15,000	8	L.F.
	PR 4	2	.095	60,000	32	R.C.
	PR 9	3.5-4	.063	24,000	14	H.F. Det.
	PR10	3.5-4	.063	15,000	8.7	L.F.
	PR11	3.5-4	.063	65,000	40	R.C.
	PR17	5-6	.15	24,000	17	H.F. Det.
	PR18	5-6	.15	15,000	9	L.F.
	PR19	5-6	.15	80,000	40	R.C.
	POWER 6/6 Each Postage 4d.	PR20	2	.15	7,000	6
PR40		4	.15	8,000	6	"
PR60		6	.15	8,000	6	"
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MORE SERVICE FOR SCHOOLS.

THE B.B.C. states that the issue of its New Programme and Syllabus of Broadcasts to Schools marks a new chapter in the history of school broadcasting. In a sense, it does.

The programme covers the period September 1929 to June 1930, while the syllabus extends over the school term from September 23rd to December 13th, 1929.

The pamphlet we have received is the first to be issued under the auspices of the new Central Council for School Broadcasting, and a foreword explains exactly the powers and duties of the new Council, the membership of which is set out in full in the appendix.

Some New Features.

The B.B.C. has always had its advisory committees for education, as for the other branches of its work; but now begins what it calls a real devolution. The new Council, with its executive, is no longer merely advisory, but a "responsible" body. Another interesting development is that for the first time the B.B.C. is able to place in the hands of teachers a full year's programme of work for the next year, long before the end of the summer term, so that school masters and mistresses will have it before them when they are drawing up their own school time-tables for the succeeding year.

The Educational policy at Savoy Hill is thus obviously gaining ground.

New features of this programme are the lessons on "Rural Survey," by Miss Charlotte Simpson, a course constructed on the lines of the "Village Surveys" described in the Board of Education pamphlet No. 61. Another new series, entitled "Peoples of the World and their Homes," has been planned by Professor H. J. Fleure, D.Sc., and will be given by eminent travellers, including the Right Hon. W. G. Ormsby-Gore, Major W. T. Blake, and Messrs C. F. Rey and Ernest Haddon.

A series on Athletics is expected to prove a popular innovation. The series has been planned to interest and inform schools in the various branches of athletics, sport and games, and the talks will be given by athletes of acknowledged authority.

Fortnightly Talks on Flying.

Well-known features, such as Sir Walford Davies on Music, Miss Clotilde von Wyss on Nature Study, Miss Rhoda Power on History, and M. Stéphan on Elementary French, are continued. Mr. Lloyd James will be giving a further course on Speech and Language.

A new venture to benefit secondary schools is a series of fortnightly talks on Flying, by Squadron-Leader W. Helmore, M.Sc., R.A.F., of the Royal Aircraft Establishment, Farnborough, who is broadcasting by special permission of the Air Ministry.

The programme also contains hints for the teacher, intended to help him to collaborate fully with the unseen teachers.

The B.B.C. urge that no school ought to listen to broadcast talks unless it has a set capable of giving absolutely clear and reliable reception, and it is rightly pointed

out that in many schools it is not rightly realised what this phrase means.

Bad Sets Used.

Many schools are content with a standard of reception that is far from perfect, simply from ignorance of what really good reception is, and if technical differences of any kind threaten to spoil good reception, teachers are urged to write to the B.B.C. about it—or to our own queries department, which offers an unrivalled service to those who want practical help in connection with their sets.

Incidentally, the B.B.C. offers information concerning the purchase of sets for use in schools. This is contained in the revised specifications for receiving sets which are now available on application to the B.B.C., and apparatus modelled on these lines can be constructed by any reliable dealer, at prices varying between £18 and £23, according to the type of set required.

It is necessary to remind schools that the best and most reliable receiving sets will not give consistently good results unless careful provision is made for maintenance. When a set has been installed, an arrangement should be made with the local dealer for the periodical charging of accumulators and the replacement of high-tension batteries when necessary. It is estimated that the cost of maintaining a school set should be about £5 a year.

Large Loud Speakers Necessary.

