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No. 431. Vol. XVII. INCORPORATING "WIRELESS" September 6th, 1930.

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NOTES FROM THE NORTH.

EMPIRE RADIO (2). By Capt. P. P. Eckersley, M.I.E.E.

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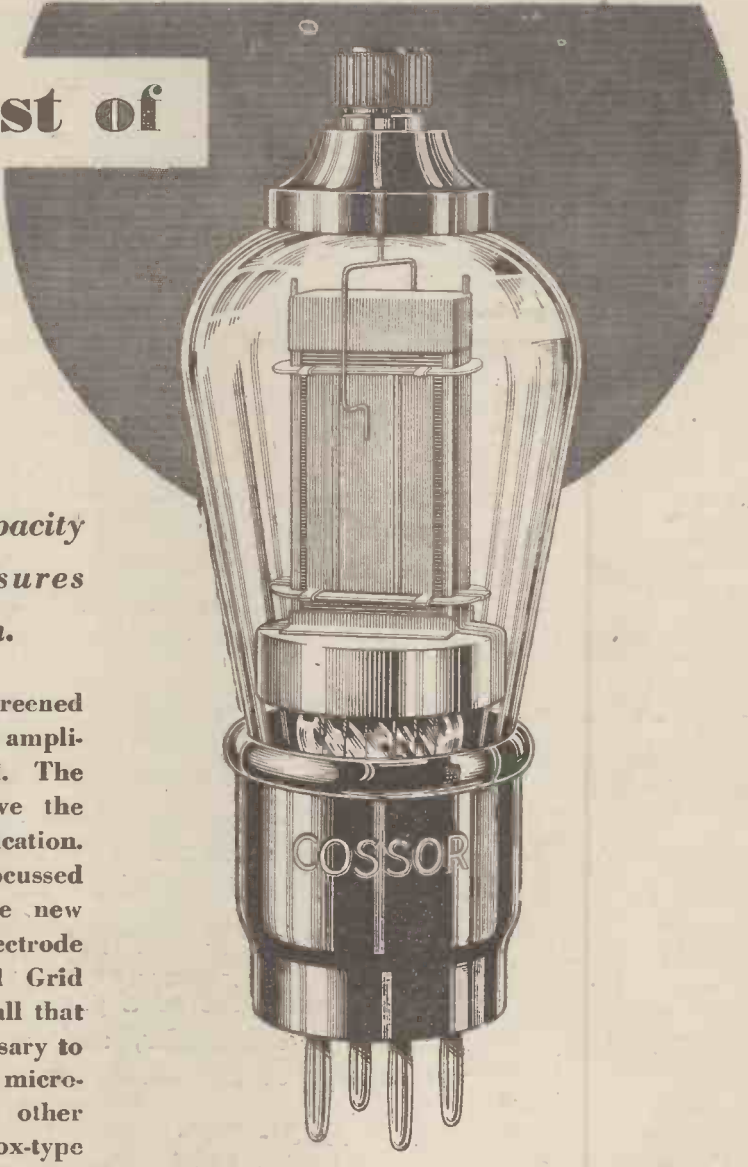

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Popular Wireless

Scientific Adviser: Sir OLIVER LODGE, F.R.S.
Chief Radio Consultant: CAPT. P. P. ECKERSLEY, M.I.E.E.
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A NEW ACCUMULATOR. "P.W.'s" PROGRESS. EXODUS FROM PARIS. "TOPPING-UP" WATER.

RADIO NOTES & NEWS

ABOUT SULPHATING. A STAR TURN. SIMPSON'S STATION. WASHINGTON ANNOYED.

A New Accumulator.

A NEW type of accumulator, invented by Dr. Drumm, of Co. Down, Ireland, is creating considerable interest in engineering circles. It is a low-resistance alkaline battery, said to have 50 per cent. higher voltage than existing types. It is claimed that it can be charged and discharged at much higher rates than other alkaline batteries, and can be charged in periods ranging from 8 minutes to 1 hour. The energy efficiency is 75 per cent under practical conditions, and the current efficiency 95 per cent. An improved secondary cell was long overdue, and we await further news of the Drumm invention.

Progress of "P.W."

HARVEY discovered the circulation of the blood and has a statue to his memory at Folkestone! "P.W." discovered how to make a wireless journal circulate and has no statue! Instead, it has live wires! (Except Ariel, who, though not statuesque, is considered by many readers to be picturesque.) One hundred and ten thousand, plus! Every week! What does that mean to you? It means that you know something good when you see it, and that 110,376 other fellows are in the secret.

Secrets of Success.

I WAS, more or less, present at the birth of "P.W." It was not hustled together by stray journalists, but founded by pukka radio men called together by "the old firm," and the same men are still with us. Nevertheless, I confess that, although I know the infinite pains which precede each issue, I am amazed at the success which attends our efforts. (The technical gang, of course, are *not* amazed. It's only what they would expect!) I am delighted beyond words, too, because, you know, apart from the business side of the thing, we have a pride in our work, which probably partly accounts for our success. *Your* appreciation, however, is the monkey gland of the whole racket—to descend to current English. It rejuvenates and stimulates us. It is the cocktail which gives us the zizz to go on!

Tra-la-la!

MORE secrets! All quite public property—like so many other "dead secrets." We are lucky to be able to have Sir Oliver Lodge as our Scientific Adviser. I should hate to have to adjudicate between him and Marconi for priority in the discovery of wireless! Anyhow, he is assured of a place on the scroll of fame. "Eck." is known to all of you. A competent radio engineer, who put British broadcasting, technically, in the front rank, and is a man to be reckoned with. The Editor, the leading spirit—well, if I boost him he will blue-pencil me, so I will say only that the certified circulation is, at the moment, 110,377 net per week—a triumph of journalism! I ses it, as knows the ropes!

THE ATTRACTION OF THE "MAGNET"

This picture was taken at a Coventry demonstration, and shows a huge replica of the new 4-valve "Music Magnet" receiver being switched on. Scores of loud speakers started into action, and loud cheers went up for little "Kit," who is seen in the foreground. (The new "Music Magnet" is, of course, a Kit receiver.)

The Exodus from Paris.

FOLLOWING the example of London and Buenos Aires, Paris is going to say good-bye to most of its broadcasting stations this year, because of the interference which they cause. Radio Vitus is going to Romainville, and Radio Paris to Essarts-le-Roi. Radio L.L. and Poste Parisien are also expected to flit from the Gay City. I think that more than one administration heartily wishes that the broadcasting under its control had been organised on British lines at the beginning.

Repetition.

A HINDHEAD (Surrey) reader, who is so kind as to subscribe himself as "Satisfied with 'P.W.' and Hindhead," calls my attention to the fact that our issue of June 28th contains, on page 443, a reproduction of a photograph which beautified our cover in August, 1927. And why not? Beauty is immortal. The "Mona Lisa" is still exhibited! Glorious pictures of nobodies are still sneaked from peers' mansions! Hence, why should we not perpetuate the pendant leg of the pretty radio fan of our photograph? The trousers of her co-listener-in are alone worth the money!

"Topping-Up" Water.

LOTS of chemistry has arrived here in connection with this subject, including a long letter from an aspirant to Inter B.Sc. honours. With most of the statements made by my chemical correspondents I cannot quarrel. I have an almost religious awe for text-books. But although theories may be acceptable the practical cases may never arise, and therefore it will doubtless interest you that the Chief Engineer of the Chloride battery firm has dealt with this point in "The Chloride Chronicle" summer issue. In general, his views and mine seem to agree.

Commonsense for "Topping."

HE says, "All distilled water is not necessarily pure, whereas some public supplies are found reasonably pure, such as those of Manchester, Birmingham, and, especially, Glasgow." In brief, the whole thing turns on what brand of water is used—and how much of it. As the Chloride expert points out, whereas an ordinary wireless battery may require only a small amount of added water during six years, for a car starter battery and those used for power and lighting the quantity of water which has to be used is much greater.

(*Continued on next page.*)

RADIO NOTES AND NEWS.

(Continued from previous page.)

About "Sulphating."

WHAT is to be done when the battery is "sulphated"? First, take action before the evil has gone beyond hope of redemption, that is, preferably, at the first signs of sulphate. I doubt whether anything could save a cell which has begun to bulge. I have, however, been successful in rescuing a badly-sulphated cell by the somewhat drastic method of washing the plates repeatedly in cold water, which removed a lot of the outside sulphate. When no more could be removed by these physical means, washing and gentle shaking, I filled up with electrolyte and gave the cell a long charge. He never recovered his beauty, but he certainly regained a lot of capacity.

The Recommended Cure.

THE Chloride people recommend that a sulphated cell be emptied of electrolyte and filled with either pure water or water acidulated with pure sulphuric acid until its specific gravity is 1·050; preferably the latter. The cell should then have a prolonged charge, even 50 or 60 hours, which should be continued for some hours after the specific gravity of the electrolyte has become constant. Repeated tests of the specific gravity must, of course, be made during the charge, and the value may eventually rise to 1·2. After this a great improvement in the condition of the plates should be observed.

The Invaders.

FERRANTI'S have sent me a photograph which at first I thought was King's Cross station on a Bank Holiday, or Amy Johnson's arrival in Hull, but it turned out to be the Ferranti invasion of Blackpool this year. Three trainloads of lucky Ferrantinos, all ready to part wi' t' brass and have a good time! Two other trainloads were emptied into London. That must have been on the day when the Tower of London was distinctly seen to quiver and the surveyor of St. Paul's Cathedral refused to come away from his new concrete till the last visitor had tripped down the steps!

Of Interest to Magicians.

H. W. T. (Stoke Newington, N.16), who is a "Magic" enthusiast, gives some details of modifications which he has made in his "Magic" Four. Anode-bend rectification, and shunt feed to first L.F. stage, being the chief. He uses "Osram" valves, S.625, D.E.L.610, D.E.P.610, and for the last stage either P.625, P.625A., or L.S.5 A. His H.T. of 250 v. comes from "Exide" 10 a.h. cells. L.S. arrangements are: "Squire" double-cone chassis and "Blue Spot" unit, all mounted on a 3 ft., 5-ply mahogany baffle, with a five guinea "Brown" horn in parallel. Results are in his opinion equal to moving coil quality and volume. (See article by Mr. Cox in "P.W.," No. 384.)

Further Refinements.

H. W. T. uses grid bias on all four valves, namely, S. Grid, 3 volts; detector, 3 volts; 1st L.F., 1½ to 9 volts; last stage, with L.S.5 A., 60 volts negative, though with a P.625 A. valve he needs 31·5 volts (neg.) and H.T. reduced to 180 volts. "Stoppers" of 100,000 ohms are permanently wired in each L.F. grid lead. A "Sifam" 0-50 milliammeter is arranged for switching into the main negative lead or the plate circuit of each valve. "It is simply nothing short of a splendid set," he says.

How Do You Pronounce It?

WHEN one of the announcers the other week referred in passing to the well-known seaside resort as "Weston-Super-Mary," he little knew what he was doing. All the word-vultures in Britain swept down on him at one go, nobly assisted by the pronunciation-wolves, who growl whenever any place with a queer name is mentioned.

The B.B.C. has just issued a book on the pronunciation of British place names, and most of these people were just keeping body and soul together while waiting for it to appear, their pens ready and their one idea in life the blood of an announcer.

SHORT WAVES.

POCKET RADIO FOR POLICE.

To trace thieves with morse speed.—"Daily Mirror."

* * *

B.B.C. PRONUNCIATION COURSE.

Sheik.—Can be rhymed with roller skate, motor-bike, or grid leak, as the reader's fancy is inclined.

Llanvairpwll.—This word is pronounced exactly as it is spelled.

Bzznskvks.—A town in Russia. The only way to pronounce this is to say "Procrastination," and sneeze after every other syllable.—"Evening World."

* * *

"Scots listeners have no grouse," we read in the "Daily Express."

But isn't this just the time of year they should have plenty?

* * *

Friend: "What's the idea of the flag in the next garden, George? Is the chap a Japanese or something?"

George: "Oh, no. That's merely a wheeze of old Brown's for letting the neighbours know that he got Yokohama on his crystal set last night."—"Humorist."

* * *

ENCOURAGING!

"Why should jazz music be broadcast up to midnight, keeping everyone up? If the nuisance continues, one can see that the cost of building additional lunatic asylums will be more than the revenue obtained by issuing licences." writes "Anti-Wireless" in the "Birmingham Gazette."

* * *

Harassed Amateur (after vainly trying to separate the stations coming in on his receiver): "I wonder if a wave-trap would be any good?"

Helpful Friend: "What about a mouse trap?"

* * *

There is a whisper from Scotland that real working crystals can be found on the shores of the west coast, and at Strontian, Tyndrum, Rothesay, and elsewhere.

It is understood that severe and widespread excavations are now taking place.

A Star Turn.

OF all the place-names I suppose that the star turn is "Sissiter," which is unkindly spelt Cirencester. Have you heard the local limerick about it? Well—

There was a young woman of Cirencester
Who, having called on her solirencester,
Refused to pay him a fee
Maintaining that she
Had merely looked in as a virencester!

Fire!

FOLLOWING a severe outbreak of fire at Consett, the mangled remains of a wireless receiver were discovered among the ruins. Buried among the bits and pieces were three Mullard valves, one of which had its base almost entirely burnt away and another its legs blacked, though the bulbs in all cases were intact.

When tested all the valves worked, and although the detector was a little off-colour and the S.G. valve was a trifle soft, the pentode was perfect.

Very hot, wasn't it?

A September Treat.

AMONG the broadcasts arranged for September, nothing looks better on paper than the "Choral Singing from Wookie Hole Cave, by the Wookie Hole Male Voice Choir."

Wookie Hole! I have not the faintest idea where it is, but it sounds good to me. And I quite envy the announcer who turns from Chamber music and that sort of stuff to inform the whole wide world he is going over to Wookie Hole, to hear the Wookie Hole Male Voice Choir singing from the Wookie Hole Caves!

Simpson's Station.

SIMPSON is to have a brand new radio station. By "Simpson" I do not mean the chap round the corner, but I refer to the township of Simpson, in North-West Territories of Canada.

You may not have heard of this particular Simpson before because it is way up near the Arctic circle. But you can picture the scene, can't you?

All the travellers, prospectors, missionaries, traders, members of the Royal Canadian Mounted Police and hard cases of Poker Flat and Red Gulch raving with jealousy, while all the lads in Simpson glue their eyes on a snowclad horizon, and speculate on what he will be like—Simpson's radio announcer!

The L.N.E.R. Listens In.

THE new Leeds-London express which is being built by the L.N.E.R. is to be equipped with earphones, which passengers can pick up to beguile the tedium of the long journey. Derby Day and other special broadcasts have, of course, frequently been picked up on trains, but this is the first time that a British railway has provided its passengers with regular programmes.

A small charge will be made for the 'phones, probably a shilling in the slot, or, as they call it in Leeds—"A bob a nob."

Washington Gets Annoyed.

BY a unanimous vote, the Federal Radio Commission has for the first time in history revoked the licence of a broadcasting station. Why? Bad language!

The station in question was in Oregon, and it was punished for the broadcast of obscene and profane language. Apparently the whole trouble arose over politics. One candidate who called himself the Oregon Wolf started to talk about the other fellows.

When properly worked up he described another candidate in such red and blue detail that the old ladies of Portland, Oregon, switched their sets off and went to bed "all of a tremble."

We think there is something to be said for the B.B.C. way, after all.

ARIEL.

EMPIRE RADIO

By Capt. P. P. Eckersley, M.I.E.E.

In the second and concluding part of his special article Capt. Eckersley details an interesting suggestion put forward by his friend, Capt. Round, and says that "it deserves a wide publicity and serious consideration."

AN article last week took up the question of Empire Broadcasting. A short-wave station located in Britain could serve two purposes (*a*) the amusement of the "lonely listener"; (*b*) the interlinking of national systems of broadcasting.

We have, so far, dealt only with the former question, and showed that while the service to the lonely listener is necessarily erratic, it can be improved by the erection of a special multi-wave-length station and by radiating special programmes for special purposes by that station.

Captain Round and I over dinner agreed most heartily that his idea was excellent and deserved to be put up for serious consideration. I have elaborated, I will continue the process.

G5SW is Obsolescent.

It is obvious that our present single wave-length station is obsolescent, it is obvious that the repetition of B.B.C. programmes is of little interest to the lonely listener and it is obvious that the times of transmission are most unsuitable.

Furthermore, a little consideration will show us that it is unfair to ask the B.B.C. either to be responsible for raising the money for an Empire service station or to make special programmes suitable to the service, or to spend revenue subscribed by British listeners for a British service for the benefit of the Dominions and Colonies.

All these problems are solved by taking up the suggestion that the station is erected by a syndicate and run for a profit by private enterprises wishing to be better known throughout the Empire. In fact, this is pure, unadulterated American broadcasting run and paid for by advertisers.

The advantages are manifold. Firstly the programmes will be automatically designed to please the Empire listener and will not be (for him) emasculated by being principally designed for home consumption.

The Money Problem Solved.

Secondly, the service will be competitive to similar services which advertise German, Dutch and American goods over the whole world.

Thirdly, the B.B.C. need have no fear that the station will be heard in Britain, and they can go their own way according to their own Charter and reap their proper reward.

Fourthly, the money question is solved, no one need worry to raise the money by public subscription, by taxation from British listeners, or from unwilling Colonial and Dominion Governments.

Fifthly, the B.B.C. would, of course, co-operate where and when it could, by allowing a rediffusion of the programmes it sponsored and which were suitable for world rediffusion—there need be no hard and fast rule in this matter.

Sixthly, the time question is solved, since the Empire diffusion body would arrange these at perfectly suitable times.

Seventhly, the service could be used for linking up the national systems as and when necessary, although, as I shall attempt to show later, these times are infrequent.

Criticism might ask would there be enough private enterprise programmes to make the scheme paying? One can imagine newspaper groups willing to buy time, particularly those interested in grouping the Empire in closer economic understanding.

The newspapers could not argue that the service would be detrimental to their interests, inasmuch as they are not designed for British listeners, and the advertisers would only be interested in world-wide, as compared to nation-wide, publicity.

Motor-car people would surely come in. Shipping interests represent another group likely to support the scheme.

The Estimated Cost.

Gramophone companies and the makers of sets for a reception of the service would have a unique publicity.

Cable and wireless groups suggest themselves. We are, I am told, an exporting nation, this is an exporter's service to make them better known and to cement world-wide goodwill.

It is very difficult to indicate the cost of such a service. Some people estimate the capital cost at two hundred thousand pounds.

I do not think so high a cost is necessary. I think three transmitters, each with quick wave-change devices would be suitable. I put the whole cost at nearer £100,000 as an outside figure than the one I mention above and have heard quoted.

This would mean a write-off charge of £10,000 a year. Then there is maintenance, land-line charges, personnel, and power supply.

The total cost of running the service might be of the order of £20,000 a year. This would mean collecting more than £50 a day for programmes. This

(*Continued on page* 716.)

A NEW EMPIRE LINK

Receiving messages at Cardington from R100 during her historic visit to the Dominion of Canada.

THE B.B.C. SAYS SO—

SO DON'T ARGUE—A PROVOCATIVE ARTICLE.

By A SPECIAL CORRESPONDENT.

IF you live in a village with a rather unusual name and which you are as familiar with as your own, you had better be careful. One night your village may be mentioned by an announcer, and as he will pronounce its name according to B.B.C. rules, you will probably not recognise it.

If you live in Wales, and your village when named aloud really sounds like a cat sneezing, and if the announcer pronounces it like a dog coughing, you can see for yourself how mistakes are likely to cause confusion.

Case of Ynysddu.

When an announcer was recently called upon to summon an aunt to the bedside of her sick nephew in Ynysddu, in Monmouthshire, he might have been excused for being unaware that this little village is pronounced Unnisthee (th as in then). But the new booklet, "Broadcast English II.," will save him from future pitfalls.

The book has been compiled from information supplied by listeners.

It is stated in the introduction:

"What the B.B.C. has done is to try to find out how the people in the place wish the name to be pronounced when it has to be broadcast, so that there shall be immediate recognition."

Alternative Pronunciations.

Listeners familiar with names that were frequently mispronounced, or with names so spelt that pronunciation was not obvious, were asked to send in the "right" one. This was checked by reference to a vicar or postmaster.

Where there are alternative pronunciations, the B.B.C. has refrained from deciding, so it has given both—or more.

Thus Cirencester may be pronounced Syrencester or Sissiter with equally valid authority, but Bicester is always Bister. Meopham, the scene of the recent air disaster, is Meppam, with no alternative, but Sawbridgeworth, Herts, may be pronounced as written, or as Sápsworth. Treryn, Cornwall, is Treen, and Ailsa, also Cornwall, is Aylia. Clapworthy, Devon, is Clappery, and Cholmondeston, Cheshire, is Chómson.

More "Doubtfuls."

Slaithwaite, Yorkshire, the site of the new Regional station, is allowed no fewer than four alternatives. "So long as she looks like 'Slaithwaite,'" says Mr. A. Lloyd James, in his introduction, "she must be content to be called something like it, and 'Slowit' will be a term of endearment restricted to her nearest and dearest, who may proudly proclaim their allegiance to her by addressing her as such. But so long as she masquerades as 'Slaithwaite' then 'Slaithwaite' she must be to the outside world, and 'Slaithwaite' she will be to the announcer."

"Cirencester," he adds, "must settle her own affairs and not expect the B.B.C. to settle them for her."

With regard to Marden, in Kent (also the scene of a recent air disaster), the booklet states: "The announcer will be criticised however he pronounces the name. If he says Mardén he will be told that it is the only local pronunciation; if he says Márden indignant critics will tell him it is Mardén; if he declares that he is really saying Márdén, he will be told that the place is never pronounced with two accents."

Any reader who questions the pronunciation in the booklet has only to send to the B.B.C. Advisory Committee on Spoken English a well-substantiated criticism, and the matter will be put right in the second edition.

BROADCASTING FOR BATHERS

The "Junior Ladies" department at some Hungarian baths where radio has been installed for the young bathers.

Adult Education.

Mr. C. A. Siepmann, a member of the British Broadcasting Corporation staff lecturing on broadcasting and education at Cambridge recently, said that nothing had been more striking in the history of broadcasting than the elevation through the years of the tastes and interests of the listening public. A complete answer had been given to both the highbrow and the lowbrow.

This has not been achieved by a coterie of "prigs," as some people think, but by answering facts. Those who doubt the effect of broadcasting on the thought and interests of listeners find their answer in the growth of adult education. "Unfortunately we are naturally a lethargic people when it comes to intellectual matters, and we are too prone to accept what we are told. Our aim is to produce among our listeners an enlightened scepticism. We regard broadcasting as a stage in adult education. It takes education out of the schools and into the home."

Mr. Siepmann believes that the majority of listeners insist on a programme which, to put it mildly, would not be imaginative. "There are opposite and sometimes rival sections among the listeners. Everyone wants everything at once. Some want philosophy, and some want jazz."

Do *You* Agree?

Although there is no doubt that Mr. Siepmann is right in claiming that broadcasting has done a great deal to elevate the tastes and interests of the listening public, we wonder how many listeners will agree with him when he contends that the majority "insist on a programme which, to put it mildly, would not be imaginative."

Surely it is the other way round. That listeners demand more imagination in the B.B.C. programmes; more originality and variety? But if the B.B.C. holds the view that the majority of listeners are such dull dogs that imagination must be kept out of the programmes, then we have a perfect explanation for the monotony and general "sameness" of programmes. It is a pity Mr. Siepmann holds ideas like that, but no doubt it is part of his duty to do so in order to conform with the famous policy: "The public must not be given what it wants." Well! Well!

* * *

The following is the list of recommended pronunciations:

WORD.	PRONUNCIATION.
Allied	Allied, but 'Allied Forces'
Amenable	Améenable
Amenities	Améenities
Behove	Behófve
Comrade	First syllable rhymes with 'Tom'
Donor	Dónor (second syllable pronounced like 'nor')
Expiration	Expyráyshon
Explosive	's' as in 'send'
Fanfare	Fánfair
Flaccid	Fláksid
Gibberish	'g' as in 'go'
Hospitable	Accent on first syllable
Joust	Jowst ('ow' as in 'now')
Livelong	Lívlong
Nescience	Néssience
Organisation	Organyzáyshon
Patron, Patroness	Páytron, Páytroness
Patronage	Páttronage
Patronise	Páttronise
Protocol	Prótocol
Puisne	Púny
Questionnaire	Kwestionnáire
Record (noun)	Récord (second syllable pronounced like 'cord')
Record (verb)	Recórd
Reredos	Réerdoss
Transference	Accent on first syllable
Vacate	Vácáyt
Vacation	Vácáyshon
FOREIGN WORDS.	
Brochure	Broshúre
Cacique	Kasséck
Harem	Háirem
Kimono	Kimóno
Levee	Lévvy
PROPER NAMES.	
Adirondacks	Addiróndacks
Albania	Albáynia
Eros	Éeröss
Riviera	Rivviáira
Seidlitz	Sédlitz
Yosemite	Yosémmity ('s' as in 'send')

POWER POINTERS

Some facts about the mains supplies that will help you to use them safely and to their best advantage.

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

D.C. mains nearly always have one lead earthed. It is not always the same lead, sometimes it is the positive one and at other times the negative. You can never be sure which it is unless you test for it.

The way engineers generally locate the earthed lead is as follows, although amateurs who do not know much about electricity should not attempt such an experiment.

An ordinary electric light bulb such as is used in the house for lighting is inserted in a socket or lamp holder, and one of the leads from this is connected to some object known to be earthed, such as a water pipe.

A Triotron Rectifying Valve.

The other lead is then touched against first one and then the other of the mains wires. In the one case the lamp will light up and thus indicate that you have in circuit the live main, the one that is *not* earthed.

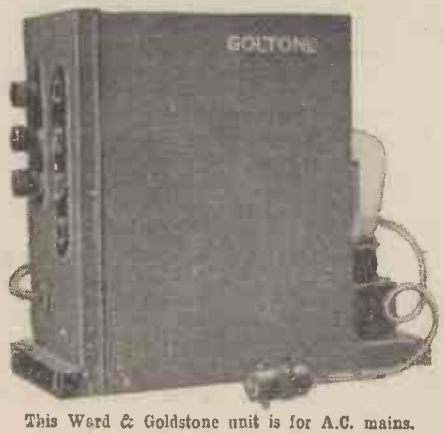
Rectifiers.

You always have to be careful that you yourself do not provide a connecting link between a mains wire and the earth. Always treat anything connected to the mains, as well as the actual mains leads themselves, with the very greatest respect. You have no proof of your own resistivity until you put it to the test, and then——!

Alternating-current mains are not earthed, so that both wires are equally alive.

Alternating current changes its direction so many times per second. It flows first in the one direction and then in the other. A mains unit incorporating a half-wave rectifier makes use of only that part which flows in the one direction.

On the other hand, a full-wave rectifier employs the current flowing in both directions. You get twice the output with a full-wave rectifier and the reason for this is obvious when you think it over.



This Ward & Goldstone unit is for A.C. mains.

Current in amperes represents a certain amount of electricity flowing in a certain time. Now A.C. current consists, as I have already said, of current that flows first in the one direction and then in the other (and an equal amount flows in each direction).

If, as in a half-wave rectifier, you wash out the current that tends to flow the one way, it is clear that, in a given time, only half the quantity will have been used.

It is said that while full-wave rectification has advantages from an economic standpoint, it is not so easy to smooth.

The "Tekade" battery charger (Dr. Nesper) is particularly compact.

That is to say, it is more difficult to eliminate hum with a full-wave rectifier than with a half-wave type.

The reason for that may be found in the rather different output that results. "P.W." readers might find it interesting if I explain this in detail because I do not think such an explanation has yet been ventured before in print, although it is one of those little things well known to engineers.

Doubling Hum Frequency.

First of all let us refresh our memories in regard to the construction of a cycle of A.C. A cycle of alternating current represents one complete series of operations. First of all the current rises from zero to maximum in the one direction and then falls again to zero. It then rises from zero to maximum in the other direction and falls back once again to zero. Thus you have two half cycles completing one full cycle.

The half-wave rectifier eliminates one half cycle. Its output, therefore, is a current that fluctuates from zero to maximum and back to zero as many times per second as there are cycles in the original supply—fifty in the case of fifty-cycle mains—and that represents the frequency of the irregularity that is heard as a hum that has to be smoothed out by chokes, condensers, etc.

But with a full-wave rectifier the output consists of a rise and fall of current of twice the frequency of the supply for the simple reason that both half-cycles figure in the operation.

This combined unit (Edison-Bell) gives both H.T. and L.T.

The full-wave rectifier has twisted every other half-cycle round, to line it up uni-directionally with the remainder of the current; so that in the case of fifty-cycle mains, instead of having an irregularity of 50 to work with you have a hum with a frequency of 100.

It will no doubt be unnecessary for me to tell you that any loud speaker will deal much better with a frequency of 100 than with one of 50. Indeed, some loud speakers will absolutely ignore the lower frequencies.