The loud speaker itself should be large and of a reliable type. In receiving a broadcast lesson it is most important that the lecturer's voice should not be reproduced in louder tones than those in which he is actually speaking at the microphone. Some speakers talk more quietly and more intimately than others, and their personality cannot make itself felt if timbre and inflection are exaggerated by the loud speaker.

The loud speaker should be used in a room no larger than is necessary for the accommodation of forty children, and it is pointed out that it is desirable that this room should be as far removed from street and playground noises as possible. If the lesson is to be taken by a class of more than forty it is better to use several small rooms with one loud speaker in each than to use two or more loud speakers in one large room.

The B.B.C. has obviously gone to a good deal of trouble and expense in connection with its service of broadcasts to schools. We would now like to see the same trouble and expense devoted to new and appetising programme features.

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THE "SUMMERTIME" FIVE

is one of the magnificent sets fully described in the July issue of Modern Wireless which is

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TECHNICAL NOTES.

(Continued from page 594.)

The amount of chokes and condensers required for smoothing a low-tension current of, say, 2 or 3 amps is quite considerable and involves a good deal of outlay.

Moreover, the current from this device, as I have indicated above, cannot possibly be superior in smoothness to that derived from an accumulator battery in proper condition. My own preference is always in favour of the accumulator-combined-with-charger for low-tension current or, if you like, some form of eliminator with small "buffer" battery to maintain constant voltage and take up hum and irregularities; but the fair-size battery—disconnected from the charger when operating the set—is my preference.

H.T. Supply.

On the high-tension side, of course, there is a great deal more to be said for the true eliminator than on the low-tension side. For one thing, the amount of current which has to be smoothed is only a very small fraction of that in the low-tension side, and this naturally makes the question of chokes and condensers much simpler.

To smooth a current of, perhaps 50 to 100 milliamps is a very different proposition from smoothing a current of 2 or 3 amps. Again, the alternative of a high-tension eliminator is either a dry battery or a high-tension accumulator battery, and in the latter case—although again I say that a battery of accumulators cannot be surpassed for excellence of current under proper conditions—the accumulator battery requires quite a fair amount of care and attention and, of course, must be frequently recharged. A high-tension battery combined with H.T. charger is, as a rule (though not always), more expensive than a high-tension eliminator.

Thus on the high-tension side we have a choice between the two principal alternatives, that is, H.T. accumulator-with-charger on the one hand, and H.T. eliminator on the other hand. The eliminator is probably cheaper, at any rate it need not be much dearer, and it is very much less trouble to maintain and operate. Therefore, I should be inclined to say that on the high-tension side the eliminator has advantages over the battery, whilst on the low-tension side the reverse was the case.

Rectifiers.

Coming now to the question of rectification, there are, as you know, several quite reliable forms of rectifier of which perhaps the principal ones are the valve, the copper oxide and the electrolytic rectifiers. The valve rectifier has the advantages that under proper conditions the rectification ratio is very high, whilst also a single valve rectifier unit is capable of operating under quite high voltages.

The principal disadvantages of the valve rectifier are, firstly, its liability to damage and its limited working life; and, secondly, though by no means so important, the energy consumption in the heated filament. Personally I think that, although valve rectifiers are quite extensively used, they are not used so widely as they ought to be. They give excellent rectification, and there is a security and steadiness about valve

(Continued on next page.)

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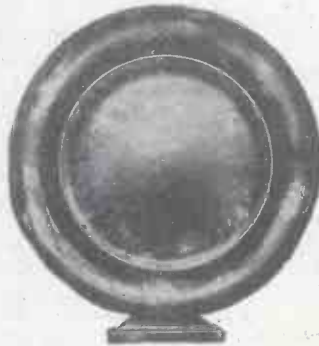
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TECHNICAL NOTES.

(Continued from previous page.)

rectification which is often lacking in rectifiers of other types.

Copper Oxide Type.

The oxide rectifier has come into very considerable use during the past year or two, mainly owing to its robust construction and its freedom from any need for attention. The oxide rectifier is well adapted for mains units where one of the principal objects in view is to use components which can be boxed up and do not need subsequently to be "got at."

For this reason the oxide rectifier, both in the high-tension and in the low-tension models, has been standardised by several manufacturers of mains units and charging devices.

For Different Purposes.

I should like to refer, in passing, to a point with regard to rectifiers which is sometimes overlooked, and that is the features required in a rectifier which is to be used for a mains unit and those in one which is to be used merely for charging purposes.

It may be said that within fairly wide



A type of Power Transformer well known for mains work—the Suprecision (Heyberd & Co.)

limits almost any rectifying device is suitable for battery charging because the actual wave-form of the rectified current is of little or no importance. I do not want this statement to be taken too broadly, but in a general way it is correct.

Wave-Form.

When we come to a rectifier for use in a mains unit or in a mains-operated receiver, however, the wave-form of the rectified current becomes quite important. The less pronounced the irregularities in this wave-form the easier it is to smooth out these irregularities in the subsequent smoothing circuit.

Press-Button Receivers.

The next step after the development of the mains unit was obviously the inclusion of the rectifier and smoothing circuit within the receiver itself, and mains-operated sets have become during the past couple of years very popular indeed. The advantage of a mains-operated set is that it is complete within itself and merely has to be plugged into the electric light, when it is all ready for operation.

(Continued on page 622.)

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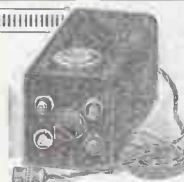
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TECHNICAL NOTES.

(Continued from page 620.)

It thus appeals to what may be called the "ordinary listener" (as distinct from the experimenter), who naturally wants the operation of the set to be reduced to the simplest possible form. In fact, an efficiently designed mains-operated set is literally a press-button receiver, and is actually simpler and easier to operate than the gramophone.

Indirectly-Heated Valves.

Mains-receivers have, of course, been designed (more particularly in the States and in Germany) for use within directly-heated valves, and in the countries mentioned receivers of this type have met with considerable success, although in this country the indirectly-heated valve never seems to have made very much headway.

It is possible, using indirectly-heated valves, to reduce the cost of the components for the set very materially. I recently had several sets of this type sent over to me from the Continent for special examination, and I was asked by a large Continental firm to give a considered opinion on the circuit and on the design of the sets, as well as on the question of their appeal to the public.

The sets in question were remarkable for their simplicity, compactness, and efficient performance, no less than for the "fewness" and cheapness of the components used. I was very much impressed with the fact that so much result had been achieved with so little material, and I believe that sets of this type will in the near future make an appeal to a considerable section of the public.

Portable Receivers.

Probably you have noticed that with the average portable set in which, of course, a frame aerial is used, it is easier to receive stations operating on the longer broadcast wave-lengths than those on the shorter waves. Some portable sets of the better type are compensated so that this difference is not so pronounced; but, unless some more or less special provision is made, the circuit will be less efficient on the short wave-lengths.

It is not difficult to see the reason for this, or rather the reasons, as there are several. Efficiency.

In the first place, the frame aerial has to be compared with the straight wire antenna and in this respect compares unfavourably with it from the point of view of inductive properties. In consequence of this the extended aerial is better adapted for tuning to the shorter waves than the more inductive frame aerial.

Secondly, the choke or resistance method of coupling, the efficiency on shorter waves is not as great as on the long waves, mainly because of the shunt capacity path across the windings which introduces leakage of the H.F. currents.

Attenuation.

Apart entirely from the properties of the receiver itself, the longer waves follow the surface of the earth much more closely than the short waves and, in consequence of this, fading and attenuation are, as a rule, less marked.

All these various causes militate against the efficiency of the portable receiver for short waves.

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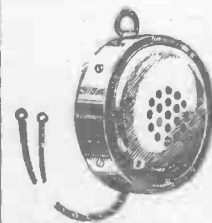
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The present set is intended to give not merely the local and 5 G B, but quite a number of foreign stations also. This it will do at quite good loud-speaker strength with just a little care in adjustment. This is somewhat unusual on a frame aerial with only four valves, and it follows from the fact that the set embodies a specially powerful L.F. amplifying circuit, as well as a screened grid H.F. stage which is exceedingly stable, yet gives a good degree of magnification.