Mind Those Condensers.

Do not forget the efficiency with which modern condensers can store electricity. Some fixed condensers can retain their charges for hours at a time, therefore always make sure that the condensers in a mains unit are discharged before you touch them.

The unit may have been completely removed from the mains and yet the condensers can still give you a nasty shock.

To discharge a fixed condenser short circuit the terminals with the blade of a screw-driver, making sure you hold this tool only by its wooden handle.

A full-wave rectifier made by Cossors.

LATEST BROADCASTING NEWS.

DIVERSIONS FROM THE WEST.

BUXTON BROADCASTS—PROMENADE CONCERTS—RED INDIAN PROGRAMME—A BARONET'S DANCE BAND.

Mention has already been made of the fact that Cardiff is contributing to the Diversions Programmes which Provincial stations have been arranging during the last few weeks. These are being made available to listeners in the South as either S.B. broadcasts from the National or London Regional transmitters.

Cardiff's Diversions will be heard on Tuesday, September 9th, and is called "The Underworld of the West." It will, of course, include some Pennillion singing, a sketch about a coal mine, after which comes the sound of a train as it approaches the Severn Tunnel—the longest in Great Britain—and in which the microphone will be installed to pick up the noise of the pumps which are in continuous use in the bowels of the earth.

The venue is then changed to the famous cave known as the Wookey Hole, which, as is generally known, has three huge chambers through which the River Axe flows, and which in the distant ages was said to be the abode of a tribe that came from Brittany two hundred years before the arrival of Julius Caesar.

From here listeners will hear items by the Wookey Hole Male Voice Choir, which should indeed be effective. The programme will conclude with Welsh airs played on the harp, a song by that famous West Country writer, the late F. E. Weatherly, K.C., and a poem by A. G. Prys-Jones.

Buxton Broadcasts.

Buxton is on the list of Northern resorts from where listeners in that Region hear regular relays of music and concert party entertainments, but something out of the ordinary from this fashionable Derbyshire spa is included in the programmes on Friday and Saturday, September 12th and 13th, respectively.

On those days, and also on Sunday, September 14th, Buxton is holding a Musical Festival, when the local Municipal Orchestra and the Northern Wireless Orchestra are combining to give three concerts.

These concerts will be conducted by Mr. Horace Fellowes, conductor of the Buxton Municipal Orchestra, Mr. T. H. Morrison, of the B.B.C., and Sir Hamilton Harty. Listeners are to hear the concerts on Friday and Saturday.

Promenade Concerts.

The dates on which the Promenade Concerts will be broadcast during the rest of the season are as follows:—

National.—September 6th, 8th, 11th, 12th, 16th, 17th, 19th, 24th, 25th, 27th, 29th; October 1st, 3rd, and 4th (final night).

London Regional.—September 5th, 10th, 13th, 15th, 18th, 20th, 22nd, 23rd, 26th, 30th, and October 2nd.

Red Indian Programme.

There was once a time when the programme builders "looked at the news" to assist them in arranging our wireless fare, and very interesting topical programmes often resulted. This method seems to have entirely ceased at Savoy Hill where, what with symphony concerts and other big events, the use of the old method has been dropped.

Nevertheless, some of the Provincial stations still find inspiration from the news of the day, and an example appears in the North Regional programmes on Monday, September 15th, when a short concert of Canadian Music will be played by the Northern Wireless Orchestra and, as a vocal contribution, a Suite of Four American Indian Songs by Charles Wakefield Cadman, a composer who sought inspiration from the folk music of the Red Indians.

The appropriateness of the programme can be accredited to the record flight to the Dominion and back by the R. 100, and to the recent elections.

A Baronet's Dance Band.

A dance band conducted by a baronet will be heard again by Midland Regional listeners during September. The baronet is Sir Robert Peel, whose forebear formed the modern police force, and was once Prime Minister of England.

His "boys," as he calls the band, were found among miners in Staffordshire where Sir Robert has his country seat, soon after the general strike, when he opened a club for men who were unemployed.

So proficient did the band become that Lady Peel, who is Miss Beatrice Lillie, the famous stage star, suggested that the combination should try its luck on the stage.

Sir Oswald Stoll arranged an audition, with the result that Sir Robert has now added dance band conducting to his other accomplishments, which include cow punching on the Western plains and leading the life of a West of England fisherman, not to mention numerous other vocational side-lines which baronets do not usually take up.

THE NIGHT HAWK

This picture shows Capt. Brewer, the B.B.C. commentator, talking to Capt. Spafford, the pilot of the "City of Melbourne," before the recent night broadcast from the air. The pilot is holding the plane's aerial, from which the commentary was radiated, and as soon as the broadcast was over the plane proceeded to Croydon without descending.

FOR THE LISTENER

This week our popular contributor—who is still holiday-making in Italy—tells of his listening experiences there with "Belinda," the portable set.

By "PHILEMON."

Earth and Air.

BELINDA has been behaving herself very much better. I find that it was my fault—as usual. A small boy, aged about ten, here on his holidays, told me that *my earth-wire was much too near the aerial lead.* As soon as we separated them, signals improved a hundred-fold!

Am I not the son of a hen? Here was I bothering about condensers and microfarads, when the only trouble was that I was earthing my aerial before the waves got into the set!

Like a man trying every conceivable trick to get his car to start, and neglecting to see if he had any petrol!

The Proms.

Consequently I have been enjoying the Promenade concerts from the Queen's Hall, particularly one on a Tuesday which came via the London Regional, just as comfortably as you have. All of us here were very much interested in the Villa-Lobos Chorus (No. 8).

We were lucky in having a young musician with us who explained that this Brazilian composer based much of his music upon the folk-music of the South American Indians, and we spotted the old Indian tune in the Chorus. There were difficult moments in the music for an old-fashioned person like me, but there was a freshness and a vitality about it which I found quite bracing, and I should like to hear more.

Explanatory.

There is one point in which I think the Continental programmes go one better than the English ones. They so often introduce a piece of music, which may be unfamiliar or difficult, with an explanatory talk.

This must be very useful to the average listener. The B.B.C. probably takes it for granted that listeners read the explanations

(*Continued on page* 714.)

CANADIAN BROADCASTING

Broadcasting in the Great Dominion of Canada is in the "melting pot," and shortly the whole business is to be thrashed out in the Canadian Parliament. In this special contribution you are given a clear idea of the numerous conflicting interests that have to be considered, and an insight into the domestic structure of Canada.

By JAMES MONTAGNES.

CAN Canada successfully operate a government-owned broadcasting system in competition with United States broadcasting under private ownership? That is the question that is before the Canadian Parliament this session in the form of a radio bill which will eliminate private broadcasting companies for a government-owned and operated company.

The Canadian radio bill is the outcome of the report of the Royal Canadian Commission on Broadcasting. That report is, in turn, the result of the closing down of four stations owned by an internationally-known religious organisation by officials of the radio department of the federal government, because listeners throughout the Dominion were disgusted with the programmes that came on the air from these stations.

However, such a furore was raised by the religious organisation and its political friends that the government was forced to appoint a commission to study broadcasting conditions in the Dominion and recommend a policy for future broadcasting in Canada.

The recommendation of the commission outlined a broadcasting company owned by the Canadian government. The present radio bill closely follows that recommendation.

High-Power Stations.

In brief, the radio bill calls for the erection of seven high-powered stations from coast to coast. These stations will be similar to the American broadcasting plants, such as W E A F at New York. In addition, there will be four smaller stations. All present broadcasting stations are to be taken over by the government and their owners reimbursed for the value of the apparatus. Programmes will be planned by a committee of twelve, representing the nine provinces and the federal government.

The scheme is so different to anything in operation in North America, that the radio bill is scheduled a stiff fight before it will become legislation. Broadcasting owners and manufacturers of radio apparatus have aligned themselves to present a solid front against the government. They will prove the strongest opposition.

Arguments For and Against.

There is no doubt that, theoretically, the scheme is excellent. In fact, so state the opposition, with good guidance, government broadcasting might even be a success. On the other hand, their strongest arguments are the alleged poor broadcasting conditions in countries such as Great Britain and Australia, where government monopoly prevails, and the vast United States broadcasting system near at hand under private ownership.

Government officials, a number of leading newspapers and a large percentage of the public, are in favour of the bill. The first-named are, as a matter of fact, confident that government-owned broadcasting will come to Canada before long.

And the listening public is being shown by the improvements in broadcast programmes from Canadian stations during the last year, that they do not have to listen entirely to United States stations to pick up good musical entertainment. There is first-class talent in Canada.

The strongest point for government ownership is not the erection of super-power stations, nor the improvement of musical entertainment. The elimination from the air of all the ballyhoo which those who now supply the programmes insist on accompanying the fine entertainment available is the point that will swing the bill to become law. Direct advertising of any sort is taboo in Canada if the radio bill goes through.

Advertising Revenue.

No doubt many American radio listeners would welcome a similar elimination from the programmes that blare forth from the loud speaker. Many a good programme has been entirely ruined because the advertiser was anxious to crowd in as many words as possible relative to his wares. Instead of gaining the goodwill of his public, he loses listeners and customers. Such a state of affairs will not be tolerated if the recommendations of the Royal Broadcasting Commission are enforced.

And yet advertising is to play an important part in supplying the radio entertainment for the Canadian listeners. It will bring the Canadian Radio Broadcasting

(*Continued on next page.*)

MEN OF THE MOMENT.

The Royal Canadian Radio Commission, which has investigated broadcasting in many countries, in order to frame recommendations for the Canadian Government. Seated, is Sir John Aird, the Chairman and President of the Canadian Bank of Commerce. Standing are (left to right), C. A. Bowman, managing editor of the "Ottawa Citizen"; Donald Hanson, Chief Radio Inspector of Canada; and Dr. Augustin Frigon, of Montreal.

CANADIAN BROADCASTING.

(Continued from previous page.)

Company, as the government-owned system is to be known, an annual income estimated by the Commission at $700,000.

Advertisers will be allowed to rent time on any of the stations of the company, under two provisions. Firstly, their programme must be of high calibre, and, secondly, their firm name can go on the air at the beginning and end of the programme only.

"The programme to which you have listened for the past hour has been sponsored by the Blank Company," will be the only form of advertising to be allowed on the air in Canada when the Dominion takes over broadcasting.

The axe is on its way to cut down the long-winded harangue about automobiles, radio receivers, soaps, hot dogs, and every other conceivable product that is to-day advertised over the air.

Every System Investigated.

Canadian broadcasting as it will be under government ownership employs the best points of radio broadcasting systems throughout the world. Every country was surveyed by the Royal Commission before it made up its recommendations. The United States was visited on several occasions. Europe was thoroughly toured, and all the improvements noted under government monopoly in Great Britain and Germany.

Canada was fine-combed for opinion from every walk of life on the broadcasting situation and suggestions for improving broadcast entertainment. Three months were spent on the Dominion alone, visiting twenty-five principal cities and holding public hearings, while letters poured in from every part of the country to augment this vast amount of material.

In the United States notes were made especially on technical advances and the direction of chain programmes. In Europe every phase of government ownership was carefully studied. Everywhere the commission went it received the wholehearted support of government officials and radio men. It was found that, with the exception of North America and a few countries in Europe, government control of broadcasting was universal.

It was a momentous recommendation that the Commission turned in. It is a big step that the Canadian government is asking the representatives of the people to make. And that this is realised by even those in favour of the radio bill is best shown in the words of the Hon. P. J. A. Cardin, Minister of Marine and Fisheries, under whose department the radio branch falls. Mr. Cardin, sponsor of the bill, said recently at Ottawa:

"What makes the problem especially difficult is that we do not know what radio broadcasting will be like in five years."

The system outlined in the bill is simplicity itself. It calls for the formation of the Canadian Radio Broadcasting Company, a joint stock company similar to the Canadian National Railways, the government-operated road that crosses the Dominion from coast to coast. The stock company will own all the broadcasting stations in the Dominion, will pay all the expensesof operating and will, therefore, collect all the revenue.

It will be managed by a directorate of twelve, three from the Dominion government and one from each of the nine provinces. These provincial directors will be chairmen of the provincial broadcasting bodies to be formed, their work including all programmes for their respective provinces. On national hook-ups the complete directorate will work together.

In order that there be no ill-feeling the government will pay compensation to those concerns now operating broadcasting stations. It is pointed out that Canada does not need to do this, that it is but necessary to recall the licences issued under the radio-telegraph act of 1913, to stop the stations from Broadcasting.

But since broadcasting has done some good for Canada thus far, those who supplied that entertainment should be reimbursed for the equipment they bought to do the broadcasting. It has been estimated that over three million dollars will have to be paid out to 78 stations for this equipment, most of which will have to be scrapped, as it is out of date.

The bill further mentions the creation of a chain of eleven stations from coast to coast. Seven of these will be 50 kilowatt stations. Three of them will be of 5 kilowatt power and one of 500 watts.

This equipment is estimated at $3,225,000 as the smaller stations are already in existence and will merely require shifting from one place to another. This money as well as the money to reimburse the station owners for their present equipment is to come out of the national treasury.

To operate such a chain of stations will cost annually approximately $2,500,000. $1,000,000 of this is to be in the form of a subsidy from the government. $900,000 is to come from listeners' licence fees. An annual fee is now being paid by listeners in the Dominion amounting to $1. This will be raised to $3. At present some three hundred thousand or half of those who own receivers pay this fee.

The amount to be collected therefore is a conservative estimate.

In Great Britain the annual fee is approximately $2.50; in Japan, Australia and Germany the equivalent of $6. The other revenue is to come from the rental of time on the air for indirect advertising, or as it is now known, sponsored programmes. About $700,000 is expected from this source.

Eliminating Interference.

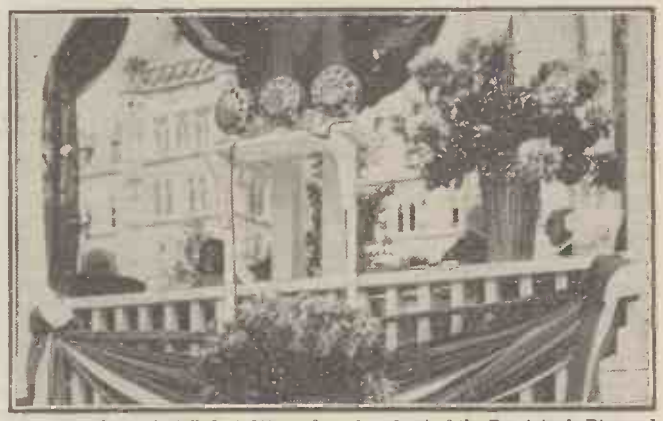
The nationally-owned company is not to have charge of anything else but the service it can render listeners, matters of wavelengths, licensing stations and listeners, these are to remain as at present in the hands of the Radio Branch, Department of Marine and Fisheries.

An interesting feature of the radio bill is the section which deals with interference. Every radio listener knows that there are times when some noise or other mars the reception of a good programme. Such noises are known in technical language as radio inductive interference. Man-made static is perhaps a more expressive term. It includes all those electrical energies sent out into space from electric toasters, oil furnaces, elevators, motor-cars, electric signs, street-car lines, power transformers, X-ray machines, and a host of others of similar ilk.

For a number of years the Canadian Government has operated a fleet of automo-

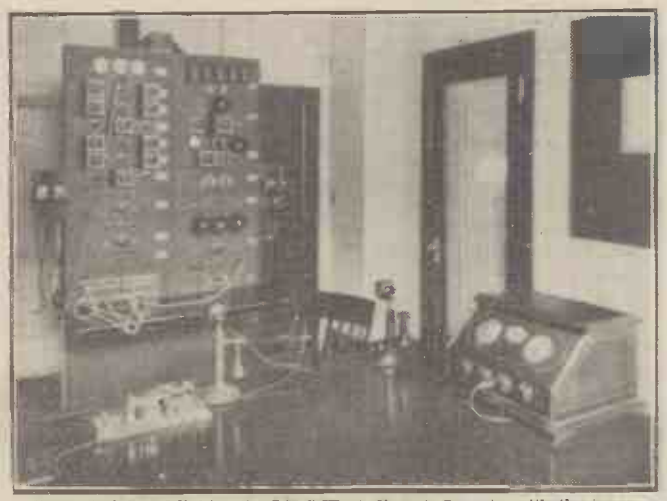
(Continued on page 712.)

A CANADIAN "CHAIN."



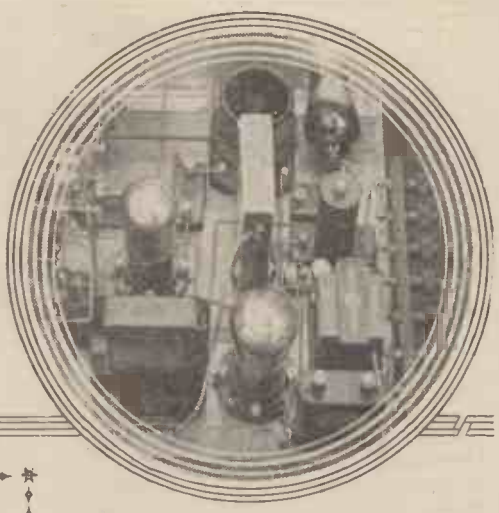
The microphones installed at Ottawa for a broadcast of the Dominion's Diamond Jubilee broadcast in 1927, when, for the first time, eighteen stations from Halifax to Vancouver were linked for a simultaneous transmission.

DISTANT CONTROL!



The control board linking the C K G W studios at Toronto with the transmitting station forty miles distant.

DEALING WITH HUMMING



Here are some really practical suggestions to try if you are troubled with humming when working your set from the mains.

By A. S. CLARK.

"BUZZ-Z-Z-Z!" goes the set, and keeps it up no matter what is done, or whether reception is taking place or not—and the disappointed purchaser of his first mains unit switches off in disgust!

To help you, and to save you trouble, should you ever find yourself in a predicament such as I have described, I am going to give you a few hints on stopping humming with mains units.

First of all you must make sure that you

This attractive-looking instrument is a Dubilier mains receiver.

are not over-running the mains unit. By this you should understand that I mean taking more current from it than the makers intend it to give.

Sometimes the use of a smaller power valve, or an adjustment of grid bias (if its value is not right) will cure the humming by bringing the current consumption within the rating of the unit.

Use an Output Filter.

The foregoing, of course, refers to H.T. mains units, but where L.T. is also obtained from the unit the same check should be applied to the filament current.

Assuming that you are working within the limits of your mains unit, the next step is to ascertain how the output terminals of your receiver are connected to the last valve. By tracing out the wiring you will easily be able to find out whether they are directly in the last valve's anode circuit or whether an output filter is employed.

One of the all-mains sets of high repute made by Philips Lamps, Ltd.

If you have an output filter you will have to try some of the later suggestions. On the other hand, if you have not, you should fit one right away and see whether it cures the trouble.

Even if it does not stop the hum completely, it is almost sure to reduce it, and

The valve on the left is a Vatea rectifier made by Abbey Radio, and the one on the right a Dario rectifier.

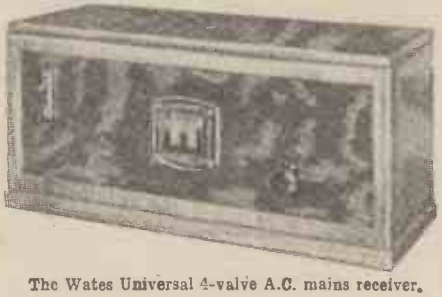
in any case it is always a desirable refinement for several other reasons.

The next step in our hunt for silence is to try extra smoothing in the form of more shunting capacity. Large fixed condensers of the Mansbridge type with a capacity of 1, 2, or 4 mfd. are required. The larger the capacity the better.

These are to be connected between H.T. positive taps on the unit and the H.T. negative terminal. Commence by trying one on the detector tap, going to the other taps afterwards. Sometimes a number of condensers in parallel across one tap are better than one extra one across each tap.

It will sometimes pay you to experiment with different arrangements for grouping the H.T. positive terminals on the set to the positive taps on the unit.

If the hum has not completely gone by now, the following scheme is almost bound to remove it. It consists of inserting de-



The Wates Universal 4-valve A.C. mains receiver.

coupling resistances in the H.T. positive wires.

These resistances should have a value between 25,000 and 50,000 ohms, and should be put on the mains unit side of the extra fixed condensers that I have been telling you about. Try one in the detector lead first, unless of course the set already has an anti-motor-boating device incorporated in its H.T. lead.

For very Obstinate Cases.

The resistances can then be tried on intermediate L.F. stages and H.F. stages. The larger the current flowing through the particular H.T. lead being dealt with the lower the value of the resistance may be.

With adjustable taps it is useful to increase their value a little to make up for the voltage drop across the resistance.

In very obstinate cases of hum it is possible to overcome the trouble by using L.F. chokes in the above manner in place of the resistances. Chokes such as are used for output filters are the right kind.

This L.F. choke is one of those made by Messrs. Wright and Weaire, who make chokes for all kinds of purposes.

NOTES FROM THE NORTH.

All the latest news about the North Regional station, the programmes, special items, and broadcasting in general in this important area is given.

By OUR NORTHERN CORRESPONDENT.

EXCELLENT progress is now being made with the erection of the North Regional station at Moorside Edge. The buildings (similar to those at Brookmans Park) are almost completed, and the installation of the two high-power transmitters and the power plant will commence before long.

Owing to the extraordinary weather experienced on this mountainous site the B.B.C. and the contractors have had to overcome greater difficulties at Moorside Edge than they have faced when erecting any other British broadcasting station.

When one recalls the delays due to the severe winter it is, indeed, great credit to the contractors that the work is now well up to schedule.

New Station Tests.

It was rather surprising to find that the erection of the masts was only recently commenced. Mast-building is fair-weather work, and the three 500 ft. giants will have to be finished before the winter gales set in. These masts, which are similar to the two 5 X X masts at Daventry, have been specially designed to withstand the terrific force of gales experienced at Moorside Edge.

If all continues to go well the first test transmissions will be heard in November or December, on the 479·2 metres wavelength. It is hoped that this transmitter will be broadcasting during programme hours before the end of the year.

The other transmitter will start testing on 301·5 metres early in the New Year, and then both will take over the complete service. All the existing North of England stations will close down, with the exception of Newcastle.

Moorside Edge is not expected to give adequate service so far north as Tyneside, so the Newcastle transmitter will be maintained; but the B.B.C. is unwilling to disclose the nature of the programme that 5 N O will then transmit, even if it has made up its mind on the question.

Catering for Tyneside.

At present Newcastle relays the mixture of National programme items and North Regional items which is broadcast by all the northern stations. From Moorside Edge the National programme will be broadcast on the 301·5-metre wave-length, and the North Regional programme on 479·2 metres.

As Tyneside listeners are to be outside the range of satisfactory alternative programme reception, it is probable that they will prefer their local transmitter to give the National programme, possibly with occasional local items, and as the Newcastle studios are being kept in order it looks as though this may be in the B.B.C.'s mind.

During the summer an increased percentage of programmes of northern origin have been broadcast by the North Regional transmitters instead of relaying the National programme. It must be said that the North Regional staff has distinguished itself in these programmes.

The outside broadcasts, under the enterprising direction of that excellent showman, Victor Smythe, have been particularly good; and so have the musical programmes, in which the Northern Wireless Orchestra, under T. H. Morrison's versatile leadership, continues to perform so brilliantly that northern listeners can hardly bear to think of the disbandment.

Carrying On!

The orchestra's latest feat was to continue to play through a programme, without missing a single note, although the studio lights went out, with one exception. This light produced hardly any illumination in the big Manchester studio; but the deputy conductor, John Bridge, had an inspiration—he lit a cigarette and used its glowing end as a baton.

As a regular listener to the northern programmes, and as one who knows the men behind the scenes, I feel particularly optimistic for the future North Regional programme from Moorside Edge, provided that Savoy Hill does not interfere.

If Savoy Hill looks after its own affair (the National programme) and leaves the northern staff to look after the alternative programme, I am confident that the north of England will obtain really satisfactory alternative programmes.

If the two programmes are to contrast effectively, it is desirable that they should be the products of two different mentalities. The trouble with the so-called alternative programmes broadcast by Brookmans Park is that they are both the standardised products of the Savoy Hill mentality.

The B.B.C. has the chance to do better in the north. The northern staff is enthusiastic and able. Savoy Hill can best help by leaving them to their own resources—and by cancelling this astonishing decision to disband the Northern Wireless Orchestra.

My chief criticism of northern programmes in the past has taken the form of an appeal for more light and frivolous items. There is no longer need for that request.

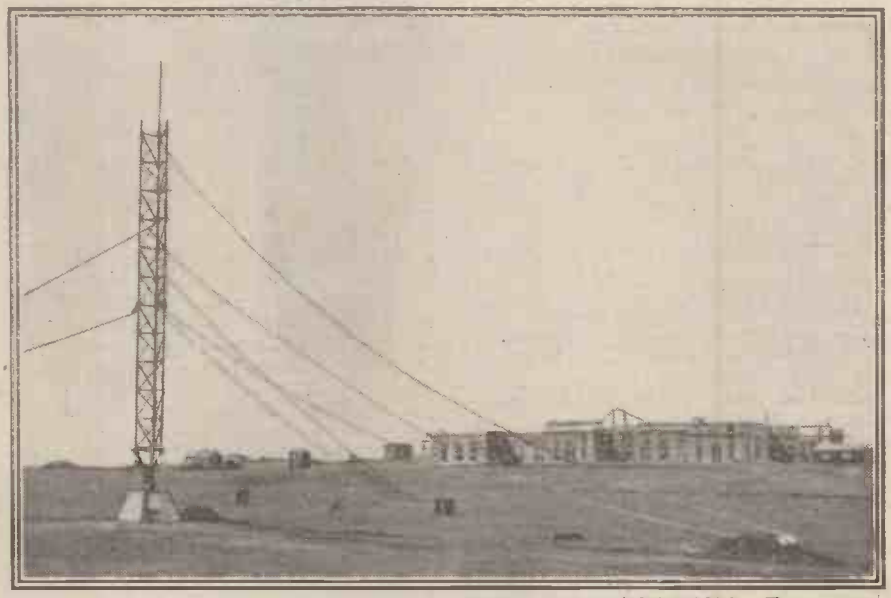
Vaudeville, concert parties, and revues are now receiving proper attention at Broadcasting House, Manchester. The Summer Mummers party, inaugurated some weeks ago, has great promise, but it would probably be better if these programmes were limited to snappy half hours.

The Summer Mummers should be energetically developed as a regular feature of northern programmes. They have abundant talent, especially vocal. They know that a catchy, well-sung chorus wins the north's heart. Their weakness has been dialogue; the B.B.C. should search the north for a writer who can brightly hit off the topic of the day, and employ him to supply them with chatter and skits for the Summer Mummers.

Diversions from the North.

The Northern Region was to supply the "Diversions" programme in the National programme on September 3rd. One hopes that their effort will prove more successful than the recent Birmingham "Diversions."

THE NORTHERN MASTS BEGIN TO GROW



The North Regional station is progressing well, and the masts are now about 200 feet high. Here you see the first one in its earlier stages.

STOP PRESS.—When the Northern Wireless Orchestra returned from holiday the following appeared in the page of notes on northern programmes in the "Radio Times": "The North Regional programmes never seem to be quite the same when the orchestra is away." Why, then, disband it when North Regional programmes are to be more extensive than ever?

CAPT. ECKERSLEY'S QUERY CORNER

METHODS OF SCREENING—DE-COUPLING DEVICES—GOING OVER TO A.C.—SHARING AN EARTH.

Under the above title, week by week, Captain P. P. Eckersley, M.I.E.E., late Chief Engineer of the B.B.C., and now our Chief Radio Consultant, comments upon radio queries submitted by "P.W." readers. But don't address your queries to Captain Eckersley—a selection of those received by the Query Department in the ordinary way will be dealt with by him.

Methods of Screening.

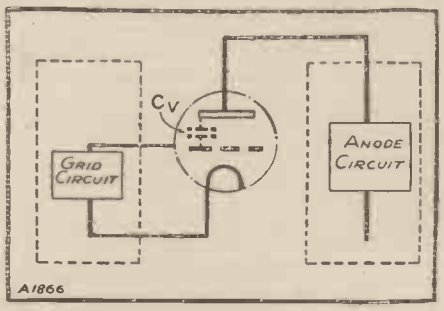
O. T. (Stoke Newington).—"Would you kindly inform me whether there is any advantage to be gained by inserting a screened-grid valve through a hole in a vertical metal screen as against mounting it on the baseboard to one side of it?"

I take it you mean "as against mounting the valve on the baseboard on one side of the screen.

Well, you see, if you take any valve circuit as in the figure it has an anode circuit output circuit part and a grid circuit input circuit part. Now you don't want these circuits to couple at all, so let's put a screen round them (shown dotted).

But what of Cv, the valve capacity? That couples anode circuit and grid circuit,

PREVENTING COUPLING



Anode and grid are coupled by the inter-electrode capacity Cv.

doesn't it, in spite of screens? So we get (see second figure) a screen between grid and anode.