Only One Dial.

The H.F. stage is actually of the same H.F. choke coupled type as that employed in the "Titan" Three, and hence it does not add an extra tuning dial with its attendant difficulty in searching (tuning is very sharp in frame aerial sets). Although there is thus only one tuned circuit, selectivity is very good indeed, as a result of the special properties of a frame aerial.

Reaction is obtained exactly as in the original "Titan," i.e. from the plate of the screened grid valve, a very small variable condenser feeding back from here into a small reaction winding on the frame aerial. The frame, by the way, can be a standard one (about 12 turns spaced $\frac{3}{8}$ or $\frac{1}{4}$ apart on a 2 ft. 6 in. framework), and the reaction winding should consist of three turns of any fine gauge of wire placed up against one end of the main winding. It should run as a continuation of the frame winding, i.e. in the same direction.

Frame Connections.

Join the beginning to the nearest frame terminal and the end to a new terminal to be marked "R." This is to be connected to the "R" terminal on the set, while the frame terminal to which both one end of the main winding and one end of the reaction winding are connected should go to the "E" terminal on the set. The remaining frame terminal is to be connected to the "A" terminal on the set.

The L.F. side contains two stages, both transformer-coupled, which means a great deal of power, but also involves some care in design to ensure stability. First, precautions must be taken to prevent L.F. oscillation, and you will observe that this has been done with some thoroughness. There is, first of all, an effective anti-motor-boating filter on the detector valve, consisting of a 30,000-ohms series resistance in the H.T. lead and

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a 4-mfd. reservoir condenser shunted down to L.T. This filter, by the way, also drops the voltage to this valve so that it can be run from the same positive terminal as the H.F. valve, so simplifying the design a little.

Another anti-battery-coupling device is the output filter for the loud speaker,

figure between this and 50,000 ohms, try them out and see which gives the best results. The differences are only very slight as a rule, so it is not worth while to trouble very much about this point.

Now about the choice of a pair of L.F. transformers. As a rule it is a good scheme to use two of different types or makes, since you will often get more even amplification in this way. It is also generally rather safer from the stability point of view.

Special Terminal Arrangements.

You will notice that the set has the usual row of battery and loud-speaker terminals on a strip along the back, while the three terminals for the frame aerial are carried on a little strip of ebonite screwed to the inside of the panel near the top. The idea here is that the frame aerial shall stand on top of the cabinet, the leads to it emerging through three holes in the top near the front—i.e. over the terminals.

This scheme makes for neatness, but if it strikes you as unduly troublesome, there is a simpler way of doing things: just mount the three terminals through the panel in the usual way somewhere near the positions indicated.

On the back terminal strip you will see one marked "Earth," which may puzzle you when it is remembered that this is a frame aerial set. This terminal is really simply for convenience in connecting up two sheets of thin copper which are attached to the cabinet.

A Little Screening Needed.

This set requires a little simple screening for the best results. First of all, you want screening between the set and the frame aerial, and this means that you must fix a thin sheet of copper to cover the whole inner surface of the lid of the cabinet.

Another sheet should cover the whole of the bottom of the cabinet inside—i.e. under the baseboard of the set. This piece acts as a very small counterpoise earth rather than as a screen.

voltage being obtained by means of a dropping resistance of either 100,000 or 50,000 ohms (voltage here is not so critical with modern valves).

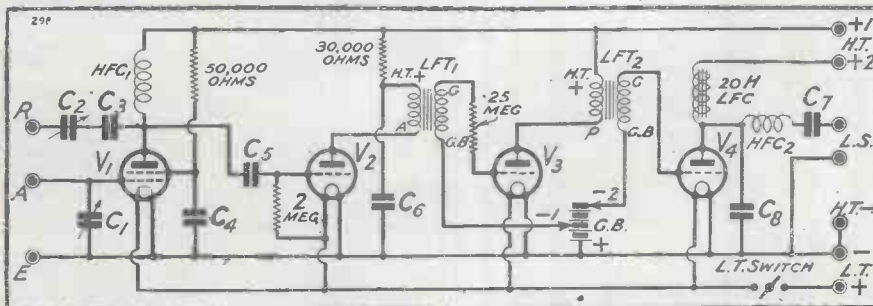
In most cases the 100,000-ohms value will suit, but if you have some odd resistances of any

COMPONENTS.