But this must be earthed, and part of the other screens. But if it's earthed as regards H.T., the valve won't work. The screen must be connected to +H.T. something.

So our compromise is to make the screen A.C. earth potential by bringing it very near the other earthed screen. So poking it through the hole is the right method.

* * *

De-coupling Devices.

W. H. H. (Sevenoaks).—"Having recently purchased the parts for a mains unit to work from my electric supply, I intend to build the unit, but wish to incorporate de-coupling schemes into the set itself. I was advised to fit 500 to 600-ohm resistances in the H.T. leads feeding the screened-grid valve. Can you kindly inform me whether the resistances serve any useful purpose, or can I improve on the arrangement?"

De-coupling schemes are certainly necessary with certain types of sets, although it is extremely difficult to generalise. The point about it is that the ideal arrangement is to have separate mains for each valve. It is not usual for supply companies to install five separate feeders, say, into one house! So all the feeds to the valves have to be "commoned" across a smoothing condenser. It is impracticable to make this smoothing condenser of so large a value that it does not present a low-frequency resistance, and so each valve is coupled to the other, and the load that it takes influences the load on the other valves. This sets up oscillations, or what is frequently called "motor-boating," and can only be prevented by de-coupling the valves in terms of resistances. I do not think you can improve on the arrangement of connecting resistances in the individual feeds, with condensers to H.T.—.

* * *

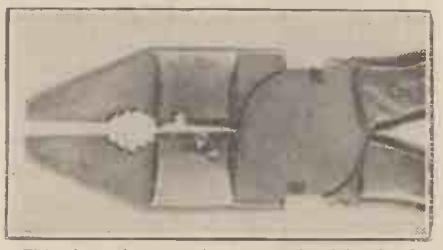
Going Over to A.C

A. M. (London).—"I am at present using a home-made D.C. H.T. battery eliminator which is giving me every satisfaction, from the point of view of a silent background.

"Now I am given to understand that the mains will be changed over shortly to A.C. of 50 cycles. Instead of 'scrapping' my eliminator, I intend to add an A.C. rectifying equipment, but would be pleased if you could tell me whether further smoothing will be desirable."

I am sorry, but as you do not specify the values of any of the components in your present eliminator, and as I do not know the character of the mains which you are using, I cannot possibly answer this question.

PUNCTURED PLIERS



This shows how *not* to use a pair of insulated pliers, for somebody cut a mains lead with this pair, to discover with a blinding flash and a general blowing of fuses that the power was not switched off! Note the holes fused in the jaws of the pliers.

You may be using a Farad capacity across your mains, for all I know! And, if I know anything about D.C. mains, it may be that a very small condenser on the set side of a choke is quite sufficient.

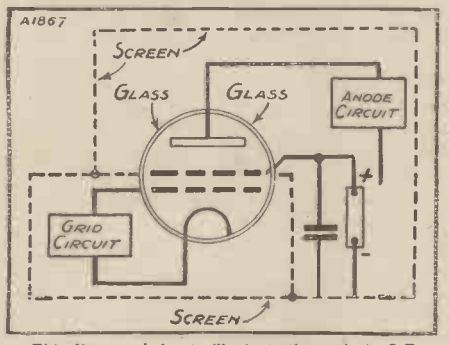
D.C. mains have a large self-capacity, and the elimination of ripple is usually possible by connecting a choke in *series* with the mains and then running a small condenser *across* the output, the set side of the choke being connected to the condenser. I have used very small condensers with a large choke, but the same conditions do not necessarily apply to A.C.

* * *

Sharing an Earth.

B. A. C. (Dundee).—"My neighbour has an excellent earth consisting of a copper

THE S.G.'s SCREEN



This diagram helps to illustrate the reply to O.T., Stoke Newington.

tube, 6 ft. long and 2 in. diameter, buried in the ground. Since my own 'earth' is rather poor, and it would only mean increasing the length of my earth lead a foot or so, do you think that my neighbour's reception will be interfered with if this common earth is used in this way?"

Theoretically, if the earth is perfect there should be no mutual interaction between two receivers tied on to one earth. But no earth is perfect, and theory may be right, up to a point, but fail to be complete.

I think you could almost certainly get some interaction—but it's impossible to prognosticate the amount. Why not try?

Then you would be in a position to confirm me in my opinion that there could be interaction, or tell me I was wrong—in which case I should wisely refer you to my original remark, and say that, for once, a neighbour has achieved perfection!

An amazing 4-valve circuit

— Not a single difficulty in assembling

It has been found necessary to design an ENTIRELY NEW CIRCUIT to enable users to cut through the NATIONAL, REGIONAL and LOCAL stations. In this respect practical tests conducted in all parts of Great Britain and Ireland have proved without question that this assembly kit offers an almost unlimited choice of stations far and near, entirely free from interference. You will find absolutely no difficulty in assembling the "OSRAM MUSIC MAGNET 4," although it is of advanced design, necessitated by the modern broadcasting conditions both in this country and on the Continent. Wherever you reside you can be sure of the utmost of radio enjoyment with this latest radio marvel.

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4. Change of wave length is effected by an external switch and the set need not therefore be opened.
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6. Assembly is the essence of simplicity.
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SHORT-WAVE NOTES.

The latest news about short-wave reception and conditions, including details of some interesting DX observations.

By W. L. S.

AFTER the longest period of "dud" conditions ever recorded, the distant stations are once more making themselves heard, and there is a distinct prospect of a great and, we hope, lasting improvement. Several of my more regular correspondents, notably "G. C. A." of London and "R. C. A." of Plymouth, mention this.

The former also backs up what has always been my experience on short waves, namely, this, that during these bad spells, when the "regular" stations cannot be heard at all, one always hears sundry "freaks" and stations in new countries that have never previously been heard.

New Stations Reported.

Furthermore these generally come over at extremely good strength. This looks as if my previous idea that conditions are always good *somewhere* may have something in it. That would mean that when we hear very few stations on the air the conditions are bad for the parts of the world with the thickest "radio population."

That would then be good for some other large areas, probably including the Pacific Ocean (which is *not* thickly populated with amateur transmitters!) and all these "stray" places that one hears.

The recent spell (by which I mean the past few weeks) has been a notable example of this. None of the regular high-powered stations, although they are definitely known to be on, have been coming through at all, and yet I have a whole crop of letters reporting new stations in the persons of H H 7 C in Haiti, V I Y B of Barbados, and S X 5 M, a boat from Salvador. The odds are that when the "regulars" start pouring through again in their old style we shall never hear these three!

"G. C. A." also mentions that during this queer spell he heard two amateurs in the Irish Free State working together on 20 metres, coming in in London at R8/9. This is, of course, quite unheard of for 20-metre work. I myself have noticed the enormous strength of several French amateurs, who are generally so weak that one takes them for real "DX" signals and hangs on to them for hours.

Amateur Telephony.

Incidentally, I must apologise to one or two readers for the printer, who put V O 2 H in place of V O Q H a few weeks ago. *V O Q H* is the boat that is at present somewhere up in the Arctic regions, and may often be heard working with British amateurs late in the evenings.

Amateur telephony on 40 metres has received a great "fillip" owing to the impossibility of doing real DX work this summer. Unfortunately, so few amateurs still seem to know of a modulation system that makes it possible to transmit intelligible speech, and the "pencil-sharpener" type of transmission is still far too popular.

Some of the unlicensed French transmitters in particular, who transmit just out of the allotted band and mutilate their carriers until they sound like spark signals, are getting the amateurs a very bad name.

Short-Wave Broadcast.

The few good examples from abroad are I 1 M M, Italy, who may be heard on 40 metres almost every night at 11 p.m. or so, and some of the Belgians and Danes, particularly O N 4 A S, O N 4 O Z, and O Z 7 K.

Fortunately the British amateur seems to be ahead of the others in technical knowledge, particularly where "fone" is concerned.

Turning now for a while to short-wave broadcast, which *will*, shortly, be reliable enough to think about once more, there is evidence of a new problem in the design of short-wavers.

One cannot deny that the freakish "conditions" I have been talking about apply chiefly to amateur low-powered transmissions, and that short-wave broadcast, though subject to changes, seldom fades out so completely as to be lost to the owner of a receiver worth the name. This means, in my opinion, that the development of short-wave broadcasting is likely to continue until the average listener has some twenty more or less reliable alternative programmes.

"Artificial Selectivity."

Now this, on the genuine broadcast wave-lengths, is a state of affairs only reached by owners of quite elaborate and expensive receivers. The problem, however, is this: That the average sensitive long-distance receiver used by the "pukka" short-wave fiend is not much use for the reception of telephony with anything approaching good reproduction.

For one thing it usually incorporates a transformer of the cheapest type, and with a good reason. The more expensive transformers with high primary inductances render the receiver rather prone to "threshold howl," and one of the easiest, and certainly the most popular way of overcoming this is to save money and use a cheap transformer.

Then, again, unless a screened-grid stage is used, the receiver is almost certain to be worked very close to the oscillation point to increase sensitivity and selectivity. This, in turn, will not improve reproduction, since the "artificial selectivity" produced by reducing the circuit damping (by the use of reaction) will cause a lack of "top" in the reproduction.

This is caused, according to one school of thought, by the fact that the receiver tunes too sharply to embrace the side-bands necessary for good telephony work. The other school considers it due to the "persistence" of the lower frequencies in the selective circuits, by virtue of the very low damping which is essential.

Possible Compromise.

Whatever the cause, it is necessary to have for really excellent telephony reproduction a receiver that is not *too* selective. Then, again, the short-wave enthusiast is not generally to be found with a very large output valve or a push-pull stage.

All of this boils down to the position that the same receiver cannot be really suitable for the reception of very weak distant signals and of high-powered telephony. Personally, I think a very good compromise can be effected, and propose to mention this later. Otherwise there appears to be no other alternative to the use of two different receivers to do the job properly.

RADIO COMMUNICATION WITH R100

This is a view of the short-wave apparatus which was installed at Cardington for the purpose of keeping in touch with R100 during her recent trip to Canada and back.

RADIO JOTTINGS

Covered wire which is made to pass through small holes in a screening box should not be relied upon to give sufficient insulation itself, but should be provided with a wrapping of insulated tape.

* * *

It is a good plan to include a flash-lamp bulb in series with the condenser and loud speaker of an output filter circuit, so that in the event of a condenser breakdown the small lamp will act as a fuse.

* * *

When the axes of two coils are in line the coupling between them is at a maximum, but when the axes are at right angles it is at a minimum.

* * *

Do not allow your set to reproduce voices at the same volume as band music, etc., for the volume of sounds are so disproportionate in the two cases that speech is bound to sound unnatural even if the set is not distorting.

WHY NOT USE YOUR MAINS?

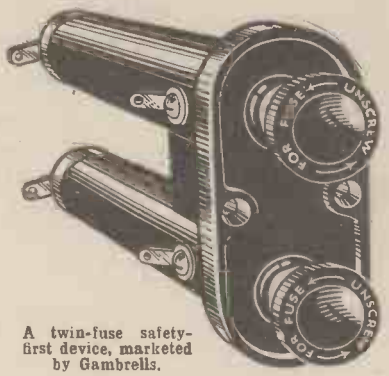
BY P. R. BIRD

Some practical points about running your set from the electric light system.

EVERY owner of a wireless set knows that power is required to run his [illegible] receiver; and that the more powerful the set, the greater is the power required to run it.

Every house that is equipped with electric light has a simple, safe and certain supply of power laid on. Yet many householders fail to take advantage of it for wireless purposes, on account of the little practical difficulties that may arise.

The truth is that electricity can be applied so easily, and so diversely, to suit



A twin-fuse safety-first device, marketed by Gambrells.

different conditions that its development in this country has been *too* diverse. In the past all the electrical power undertakings have had their own ideas about the kind of power you should use, and consequently electrical apparatus for use in one town might be quite useless in another, or indeed in even a different part of the same city.

Each kind is equipped with a meter where it enters the house, and on the meter you will generally find that the details of the supply are marked. (If not, the full details will be found on the form of agreement between the householder and the electrical company concerned.)

Meter Markings.

Sometimes the markings on the meter are quite simple, such as "Direct Current, 240 volts." Or you may find, "Alternating Current, 250 volts 50 cycles."

Alternatively the abbreviation A.C. may be used for the alternating current, or D.C. for the direct current, and, of course, the

With electric light in the house there are many ways of supplying radio power, simplifying upkeep, and improving your radio reception.

voltages may be other than those quoted, for in this country the voltage supply may be anything from 100 to 250 or thereabouts and the current either D.C. or A.C.

A year or so ago an important move was made towards standardising the electricity supply in the British Isles and when the new power distribution gets into its swing most of the supplies will be of one particular kind, namely 230 volts 50 cycles A.C.

Smoothing the Supply.

Before light or power mains can be applied to the set for high-tension current, lighting the valves, etc., it is necessary to visualise what kinds of electricity you are supplied with. Suppose, for instance, your meter says "230 volts D.C." What does that mean?

D.C. means direct current, or current that flows in one direction, so that of the two wires coming from the supply to a lamp or similar piece of apparatus, one is always negative and one always positive, just like the two terminals on a battery. So that theoretically a 230-volt D.C. supply is like a large 230-volt battery in the house. There are, however, several differences!

The most important one is that, unlike the battery, the D.C. mains do not supply perfectly *smooth* current. They suffer from slight fluctuations and variations which have the effect of making the supply "rough."

A battery gives a perfectly smooth supply, and therefore is silent in operation. But D.C. mains used for the same purpose have so many "ripples" on them that they

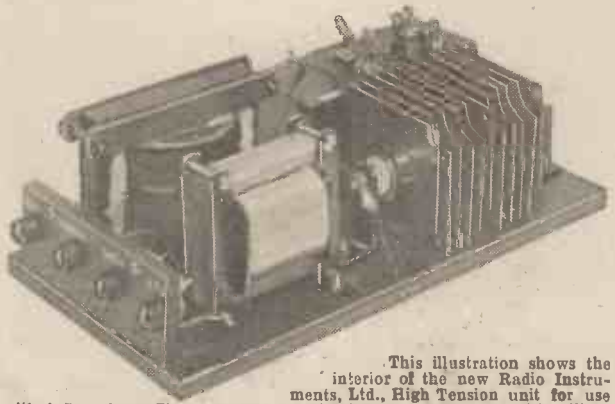
This ingenious safety socket is a Bulgin product.

must be smoothed out with special smoothing apparatus before they can work a set silently, like the battery.

Some D.C. mains are worse than others in this respect, but in all of them smoothing apparatus must be used before they attain the perfect quietness of battery operation. This hum, by the way, can be *completely*

(*Continued on next page.*)

The famous Marconi U.8 rectifying valve.



This illustration shows the interior of the new Radio Instruments, Ltd., High Tension unit for use with A.C. mains. The protective covering has been removed, and it will be seen that a metal rectifier is embodied in this instrument.

GETTING POWER FROM THE M

This is a Varley all-from-the-mains receiver.

counteracted, so that a set running from the mains can be absolutely silent just like the set running from batteries.

For wireless purposes we require low voltages as well as high. Our 230-volt mains cannot be used to work apparatus with 2-volt requirements unless some means is employed of "breaking down the voltage."

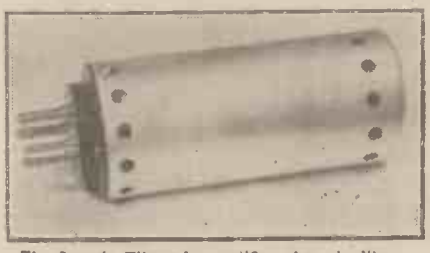
This effect can be obtained by resistances of suitable values, so that theoretically there is not much difficulty in the way of using D.C. mains.

An example of "Regentone" mains unit design.

Alternating current (A.C.) is entirely different from D.C. With this form of supply the voltage is not always applied in one direction, but it varies in amount and changes its direction many times in each second. The current and the voltage are alternating.

For instance, the voltage, which at one moment is at its maximum falls to zero immediately afterwards, and at this moment no voltage is being supplied. Immediately afterwards the voltage starts to rise again, but in the opposite direction, and having attained its maximum voltage in that direction it returns once more to the "no voltage" position, from which it again rises to a maximum in the first direction. And so on.

The complete rise and fall, fall and rise, is called a "cycle."



The Igranic Elkon dry rectifier plugs in like a valve.

And the number of complete cycles that the current makes in one second is known as its frequency.

Advantages of A.C.

Thus in alternating current we have to consider not only the voltage, but the frequency of the supply as well (the frequency is usually about 50 cycles per second).

For wireless we chiefly require direct and not alternating pressure, so that before A.C. mains can be utilised for wireless it is necessary to *rectify* the supply. In other words, to make it unidirectional. This rectifying can be carried out in different ways, as will be explained later.

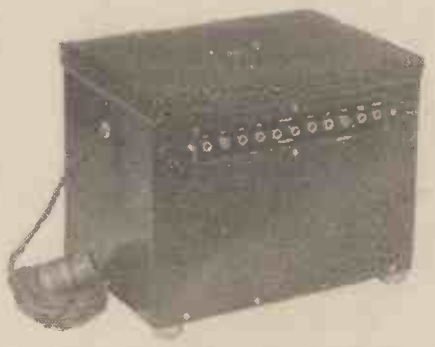
We have said that A.C. can be "converted" into direct current. The great advantage of the A.C. supply is that at the same time the pressure or voltage being applied can be changed, as required.

If *direct* current is supplied at, say 200 volts, this can be reduced by resistances, as required, for a figure below that, but cannot be conveniently increased. *Alternating* current, on the other hand, merely by passing through a suitable transformer, can emerge as alternating current of either much lower or much higher voltage, according to the transformer used. And it can then be smoothed out and used as direct current at the low or the high voltage.

Easy to Arrange.

The simplest forms of rectifiers are called "half-wave" rectifiers. In addition, there are "full-wave" rectifiers, and you will find reference to these in the article on "Power Pointers" in this issue.

Rectified A.C., like D.C., can be applied to the set in the same way as batteries, for lighting the valves, for supplying the plate voltage and the current, or for supplying the grid bias. And the advent of dry recti-



The H.T. unit shown above is an "Efesca." (Falk, Stadelmann.)

A full-wave Osram rectifying valve above, and below is one of the house dry rectifiers. Right, a mains transformer.

Of the four illustrations below, the first is a Mazda rectifying valve (U.65/550 identification marks. Beside this is a Ferranti mains receiver, and lastly there is

H.T. and L.T. are obtainable from this unit. (Garnett Whiteley & Co., Ltd.)

REDUCE YOUR RADIO

AINS IS THE LOGICAL WAY

fiers and special rectifying valves has made the operation both easy to arrange for and trouble-free in operation.

This brief reminder of the essential difference between direct-current and alternating-current mains will serve to show that on no account should D.C. apparatus be used for A.C. or vice-versa, and that each type of mains has certain advantages and disadvantages.

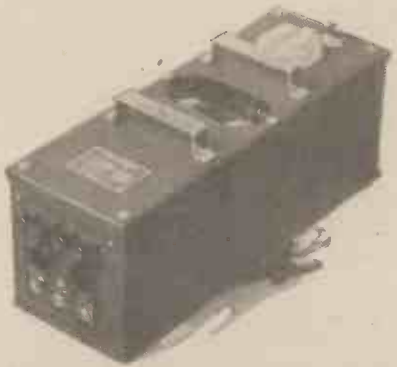
Now let us consider some typical cases and the methods available by which the mains can be utilised. First of all, let us take the man who is buying a new set.

Some Typical Cases

Whether his house is fitted with D.C. or with A.C. mains he will be able to purchase a complete outfit in which all the power for the receiver comes through an ordinary flexible lead. Such a set plugs into a socket or to a power-point, and is switched on or off just like a lamp, with no trouble and very small running expenses.

There are a great many mains-driven sets now on the market, so that choice is wide. By carefully studying the makers' lists you can ensure obtaining the exact type of set required.

Some of these mains sets employ ordinary type valves as run from batteries, the place of the latter being taken by a suitable mains unit. Other sets use valves specially designed for operation from the mains.



Easy accessibility is one good feature of the Partridge & Mee H.T. unit.

This Lissen portable can be worked from the A.C. mains.

Low Running Costs.

Here, again, there are several types, some being special "mains" valves and others having short, thick filaments that can be run from raw A.C. The special "indirectly-heated" mains valves are provided with an extra electrode or heating element, and connect by five valve pins instead of the usual four. For various practical reasons they are intended for use with A.C. and not D.C. mains.

Although the first cost of a mains-driven set is necessarily rather high, its running costs are often astonishingly low. And as most of the apparatus in it is of the long-life type, covered by a guarantee or by a maker's reputation, the high initial price is often completely offset by low running costs. The exact figure can generally be obtained from the makers.

There is much that can be done with the mains apart from buying an all-from-the-mains set. If your present set is satisfactory, but you are bothered by battery renewals, you can arrange to supply it with high tension or with low tension, or both, by means of a suitable unit or units.

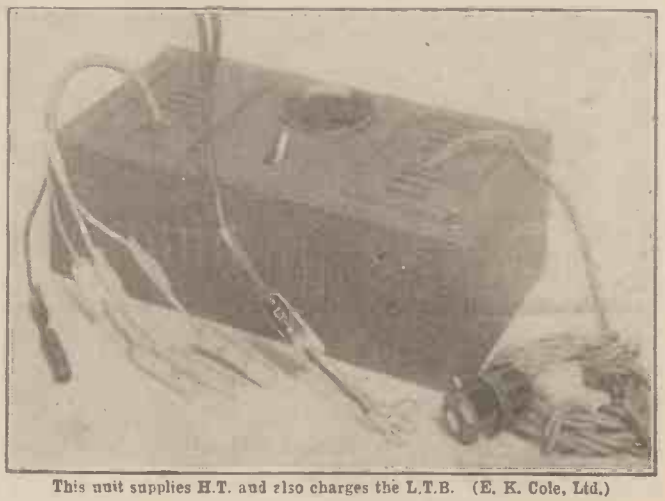
This mains unit is one of the Tannoy Products.

Owing to the ease with which alternating current can be stepped down to a lower voltage supply, it is the man whose house is fitted with *A.C.* mains that can do the most in deriving power from them. If your set takes, say half an amp. or more filament current at 2, 4, or 6 volts, it is quite possible

(*Continued on next page.*)

is shown
Westing-
ll-known

), and next is a fixed condenser that carries its own
an "Atlas" A.C. mains unit, due to H. Clarke & Co.



This unit supplies H.T. and also charges the L.T.B. (E. K. Cole, Ltd.)

RUNNING COSTS

WHY NOT USE YOUR MAINS?

(Continued from previous page.)

to " break down the voltage " of D.C. mains until the pressure across the filament supply is equal only to 2 volts, 4 or 6, as the case may be; but the disadvantage is that the mains are supplying this current at the high voltage supply of the mains.

Most of the pressure is thus wasted in heat-dissipating resistances, which serve no

Whatever the voltage of your A.C. mains you can get a transformer to give the desired voltage output. This one is a Heayberd.

useful purpose apart from giving a drop in voltage, and have to be paid for as part of the running costs. Thus it generally happens that the man with D.C. mains confines his use of the mains to deriving the H.T. supply, and not the L.T.

Banish Battery Bother.

D.C. mains are eminently suitable for H.T. supply, for no rectifying apparatus is necessary as with A.C. Moreover, the smoothing apparatus is neither very elaborate or expensive.

One of the great advantages of deriving the H.T. from the mains is the fact that not only is all battery bother abolished, but really high voltages are obtainable, and thus the first essential for good quality reproduction is assured.

With the object of reducing costs, many famous firms have placed on the market kits for building mains units (both for A.C. and for D.C.), together with full instructions and details of the methods of assembly. Those constructors who do not wish to go to this trouble can, if they prefer, buy the units complete, many types being available for different types of sets. It is important to remember that the H.T. unit must be rated to give not only the required voltage, but it must be capable of supplying the *current* required at that voltage. (This current is the total milliamps consumed at the plates of the valves as measured by a milliammeter placed in the negative H.T. lead, or calculated from the valve maker's

You need a good reliable condenser to stand up to mains voltages. This is the Hydra.

curve showing the total plate current consumption.)

Now what about the man who would like to dispense with all the bother of charging batteries, but who has a perfectly good accumulator on hand? Obviously it would not be economical to dispense with this, for usually nothing like the price it is worth can be obtained for it.

Cost-Free Charging.

What is wanted is something to keep it in good condition constantly so that it does not have to be taken to be re-charged periodically. In these circumstances the householder can, with safety and certainty, do his own battery charging.

There are several different ways of setting about this operation. For the charging of the battery is simply a reversal of its normal function.

Obviously the mains are quite capable of fulfilling these conditions. If the mains are of the D.C. type the current and voltage must be limited to suitable values by means of resistances.

Sometimes it can be arranged for all the lamps in the house when used for lighting to act as resistances for the purpose, by installing a charging board in such a

Examples of the Mullard and Six-Sixty full-wave 4-volt rectifying valves.

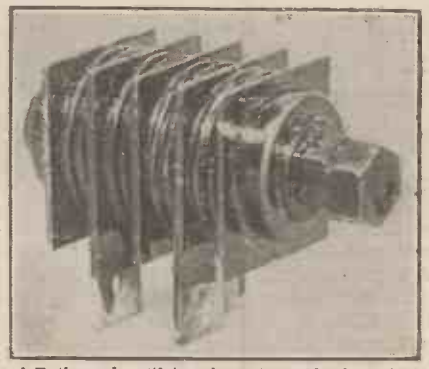
position that whenever a light is switched on in the house the current to it passes through an accumulator in the required direction.

In this way no extra electricity whatever is required, the cost of the charger being covered by a very slight dimming of the lamp. This is not noticeable in ordinary circumstances, so no running cost whatever is incurred.

Methods of Rectifying.

As the *direction* of current is important when charging, it is obvious that for alternating supply mains the charger must embody some form of rectifying apparatus. This may be of the mechanical type, in which vibratory rectifiers are included; the thermionic type, which covers different valve rectifiers; or a metal rectifier. (Other types are used as well, but the valve and metal rectifiers are by far the most common.)

The advantages of charging your accumulator at home need hardly be stressed. Apart from being much easier you can



A Rothermel rectifying element capable of providing a 2½ amp. charging current.

prevent all mis-handling. Moreover, as the wireless set is in use only for five or six hours out of the twenty-four hour day, it is possible to arrange the charging to be done at a low rate—a fact that has several advantages.

The device for giving long, slow charges of this type is known as a "trickle" charger. As it is inexpensive and very easy to fit and to operate, the popularity of this class of apparatus is not surprising.

Units are now manufactured which embody an L.T. charger in an H.T. unit, the single compact piece of apparatus thus supplying H.T. all the while the set is on and keeping the battery charged while the set is off.

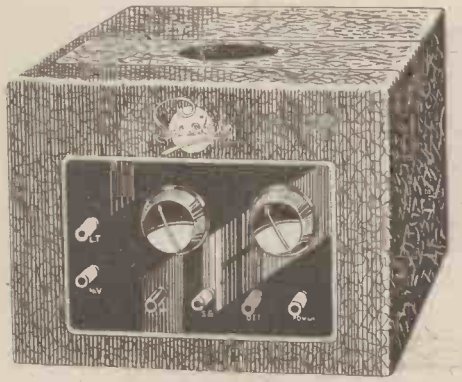
Safe and Certain.

Enough has been said to show that although radio power can be drawn from the mains easily and efficiently, there are certain side issues and complexities to watch. These need not puzzle the consumer, for an enquiry to any of the firms supplying mains apparatus will clear up any doubtful point.

Some people fear to use the mains because of the alleged "danger."

This is a wrong attitude. Reputable British firms who make radio apparatus for mains working do so under the recommendations of The Institution of Electrical Engineers, specifically compiled to make radio power as safe and as certain as any other household electrical equipment.

Little has been said about the low cost and convenience of mains apparatus, but these are two of the most important advantages from the user's point of view. It is true that first cost is a big item comparatively, but once installed the simplicity of action of mains apparatus is a revelation to anyone who has hitherto been dependent on battery renewals.



You can get both H.T. and L.T. from this Wholesale Wireless unit.

FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found—?

FRANKLIN CONDENSERS.

WE hear much about fixed condensers breaking down, and some of us experience the trouble, too. I have had quite a large number of cases come within my personal experience, and I must say some of them were attended by quite disastrous consequences.

Mica is presumed to be one of the safest materials to use as a dielectric, but the old stigma against "paper" has now been entirely removed.

The condenser is built into a stout metal casing.

There are paper dielectric condensers available that will stand up against any voltage that one is likely to meet even in a mains set.

One such make is the "Franklin," a product of Franklin Electric Co., Ilford. Franklin fixed condensers, moreover, are guaranteed for six months, provided they are used within their voltage ratings.

The prices of Franklins are attractive, too, ranging as they do from 1s. 6d. for ·001, to ·01 mfd. tested at 500 volts D.C., to 5s. 10d. for 4 mfd. tested at 500 volts A.C.

They are contained within neat aluminium casings and are provided with good terminals. I find them of good standard from every point of view.

TELSEN'S NEW ACTIVITIES.

Well known though the name of Telsen has already become, there is little doubt but that it is destined to achieve an even greater prominence in the very near future.

Up to the present the Telsen Electric Co., Ltd., have specialised in the production of L.F. transformers, although, I believe, their other interests have always been fairly widespread. Now, however, they are entering the season not only with a completely redesigned, better-than-ever L.F. transformer, but also with other radio components.

I am not in a position to reveal their complete programme, but I fancy they have some very interesting things up their sleeves.

However, I have received samples of the new Telsen Radiogrand L.F. Transformer and of the Telsen Valve Holder and H.F. Choke.

The most outstanding feature of these new Telsen components is that they are all contained within excellent mahogany-coloured bakelite mouldings that are decidedly distinctive in character.

The H.F. choke is rather on the small side—in fact, it is one of the smallest I have come across. It fixes vertically on the baseboard and the two terminals are located on the side of the device.

On test we found this H.F. choke to be perfectly satisfactory on both the medium and long waves. (By the way, we have recently devised and constructed a special H.F. choke tester that enables us to test any H.F. choke in a few seconds.)

There is nothing particularly distinctive about the Telsen valve holder—it is a straightforward, honest proposition that does its job perfectly. You can see exactly how it is constructed from the accompanying photograph.

Finally, I come to the new Telsen Radiogrand L.F. transformer. This, as I have already indicated, is built into a bakelite casing. But, additionally, it is shrouded and provided with an earthing terminal. A useful advantage that, in these days of high efficiency two-transformer sets.

It has a ratio of 3–1, which is, one might say, quite an "all-purpose" ratio, although, really, it is not so much the actual ratio that matters as primary inductance and secondary self-capacity.

The terminals of the Telsen are arranged around the base of the component and are adequately spaced. I have a slight criticism to make in regard to the terminal markings. These are in relief on the shoulders of the casing, and are not very easily read. "Engraved" lettering would be much plainer. However, that is a small point, and has little to do with the technical efficiency of the article.

In regard to this latter, we are able to report very considerable progress. The original Telsen was, to put it mildly, in danger of being left a good way behind, so healthy has been the progress in transformer design during the past year or two.

However, this new transformer gives Telsen a fresh jumping-off point of no mean height. Sold at Telsen prices, all these new Telsen components should, indeed, prove very popular lines indeed.

They will no doubt find their way into a very large number of sets this coming winter. H.F. chokes, L.F. transformers and valve holders are all very important components that need to be chosen very carefully.

Manufacturers and traders are invited to submit radio apparatus of any kind for review purposes. All examinations and tests are carried out in the "P.W." Technical Department, with the strictest of impartiality, under the personal supervision of the Technical Editor.

We should like to point out that we prefer to receive production samples picked from stock, and that we cannot guarantee their safe return undamaged, as it is our practice thoroughly to dissect much of the gear in the course of our investigations!

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

This photo shows two each of the new Telsen transformer, H.F. choke and valve holder.

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

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

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

WHICH MAIN IS EARTHED?

M. F. (Barkingside).—"I am putting in a trickle charger for my 2-volt accumulator to save hunking it along to the charging station every week. I bought the charger, which seems to be exactly what I want, and I am all clear about installing it except on one point.

"It says that the charger should be fitted in that main which is in the earthed supply. How can I tell which main is earthed?"

It is very desirable that charging and similar apparatus should be in the earthed lead. And it is very easy to tell on D.C. supply which main is earthed if you are careful to carry out the following instructions.

On the other hand, it should be remembered that electrical supply companies often specifically warn their consumers that it is an infringement of the conditions of supply for the wiring to be interfered with by any unauthorised person, so we think that you should get an experienced electrician to do the job for you as you are not qualified to do it yourself. (Upon enquiry you will probably find that the permission of the company to alter the wiring is regarded as essential.)

We stress that you should not overlook this point in view of the fact that a great many of the electrical supply companies are now altering their mains from D.C. to A.C., and it might affect a replacement of any apparatus you install if you have fitted it without permission.

The test for which main is earthed is best done by running a well-insulated flexible lead from a tap, buried plate, or similar earthed point, to one side of a lamp holder in which is inserted a lamp of the ordinary mains voltage. The other side of this lamp holder should be fitted with another well-insulated flexible lead. This second lead should be carefully tapped on first one and then the other supply leads. That side of the mains which is *earthed* will, of course, have no visible effect, as the other end of the lamp also is earthed.

That side of the mains which is not earthed will, however, light the lamp, and will thus indicate which main is which. Join the charger in that lead which does *not* result in the lamp lighting.

THE "MERCURY" FOUR.

Although the general construction of the "Mercury" Four becomes quite clear on inspection of the photos and wiring diagram which have already appeared in "P.W.," one wiring point calls for note: the leads to S_2 should be soldered in place before the reaction condenser is fitted to the panel.

The two L.F. amplifying stages are assembled on a narrow shelf (supported by fillets) which is fitted below the receiver portion.

Now about the connections between the L.F. amplifier and receiver portions. First, note that a flex lead comes off the H.F. choke in the receiver portion, passes down through a hole in the baseboard, and ends in a plug which goes into "plate socket on baseboard" on the amplifier.

Next, note the two L.T. flex leads from the amplifier. These end in plugs to be inserted in the two sockets in the baseboard of the receiver portion, placed between the B.S.G. coil and H.F.C.2.

Of these sockets, the one nearest the panel must not make contact with the copper sheet, so cut away the copper just round it. The other must make contact with the copper to complete the L.T. circuit.

The general assembly of the outfit is quite easy to follow, too, but we should perhaps mention the loud-speaker question. What you want here is an assembly which does not take up much space, and the Mullard "portable" type is very suitable. This, of course, is to be mounted behind the fret in the cabinet front.

There is quite a good space for batteries, and you will want a small "unspillable" 2-volt accumulator, a 9-volt G.B. unit, and about 100 volts of H.T. For the latter a 99-volt unit will serve, or one of the actual 100-volt rating. It is also possible to get 120 volts in by using two 60-volt units of a small size in series.

Now you just want the necessary working data and you are ready to start. Here they are in summarised form. Valves: one S.G., one H.F. or special detector (V_2), one L.F. (socket between R.C. unit and L.F. trans.), and one small power, all 2-volters.

Now the voltages: H.T. + 1, 60-80 volts; H.T. + 2, about 100 volts; H.T. + 3, about 50-60 volts: H.T. + 4, about 100 volts. If 120 volts available, give it to H.T. + 4 only. Can be used on H.T. + 2, also, but consumption then goes up still further. The grid bias should be 1½- or 3-volts negative on G.B.—1, and 6 to 9 volts on G.B. — 2. Use as much as possible without spoiling quality.

The limitations of space have prevented us from dealing with every little detail as fully as we might have wished, but we think the more advanced reader, for whom the set is intended, will have no difficulty whatever in following everything out.

MILLIAMMETER KICKS.

A. N. (near Manchester).—"When attending a junk sale the other day I acquired a milliammeter for 7s. 6d. It may not be perfectly accurate as regards quantity, but it certainly is sensitive, for it shows the kicks in my plate circuit with startling clearness.

"I have been working hard to find the point of correct grid bias ever since I got the milliammeter, but still I am not out of the wood. So far as I can tell by ear, reception seems perfect, except, perhaps, a trifle discordant when the local is tuned full in and playing certain notes.

"On no other stations is this noticeable, and so far as can be told by ear the tone is excellent. When I put the milliammeter in I find that the local station tuned fully in makes the needle kick both ways, up and down.

"Only the *local* station has this effect.

(*Continued on page 710.*)

CAN WE HELP YOU WITH YOUR SET?

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

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

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

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

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

WHAT DO *YOU* THINK ABOUT THIS?

A Bournemouth reader who built a Det., 2 L.F. (resistance and transformer stages) was very pleased with both quality and volume. But after ten days' good service the set "went back" on him. The volume was affected less than the quality, which went "all to pieces," and made the set a misery to listen to.

Tests with a milliammeter showed that the detector and last valve were taking normal plate currents, but the second valve, which had an L.F. primary in series with the plate circuit, was taking two and a-half times as much current as usual.

The valve itself appeared O.K., so grid bias was suspected. But the G.B. battery was new, and showed up O.K. on the voltmeter. Can you guess

WHAT WAS WRONG?

N.B.—There is no prize for answering this, but from time to time we shall give a radio problem (followed the next week by the answer) in the hope that readers will find them both interesting and instructive. (Look out for the solution of the above next week.)

The trouble which was described last week was a very easily traced one. The reaction coil used was wound in the wrong direction. Reversal of the reaction coil holder's wiring cured the trouble.

NEW

IMPROVED & INCREASED RANGE OF THE FAMOUS TELSEN COMPONENTS

To the already famous range of Telson Transformers, we have now added this series of New Components, each embodying many new features which at their prices represent the finest range of their kind upon the market.

Only Telsen could produce Components of such technical perfection and beauty of finish—components that are worthy of any circuit—that you can rely upon with the utmost confidence to do their job and do it well, and at their prices—well anyone can now afford the best—by test, they are far the best. Don't hesitate, build your new season's Set with Telsen famous Components, "Radio's Choice for Better Radio Reception."

Telsen Variable Condensers (Bakelite Dielectric). Particularly designed for use as a reaction condenser, may also be used as a neutralising condenser where large capacity is necessary.

All vanes are insulated with Bakelite which eliminates the possibility of a short-circuit between the moving and fixed vanes.

Made in three capacities: '0005, '0003, '00015, supplied complete with pointer knob with one-hole fixing for panel mounting.

Price 3/- each

Telsen "Radiogrand" Transformer, new model, shrouded in Genuine Bakelite, with new windings and core, fitted with earth terminal.

Made in ratios 3–1 and 5–1. Price 12/6 each

Telsen 7–1 Super Ratio "Radiogrand" Transformer, giving enormous amplification with perfect reproduction, shrouded in Genuine Bakelite, with new windings and core, fitted with earth terminal. Price 17/6 each

Telsen "Ace" Transformer, the ideal model for all Portable Sets and where space is limited, gives perfect reproduction throughout the musical range. Shrouded in Genuine Bakelite, with new windings and core, fitted with earth terminal.

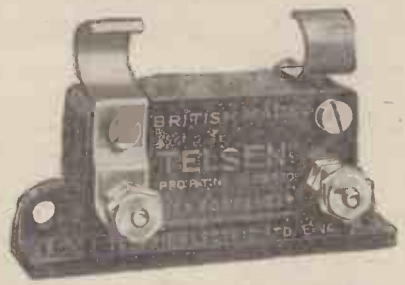
Made in ratios 3–1 and 5–1. Price 8/6 each

Telsen H.F. Chokes, designed to cover the whole wave-band range from 18 to 4,000 metres, extremely low self-capacity, shrouded in Genuine Bakelite. Inductance 150,000 microhenries, resistance 400 ohms.

Price 2/6 each

Telsen Valve Holders. Pro. Pat. No. 20,286/30. An entirely new design in Valve Holders embodying patent metal spring contacts, which are designed to provide the most efficient contact with the valve legs, whilst allowing the valve to be inserted or withdrawn with an easy movement instead of being subjected to undue strain which often causes damage and loss of efficiency to the valves. Low capacity, self-locating, supplied with patent soldering tags and hexagon terminal nuts.

Price 1/- each



Telsen Fixed (Mica) Condensers, shrouded in Genuine Bakelite, made in capacities up to '001 mfd. Pro. Pat. No. 20,287/30, supplied complete with Patent Grid Leak Clips to facilitate series or parallel connection. Can be mounted upright or flat.

Price 1/- each

FOR

BETTER RADIO RECEPTION

TELSEN COMPONENTS

Advt. of Telsen Electric Co., Ltd., Birmingham.

RADIOTORIAL QUESTIONS AND ANSWERS.

(*Continued from page* 708.)

"But when I have corrected it to the best of my ability with grid bias so as to make the needle remain as steady as possible, I find that the needle is steady on all other stations except the local and 5 X X, when it tends to kick upwards a little on the very loud passages. I have tried all permutations and combinations of G.B., H.T., etc., and this is all I can get after a lot of trouble with it.

"As I say, it sounds all right, and I was perfectly satisfied until I had the milliammeter, but I should like to know what it means by this failure to remain quite steady even when the set sounds good."

When the needle of a milliammeter in the plate circuit of the last valve kicks both up and down it indicates that the valve is being overloaded—that is to say, that the input to the set is rather greater than the valve can handle. In such circumstances the best plan (apart from altering set or valves) is slightly to detune the set or slightly to shorten the aerial, so that even when tuned full in the set is not receiving more signal voltage than the last valve can handle.

If you use the set for long-distance listening it seems a pity to alter the aerial, so we should employ a volume control for the grid of the last valve or else slightly detune the set, if this can be done without bringing in neighbouring stations. All that is necessary is to reduce the signal input slightly to that point where it does not result in overloading the last valve.

The fact that you get upward kicks on 5 X X points to the fact that you may be applying just a little too much negative bias to the grid of the last valve. This is very likely to happen when altering grid bias in order to overcome overloading, and in any case, if the 5 X X distortion introduced is not noticeable by ear, we should not worry about it.

If, however, you fit a volume control in order to reduce the local station strength when tuned in fully, this would also come in useful to reduce the strength of 5 X X a little.

A GOOD LONG-DISTANCE TWO-VALVER.

M. J. D. (Cleckheaton).—"I want a really good long-distance two-valver on the lines of your 'Regional' Two, but without the special rejector in the aerial circuit, as I have a separate rejector already made.

"I have the following components which I should like to incorporate: Differential condenser, 3½ to 1 L.F. transformer, H.F. valve small power valve, H.F. choke, 400-ohms potentiometer, ·0005-mfd. tuning condenser, plenty of coils, fixed condensers, switches, etc. Please give the wiring in words."

If you have a Brookmans Rejector you will not require a small condenser in the aerial circuit, so that your aerial lead will come straight to a tapping on a 60-turn X-coil, this being inserted in a coil holder of the baseboard-mounting type. Beside it should be another holder for the reaction coil.

The rest of the parts will be named in the wiring instructions below, but remember that exact spacing plays an important part in the success of the long-distance simple receiver, and as the blue print describing the "Regional" Two is still available (price 6d., post 1½d. extra), we think you would be well advised to get this to make sure that the layout is as good as possible.

The actual connections will be as follow:

L.T. + terminal to one side of the switch. Remaining side of the switch to one filament socket on each of the valve holders and to one end of the potentiometer.

Remaining filament terminals on each valve holder are joined together and to L.T. −; to H.T. −, to grid bias +, to the moving vanes of the differential condenser, to the remaining end of the potentiometer, to the ·0005 variable tuning condenser, to the pin side of the 60-turn X-coil holder, and to earth.

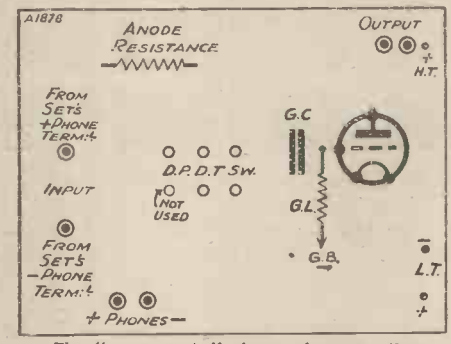
The slider of the potentiometer should be taken to one end of the grid leak, the other side of which goes to the grid socket on the first valve holder and to the ·0003-mfd. condenser. Remaining side of this condenser goes to the fixed vanes of the ·0005 tuning condenser, and to the remaining side of the aerial coil holder.

The plate socket of the first valve holder goes to one set of fixed vanes on the differential reaction condenser and to one side of the reaction coil holder. Remaining side of this holder goes to the remaining fixed vanes of the differential reaction condenser and to the H.F. choke.

The other side of the H.F. choke goes to one primary terminal on the L.F. transformer, and the other primary terminal to H.T. + 1. The grid of the second valve holder goes to G on the L.F. transformer, the G.B. − terminal of which goes to a grid-bias negative lead.

The plate terminal on the second valve holder goes to the negative loud-speaker terminal, and the positive loud-speaker terminal goes to H.T. + 2. (If proper reaction effects are not obtained, reverse the leads to the reaction coil holder.)

POPULAR "WIRELETS" No. 18



The "components" shown above are those necessary for a one-valve amplifier (resistance coupling) with a switch to listen on 'phones to the set itself, when desired. The idea is that the amplifier is joined up to the set and then the D.P.D.T. switch gives you either "set only" or "set with amplifier" without the necessity of changing connections. Can you "wire up" the circuit to bring in the extra valve by means of the switch shown?

(Look out for the answering diagram next week.)

CANADIAN BROADCASTING.

(*Continued from page 694.*)

biles manned by radio engineers to combat this interference, by means of installing such apparatus as is necessary to eliminate the interference from receivers. There has never been legislation to compel the user of electrical apparatus causing such interference to install the necessary equipment to rid the listeners of the noise caused by his equipment. The radio bill will make such legislation possible, liberating the listener of at least man-made static.

Indirect Advertising.

In order that everyone who has some objection to make to government-controlled broadcasting may do so, the radio bill will first be placed in the hands of a parliamentary committee, which will hold public hearings, make modifications to the bill, and present it to Parliament again. Here are some of the points to be brought up by the opposition.

The provinces of Quebec and New Brunswick, while voicing their co-operation along with the other provinces, state that they do not intend to give up their rights under the British North America Act, by which they claim to have a right over the air above their provinces. They are not anxious to give up this alleged right to the air to a government-owned broadcasting company.

And as champion of the cause is La Presse of Montreal, largest French-Canadian daily in the Dominion, which is also the owner of the only station in North America over which announcements go out all the time in both French and English. In the bargain C K A C, the call letters of La Presse, has but recently installed a 5,000-watt station, one of three in the Dominion, and is thus one of the most powerful in Canada.

On the question of indirect advertising, the plea is sure to be raised that the Canadian manufacturer and distributor will be placed at a disadvantage with his American competitor, says the Toronto Star. For the American advertisers will continue to put their barrage of advertising across, while Canadian advertisers will be curbed through being able to only mention their firm name over the air in conjunction with a programme.

This same question from a different angle is interesting radio manufacturers. They claim that with competition between stations eliminated, programmes will become humdrum. Private enterprise, it is stated in the Toronto Telegram, would have a much keener interest in improving programmes.

Combating Americanisation.

Then there are those who claim that only with an expensive receiver will the listener be able to steer away from his local government-owned station. Why should the listener be forced to hear only the one station, is their query. Besides this faction, there is another which claims that Canadian listeners will turn to American stations for their radio entertainment.

Those in favour of the radio bill point out that government-owned broadcasting will furnish a means of combating the Americanizing influence of the present system. They feel that with good programmes coming from Canadian stations which will reach into every part of the Dominion dials will spin towards the Canadian stations rather than towards the other.

Even the Ottawa Journal, which does not compromise itself on the question, states that no matter which system is adopted, direct advertising must go. It quotes Dr. Lee De Forest, pioneer radio inventor, in a recent address before the Institute of Radio Engineers in New York as saying:

International Questions.

"I attribute a part of the present slackening in radio sales as actually due to this one cause (direct advertising). The radio public is, I believe, becoming nauseated by the quality of many of the present programmes."

Others point to the success made by another government-operated utility, the Canadian National Railways. Some point to the success of the government liquor control systems in the various provinces. In Ontario they have another government-operated public utility service to hold up as a shining example, the Ontario Hydro Electric Power Commission. Therefore, why should not so formidable a feature as radio broadcasting come under government control through the formation of a national broadcasting company free from political influence is their cry.

What the results of the bill will be on international questions remains to be seen. Many American firms operating Canadian

(*Continued on page 714.*)

CANADIAN BROADCASTING.

(*Continued from page 712.*)

subsidiaries may or may not use the government-controlled air. Will American broadcasting concerns place their programmes at the disposal of the Canadian stations as they do now, for outstanding features from other countries are to be placed on the Canadian stations, according to plans submitted by the Royal Commission ?

What will happen to the wave-length situation when Canada comes along with seven super-power stations for which she has at present only six exclusive wave-lengths ? That question has already caused a considerable number of conferences and a great deal of diplomatic friction, despite the fact that Canada is entitled to take any wave-lengths she wishes and does not have to abide by the findings of the United States Federal Radio Commission.

Some Change Certain.

These are but a few items of international interest.

Something is going to happen to broadcasting in Canada. There will be a change one way or another. But whatever happens, the system that ultimately comes into existence, be it private or public ownership, will be the one that the public at large desire, and direct advertising will go by the board.

FOR THE LISTENER.

(*Continued from page 692.*)

given in the official programme in the "Radio Times."

They may, or they may not. In any case, an explanatory talk coming immediately before a performance is much more useful than any amount of printed matter to a listener whose listening is a recreation rather than a religion. Frequently I have missed the point of a piece of music, or of a song in an unfamiliar language, and have probably misjudged it, through lack of a brief explanation given "on the spot" as it were.

Strange Items.

At 6.30 a.m. one Sunday morning, Berlin broadcast a lesson in "Wireless Gymnastics."

I didn't hear it. I imagined it the night before. I thought everybody lay late in bed on Sunday mornings. Apparently not in Germany.

At an hour when most Christians are communing with the angels in sleep, Germany is lying on its back on the floor, the loud speaker switched on, and is busy massaging the liver, or deepening the chest, or doing physical jerks by numbers at the command of an invisible bombardier.

It is a pretty picture; and may account for Germany's greatness as much as the "playing fields of Eton" account for our own. At nine o'clock the same morning, after a "Press Review," Budapesth was broadcasting "Beauty Hints."

The girls rise early in Hungary. They are at their looking-glasses in their pretty dressing-jackets, while through the loud speaker some Beauty Specialist instructs them in the use of face-cream and lipstick, and perhaps how to lift their faces: the whole performance concluding, like a Ballet, with the Dance of the Powder Puffs. That, too, is a pretty picture.

Church Parade on Sunday mornings in Budapesth must be a mighty pleasing sight!

The Co-Optimists.

Later in the week our luck held and we heard the Co-optimists from London.

Belinda was sitting on the table in the window. The neighbours, as their custom now is, were sitting around outside.

It had been a hot day. A golden moon was presiding over a cool night. Suddenly Davy Burnaby! How delightful it was!

Our friends did not understand the chatter but they smiled because they saw how happy we were. They loved the songs. And when we came to that 'pun' song with a chorus to the tune of "John Brown's Body," they laughed and swayed on their haunches and joined in.

For they knew "John Brown's Body." I must get them to teach me the words they sing to it.

AN ADVERTISER'S CORRECTION.

The National Accumulator Co., Ltd., ask us to state that an error appeared in their advertisement which was published in last week's issue. The L.A. type L.T. accumulator is not equipped with the new patent "Tell-Tale" device.

EMPIRE RADIO.

(*Continued from page* 689.)

should not be impossible, if American experience is any guide.

I want to say that these estimates are very rough indeed, and are included to give "the order of quantity" and not to allow enthusiasm to overlook facts.

At any rate, I understand that the B.B.C. and the Government have had long discussions on the point, and nearly everyone is agreed that the money must be found.

On the basis of the present proposals *all* the money must be found from sources outside the B.B.C. revenue, and the Treasury is probably and rightly somewhat scared of the project.

Private enterprise might not feel justified in raising the full capital. But the money has to be found; here is a proposal to show how it can find itself a legitimate return, even though this return might not satisfy a speculator.

The Matter now Decided.

I am no financier in the true sense of the word; but I have the common sense to see that Captain Round's suggestion may show the authorities a way out and reduce their present rather frightening obligations. Meanwhile the lonely listener wants his service.

I had written these last words when I learnt that the matter had been decided; the Colonial Office are to spend £23,000 a year (my £20,000 is not so bad an estimate; you may rest assured the B.B.C. have told me nothing of their plans).

But why? We are not so rich as all that, are we? And if the revenue has been guaranteed it need only be a maximum. We might get £10,000 a year by advertising thus reducing the debt.

I think Captain Round's suggestion deserves a wide publicity and serious consideration. Purists will reject it automatically, but it's about time someone thought about things on their merits.

TECHNICAL NOTES.

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

Use of Laminated Cores.

"WHY is the iron core of an L.F. transformer and an L.F. choke laminated, and why are the laminations packed so tightly into the bobbin?" This is one of various queries I have had on this point from time to time, so, although those of you who are more experienced in radio are well aware of the reasons for laminating the core, there are evidently many newcomers who are not.

The core of a transformer or choke (they may be regarded as the same thing so far as the present discussion is concerned) not only acts as a mass of magnetic material, but being metallic also acts as an electrical conductor. To simplify the explanation let us assume for a moment that the core is made of copper instead of iron; then the magnetic properties can be forgotten and we may consider only the electrical properties.

"Shorted" Winding.

Clearly, when the current commences to flow one way in the adjacent winding of the transformer there will be an induced current in the opposite direction in the core precisely as there would be if this core consisted of a number of turns of wire. The difference is, however, that the resistance of the core is very much smaller than would be the resistance of a coil of similar wire.

The currents will be alternating in accordance with the A.C. current in the adjacent core of the transformer. These currents are known as "eddy" currents and inasmuch as the core represents a *short-circuited* winding the eddy currents dissipate themselves in the form of heat and represent a dead loss of energy.

It is important, therefore, to arrange the core in some way so that the effect of the eddy currents is as far as possible defeated. If the core is sliced up into a number of thin layers, or "laminations," which are electrically insulated from one another, each of these tries to act as an eddy current circuit in itself, but the eddy currents in one lamination tend to neutralise those in the adjacent lamination and so the net result of the eddy currents, considered in the whole pile of laminations, is very small.

Eddy Currents Defeated.

The iron laminations used for the core are generally coated on one side with paper, which thus acts as a separator between adjacent laminations.

The reason the laminations are packed tightly together is in order to get the greatest amount of magnetic material into the available space in the bobbin, as this has a direct effect upon the inductance of the winding.

Pick-up Efficiency.

Another reader wants to know whether the efficiency of an aerial will be increased by the addition of extra insulators in series with those already in use and whether these extra insulators will improve the quality of the reception of broadcast programmes.

The question whether additional insulators will improve matters depends entirely upon whether the insulation is already as near as may be perfect. If it is, then additional insulators will have no effect.

If it is not, then additional insulators will certainly improve the efficiency of the aerial. Clearly any signal energy, induced in the aerial by the incoming electric waves, which runs to earth owing to faulty insulation, cannot be going into the receiver and to that extent the efficiency of the aerial is below normal.

Effect on Quality.

As regards the quality of reception, I do not think this will be influenced by a slight difference in the insulation of the aerial, except in so far as there may be "damping" and also in so far as the weaker incoming energy may require extra amplification to reach any particular desired volume of final reproduction.

In any case, the insulation of the aerial is so readily attended to and requires so little further attention that I cannot imagine any experimenter putting up with faulty aerial insulation.

(*Continued on page* 718.)

TECHNICAL NOTES.

(*Continued from page* 716).

Smoothing.

Referring to my remarks a week or two back on the question of adding extra H.F. smoothing to a mains unit, this question has again been raised by a reader who tells me that he finds it quite impossible to get rid of the noise from his H.T. unit (working on D.C. mains). He has returned the unit to the makers but apparently it is just as bad as before.

This appears to me to be definitely a case where the unit is quite probably correctly designed for operating on the *average* electric mains, but the particular mains in question are exceptionally bad from an H.F. point of view and therefore the standard smoothing units are ineffective.

A Good Set!

It is not often that one receives a letter from a reader stating that his receiver—a commercial model—is "as nearly perfect as may be."

Most of the letters one receives are asking for advice with regard to sets or circuits which are *not* up to scratch and therefore a letter of the other kind is quite refreshing. But even then the letter does not finish without a slight complaint!

In this case it takes the form of a reference to the moving-coil loud speaker; apparently the only criticism of the set is that the male voice—for example, the voice of the announcer—comes through with "gigantic boom;" if the volume control is re-adjusted so as to reduce the loudness of the voice, then the music is not loud enough.

Speaker Characteristics.

This is rather a characteristic of the older moving-coil type of loud speaker, and although some people object to it I think the majority of moving-coil devotees regard it as an attractive feature. The stentorian boominess of the announcer's voice from a moving-coil loud speaker is much sought after by many listeners, and I have known of cases where readers have actually gone in for moving-coil speakers solely because they liked this particular effect!

The earlier moving-coil speaker tends to bring out much more prominently the lower register and inasmuch as the male voice is usually in the lower range of frequencies, whereas many of the musical instruments are much higher up in the scale, this will account for the effect which my correspondent describes.

There are various ways to secure a more uniform response to the different parts of the register, but in the particular case in question the simplest thing would be to adjust the volume coutrol for each item.

An Aerial Problem.