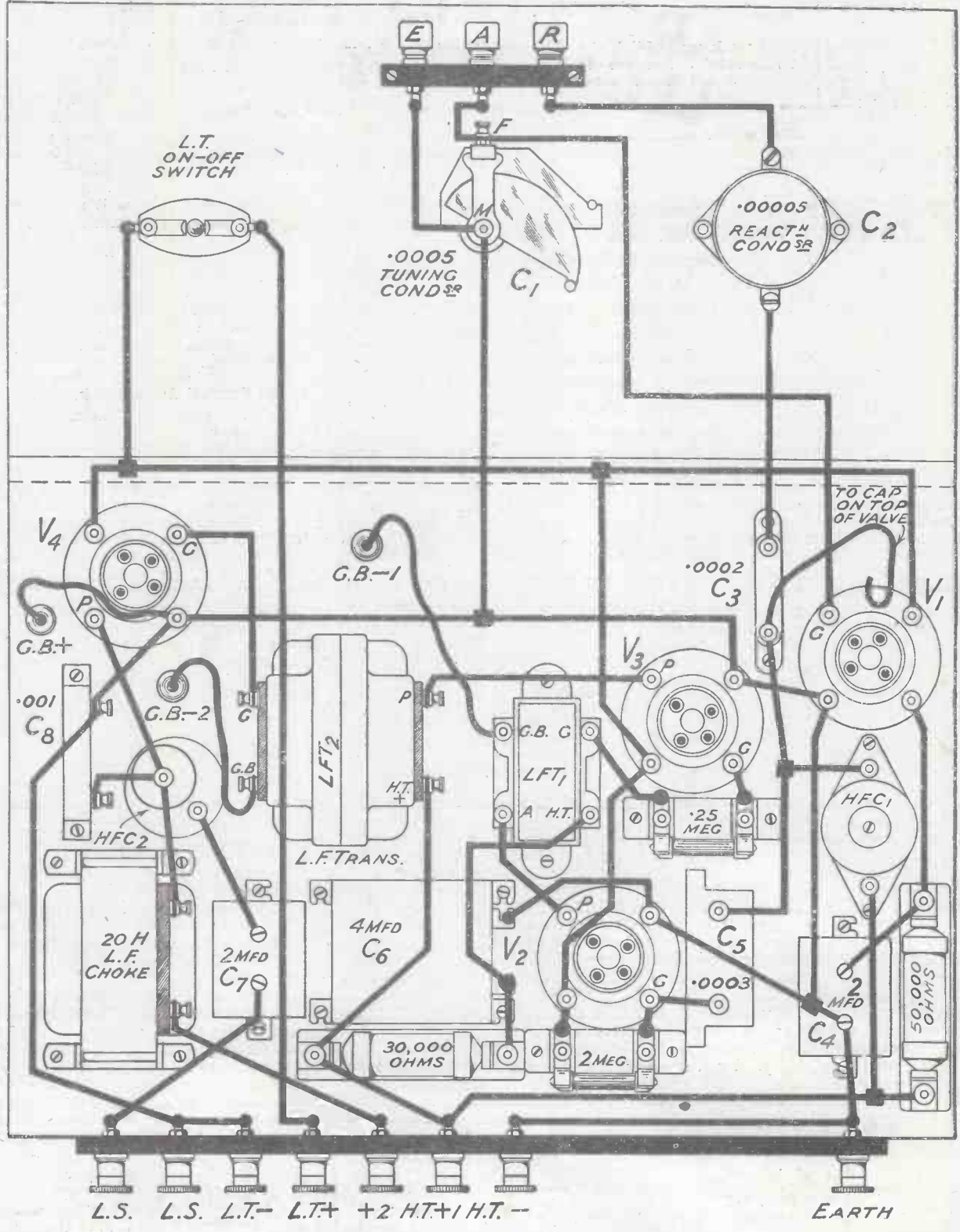
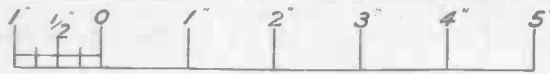
- 1 Panel, 14 in. x 7 in.
- 1 Cabinet and baseboard, 10 in. deep.
- 4 Sprung valve holders.
- 1 .0005 variable condenser.
- 1 .00005 reaction condenser.
- 1 L.T. switch.
- 2 L.F. transformers.
- 1 50,000- or 100,000-ohms resistance and holder.
- 1 30,000-ohms resistance and holder.
- 2 H.F. chokes, one to be suitable for S.G. coupling.
- 1 Output filter L.F. choke.
- 1 4-mfd. condenser.
- 2 2-mfd. condensers.
- 1 .0003-mfd. fixed condenser.
- 1 .0002-mfd. fixed condenser.
- 1 .001-mfd. fixed condenser.
- 1 2-meg. leak and holder.
- 1 1-meg. leak and holder.
- 1 Terminal strip, 14 in x 2 in. or 12 in. x 2 in.
- 1 Terminal strip, 3 in. x $\frac{3}{8}$ in. for A, E, and R terminals.
- 11 Terminals.
- Wire, screws, flex, etc.

which adds just the necessary reserve of stability to make the set very "safe" indeed. A further device intended to prevent trouble here is the H.F. filter device (H.F.C. ₂ and C₃) which prevents H.F. currents from getting into the loud-speaker leads and being fed back into the frame aerial by induction. As a further help in this direction, there is a resistance of .25 meg. in series in the grid-lead of the first L.F. valve.

The screening grid of the S.G. valve, by the way, is fed off the same H.T. terminal as the anode, the correct lower



Join each screen to "Earth" with a short piece of flex. Suitable valves for the set are these: H.F., one of the S.G. type; detector, H.F. type (20,000 ohms); first L.F., L.F. or G.P. type; last valve, power or super-power—the latter for preference, if your H.T. supply will stand up to it.



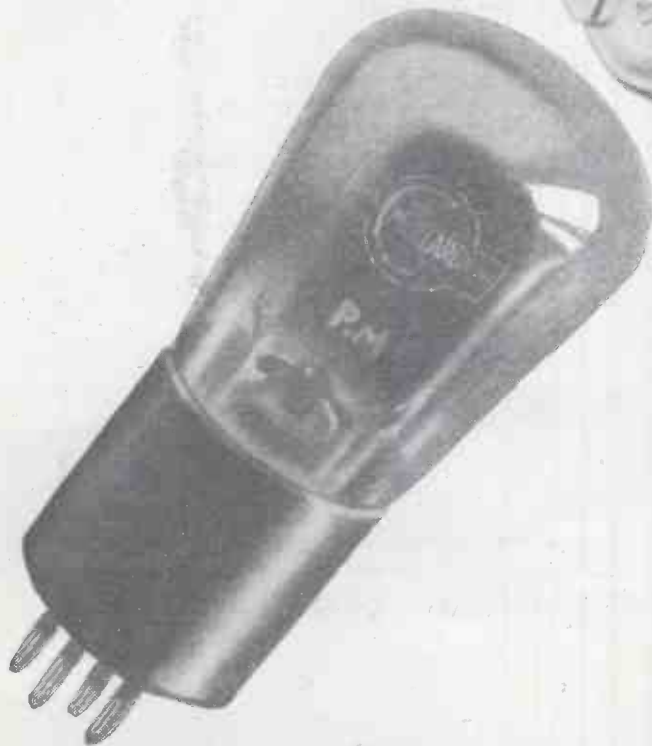
L.S. L.S. L.T.- L.T.+ +2 H.T.+ / H.T.- EARTH

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