"Would it be possible to make an efficient aerial by simply hanging out a piece of insulated wire from the top floor of a three-storey building, allowing the wire to reach nearly to the ground?" This is a query raised by a Glasgow reader, who bases his idea upon the notion that the horizontal span of an aerial does not contribute appreciably to the pick-up efficiency of the aerial.

It is perfectly true that height is more important in general than horizontal span, but at the same time the horizontal span

(*Continued on next page.*)

TECHNICAL NOTES.
(Continued from previous page.)

also has something to do with the aerial efficiency and even a vertical rod or wire may not always be as efficient as the same length of rod or wire used in the conventional shape.

In any case the idea of hanging the wire out of the upper storey of a house is not a very good one, because the lead-in would presumably have to be at the top end of the wire, the free end of aerial being at bottom.

If my correspondent means that the top end of the wire is to be insulated and the bottom end connected to the lead-in to the lower rooms, then the scheme should work tolerably well, although even then the proximity to the house is a point against it. But if the lead-in is to be brought into the upper storey it would be much better to run the wire horizontally instead of allowing it to hang vertically downwards.

Making a Choke.

Many readers have written regarding the use of a heavy low-frequency choke to act as an additional smoothing device to the output of a mains unit and those who wish to make up a choke for this purpose want to know what the specification should be.

Assuming that the choke is to have an inductance of, say, 40 henries and to carry a current of, say, 50 or 60 milliamperes, I can give you some general direction but, of course, very much depends not only upon the size of the core but also upon the magnetic material of the core.

If you are using the conventional "stalloy" with cross-section of about half to three-quarter inch square, then you might use about No. 38 wire (*not* cotton covered, of course) and wind about 7,000 to 8,000 turns. The gap round the magnetic core should not be more than about $\frac{1}{32}$nd of an inch.

Three-Wire Supply Systems.

With the great increase in popularity of mains units, you will often read hints telling you how to take precautions so as to avoid any possible risk with the electric light mains.

Although a great deal has been done by radio manufacturers to make mains units as safe as possible, it is just as well not to ignore altogether the safety hints which are given from time to time.

Electrical Precautions.

I have been asked several times by readers why it is that in some cases the negative and in some cases the positive pole of the electric light mains is earthed (referring, of course, to direct-current supply), and what is the "three-wire" system of electric supply?

The explanation of the three-wire system comprises also the explanation as to why in some cases the one pole and in some cases the other is earthed. According to the so-called "three-wire" system, the current is produced at the generating station at a voltage of, perhaps, 400 to 500 volts; let us say 500 volts.

Then the positive supply cable from the generating station will have a voltage of 250 volts *above* that of the earth, whilst the voltage of the negative cable will be 250 volts *below* that of the earth. In this way it is possible to get a voltage across the mains leads (if you had access to them) of 500 volts.

(Continued on next page.)

TECHNICAL NOTES.

(Continued from previous page.)

"Three-Wire" System.

Owing to the presence of the earth or "return" cable, we have altogether three cables, which explains why it is called the "three-wire" system. If the earth cable and one of the others are led into a particular house, the voltage available across the two will only be 250 volts.

If the cables leading into your house, for instance, happen to be the earth cable and the negative lead, then the earth lead must be regarded as positive in relation to the other one, and in your case you will find that it is your positive lead which is earthed, which is simply another way of saying that the "live" lead is at a negative potential.

If it should happen that your leads are the earth lead and the positive lead, then it will appear that your negative lead is earthed, which is simply another way of saying that the "live" lead is at a positive potential in relation to earth.

Balancing the Load.

On the three-wire system it is a common practice to wire up the houses in one street on the neutral and positive leads, whilst those in the adjacent street will be wired on the neutral and the negative leads, successive streets being, so to speak, alternately positive and negative. By an arrangement of this kind it is a simple matter for the supply company to ensure that the electrical loads on opposite sides of zero are approximately balanced.

I should mention that the neutral or earthed lead is earthed at the generating station.

TECHNICAL TWISTERS

No. 25.—TUNING.

CAN YOU FILL IN THE BLANKS?

Circuits are said to be "in tune" with one another when they are adjusted to the same . . . . . or to the same . . . . . .

Tuning may be altered easily by readjustment of the circuit's . . . . . or of its . . . . . .

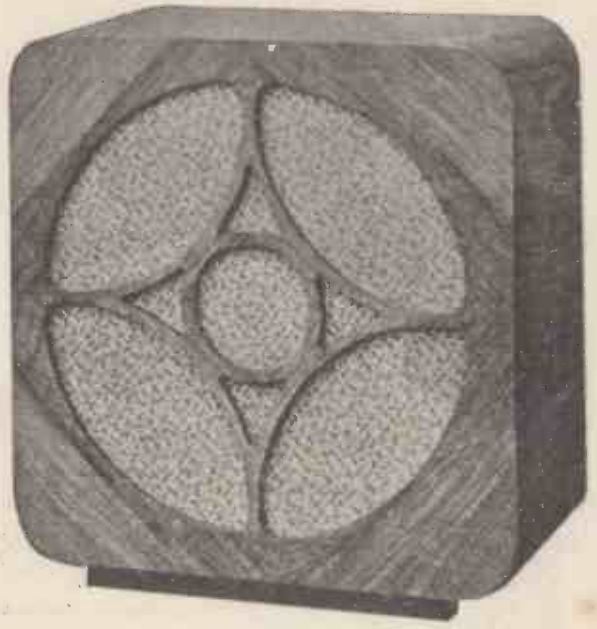
If your set has two tuned circuits they should be in tune with each other as well as with the station which is being . . . . . .

When linked or coupled circuits are in tune with each other the energy transference between them will be at a . . . . . .

Last week's missing words (in order) were: Ampere; Voltage, Resistance; Increases; Decreases; Milli, Micro.

TWO OF THE BLUE SPOT RANGE

Blue Spot TRADE MARK

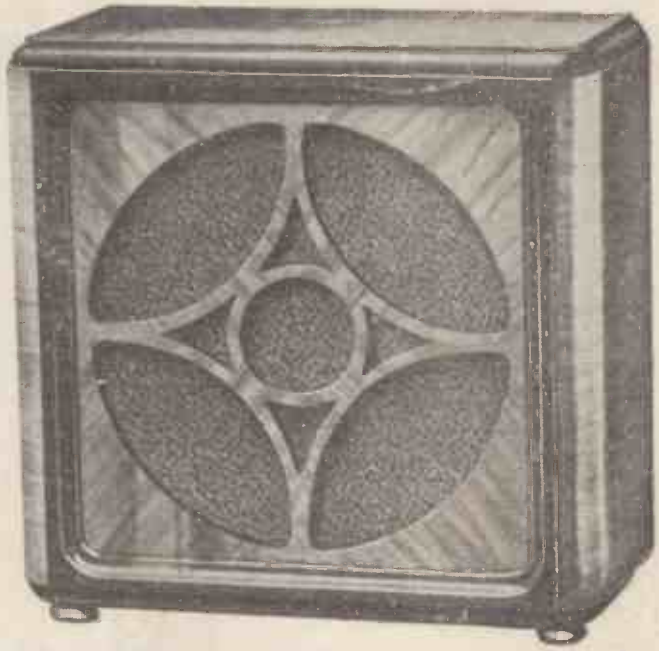


41K This speaker's arrival on the market is a great event in wireless history—accurate reproduction at a popular price. Almost every home in England can now have its Blue Spot speaker. Housed in a beautiful walnut case this fine speaker costs **£2.10.0**

29R This is quite definitely the best Blue Spot speaker that has yet appeared. There is no higher praise.

Whatever type of programme you enjoy, you will enjoy it better with this magnificent speaker. If your taste is for chamber music you can now hear it as hitherto you could only hear it in the concert room; if you prefer jazz you can listen to it with all its pep and snappiness.

And the cabinet is a beautiful piece of furniture in keeping with its wonderful output. Price **£6.6.0**



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OLYMPIA, SEPT. 19-27—STAND No. 217. MANCHESTER RADIO SHOW, OCT. 8-18—STAND No. 30

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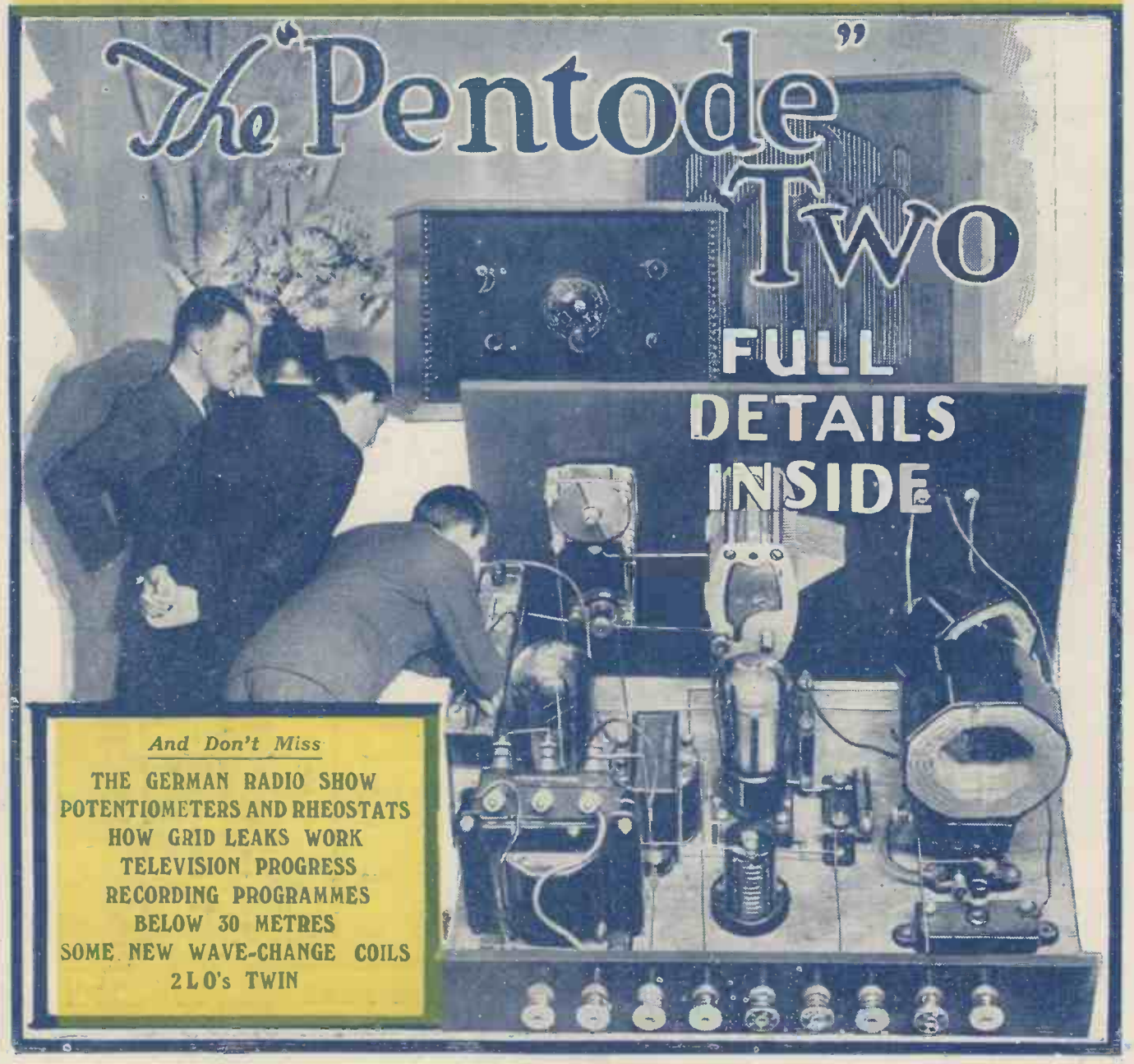
REGISTERED AT THE G.P.O. AS A NEWSPAPER.

THE EXHIBITION. By Capt. P. P. Eckersley, M.I.E.E. (See Page 729)

Popular Wireless

Every Thursday PRICE 3d.

No. 432. Vol. XVII. INCORPORATING "WIRELESS" September 13th, 1930.



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TELEVISION PROGRESS
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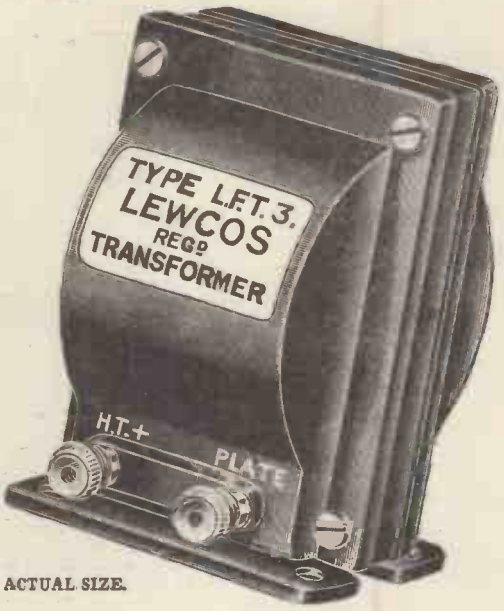
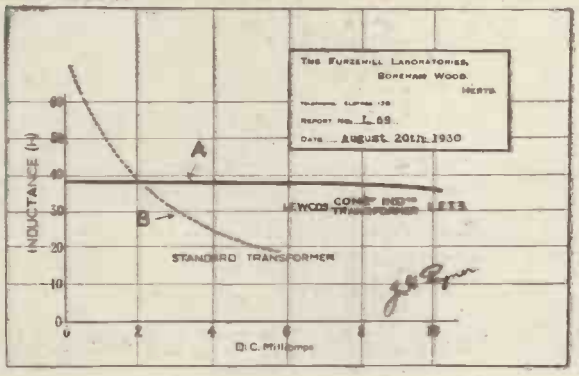
SOME NEW WAVE-CHANGE COILS
2LO's TWIN

PREDOMINANT IN ITS OWN SPHERE



ACTUAL SIZE.



The LEWCOS L.F. TRANSFORMER

TYPE 22 — PRICE 20/-

Another Lewcos Achievement!

The Lewcos LFT3 Constant Inductance Transformer has a constant inductance for different values of anode current. If a valve takes a mean anode current of, say, 2½ milliamperes, it is quite possible that this current may fluctuate between ½ and 4½ milliamperes, when the valve is working on a loud passage of sound. With an ordinary transformer the inductance of the winding is considerably different in the two cases. (See Curve B.) In other words, the two halves of the low-frequency wave are not amplified equally, introducing marked distortion. This is the reason for the failure of the average radio set to reproduce loud passages clearly, since the transient effects are particularly affected by this lack of symmetrical amplification. If the inductance is constant, however, the amplification remains the same, irrespective of signal strength (see Curve A), so that an instrument such as a piano, which is notoriously difficult to reproduce with standard apparatus, regains its natural tone where the Lewcos Constant Inductance Transformer is employed.

The Lewcos Constant Inductance Transformer maintains its inductance at a high figure up to 10 milliamperes D.C. It will be seen, therefore, that there is no trouble experienced from saturation. This transformer can be used after any normal valve, whether in the first or second stage, since the inductance is high enough for good first stage working, whilst it is capable of carrying the large anode currents likely to be encountered in the later stages. The ratio is 3 : 1, and the Curve A, which is reproduced, has been independently taken by a well-known radio engineer.

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Now is the time for every radio enthusiast to commence building his new season's set—or perhaps, in many cases, it will only need revising to bring it up to present "Regional" requirements.

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COMPONENTS

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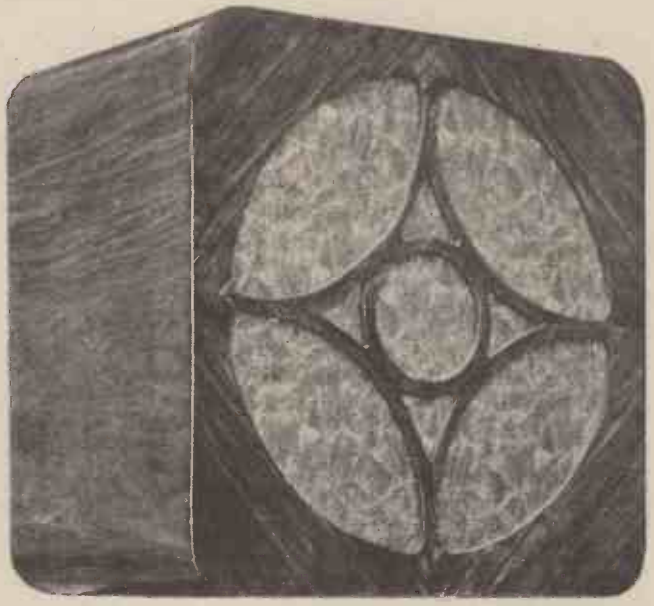

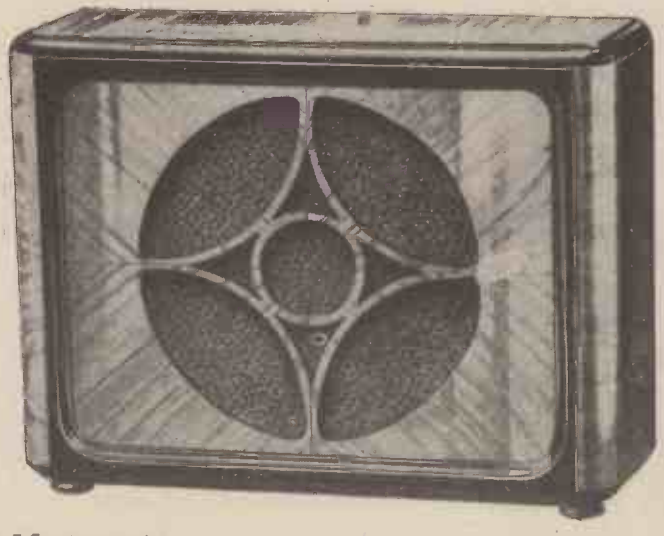

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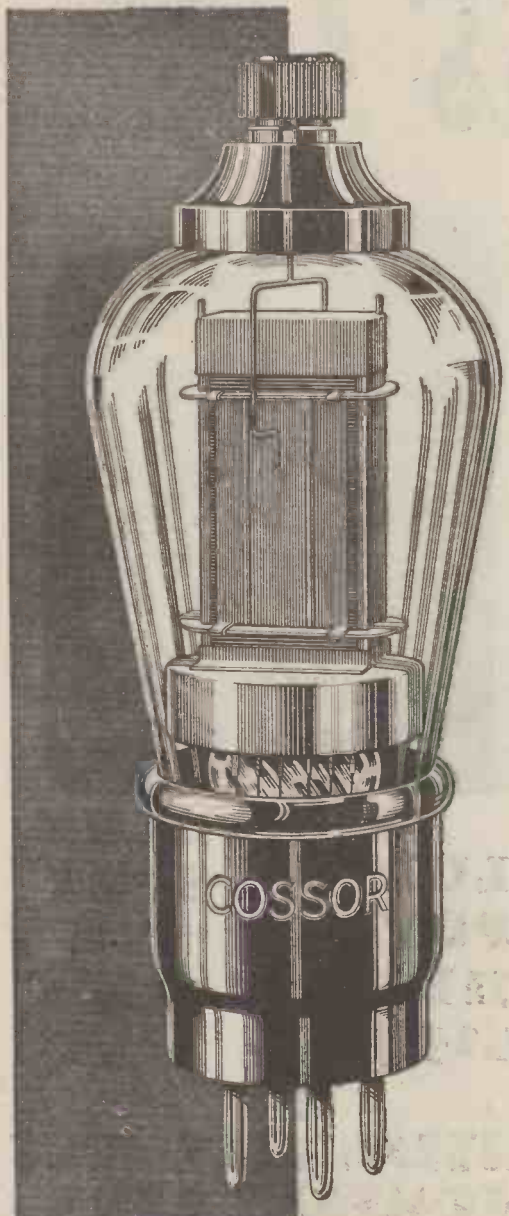
Highest *effective* amplification

yet attained with a Screened Grid Valve



Radio technicians know that it is useless to expect a substantial stage gain from any Screened Grid Valve—however good its other characteristics—which has a high inter-electrode capacity. Cossor engineers have been striving for months past to reduce the self-capacity of Cossor Screened Grid Valves to a negligible figure. So successful have they been in their efforts that the new Cossor 215 S.G. has an inter-electrode capacity of only ·001 micro-microfarads—so small, in fact, that none but the most elaborate and specially-designed apparatus can measure it. As a result, this new Cossor Valve permits a degree of effective amplification which a year ago would have been considered utterly impracticable. No other make of Screened Grid Valve has such a low inter-electrode capacity or can, therefore, equal the remarkable stage gain which it permits.

THE NEW COSSOR 215 S.G.

Cossor 215 S.G. 2 volts, ·15 amp. Impedance 300,000. Amplification Factor 330. Mutual Conductance 1·1 m.a./v. Normal working Anode Volts 120. Positive Voltage on Screen 60-80. Price **20/-**

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Record low inter-electrode capacity

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SEPTEMBER MORN.
THE HAPPY THOUGHT.
LONG-RANGE CONDITIONS.
THE RADIO EXHIBITION.
HEARD LISBON LATELY?

RADIO NOTES & NEWS

SHORT WAVES, TOO.
MORE NEWS FROM CINCINNATI.
A TEN-VALVER FREE!
THE RADIO ROBERT.

September Morn.

WELL, here we are right in September. There is autumn to right of us, autumn to left of us, winter in front of us and storms by the hundred. It's not exactly a gay time of the year, is it?

You come back from the holidays broke to the wide. You catch your first cold. You get out your winter heavyweights from the bottom drawer, and you put your tennis things away. The leaves all blow down, and the bills all pile up! But——

The Happy Thought.

BUT suddenly right in the middle of your misery there comes a happy thought. You grin. You clap the hands, you chuckle and you chortle at the beauty of the big idea. For you have remembered—September may mean autumn, but it also means the beginning of the radio season!

It's dark when you get home at night, but—oh, boy, doesn't the first fire look good? Softly o'er the evening twilight steals the solemn sound of the muffin man's bell. You switch on your radio and find you are King of the Ether!

Long-Range Conditions.

THE foreign stations, lately so coy and distant, now simply crowd around the aerial. Old favourites come back, louder still and better than ever. The X's have all departed, the new programmes are there, and, with a sigh of satisfaction, you can settle down to tune in the whole, wide world.

The Radio Exhibition.

APPARENTLY the Radio Exhibition, which opens at Olympia next Friday, is going to be a record-smasher this year. The Radio Manufacturers' Association has been patting itself on the back at the entries, and some bright boy has calculated and computed that the value of the goods to be shown at Olympia will amount to a little more than five million pounds!

The Show is running from the 19th to the 27th of September, and if half what they say about it is true it's going to be a real rip-snorting "hum-dinger."

Heard Lisbon Lately?

LISBON is a station that I have never paid any special attention to. But for some reason everyone lately has been asking me about Lisbon. Why there should be this sudden interest about the wretched place, I don't know. Yet everyone writes to me about it, or, what is more annoying, writes about something altogether different and puts in a P.S.—"IMPORTANT. What is Lisbon's time and wave?"

Short Waves, Too.

AS I say, I never have been fond of the station, but my latest information is that Lisbon works on 320 metres, on Mondays, Wednesdays, and Fridays, from 11 p.m. to 1 a.m. (Short waves on 43 metres, Friday, 11 p.m. till about 12-30 a.m.).

That's *all* I know about it. If anyone knows better, put it into the next letter to the Editor. (*Not* to me, or we shall have another Lisbon earthquake.)

THEIR PORTABLE WIRELESS!

Having plenty of spare vans and petrol, the Army's idea of a "portable" set is one which can go into a big lorry, that also carries collapsible masts and a signalling crew. This view shows a field wireless set just going into action near Cheltenham.

More News from Cincinnati.

HE'S written again! That indefatigable Mr. Fred Easter, of 3353, South Side Avenue, Cincinnati, Ohio, U.S.A., has sent me another walloping packet of short-wave notes for the benefit of all you fellows.

Among the items are stations H R B, Honduras, now on the air 2 to 5 a.m. on Tuesdays, Thursdays, Saturdays, and Sundays. This station is installing a crystal control, and using wave-lengths from 49·95 to 48·62. Announcements are in English and Spanish, and all reports of reception can be sent to Mr. See, care of the Tropical Radio Telegraph Co., Tegucigalpa, Honduras, and will gladly be acknowledged.

A Ten-Valver Free!

HERE is another good thing that Mr. Easter has put us on to. He says that station W 9 X A A, North-East Tower, Navy Pier, Chicago, will broadcast a special test programme on 49·34 metres on October 4th, beginning at 10 p.m., and continuing to 6 a.m., October 5th. A number of prizes will be awarded on that occasion, the star turn being a 10-valve long and short-wave super-het.

If you fancy your luck on 49·34 metres you ought to have a go at this. (Plenty of other prizes.)

The Radio Robert.

HEARD the latest from Scotland Yard? It appears that for the past two or three months experiments have been carried out by the Brighton police force with a remarkable wireless invention to aid in tracking criminals.

The idea is that every policeman on his beat within eight miles of the local headquarters can always be called up instantly by radio. He will either receive a message direct from headquarters or will run to the nearest police box and get in telephone touch, to receive details and how-to-catch-him hints.

They say that an ex-wireless-operator policeman is the originator of the idea, which certainly sounds a jolly good one.

(Continued on next page.)

RADIO NOTES AND NEWS.

(*Continued from previous page.*)

A Home From Home.

DID you notice that bit in the paper about New York's latest ? They are putting up a little hotel there—just a mere shack, with a couple o' thousand rooms or so ! And every room is to have a choice of six wireless programmes !

The exact length of wire that will be required has not been exactly worked out yet, but it will be round about 190 miles.

'Ware The Dark Stranger.

LISTENERS are hereby warned against a trickster who has been operating in parts of London. This smooth-tongued individual declares that he represents a well-known firm of wireless manufacturers and produces what appears to be an official card from the firm.

When he sees the set he says that it is the old type which the firm are now modifying free of charge, and suggests taking the set away and returning it on the morrow. If you part with your set you hear nothing more of the affable stranger who, of course, has nothing whatever to do with the firm in question.

A Maintenance Scheme.

IN connection with my remarks under this heading (" P.W." Aug. 30th issue). the Hon. Solicitor to the Radio Association writes to the Editor as follows :—

Your contributor is most singularly ill-informed in making such a statement regarding these Examinations, which have been held at intervals since 1923. The attached specimen examination papers will serve to show the high standard which has been maintained. I would also point out that the Select Committee on Broadcasting which sat in 1926, dealt with this Association's Examinations, and made the comment that the standard set was very high. The Examiner of the Association who sets the papers is Professor E. E. Fournier d'Albe, D.Sc., Fellow of the Institute of Physics, and technical consultant of the Association.

The Northern Regional.

HUDDERSFIELD and district readers who have been up on Moorside Edge lately will not have failed to notice that the B.B.C. is making progress with the Northern Regional station. One of the masts has already sprouted up to 200 feet or so.

It's got to be more than twice as high as that, and some of the old locals are already shaking their heads at it. They seem to think that the B.B.C. is making a fine-looking job, but not allowing for the gales which make Moorside Edge one of the wildest spots in the country !

Testing Soon.

BUT there is no need to worry. Velocities and temperatures have been worked out, allowing for all the snow and ice that can attach itself to the mast and aerials, and for the hardest wind that ever blew over Yorkshire. And over and above it all a good safety margin has been allowed.

I hear that the first tests are likely to take place late in November or early in December.

" Say Bo."

THAT is what the announcer did *not* do. He did not say " Bo."

He was issuing an S.O.S., and stated that the person required lives in " Bow," which he pronounced to rhyme with " Now." And all true Londoners shuddered audibly.

Realising that he was at fault, he instantly corrected himself and said " Bow," as in " Say Bo," or Little Bo Peep.

If that little incident did nothing else it certainly proved that the announcer was not a true Londoner, for the definition of your true marrow-in-the-bone Cockney is that he must be born within the sound of Bow bells.

Stars of the Continent.

IN a cheery letter from western Ireland, " X-Rayser " pays a big tribute to the London Regional.

He says it has knocked out 5 X X, hitherto the most popular station in his district. Whilst the London Regional gives splendid signals, Toulouse is the most reliable of all the medium wave-band stations. Rome, steady but not strong, Langenberg and Hamburg occasionally very clear but not reliable, and 2 R N—well, I'd better not repeat it. (By the way, " X-Rayser," I passed your note to W. L. S.)

SHORT WAVES.

" Some of the so-called humour from Savoy Hill makes us sigh," says a listener-in.
Too B. B. C.-rious.—" Star."

* * *

OUTWITTING 'EM.

The article on " B.B.C. Name Problems " reminds me that they—like most outsiders—mispronounced our town's name. We are not With-am, not even With-em, but just Wit-em.

What else would you expect with the River Brain flowing through the town ?—
" Daily News and Chronicle."

* * *

Flat Dweller : " Are you on speaking terms with your next-door neighbour ? "
Second Ditto : " No, only on wall-thumping terms. He owns a wireless set with a *very* loud speaker " !

* * *

" Even when I take off the accumulator the valves still light up, and the more H.T. I put on, the brighter they light," says a correspondent in a letter to our Query Department.

Well, it's an ill wind that blows the valve-makers no good.

* * *

It is reported that the B.B.C. intend making frequent appeals to prevent the scattering of litter.

It's certainly good news to hear they've decided to improve the programmes at last.

* * *

OVER THE RADIO.

" Oh, Bertie, listen to that marvellous jazz ! "
" Why, that's classical music they're playing ! "
" Well, it sounds good enough to be jazz."
—" Answers."

American Advertisements.

AS you know, the Americans do not believe in any form of State control for broadcasting, but prefer to get the broadcasting revenues from advertisements rather than from licences.

Some Americans doubt the wisdom of this, and one of their leading papers asked Dr. Lee de Forest, the noted inventor, what he thought of it. He is all for B.B.C. methods !

Some Home Truths.

DR. LEE DE FOREST is known the wide world over as " the man who put the grid in the valve," and in addition to making dicoveries of this calibre he certainly has the knack of putting pep behind his remarks. For when the newspaper asked him what he thought was the most undesirable feature of American broadcasting, the reply was :

" The insidious influence of the avaricious advertisers, the stupid insistence of direct, crass, venal advertising, and the nauseating quality of the present programmes."

British enthusiasts who want to do away with the B.B.C. and substitute advertising like America, should remember these well-chosen words, and the fact that Lee de Forest has had plenty of opportunity to study the two situations.

Names of Places.

IN view of the storm it has aroused, it is only fair to say that the B.B.C.'s book on pronunciation of place-names—referred to last week—was prepared very carefully indeed. The interesting fact is that listeners themselves supplied practically all the information the book contains, and this information was tested either by a personal letter to an acknowledged authority, to the minister of the parish concerned, or to the post-master.

To give the B.B.C. its due I must say that in every single case in which I have been able from knowledge of the district to check up their pronunciation of queer names, their findings have seemed to be the right ones.

The " Magic " Wave-Change.

I STILL continue to receive a number of letters about this interesting subject, of which the following is typical :

" Since fitting wave-change to my 'Magic' Four I can get forty stations on the loud speaker, which is marvellous considering I live in a swamp area—(Cricklewood).

" Wave-change has not affected the volume of the set at all, and I can get more than half the stations without reaction. I think the 'Magic' Four with wave-change switching the best set of the day."

(By the way, in answer to many enquiries, the original letter from Mr. Donald on the above subject was published in " P.W." No. 428, August 16th issue.)

Coventry, Too.

THE Brighton Police Force is not the only one with bright ideas about radio sets to track criminals. It now transpires that other police forces as well have been tackling this problem, and that astonishing results have been obtained.

Apparently the Coventry Branch of the General Electric Co., Ltd., have been working for the police on similar lines, and although the Chief Constable of Coventry prefers to lay low and say nothing, at the moment, I hear that he has quite satisfied himself about the possibilities of the scheme.

Push and Pull.

JUDGING from a newspaper cutting sent to me last week, a certain well-known provincial newspaper is getting a bit tied up over push-pull. Replying to an inquiry from one of their readers, they gave a rather incoherent paragraph which concluded—" and H. G. should remember that pull will never be push really pull will never be push really pull "——

I wonder if someone will get the push (really) for that !

ARIEL.

THIS YEAR'S EXHIBITION

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

Our Radio Consultant-in-Chief tells you what he hopes to see at Olympia, and proffers some sound advice to the wireless industry.

WE begin another wireless year. We have an opportunity now to look around, square our shoulders, face the facts, and examine the industry. Everywhere I hear people complaining of dull times, dull programmes, but hoping for a burst of prosperity and excitement when the season starts in earnest.

Personally, I am disappointed in that few firms seem to be actively alive, few people seem imbued with enthusiasm and, as a consequence, few new ideas find their way into the product itself. We are, however, apt to keep waiting for this millenium unless we make it come ourselves.

What Will the Show Reveal?

What material have we? And how do we use it? What chances are there that this Show will reveal real thinking? Since I was first interested in broadcasting, I have seen a remarkably rapid evolution in valve and loud-speaker design, but except that sets embody these new components, the sets themselves are much the same.

Perhaps the most useful tool in the hands of the designer to-day is the screened-grid valve. There is furthermore the pentode, a direct consequence of our backwardness as a country in supplying electricity for household use.

The advantages of high-frequency magnification are not so obvious as one might at first imagine, and certainly more seldom used than they might be. What, after all, do we gain by using two or three stages of screened-grid valve magnification?

I suppose we gain the facility of being able to use smaller aerials, and people might argue that we can the more easily bring the steady detector grid volts to a proper value; but I am convinced that most people do not want great sensitivity, that a medium indoor aerial suffices for the local and two or three other programmes.

Set Design.

Power grid-leak detection is not so insistent on a relatively large detector grid volts as bottom bend, and one high-frequency magnification suffices with a reasonable aerial.

Then the apologists for many stage high-frequency magnification argue that it gives a relatively better response curve—squarer shouldered, and so on. But the response curve of the loud speaker is seldom linear and often a single circuit with reaction gives far more pleasing quality by pushing in more bass than the most carefully designed non-reactive high-frequency staged circuit.

But *selectivity!* Well, seriously, I maintain that the selectivity of a three-stage high-frequency set is still insufficient in a great many cases to cut out the 9 kilocycle night-time heterodyne from other European stations.

This form of interference is unquestionably the most serious, and unquestionably calls for elimination service conditions of listening. One high-frequency magnification is, therefore, probably as efficient, looked at from the true service viewpoint, as anything for modern requirements.

Lastly, I cannot see the value of the multi-high-frequency set when it is realised that it presupposes a ganged condenser which, even in its best form, may have an error of 5,000 cycles at the shorter waves. So the screened-grid valve is valuable, but I feel it is being asked too much by designers when they use two or three in cascade.

We have new knowledge of grid-leak rectification, and now realise that this comes so near to an ideal as to be of great value commercially.

The pentode valve is a compromise. According to various measurements it is difficult to arrange the pentode to give a linear output. While the pentode may be an excellent compromise for the cheap battery set, I condemn its use in anything approaching the £20, £30 range of instruments as prices range to-day. So having outlined my ideas of the value of the building material, how best can we finish the structure?

Firstly as to circuit. It seems to me that the average man is best pleased by a three-valve set. A set having a stage of high-frequency, a single-tuned circuit (to overcome ganging and give true one-knob tuning), power grid-leak detection, and a nice medium comfortable output valve.

There should be three independent adjustments, volume, tuning, and selectivity. The set should be compact in one unit with loud speaker; it should be available for mains or battery with slight adaptation. And it should be good.

Mains Receivers.

For mains sets the aerial could well be the cord lead of the plug. And the price? If anybody had guts and could take the few proper risks and give some of the enthusiastic and knowledgeable young technicians who are eating their hearts out to-day, a chance, the price, for the all-mains set, should be a ten-pound note.

Shall we see anything like it at the Show?

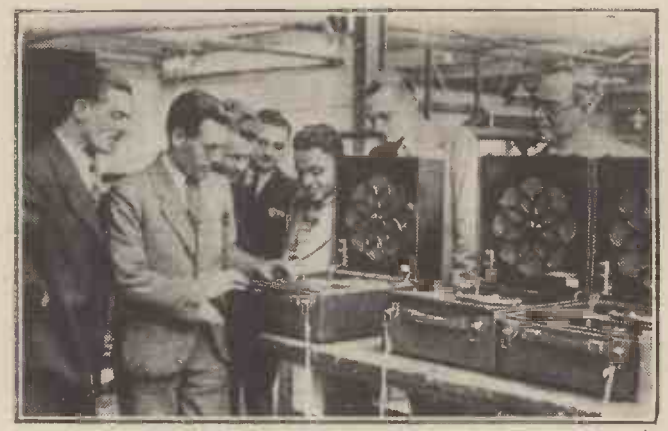
We may, let us hope so. If not you will realise that I am a generous person to give these ideas away free for next year; but the ideas are not new. It's not a question of new ideas, it's a question of someone with the knowledge and courage to put ideas into practice. So long as wireless counts as a basis for share juggling so long will the public be the worse served.

But to close the article, I would like to add a word on appearance. The wireless set has not yet found its true form, but meanwhile can we not get away from this awful dull polished wood-stuff? Has no one heard of aluminium or canvas or white wood, or stainless steel, or colour, or green dials with red scales or lamps, or—oh! something gay and exciting?

I shall go to the Show hoping. I wonder if it will be as last year, and the year before, and the year before that; just boxes, with some new ideas in components screwed down inside them. They work! Yes, sometimes! Nevertheless, it could be such fun if a "Morris" of wireless arose and did what is obviously waiting to be done.

So many manufacturers seem to think it's infra dig. to make what they call "cheap" stuff—to give the public service,

THE G.E.C. "AT HOME"



Radio wholesalers examining Gecophone 4-valve portables at the G.E.C. factory at Coventry.

LATEST BROADCASTING NEWS.

POLITICAL BROADCASTING

NORTHERN FEATURES—MANCHESTER MID-DAY CONCERTS RESUME—BELFAST ITEMS—STREET CRIES—LONDON HIGH SPOTS

Political Broadcasting.

QUITE a little storm was caused by the "P.W." scoop about a series of broadcasts on Empire Trade to be initiated by Lord Beaverbrook on October 18th. There could be no denying the facts, which had been secured authoritatively from a party headquarters.

All that Savoy Hill could do was to remonstrate about the statement that they had abandoned hope of any agreement between the political parties on the general subject of controversial political broadcasts apart from those at election times.

If the wording unwittingly conveyed a wrong impression, "P.W." is glad now to put it right. The general issue of political party broadcasting is in abeyance until Parliament reassembles, and the whips can get together again.

Apparently there was to have been a three-party conference with Sir John Reith at the House of Commons just before the House rose, Sir John did, in fact, turn up to keep the appointment, only to discover that the incident of the stolen mace had so upset parliamentary arrangements that political broadcasting was to be considered in October or November instead of in July.

But stolen maces may upset the even tenor of parliamentary life; they do not, however, suspend the broadcasting service. So the B.B.C. quite rightly left over the main issue and decided to deal on its own with the specific subject of Empire Trade, debated between Lord Beaverbrook, Sir Arthur Salter, Sir Basil Blackett, and any representatives the parties may care to put up.

Such action was absolutely right. The B.B.C. had merely to keep the scales of opportunity evenly balanced; given this, the Corporation owes to the public informative and interesting treatment of such matters as Empire Trade: not solely "Empire Free Trade," mark you.

Northern Features.

An interesting feature for listeners to the North Regional programmes during the week beginning September 21st is a musical tour of Europe.

The Northern Wireless Orchestra begins its "tour" on Sunday afternoon in the East of Europe with a programme of Russian music conducted by Mr. Percy Pitt, former Musical Director of the B.B.C. The orchestra will play works by Tschaikovsky, Moussorgsky, and Glazounov, and Anderson Tyrer will play with the orchestra Tschaikovsky's First Pianoforte Concerto for Pianoforte and Orchestra. Russian songs will also be sung by Booth Unwin (bass).

Next day the orchestra will tak listeners to France and will give a short programme of light music full of charm and grace, which to the world is typical of French music, the composers chosen as representative being Messager, Chaminade, Massenet and Gabriel Marie.

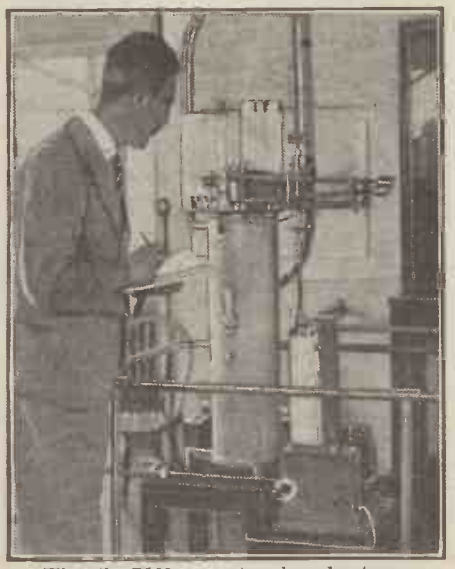
On Tuesday evening the orchestra will visit first Spain, when they will play Spanish dances by De Falla and Granados, and later Italy, when they will give selections from operas by Verdi and Puccini.

By Friday evening the orchestra will have travelled the long distance back to the north and will play works by representative Scandinavian composers—Sibelius, Grieg and Jeul-Frederiksen.

Manchester Mid-day Concerts Resume.

Listeners will be pleased to learn that the Manchester Mid-day Concerts are once again to be relayed throughout the Northern Region.

THE WEATHER WATCHER



When the R100 was out on her adventurous trip to Canada a constant watch on weather was necessary, and she was notified by radio of the prevailing conditions on her route. This illustration shows an official reading the Cardington weather chart.

The concerts will be broadcast between 1.15 and 2 p.m., and at the opening one, on September 23rd, The Northern Wireless Orchestra, conducted by Mr. T. H. Morrison, will give a programme of works by Mozart.

They will also play the G Minor Symphony (which is being given by special request) and a little known concerto for flute and orchestra, in which the flute is to be played by Cissie Locke.

Belfast Items.

The Radioptimists, who are so popular with Scottish listeners, are paying a visit to the Belfast studio on Saturday, September 27th. They will be certain of a hearty welcome from Ulster.

No one has done more to revive the almost forgotten traditional melodies of Ireland than Carl Hardebeck, and some of his works will be included in a short programme of light Irish music which will be broadcast for Irish listeners on Friday, September 26th.

Street Cries.

Mr. William Moore, whose talks are always entertaining, will describe for Ulster listeners on Thursday evening, September 25th, the distinct characteristics of the street cries of Belfast. These quaint cries have now disappeared, owing to modern business methods and police regulations, but they were as picturesque as any in the world.

London High Spots.

"Through the Looking Glass," which was adapted for radio production by Cecil Lewis, will be broadcast on Monday, September 15th (National), and Tuesday, September 16th (Regional).

If conditions permit it, the B.B.C. intends to relay a series of commentaries from America on the seven races for the America Cup. On each day—September 13th, 15th, 16th, 17th, 18th, 19th, and 20th—it is hoped to relay the N.B.C.'s opening commentary (at 5 p.m.) and the final summary (at approximately 10 p.m.). The commentaries will be broadcast from a U.S. destroyer following the yachts.

FOR THE LISTENER.

This week our popular contributor—who is still holiday-making in Italy—tells of his listening experiences there with the portable set.

By "PHILEMON."

Autumn Programmes.

THE series of "International Conversations" promises very well. The idea apparently is that an Englishman will converse with a foreigner, and try to get out of him what his country thinks of us.

If he will speak the truth, it should be both entertaining and instructive. I was talking one night to a very intelligent young German who told me of a German book, recently published, in which Germans and English are contrasted.

"You will never understand us properly," he said, "because we Germans are intellectual, and you English are animals."

He hoped I would not be offended by the word. He was afraid that it wasn't quite the right word.

I confess it sounded a little odd. But he explained that what he really meant was that, while the Germans worried things out with their intellectual mind, we Englishmen got straight to the point with our instinctive mind, and lived much more by insight and flair than the Germans do.

That sounded better! Very likely it is true.

Science and Religion.

This series of talks also promises well. It will be given on Sundays.

Most people are interested in the subject and it is to be handled by men who can be relied upon to speak their minds, on whichever side they stand—J. S. Haldane, Dean Inge, Prof. Eddington, Bishop Barnes, and others.

(*Continued on page* 762.)

2 LO'S TWIN

Although 2 L O has given way to the new Brookmans transmitter its famous Australian "twin," 3 L O of Melbourne, is still going strong.

From our SPECIAL CORRESPONDENT.

I REMEMBER being at Marconi House, in the Strand, about a week before the B.B.C. was formed. The little 1½-kilowatt transmitter was being tested (it was in the afternoon) before a short programme which was to be given in the early evening.

Captain Eckersley had been up there, too, after coming back from the old "Two-emma-tock" station, of which he was in charge, at Chelmsford, and there were one or two other engineers who are now big people in the B.B.C.

A Visit to Melbourne.

How little we all dreamed that these four transmitter panels were to blossom out into the grandiosity of 2 L O, thence to the B.B.C., the Corporation, and the 50-kilowatters of Brookmans Park and Moorside Edge!

A bit later, when the Marconi House transmitter had been shifted to the top of Selfridge's, I was on business at Melbourne, Australia, and took the opportunity of going along to see 2 L O's "twin"—namely, 3 L O. At that time 3 L O was putting out a goodly number of kilowatts on about 32 metres, and I had often heard his transmissions in London. He was well received on good DX evenings by many British amateurs.

3 L O's first impression is that it is a little B.B.C.-ish, perhaps 25 per cent and 75 per cent American. Nevertheless, as I found out later, all the radio gear had been supplied by the A.W.A. It was in the studio arrangements and office routine that 3 L O seemed rather un-British.

I was ushered into the gigantic reception room adjoining the main studio; leading right out of it, in fact, so that the 120 people who could be accommodated in the reception-lounge could see and hear the artistes. Not a bad idea, and a little less nerve-racking than the loud speakers in the B.B.C. Savoy Hill waiting-rooms.

The studio being quite an open affair, I was conducted to the announcer while a broadcast was on—a thing quite *Verboten* under the B.B.C. regime—and he, sitting at a desk at one side of the studio, 'phoned through to the station director!

A rather striking idea, this, where one could walk about the studio with great freedom, and where the announcer, with a station microphone at his right and a telephone to his left, acted as a sort of super-Commissionaire!

Resonant Background.

There were a separate couple of "mikes" for the artistes, and when their broadcast was over the announcer turned the knob of a small fader control which brought his microphone into circuit without any click and announced the next item. At intervals he struck a row of tubular bells to announce the time, and to indicate programme intervals.

After the formalities of introduction, I was taken through to the control-room, and then to the transmitter itself. One of the control men handed me a pair of 'phones, so that I could listen to the happenings in the studio next door.

I was struck by the resonance of the background—hardly an echo, but the kind of resonance which would be expected from the studio, which had a barn-like roof with no padding, and only loose hangings on the walls.

Outside Broadcasts.

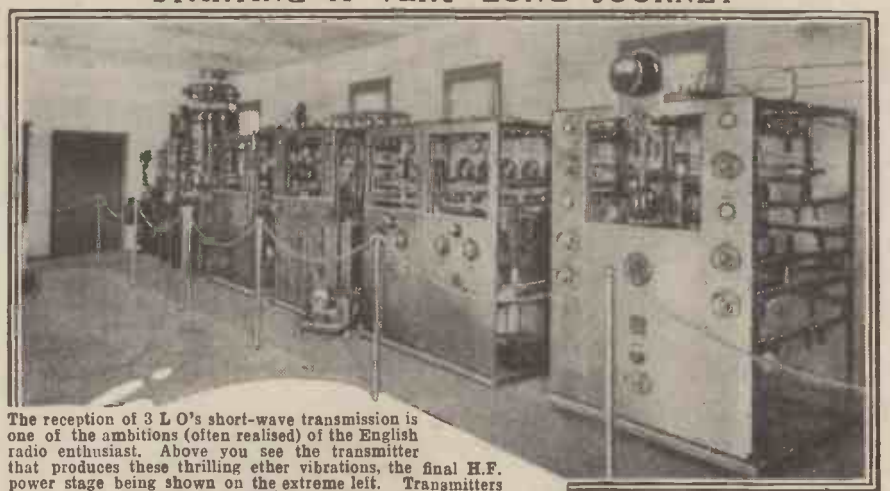
I daresay many people who have heard 3 L O on the "wavelets" a year or so ago will remember this "open" background, and I expect it was accentuated by the microphone being in the centre of the room, as a rule, and soloists often had the empty studio to themselves.

The control-room was connected to the programme lines outside by a telephone-bureau type of switchboard, and as there were separate amplifiers for each line system, the engineer in charge had a busy time when there were outside broadcasts. He could watch what was going on in the studio through a sound-proof glass window, reminiscent of the B.B.C. in 1923.

True to Yankee broadcasting style, a "record" man in the control-room was busy writing down a log of each item, the transmission time, and so on.

Before I left the regular transmission was over, and a test was carried out with a separate "mike" brought in from the studio and placed near the transmitter, so that one of the engineers could watch the dials and do the talking. And so, while 3 L O goes on, its "twin," 2 L O, is silenced, and no longer do we hear the old and trusted call-sign.

STARTING A VERY LONG JOURNEY



The reception of 3 L O's short-wave transmission is one of the ambitions (often realised) of the English radio enthusiast. Above you see the transmitter that produces these thrilling ether vibrations, the final H.F. power stage being shown on the extreme left. Transmitters use H.F. amplifiers very similar to receivers. The energy in this case is modulated with speech and music, and then amplified at H.F. until sufficient aerial power is developed.

RECORDING PROGRAMMES.

By H. G. AYTOUN KAY.

Our contributor gives a few preliminary remarks f an aspect of home radio experimenting which is likely to prove very popular this season. The necessary gear costs but little, and interest in home radio recording is sure to be widespread.

IN theory, at any rate, it should be possible to pick up and reproduce wireless impulses transmitted days or even years ago. No doubt, too, the golden notes sung by Melba at the first broadcast transmission in England are still travelling through the ether, perhaps to be received by some yet-to-be-invented set.

Whether this possibility exists or not most of us have heard some broadcast item which we would like to be able to reproduce again at will, and the means for so doing will soon be available to everyone.

Recalling the Past.

My own loud speaker has, in fact, surprised its audience on more than one occasion by giving out the News Bulletin of the previous evening; and at any time I can, if I will, hear again H.M. The King at the recent opening of India House, or Miss Amy Johnson's speech, broadcast when she arrived at Croydon.

Imagine the interest and value in years to come of being able to reproduce again anything which has been broadcast. Imagine, too, the fascination of hearing again something of special personal appeal—a speech by someone who is the object of your political hero worship, for instance, and whom you may never actually otherwise hear; or a particularly haunting song which appeals to your own individual preference.

The apparatus which makes this possible is not a hyper blooperdyne-cum-time machine, but simply a home recording gramophone, an instrument about the same size as an ordinary table model machine, and no more complicated to use. Attached to a wireless set in exactly the same way as a loud speaker and still keeping the latter connected, it will record the broadcast programme.

A Simple Process.

Moreover, by the use of a cheap and simple microphone it is quite easy to make a record of one's own voice. Here may I interpose the remark that I do not propose to worry my readers with anything but a simple and non-technical explanation of the process.

As to the signal strength required for making a record, it is always difficult to define degrees of loudness, but a portable set or three-valve set suffices for recording items from a local broadcast station, and a good record can be made with probably less signal strength than is fed into most loud speakers. In fact, using an ordinary four-valve set consisting of one H.F., screened grid detector and two L.F., I have recorded Rome's Lady Announcer as well as Tzigane music from Budapest.

The disc on which the record is cut is made of a special aluminium alloy. A ten-inch record is a convenient size for home use, and runs for just over three minutes. Both sides can be utilised for recording, and the disc as supplied has a perfectly plain, smooth surface. The sound track or groove is cut in the metal by a diamond point carried in what appears to be an ordinary electrical pick-up.

Of course, my readers will understand that this pick-up, or more correctly cutter head, works in the reverse direction from normal, i.e. instead of converting the vibrations of a needle into electrical energy, it translates the electrical impulses, which in the loud speaker appear in the form of sound, into mechanical vibrations of the diamond cutter.

For driving the turntable a rather more powerful motor than that used in an ordinary gramophone is required, because not only has the motor to overcome the friction between the diamond point and the metal disc, but it has also to drive the gears which gradually traverse the cutter arm across the face of the disc.

If now we imagine the turntable to be rotating with an aluminium disc in position, then the record is started by lowering the cutter head in position on the outer edge with the diamond point pressing on the metal. Were the cutter head to be held in an ordinary pick-up arm, then, the disc being plain, the point would simply fly across it.

A Special Cutter.

If, however, the arm is definitely moved across the disc at a pre-determined rate, then the point will cut a spiral groove which starts on the outside of the disc and extends towards the centre. Again, if the point while it is cutting its way across the disc is vibrated in sympathy with whatever is being recorded, the point will trace a wavy line which will, in fact, be a graphical reproduction of the sound.

The superiority of electrical recording by comparison with the now obsolete acoustic method is well known and the simple electrical process I am describing gives excellent results. It must not be assumed from this that the production of the ordinary gramophone records sold by world famous manufacturers is an easy and inexpensive task.

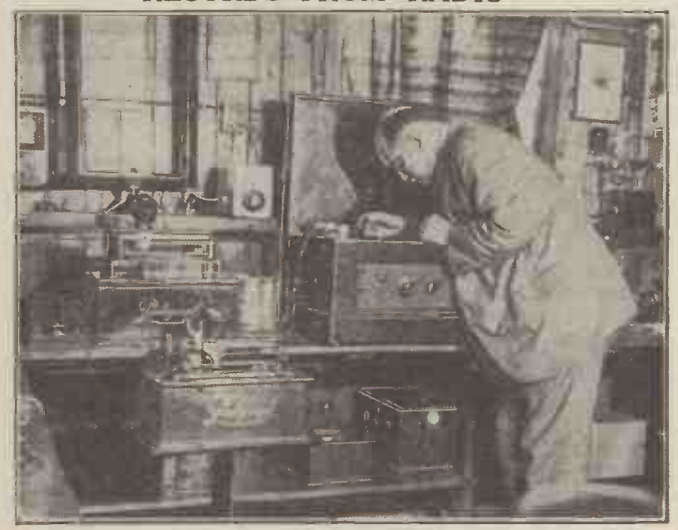
No Technical "Snags."

On the contrary comparable results could never be obtained by an amateur who attempted to make a direct record of part of a Symphony Concert, for example. Before any record can be made considerable skill has to be exercised in placing the microphones, arranging the performers so as to obtain a proper balance and controlling the input to the amplifiers.

Gramophone record-making companies employ experienced technicians for this purpose, but when broadcast programmes are recorded all these problems have been taken care of in the studio and control-room by the broadcasting authority. The home recorder obtains the benefit and is able quite easily to make his own records in the manner I have outlined.

At a later date I hope to be allowed to afford further details and illustrations of the apparatus required.

RECORDS FROM RADIO



A German experimenter operating a machine that transfers radio programme items on to metal records, which can be used on any ordinary gramophone. The results compare very well with those given by the well-known wax recorders that can be seen in the photo.

ODD ITEMS

Most L.F. instability is due to the coupling effects of the H.T. supply circuits.

* * *

Where an enclosed R.C.C. unit is used, and it is wished to reduce the value of the grid resistance to remove a tendency to instability, an external grid leak may be connected between the grid and grid-bias terminals of the unit.

* * *

The usual values of the resistance and condenser for a decoupling (or "anti-motor boating") circuit are 20,000 to 40,000 ohms, and at least 2 mfds.

* * *

If you think that an anti-motor boating device would improve your set do not be discouraged if there does not appear to be room inside the set for it, as the wiring can in nearly all cases be done externally just as well as internally.

* * *

Listeners in the London area who find the Regional and National programmes overlapping one another often discover that if the horizontal portion of the aerial is cut away and the down-lead only used, the two programmes can be separated easily and there is no serious loss in strength.

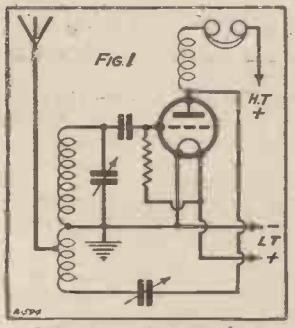
SOME NEW WAVE-CHANGE COILS

Here are the first details of a new wave-change scheme of a particularly ingenious nature. It is remarkably simple, and its applications are quite universal. It can be applied to sets using H.F. amplification of either "Neut" or S.G. varieties.

By C. P. ALLINSON, A.M.I.E.E., F.Inst.P., Inc.

ONE of the complications in designing a wireless receiver for use in England is the fact that it has to be designed to cover two wave-bands. Ours is not the simple problem of meeting the requirements of a single wave-band from 200 to 600 metres, for we have also to cater for the 1,000 to 2,000-metre band.

I have tried various switching schemes from time to time, with varying degrees of success, and some of them are quite satisfactory. The great disadvantage they possess, however, to my mind, is the fact that the coils are often over numerous.

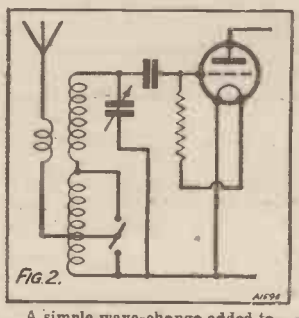


This is a straightforward Reinartz circuit.

Take, for instance, the simple Reinartz circuit shown in Fig. 1. When we want to switch this we have to be able to transfer the aerial lead to a new tap, increase the size of the grid coil, and put on more reaction. In the ordinary way this would mean complete duplicate coils with anything up to a three-pole two-way switch to give us the desired wave-length change.

Simple Switching Scheme.

A quite useful way of switching this circuit is shown in Fig. 2. Here the circuit is slightly altered to meet simple wave-change requirements. Instead of the aerial being tapped on to the continuation of the grid coil as it is in Fig. 1, the short-wave aerial winding is entirely separate, the end being taken to a tap on the long-wave grid winding.



A simple wave-change added to the Fig. 1 circuit.

Then, by means of a three-point shorting switch, the long-wave grid coil and aerial tap are short-circuited for short-wave reception. But this does not take care of the reaction winding, and a separate switch or switch contact has to be provided to give the desired change.

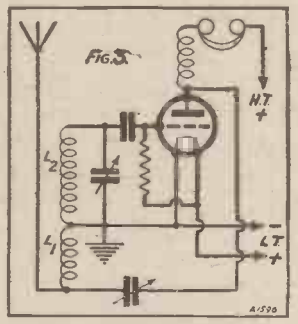
During recent consideration of the problem, it struck me that it must surely be possible to reduce the number of windings. This was what I chiefly had in mind—a method of reducing the coil to its simplest possible form.

With Reinartz Reaction.

First of all, we can eliminate the extra aerial coil by using the simplified Reinartz circuit as given in Fig. 3, in which the same winding serves as aerial coil and reaction. Now let us see what we have in the way of windings for short-wave reception: A common aerial-reaction winding, L_1, of 6 to 10 turns, and a grid coil, L_2, of 50 turns.

When we switch over to the long waves, however, we want an aerial winding (which also gives us reaction) of about 60 turns, and a grid winding of 250 turns.

All the above turn numbers are, of course, approximate, and will be influenced by the size of former used, and the method of winding employed, but they are the usual turn numbers with which we work for short and long wave-bands respectively.



Here the extra aerial coil is eliminated, the reaction winding being made to do two jobs.

To return to our subject, however, the short-wave aerial and grid coils in series give us from 56 to 60 turns, so why not turn these two coils into one aerial coil for the long-wave reception, thus reducing our coil to one continuous winding with taps taken out at suitable intervals?

Two Useful Methods.

The scheme applied to a detector circuit is shown in Fig. 4 (A and B), and you will see that the change can be made with one of the ordinary five-point plunger switches (by this I mean push-pull) which incorporate one two-way switch and one on-off switch, or else with a small two-pole two-way switch of the anti-capacity type.

Actually, this can be done in two ways, and both are shown, so that you may choose the most suitable method for your own requirements. The portions of the coil marked 1, 2 and 3, are the S.W. aerial coil, short-wave grid coil, and long-wave grid coil respectively.

In the same way, this scheme can be used for the aerial coupling in front of an H.F. valve or for H.F. switching using either transformer or tuned-anode coupling, providing always that shunt feed is used.

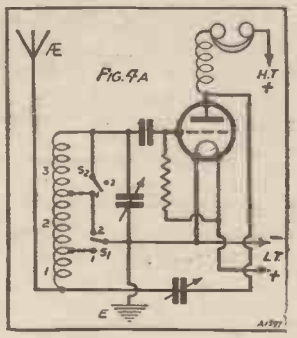
Fig. 5 shows a practical example. A screened-grid valve H.F. stage is used with auto-transformer coupling, so as to give reasonable selectivity, and both aerial and H.F. coils (L_1 and L_3) are switched by the new method. You will see that in both cases the coils have been reduced to their simplest and cheapest form, and will entail less winding (if you make them yourself) than any other type of change-over coil.

H.F. Wave-Changing.

To take the Fig. 5 circuit in detail, L_1 is the aerial coupling coil. It consists of 360 turns of wire on a 3-in. former. If it is desired to make the coil efficient, the short-wave winding should be wound with not less than 24 S.W.G., while the long-wave winding may be 32, 34, or 36. The size is not critical in this case.

Taps are taken at 10 and 50 turns of the short-wave winding, after which the long-wave coil is wound on without a break. This simplifies the construction, for taking taps on a thin wire is not always too easy a matter, especially for the less experienced constructor.

The H.F. coil is identical with the aerial coil, except as regards the number of turns in the short-wave aerial winding. Unless a very high degree of selectivity is required, I would advise you to put on about 50 turns, though you can put on more provided that this will give you sharp enough tuning for your purposes. This, with the 50-turn grid coil, will give you a 100-turn primary for long-wave work.



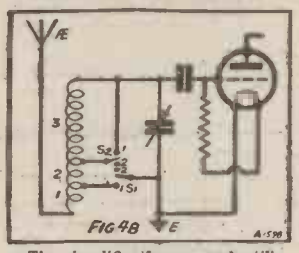
One coil only is used for long and short waves tuning, as well as for aerial coupling and reaction!

(Continued on next page.)

SOME NEW WAVE-CHANGE COILS.

(Continued from previous page.)

If you want to use reaction in the detector circuit, 100 turns is perhaps rather large even on the long wave; while 50 turns is a bit high for the short, so that it will be essential to use a differential reaction condenser, and even perhaps to put a small fixed condenser between anode and filament of the detector valve to reduce the amount of reaction available.



The simplification proceeds still further.

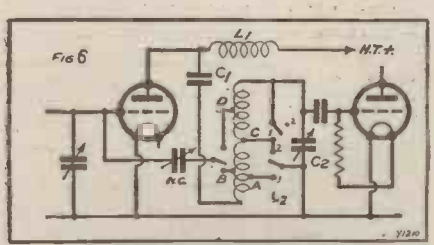
On the other hand, if you use R.C. coupling, possibly with anode-bend rectification, you won't find these reaction turns too high; in fact, you may even find that you haven't got quite enough reaction at the top of the long- or short-wave band.

It will be seen that this wave-change method lends itself to all kinds of applications, wave-meters, wave-traps, etc., and it is quite a sound scheme to mount your coil with its switch on a small base, and by providing some simple method of ganging the switches the whole set can be changed over from one wave-band to another with the movement of one control only.

Easily Matched Circuits.

This method of construction enables two tuned circuits to be matched up very easily, as either grid winding can be suitably adjusted without disturbing any other winding.

If you want to, the long-wave winding can be pile-wound alongside the short, while if space is a consideration, this will be found to reduce the size of the coil considerably. Similarly, the short-wave aerial coil can be made as small as possible by using a thin gauge wire, or at a pinch, though



The scheme adapted for neutralising.

it involves extra labour, it can be wound over the top of the grid coil on ebonite spacers in a manner that is now well known.

The adaptation of this scheme to a neutralised H.F. circuit is shown in Fig. 6, and this will serve as a guide for other circuits which are not so simple as the aerial or S.G. circuits.

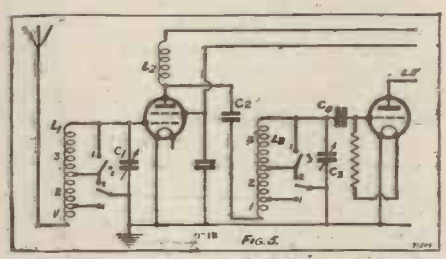
It was obvious from the general form of the simplified method of coil construction that it would be necessary to use shunt feed so as to eliminate all H.T. current from the coil, and after several different methods had been tried out, the Fig. 6 arrangement was finally arrived at.

I have just shown the H.F. valve with its output, and the detector valve with its input circuits so as not to confuse the reader with any irrelevant details. L_1 is the H.F. choke used to give shunt feed in conjunction with the H.F. amplifier, while C_1 is the necessary coupling condenser which has the usual value of ·0003. L_2 is a coil provided with a number of tappings. Since we are using reaction we need not worry much over its H.F. resistance, for this, as you know, can be wiped out by the use of reaction.

How Coil Is Made.

First of all we have a tap, A, at 12 turns which gives the short-wave primary or anode winding, the tap being connected to L.T. Then comes another tap, B, after a further 12 turns, and this gives the neutralising winding. Then comes the tap C after a further 38 turns, giving us a 50-turn coil between A and C, which is the short-wave grid coil. The rest of the winding is shorted out for short-wave work.

When we switch over to long waves, what exactly happens? The anode lead stays where it is. What was the grid coil now becomes part of the anode, or primary, winding, and a tap taken at 62 turns from



Mr. Allinson's new scheme applied to a circuit embodying an H.F. stage.

C, as shown at D, gives the long-wave neutralising winding. After this a further 190 turns completes the 250-odd-turn long-wave grid coil.

Not only is the switching actually much simpler with this scheme than it is usually with the split-primary neutralised circuit, though at first sight it may not be apparent, but the coil is certainly made as simple and straightforward as it can possibly be.

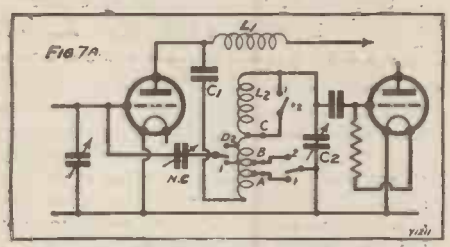
If your receiver is located where you need very high selectivity on the long waves, and you are prepared to sacrifice a little signal strength to get it, then the coil winding shown in Fig. 7 at A will be more suitable. Here the anode or primary winding has 24 turns only on the long wave, being comprised of the short-wave anode and neutralising windings only.

A Further Modification.

A tap is then provided a further 24 turns up the coil so as to give the long-wave neutralisation, while the size of the whole coil is suitably adjusted to tune correctly.

A further modification which gives a still simpler circuit is shown at B, in Fig. 7, but this has the disadvantage of giving rather tight coupling on the short-wave band, and this, if you are close to Brookmans Park, is not altogether desirable. There are many listeners, however, who are quite a good distance from the nearest broadcast station, and they will find this circuit a useful one, though the coupling on the long wave is a little looser than in the Fig. 7A circuit.

The short-wave primary winding is given 17 turns, and a tap is taken at 17 turns from A, the beginning of the short-wave grid coil, which is wound to have exactly 51 turns. You will now see that by transferring the neutralising condenser from B to C the necessary adjustment for the long wave is made with the greatest economy of tappings and switching.



Shunt feed stops the H.T. from flowing through the coil.

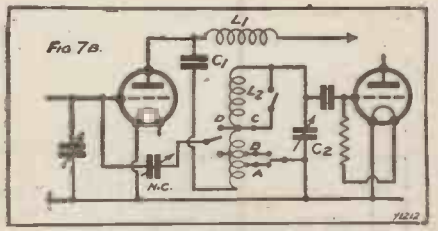
At first it looks as though the Fig. 7B circuit were the same as that in Fig. 7A, but a close examination will show that it has one tap less, and thus for making the coil it is simpler.

The exact choice of the three circuits of Figs. 6, 7A or 7B will depend on the performance you want.

Highly Elastic System.

With Fig. 6, which is a general circuit, you can adjust your taps to give any desired result with any given valve. It is a highly elastic circuit, and can be suited to all special cases.

Two of these special cases are dealt with separately in Figs. 7A and 7B; 7A results in all tappings being taken on the short-wave winding, so that the long-wave winding which is usually of thin wire, can be put on without interruption, while 7B gives a still simpler form of construction. The tapping points have been lettered the same way as in Fig. 6, and this will help you to trace out the variations between the three circuits.



The final modification of fig. 6.

YOUR AERIAL AND EARTH.

The down lead of an aerial should come either from one end of the horizontal span, or from its centre.

* * *

A piece of galvanised iron as used for roofing makes an ideal earth plate.

* * *

Where a counterpoise earth is used, remember that the insulation of this should be as good as that of the aerial.

* * *

Among the advantages of a counterpoise earth are the fact that it sharpens tuning, and is often effective in reducing humming interference.

POTENTIOMETERS AND RHEOSTATS

A practical article for constructors. Details of simple schemes for improving your set results are given.

By A CORRESPONDENT.

THERE must be thousands of potentiometers languishing neglected in drawers, junk boxes, or those "glory holes" that all wireless men like to possess. When sets were modernised some time ago on the introduction of neutralised circuits and other "non-losser" methods of obtaining stability on the high-frequency side, no use could be found for the potentiometer, which formed part of every old set incorporating radio-frequency amplification.

It *had* to. In those days there was no satisfactory method of holding down circuits that tended to oscillate wildly but by the introduction of grid-current damping with the aid of the potentiometer.

Holding down circuits in this sort of way became out of date a long while ago.

We need that kind of thing less than ever to-day, for the high-frequency amplifier, even if it incorporates several stages, is as docile as could be desired. Hence the discarded potentiometer remains idle and apparently useless.

Not Useless.

But it is not useless; in fact, I would make bold to say that there are few sets whose performances cannot be improved by the use of a potentiometer, not as a high-frequency stabiliser, but to provide fine adjustments of the grid bias (positive or negative, according to whether it is of the leaky-grid or anode-bend type) of the detector valve.

Let us take the leaky-grid detector first of all. It is a common practice nowadays to connect the grid-leak return direct to the positive leg of the filament, the fixed filament resistor (if one is used) being placed as a rule between the point of connection and the L.T. positive busbar.

Now, though most valves will rectify pretty well, whether the grid-leak return is connected straight to the low-tension positive busbar or to the point just mentioned, it is largely a matter of luck whether either of these connections enables the valve to be absolutely at its best as a detector. If we so arrange matters that the positive grid bias is finely variable we can make sure of getting the best results from the valve and we shall find that an improvement is made in another direction.

Obtaining Smooth Reaction.

This is the reaction control. Ideally this control should be velvet smooth. As the coupling is gradually tightened there should be a progressive increase in signal strength. Then, as the point of oscillation is approached a faint rushing noise should be heard. The set should glide almost imperceptibly into oscillation and should come out of it again when the coupling is loosened to the point at which oscillation began.

Correct Grid Bias.

Too often we find that just as the set is being brought to its most sensitive condition, a little below the point of oscillation, a "plock!" is heard followed by wild oscillation. The set does not glide into oscillation; it falls in with a bang! As the coupling is loosened we have to turn back a long way past the point at which oscillation began before stability is obtained once more. This kind of thing is bad enough in the set intended for medium- and long-wave reception; it is almost fatal to good results in the short-wave receiving set.

The use of our old friend the potentiometer in the proper way will often effect a complete cure, giving silky reaction with no sign of overlap.

Here is the way in which the potentiometer should be used with a leaky-grid detector. Wire the instrument across the low-tension busbars and connect the grid-leak return, not in either of the ways previously mentioned, but to the slider of the potentiometer.

It will probably be found that the adjustment of the instrument which gives the most effective rectification differs a little from that which provides the smoothest reaction. Without the potentiometer we have often to take our choice between efficient rectification *plus* bad reaction, and smooth reaction control combined with poor rectification. With the potentiometer we can strike a happy mean in the matter of positive grid bias, which allows us to obtain the most efficient detection consistent with good reaction control.

A little experimenting with the potentiometer will show just what setting gives the best results, and once this has been found it will be rarely necessary to touch it again. There is thus no need to mount the potentiometer so that an additional knob appears upon the panel. It can be placed upon the baseboard and hidden away inside the cabinet.

Now for the anode-bend detector. If, as is usually the case, the grid battery employed is one consisting of dry cells wired in series, we can obtain nothing finer than 1½-volt steps when adjusting grid bias. An examination of valve curves will show that something better is often needed in order to bring the working point just to the top of the lower bend, which is clearly the proper place for effective working.

This is easily accomplished by connecting the potentiometer across the low-tension leads and connecting the positive of the grid battery to its slider. Tiny adjustments in the biasing voltage can now be made and a setting found which brings the detector valve to the top of its form.

The Rheostat.

An up-to-date use can also be found for the rheostat. One of the difficulties experienced by those who live in the service area of a broadcasting station is this: to hear foreign stations one or more stages of high-frequency amplification are required; for the local station very little of such amplification is needed or the set is overloaded since volume is too great.

The simplest way of dealing with the problem is to instal a volume-control device in connection with the high-frequency valve or valves; and a perfectly effective volume control can be contrived by means of the rheostat. Fit one of these to the filament circuit of the high-frequency valve, or to the first of them if there are two. Dimming the filament by means of the rheostat cuts down the amplification and reduces the volume.

HOW PILOTS TUNE IN.

A new radio-set tuning device for aeroplanes. The pilot merely has to knock the handle round with his gloved hand to tune his radio outfit.

THE GERMAN SHOW.

Here is a brief description of the main points of interest in the recent Berlin Radio Exhibition.

By OUR NORTHERN EUROPE CORRESPONDENT.

IT is a rather difficult matter to give an impression of the giant German show in a few words. It is perhaps, interesting to point out that the whole organisation is different from our show at Olympia.

Olympia is in the hands of the Radio manufacturers, the German exhibition is regarded as THE great radio event of the year by all and sundry. The German broadcasting company, the Reichs-Rundfunk-Gesellschaft, the German Post Office, and with it the Ministry of Posts, the town of Berlin, and, of course, the manufacturers, all these take a very active interest in the organisation of the show.

A Gigantic Exhibition.

And this year the whole gramophone industry has co-operated. And that is more or less the reason for the very official speeches held at the opening ceremony, for the broadcasting of the whole ceremony from all German stations and for the ceremony itself.

The show is meant to be a full-length photo of German radio in all its phases, and so no wonder the exhibition grows in size from year to year, and shortly, if growth continues, will become unwieldy. Already it is much too large for the average listener. A day's hard work is necessary to get even an idea of the whole of the show.

Screened-grid is the most popular form of valve. Three screened-grid valves in one set are to be found quite often. Sets have become cheaper and more efficient. The medium-priced all-mains three-valve receiver, with L.S. or built into the L.S. right away, promises to be the most popular.

Selectivity on this type of set has been increased considerably, I suppose in view of the coming generation of giant transmitters this autumn and winter. The design of sets in general has not changed very much. Short-wave sets for the mere listener with no technical ability have been developed.

Ultra S.W. receivers for waves right down to 14 centimetres are to be found. Unspillable accumulators, the new rod-like valves developed by Telefunken (the German Marconi), television kits, and full-fledged receivers, screened-grid valves of the three-fold type by Loewe, even a new aerial insulator, like a flat plate can be seen at the show.

A Giant Speaker.

The giant Siemens L.S. was in operation at Berlin's Eiffel Tower, the Funkturm, disturbing the surrounding district for several kilometres in all directions. I understand that if one gets too close to the giant L.S. and it is working at full force, deafness, at least for a period, will result.

In view of the growing popularity of television one firm shows a series of photo-electric cells for all purposes, the moment one got too close to a certain part of the stand a bell began to ring and a red light would flash "ALARM," which meant that one had intercepted some hidden beam of light.

The non-radio part of the exhibition, that devoted to gramophones, was equally interesting. An historical show gave us an idea of the development of the gramophone industry. Even Edison had sent along a special record of his voice to be played to visitors.

SEEN AT THE SHOW

A giant loud speaker, disguised as a drum, which stood on a car outside the Berlin Radio Exhibition, inviting people to "roll up."

Talkie Demonstrations.

One of the most important firms, which works together with the German talkie film concern Tobis, had arranged a kind of acoustical cabaret, but it was not only acoustical, there was some good dancing by a troupe of six girls and the solo dancer of the Grosses Schaupielhaus in Berlin appeared on two occasions.

Then there was a complete model of a modern talkie film studio, and one could listen-in to many famous men and see them at the same time.

Home Recording.

Round two stands there always was a throng of people. At one you could observe a rather horrible instrument of musical torture, a combination of a radio receiver, gramophone, and piano all in one, the whole looking like a grand piano.

At the other stand people were seen recording their own voices and getting the record to take home with them. Both the Literaphone, a more ambitious and expensive instrument, and the Majestograph for the people with the smaller purse, were having a lot to do.

POINTS TO REMEMBER.

Water and ordinary washing soda make a good solution for removing any deposits which may have formed upon the terminals of your accumulator.

* * *

Clean accumulator terminals can be kept clean if smeared with petroleum jelly.

* * *

Particular attention should be paid to the insulation of H.T. accumulators and H.T. batteries in series, as the slightest leakage between adjacent sections represents a serious drain upon the battery.

* * *

An excellent means of reducing the damping of an aerial for short-wave work is to connect an ordinary neutralising condenser in series with it.

* * *

The carbon rod obtained from an old bell battery makes quite a good rough-and-ready resistance element, a six-inch rod usually having a resistance of about 50 ohms.

* * *

RENEW YOUR PANEL.

Do not put up with a disfigured panel with a hole in it, as there are many ways of filling this inconspicuously.

* * *

Black sealing wax and shoemakers' heelball are two of the easily obtainable substances which can be used to fill unwanted panel-holes.

* * *

A stick of black Glitterwax obtainable from any toy shop for a few pence will enable an old well-drilled panel to be refilled and to look like new.

* * *

Where a counterpoise earth is used instead of a direct connection to avoid hum, it should be remembered that its insulation is just as important as that for an aerial.

* * *

Where hum is troublesome a different earth is always well worth trying.

* * *

There is no need to build a special set for short-wave reception as most sets can easily be adapted for this, either by special coils or by a plug-in scheme like the "Antipodes" Adaptor.

* * *

By arranging that the down lead from the aerial either dips below the lead-in point, or else is fitted with a little draining pipe to carry off the rain, a good deal of leakage due to wet lead-in, etc., can be overcome.

FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found—?

A GOOD SWITCH.

"P.W." readers will no doubt have gathered from past reports that I do like a switch that clicks! The new Colvern Rotary Switch has an excellent click action, but it only clicks really loudly when you turn it to the "off" position. Is half a clicking action better than no click?

Well, in the case of this Colvern product I must say that I get all the clicking that I want, for the simple reason that the switch

The new Colvern Rotary Switch.

goes into its "ON" position with a little bumpy feeling as you turn the knob.

And as to the other points in this Colvern switch, it makes a very efficient contact, and one in which it is not possible to visualise intermittency or any other deficiency arising. There are neat little slotted and milled terminal screws, in addition to soldering tags, and these are taken out at opposite ends of the device accessibly and with wide spacing.

The indicator knob is of unusual design, and is excellent to handle.

The single Colvern switch (simple make and break, one way) retails at 1s. 3d., and the double switch at 2s. 6d. The latter is suitable for ganging, for, by removing a screw in the cam at the bottom, the rod can be withdrawn and a long one connecting as many switches as desired can be inserted.

THE CELESTION "TILTATONE."

I have recently had the opportunity of testing a Celestion "Tiltatone," a device about which no doubt most "P.W." readers have at least heard, for it has already achieved no little fame.

In brief, it is a device that you connect between a pick-up and set or amplifier in order to bring up the low and high notes and increase the volume.

It is quite a small article, and it carries just the input and output terminals, an excellent volume control and a tone adjustment.

This last gives you a fine control of the bass and high notes, by subduing and accentuating the middle frequencies just as desired.

And the volume control operates without in any way upsetting the balance achieved. An important point, that. The step-up in volume given by the "Tiltatone" is impressive, and in that respect it is like adding a valve amplifier.

Equally wonderful is the way in which the bass can be brought out so that the low notes are given most exciting vigour.

The controls are exceptionally smooth—another great asset.

The "Tiltatone" is built into a metal box so that it does not tend to pick up extraneous noises.

Altogether, I consider it an achievement and the sort of thing all serious radio-gram enthusiasts should hear demonstrated. It costs £4 17s. 6d.

"P.W." readers who visit Olympia will have an opportunity of examining the "Tiltatone" additionally to some entirely new Celestion loud speakers, which, it is claimed, will cause a considerable stir in radio circles.

NEW WATES LINES.

The new illustrated price lists due to The Standard Battery Co. reveal that this enterprising concern is entering the new season with Wates A.C. Mains sets, Gramophone Pick-ups, and other entirely new lines. Readers of "P.W." should make a point of securing these lists.

AN AMERICAN OUTFIT.

You seldom see an American set that has fewer than five valves. Actually it is probable that five valves represents the absolute minimum for average requirements.

The reason is not so much, as popular opinion would have it, that the Americans cannot achieve European efficiency and have to have a string of "tubes" before they can get adequate results, as it is that mains working is almost universal. This means that H.T. and L.T. economy is hardly considered.

Further, there is undoubtedly more money available for buying things of a more ambitious character.

However, it is a fact that America believes in modest if not really low-gain stages, in order to achieve high selectivity and stability. Moving-coil speakers, too, are almost universal.

You can get an excellent idea of modern American radio set design tendencies from the accompanying photograph, which illustrates the "First National" Kennedy Chassis, an American outfit that is being sold in this country by the Park Radio and Engineering Co., Ltd., of Manor Park.

The price is £37 10s., inclusive of valves and moving-coil loud speaker unit. The only items needed to make the outfit an absolutely complete receiving system are a cabinet and a baffle for the loud speaker.

Manufacturers and traders are invited to submit radio apparatus of any kind for review purposes. All examinations and tests are carried out in the "P.W." Technical Department, with the strictest of impartiality, under the personal supervision of the Technical Editor.

We should like to point out that we prefer to receive production samples picked from stock, and that we cannot guarantee their safe return undamaged, as it is our practice thoroughly to dissect much of the gear in the course of our investigations!

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

It is, of course, an entirely all-electric, affair. You connect the mains leads to a lighting point, join up an aerial and earth, and away you go!

The circuit comprises three screened-grid H.F. valves, detector, and two L.F. stages the final L.F. stage being a push-pull.

The receiver is free from hum and wonderfully sensitive, stations coming in well with no aerial at all. It is also selective, and the quality of a high standard.

Tuning is carried out with a drum-drive operating ganged condensers. The screening, and indeed the whole construction, are excellent. Compactness is achieved with apparently no sacrifice.

It undoubtedly is a fine outfit, and the fact that it has no wave-change is not so very serious in view of the DX qualities and selectivity it possesses.

This is the "First National" outfit. The three Screened-Grid valves are contained in the metal screening cylinders which can be seen to the left.

Varley

FAMOUS SINCE BROADCASTING BEGAN

Long before Broadcasting became what it is to-day, Varley had won fame for their coil winding.

On this experience is founded Varley's latest achievement in radio. Varley Impedance Matching Output Transformer—a new component of advance design—gives six different ratios. Accurately and without difficulty you can match loudspeaker and output valves.

Remember that Varley Components are descendants of a long line. Since radio came Varley ideal has been quality. The Varley Impedance Transformer is the only adequate answer to a modern radio problem.

IMPEDANCE MATCHING
OUTPUT TRANSFORMER

£1 : 2 : 6

6 ratios: 8-1, 10-1, 12-1, 15-1, 20-1, 25-1

For RADIO

OLIVER PELL MANUFACTURE

Varley

STAND No.
105
NATIONAL RADIO
EXHIBITION, OLYMPIA.

Advertisement of Oliver Pell Control Ltd., Kingsway House, 103 Kingsway, London, W.C.2. Telephone: Holborn 5303.

TELEVISION PROGRESS

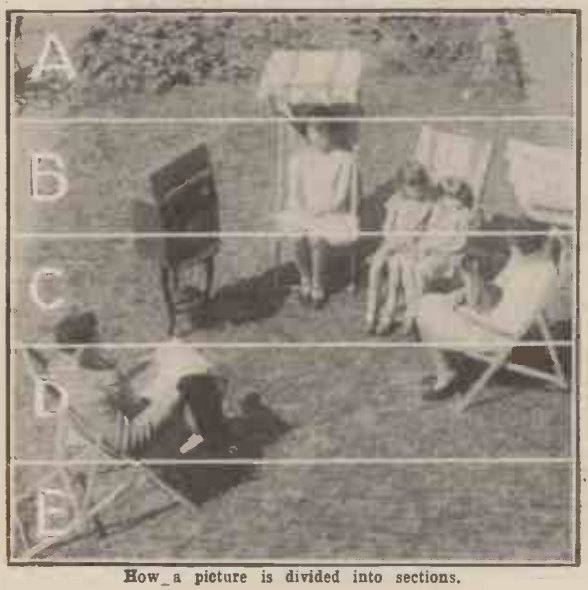
By CARDEN SHIELS.

An account of some of the latest schemes suggested to overcome the various snags encountered in Television.

THE limited service now being provided for the benefit of those equipped with television receivers merely serves to emphasize the fact that, on the technical side, television has still a very long way to go before it can hope to compete in general interest with ordinary broadcasting.

Although comparison between the two services is inevitable, it is only fair to point out that broadcasting has had every advantage over the newcomer, both as regards initial development, and in the manner in which it was first presented to the public.

SIMPLIFYING SCANNING



How a picture is divided into sections.

For many years before the war long-distance transmissions of wireless telephony were being carried out on the Poulsen arc. During the war the importance of the new wireless "arm" was such that neither time nor money was spared by the Government to bring it to perfection. Among other improvements this period saw the successful development of the thermionic valve, both for transmission and reception.

Consequently by the time the B.B.C. was established wireless transmission of speech and music had passed far beyond the experimental stage. In particular it had been safely nursed through the critical stages of early development—and this without having to depend for funds upon the acid test of commercial success or failure. Finally, it was launched as a national service with all the resources of the Government behind it.

Television, on the other hand, has had to stand on its own feet, and to depend for financial support upon money subscribed by the public on exactly the same terms and conditions as any other purely commercial undertaking.

Unfortunately the commercial development of television has also been handicapped by a spirit of over-optimism. Claims were made to a standard of performance which it was not possible to attain either then or now. For instance, the public were led to believe that television would enable them to see tennis players in action at Wimbledon, and even to follow the progress of a Test match in Australia.

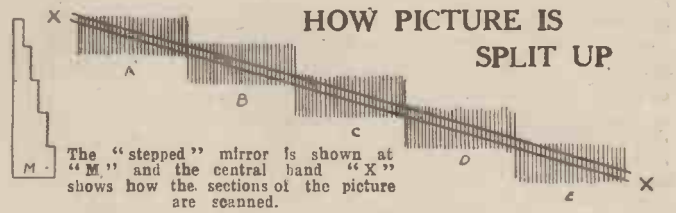
The programmes now being transmitted fall so short of this standard that the contrast has naturally created much disappointment. The danger is that the reaction may be overdone, and that the general public will come to regard television as little more than a scientific toy.

Any invention that is put upon the market prematurely, i.e., before every detail has been thoroughly worked out and made perfect in practice, stands a grave risk of failure, particularly if it has not reached the stage where success can be assured by performance.

Up to the present, television has been dependent upon the use of mechanically-rotating discs, which serve to analyse or cut up the picture during transmission and to re-assemble it in reception. The natural limitation to the speed at which "scanning" can be performed in this manner restricts the size and definition of the view to be transmitted, so that in practice the received picture is reduced to the head and shoulders of two or, at most, three persons.

Given a sufficiently elaborate transmitting and receiving equipment much larger pictures can even now be reproduced. For instance, the General Electric Co. have recently succeeded in televising the performance of a play over more than a mile of land-line, the received pictures filling a screen 6 ft. square. The reproduction is reported to have been clear in definition and quite free from flicker. But the cost of such an installation would be quite prohibitive for domestic use.

HOW PICTURE IS SPLIT UP



The "stepped" mirror is shown at "M" and the central band "X" shows how the sections of the picture are scanned.

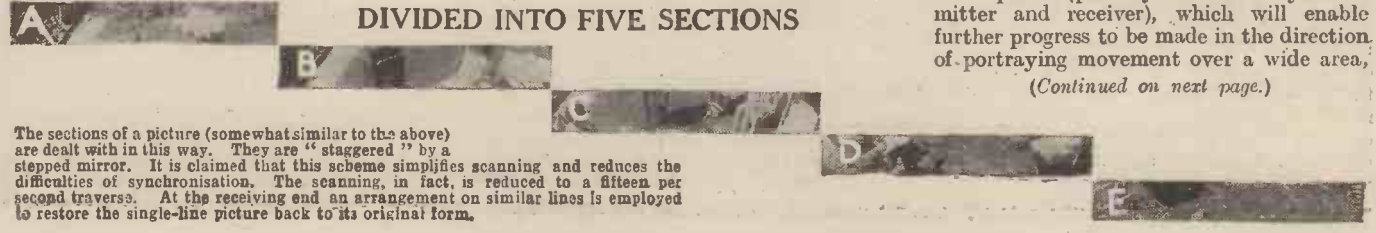
New Development Required.

In the early stages of wireless telephony on the Poulsen arc, the transmitted speech was coarse and rough, owing to fluctuations in the carrier-wave and to imperfect modulation. The introduction of the thermionic oscillator changed all this and by setting up an entirely new standard of performance made broadcasting what it is to-day.

Television is now waiting for some similar development (possibly a cathode-ray transmitter and receiver), which will enable further progress to be made in the direction of portraying movement over a wide area,

(*Continued on next page.*)

DIVIDED INTO FIVE SECTIONS



The sections of a picture (somewhat similar to the above) are dealt with in this way. They are "staggered" by a stepped mirror. It is claimed that this scheme simplifies scanning and reduces the difficulties of synchronisation. The scanning, in fact, is reduced to a fifteen per second traverse. At the receiving end an arrangement on similar lines is employed to restore the single-line picture back to its original form.

HIDDEN WIRING.

How to tuck leads neatly away beneath a baseboard.

By C. P. A.

MANY constructors are now using the sub-panel or under-baseboard type of wiring up a receiver, because it enables a very neat job to be made of a set.

No longer is it necessary to let filament and H.T. supply leads take up space above the baseboard where they confuse the run of other wires and tend to make it look untidy and crowded, for all such supply leads can be relegated to the under-side of the baseboard, where they will do their work just as efficiently even though they be out of sight.

Very Convenient.

This method of wiring is particularly convenient with a modern multi-stage H.F. amplifier using screen-grid valves, where all circuits are carefully de-coupled and separate H.T. and filament leads taken from each stage right back to the terminals.

Just imagine what such a set would look like with numerous braided leads all laid along the top of the baseboard.

Although it does not really matter what these leads look like when they are taken under the baseboard it is much simpler to check things over and trace out circuits if a definite scheme is followed, and the leads are taken neatly in certain recognisable groups.

It is of great assistance in doing this if various types of clips and staples are used, and some useful gadgets of this description are shown grouped together in the photograph.

If you want to carry a number of separate leads close to each other—the wiring might call for some such arrangement as that shown sketched in Fig. 1.—then a brass strip as illustrated at the top of the photograph would be useful.

A DEFINITE SCHEME

The leads should be arranged in some orderly plan.

Perhaps you prefer to have a clip that shall be made of insulating material? Then bits of scrap ebonite cut and drilled as shown on the left and right of photo will do the trick. It is probably easier for most constructors to drill half a dozen holes in a piece of ¼-in. ebonite than to bend a piece of brass backwards and forwards. These ebonite clips can be made to take any number of leads from one to a dozen, the single ones being found useful to support long leads or to bring a lead round a corner.

The photograph shows two of these ebonite clips, one meant for two leads and one for four. They are fixed with a couple of ½-in. No. 3 brass csk. screws to the underside of the baseboard.

Perhaps a couple of leads at high potential to each other have to be taken across each other and you want to be on the safe side as regards any possibility of the insulation between them breaking down and creating havoc as a result.

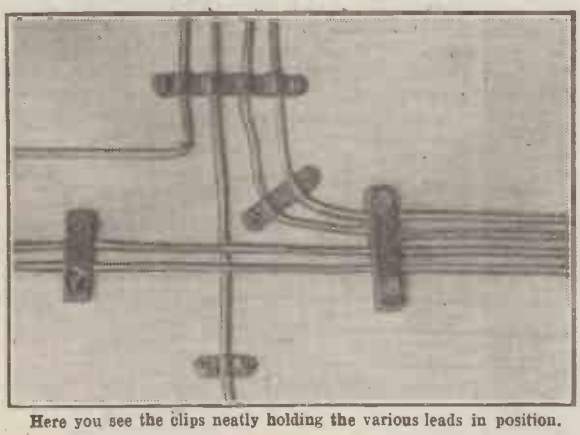
A "T" Clip.

Then a T clip can be made to suit the occasion. This, like the other clips, can be cut out of a piece of scrap ¼-in. ebonite.

Another type of clip can be made to hold down a fat bunch of leads. This type is easily made out of any scrap strip metal and should be just the right size to grip the leads tightly without exerting undue pressure, which might damage the insulation between adjacent leads.

If you are proud of your workmanship you will certainly like to use these handy gadgets, the photographs taken under the baseboard of a set shows you how it helps to give it a workmanlike and shipshape appearance. Note also that a small brass brad round which one lead can be taken is a useful tip for taking single leads round a corner sharply. The brad should be put in at an angle so as to withstand the pull of the wire. This will also prevent the wire from slipping off.

SECURED BY CLIPS



Here you see the clips neatly holding the various leads in position.

TELEVISION PROGRESS.

(Continued from previous page.)

such as is shown on the cinema screen. Among other possibilities there appears to be room for considerable improvement in the optical system used to throw the image on to the scanning disc.

For instance, a suggestion has recently been made to transmit a broad field of view having poor definition, simultaneously with one or more "spot-light" areas of very high definition. It is pointed out that the human eye actually sees in this fashion, i.e., although it embraces a large field of view, it is only actually focussed at any one time upon a small area, which shifts from point to point as the view is explored.

Another Method.

By combining two or more sets of pictures in this way a comparatively large background could be transmitted showing particular areas in clear definition as the centre of interest shifts from place to place.

Still another suggestion is to convert the whole area of view into a "single line" equivalent so as to simplify scanning and reduce the difficulty of synchronisation. The transformation from two dimensions to one is secured by focussing the scene upon a "stepped" mirror, which reflects it in layers which are displaced or "staggered" relatively to each other.

For instance, a picture such as A—E when reflected from a stepped mirror M appears in the extended form shown, each horizontal section A—E being displaced laterally so that the end of one coincides with the beginning of the next. If each strip is small in width, the average light intensity across the whole width corresponds substantially to that at the centre of the strip.

Reconstructing the Picture.

The central band X, X, shown running through the shaded bands, accordingly represents the straight-line equivalent, so far as distribution of light and shade is concerned, of the original two-dimensional picture. The work of scanning is then reduced to a single straight-line traverse repeated fifteen times per second. At the receiving end a similar arrangement is used to restore the single-line picture back to its original form.

SOME VALUABLE PRACTICAL TIPS.

If you are assembling your own loud speaker, do not hurry over the joints or attempt to fix the cone in position before it is thoroughly dry, as many a rattle or buzz in the finished speaker has arisen from this cause.

* * *

Do not forget that the adjusting screw on your loud speaker may occasionally require attention, as in dusting, etc., it is very easy to move this slightly with consequent ill-effects upon the quality of reproduction.

* * *

Do not forget when assembling a loud-speaker unit that the driving rod should be mounted to come exactly opposite the tip of the cone itself.

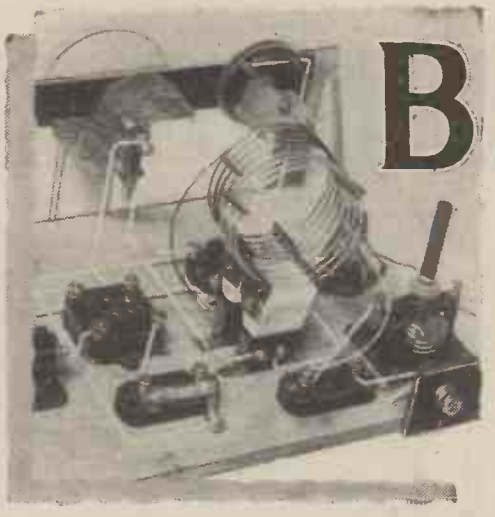
If you are troubled with a loud-speaker locking nut loosening, and so setting up chatter, remember it can be permanently secured after it is tightened by a little adhesive run into it, or even by a spot of candle grease.

* * *

Grid bias is dependent upon the anode voltage supplied to the valve, so that a big alteration in the H.T. voltage means it is generally advisable to alter the G.B. plug also.

* * *

One reason for the great improvement in permanent-magnet loud-speaker units is the big strides being made in the production of magnet steel of very high efficiency.



BELOW 30 METRES

Some thoroughly practical hints on the subject of short-wave reception, a fascinating sphere of radio that is open to every one who possesses a fairly ordinary valve set.

By R. W. HALLOWS, M.A.

ABOVE 30 metres almost any kind of set consisting of a grid leak and condenser rectifier followed by one or more note-magnifiers will give *some* account of itself, but as we drop below 30 metres it becomes more and more essential that the set be designed especially for the job, and well designed at that.

In searching for short-wave stations the only satisfactory method is to keep the set just, and only just, in oscillation until a carrier-wave is picked up. The reaction is then slightly slackened so as to bring the set just short of the oscillating point, and the grid tuning condenser is adjusted minutely.

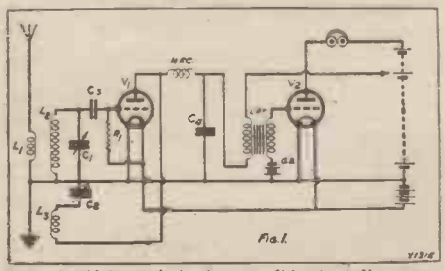
All of this is easy enough if the reaction control is velvety smooth, but absolutely impossible to carry out if it is rough, fierce or "grunty."

"Floppy" Reaction.

Fig. 1 shows a circuit which is used very widely in short-wave receivers. The reaction, it will be seen, is controlled by varying the flow of oscillating current through the reaction coil L_3. This is done by means of the reaction condenser C_2, which is used here very much like a water-tap, increasing or decreasing the flow to earth. The rest of the circuit is perfectly simple and straightforward. Notice that the grid leak is connected to the positive filament leg.

With the circuit in the simple form shown in Fig. 1, various troubles are not infrequently experienced. We will suppose that the set has been made up with an ebonite panel, and that the values of certain important components are: C_1, ·00015 mfd.; C_2, ·00025 mfd.; C_3, ·0002 mfd.; C_4, ·002 mfd.; R_1, 2 megohms. The "user" desires in trying out the set to bring it just into oscillation.

A "STRAIGHT" CIRCUIT

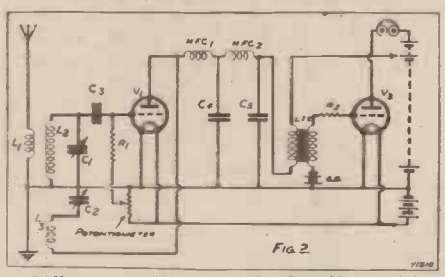


A widely-used short-wave "hook-up."

As he tightens the reaction coupling by means of C_2 he finds that instead of gliding smoothly into oscillation the set passes suddenly into that condition with a plock, nor will it cease to oscillate until the reaction coupling is loosened considerably. This is the worst form of floppiness. It indicates as a rule that the grid leak is of much too low a value.

Instead of 2 megohms, 3, 4, or 5 may be tried. The plate voltage of the detector valve should also be adjusted to see whether this will produce any better result. Usually an improvement can be made in these ways, and it may be found beneficial to fit a filament resistance in the positive lead of the valve.

PLUS POTENTIOMETER



Adding a potentiometer enables the grid potential to be adjusted closely.

Most likely, though, the set will not behave itself as it should, except in the upper part of the short-wave band. Lower down, the user will probably experience one or other of two new kinds of reaction trouble. This is threshold howl or grunting.

The set is no longer floppy, inasmuch as it goes into and comes out of oscillation at just about the same setting of C_2. As this condenser's reading is increased gently in order to produce oscillation, something rather unpleasant happens. Without the premonitory slight rustling noise that should be heard in the telephones a howl or grunt occurs.

Detector Grid Potential.

Look carefully at the Fig. 1 circuit and see whether you can see anything in it that handicaps the detector valve. In a receiver intended for the broadcast band it is quite justifiable to connect the grid-leak return to the positive filament leg, but something better is needed in the short-wave set, for here it is most important to get the grid potential of the rectifier *exactly* correct.

Fig. 2 shows how this may be done by taking the grid-leak return to the slider of a potentiometer. The potentiometer enables one to effect one of those compromises which are so useful in wireless.

Actually the best reaction effects are obtained with the grid almost at zero volts, and the best detection effects when it is considerably positive. By careful adjustment of the potentiometer one may find a setting—generally rather near the negative end—which will give perfectly smooth reaction control combined with reasonably efficient detection.

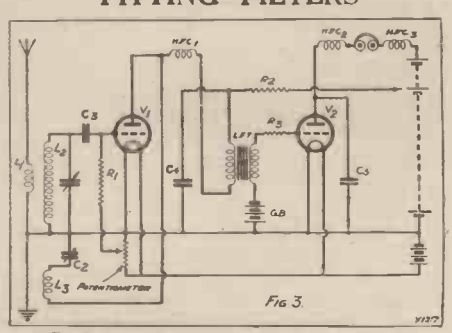
Filter Schemes.

But the grid potential is not the only point that matters. We are faced in the short-wave set with another very fruitful source of reaction fierceness. This is the leakage of high-frequency currents from the detector into the low-frequency part of the set. Undesirable couplings are thus set up and reaction simply will not remain smooth on the very short wave-lengths.

Fig. 2 shows how an improvement may be made by the use not of one high-frequency choke, but of a filter circuit consisting of two of these and two condensers, C_4 and C_5, both of which act as by-passes for H.F. currents to earth.

Further, a high-frequency stopper in the form of a resistance R_2 is incorporated in the grid circuit of the low-frequency transformer. A final circuit that is worth trying is that shown in Fig. 3. Where a filter circuit is arranged to prevent H.F. from getting into the 'phones and H.T. circuits.

FITTING FILTERS



H.F. chokes and resistances used to confine the H.F. to its own parts of the circuit.

The Pentod

If you are interested in a compact two-valver capable of giving here is the very set you want. It gives you wonderful result economical propositions ever brought forward. Incorporatin bristles with those modern refinements that make for ine construction and ease of control.

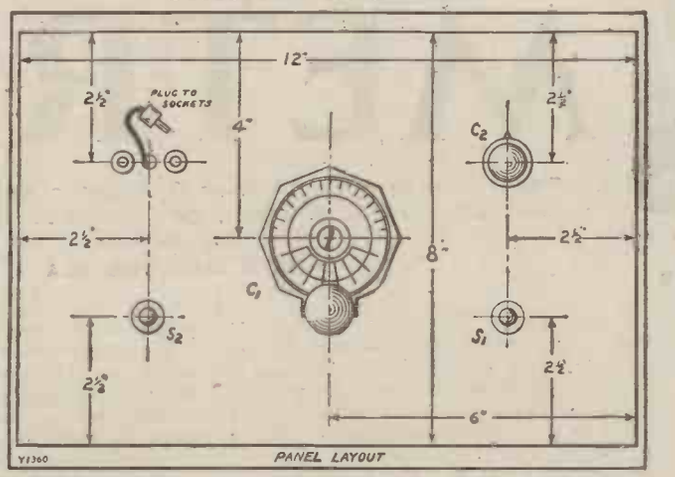
Designed and Described By The "P.W." RESEARCH

THERE is always a sort of fascination about the "little 'un" which can do the work of a "big 'un," and that attraction you will find is possessed to the full by the "Pentode" Two.

It is a most interesting little set to handle, for all the time it gives you the impression of being much bigger than it really is with a power and punch you generally associate with a three-valver.

Indeed, you are likely to find that you will quite often have to open the lid to convince visitors that it has really and truly only got two valves!

STATIONS IN DOZENS



There is only the one tuning control, and using this, with little reference to the reaction adjustment, a very large number of stations can be received any night.

Simplicity!

Along with this very attractive feature of tremendous power in small compass it has lots of other good points. Here is an important one: It uses perfectly standard plug-in coils, and only three of them at that, yet it has really efficient wave-change switching, giving excellent results on both normal and long waves.

Moreover, the switching is of the simplest possible kind. It is actually done with the simplest of all switches—i.e. the plain on-off kind. Any good make of L.T. switch will serve the purpose perfectly. What could be more straightforward than that?

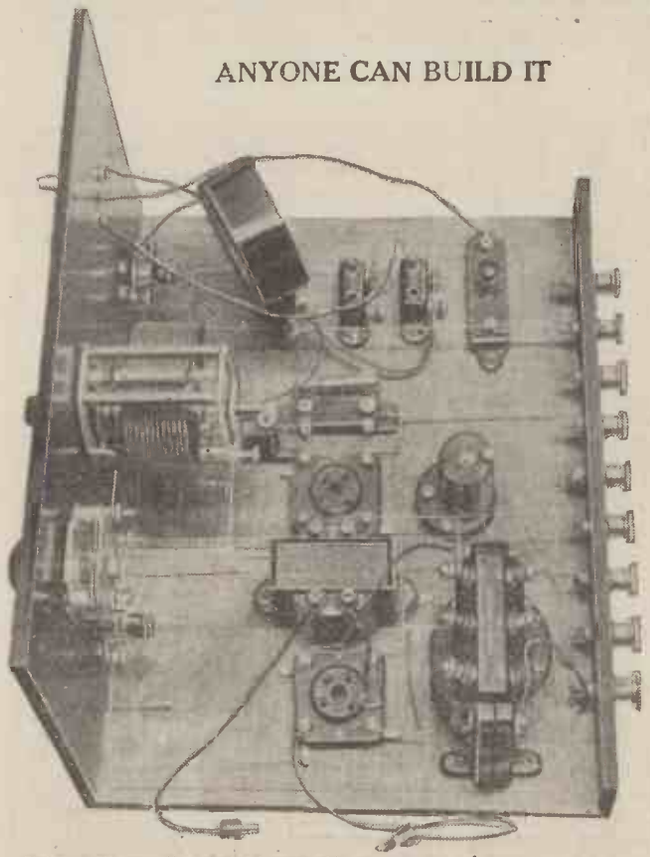
Perhaps we ought to hedge just a little. So far as going from your local station to 5 X X is concerned, the whole operation is performed by working switch S_2 and re-tuning, but if you want foreign stations on the long waves—i.e. more selectivity—then you must also move a plug on the panel from one socket to another. Even so, it is still pretty simple, isn't it?

Long and Short Waves.

Just have a look at the circuit diagram, and you will see how this delightful simplicity has been combined with efficiency. Note that L_2 is the long-wave "X" coil which gives aerial coupling and tuning. For medium (normal) waves switch S_2 is closed, and this puts the smaller X coil L_1 in parallel.

In this way high efficiency is maintained on both wave-bands.

ANYONE CAN BUILD IT



It is merely a matter of simple assembly, as you can see, and the work of wiring shouldn't take you long, even if you have had but little experience.

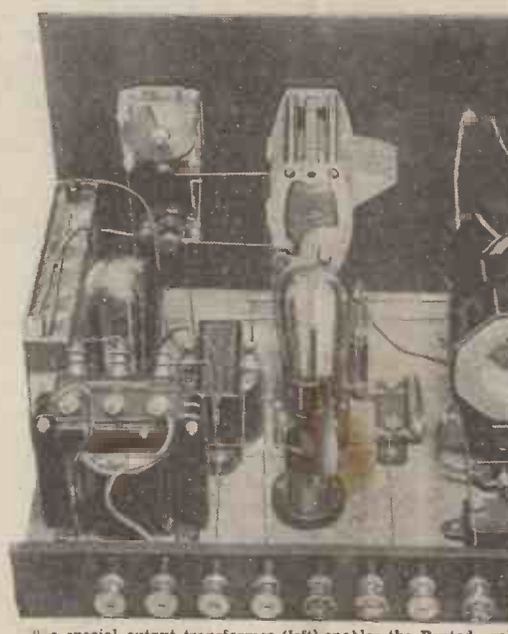
The Pentode.

The reaction arrangements are delightfully simple, too, for by using a special little coupling scheme we have made the same reaction coil serve on both wave-bands! By carrying on a very easy little adjustment when the set is first put into use you can make this single coil give perfectly satisfactory reaction on both wave ranges.

The rest of the circuit is very plain sailing. There is a compression type of adjustable condenser (C_1) in the aerial lead to control selectivity, and differential reaction of our improved type.

Following on you see the pentode L.F. stage, and this, too, is quite straightforward, with transformer intervalve coupling and a pentode output transformer. This last has a variety of secondary terminals, giving different ratios, so that you can be sure of suiting your particular loud speaker.

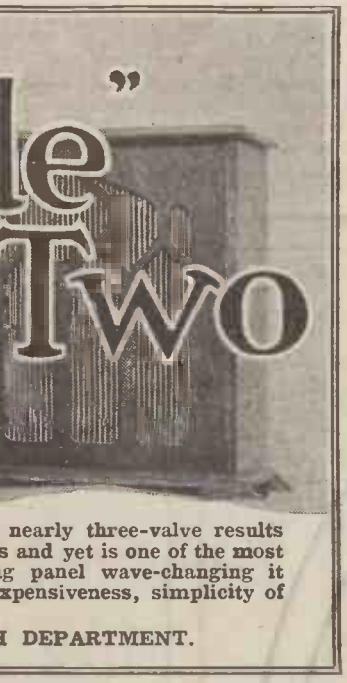
You will find the set is a particularly easy little job to build, for it has been very carefully worked out to give very simple assembly and wiring. Quite likely you will only have to purchase the pentode output transformer, for there is nothing special about any of the other parts, and you can use up any



The special output transformer (left) enables the Pentode va to its very best advantage.

YOUR SHOPPING GUIDE TO THE COMPONE

- 1 Panel, 12in. × 8in., or 12in. × 7in. (Trolite, or Lissen, Paxolin, etc.).
- 1 Cabinet to fit. (9" Baseboard).
- 1 ·0005-mfd. variable condenser (Lissen, or Lotus, Ready Radio, J.B., Dubilier, Ormond, Formo, Polar, Igranic, etc.).
- 1 Vernier dial, if condenser not of slow-motion type (Ormond or Lissen, J.B., Igranic, Formo, Lotus, etc.).
- 1 ·0001-, ·00013- or ·00015- mfd. differential reaction condenser (Lotus, or Dubilier, Lissen, Formo, Magnum, Ready Radio, Wearite, etc.).
- 2 L.T. switches (Lissen, or Lotus, Benjamin, Igranic, Bulgin, Ready Radio, Red Diamond, Magnum, Ormond, Pioneer, etc.).
- 2 Small sockets and 1 plug (Eelex, etc.).
- 3 Coil sockets (Lissen, or Lotus, Wearite, Igranic, Magnum, Red Diamond, Bulgin, etc.).
- 2 Sprung valve holders (Formo, or Benjamin, Lotus, Telsen, Igranic, W.B., Lissen, Wearite, etc.).
- 1 H.F. choke (Wearite, or Varley, Telsen, R.I., Lissen, Dubilier, Ready Radio, Bulgin, Lotus, etc.).
- 1 Low-ratio L.F. transformer (Igranic, or Lissen, Ferranti, Varley, Telsen, R.I., Mullard, Lewcos, Lotus, etc.).



nearly three-valve results
s and yet is one of the most
g panel wave-changing it
xpensiveness, simplicity of

I DEPARTMENT.

lve to be used

you have so long as they are of good makes and the right values.

Now for some operating instructions. First you want the coil sizes. Here they are: Coil L_1, No. 60X; L_2, No. 250X; L_3, No. 100 or 150. Valves: V_1, H.F. or detector; V_2, pentode.

H.T. Volts.

At first have the L_1 socket fixed with only one screw, so that you can swivel it. Start with it as shown in the photos, and move it a little one way or the other until you get satisfactory reaction effects on the normal wave-band. (They will already be O.K. on long waves.)

ENTS.

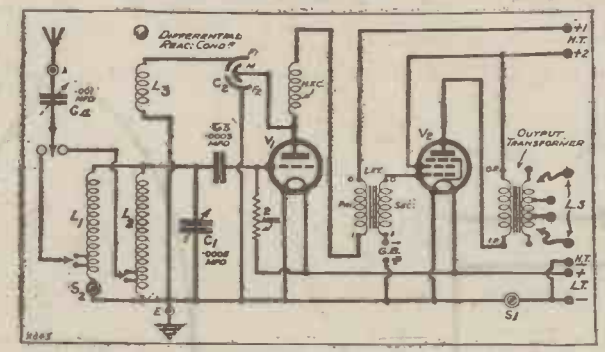
1 Pentode output transformer (R.I. or Varley, Igranic, Lissen, etc.).
1 ·001-mfd. (maximum) compression type condenser (Formo, or Lewcos, Lissen, Polar, R.I., etc.).
1 ·0003-mfd. fixed condenser (T.C.C., or Lissen, Dubilier, Ferranti, Ediswan, Mullard, Igranic, Telsen, Ormond, etc.).
1 2-meg. grid leak and holder (Dubilier, or Lissen, Mullard, Ediswan, Ferranti, Telsen, Igranic, etc.).
1 Terminal strip, 12 in. × 2 in. (Wearite, or Magnum, etc.).
9 Terminals (Eelex or Belling & Lee, Igranic, etc.).
Wire, screws, G.B. plugs, flex, etc.

H.T. voltages, about 60 or 70 on H.T. + 1 and 100 or preferably 120 on H.T. + 2. Grid bias is to be set in accordance with the instruction slip received with the pentode.

For medium waves, place plug in No. 1 socket, and close S_2. To go over to 5 X X, put S_2 to "off" and retune. To get foreigners on long waves, have S_2 "off" as before, and put plug in No. 2 socket. Pretty simple!

The choice of a suitable pentode valve for use in a small set, by the way, calls for just a little consideration. The point is that with a small set you may be using only a modest capacity H.T. battery, and so the question of anode current becomes important.

STARTLING SELECTIVITY



For a two-valver so free from trills, this receiver has really startling selectivity, and can cope easily with bad local conditions.

Battery Life.

Now, the pentode is a valve which varies considerably as to its characteristics between the various makes on the market. Accordingly, it is as well to note the working anode currents of the different specimens whose purchase you are considering.

In general you will find that the pentode comes roughly into the super-power class so far as H.T. consumption is concerned, and therefore it is best to provide it with a really large capacity H.T. battery. If, for any reason, you are obliged to use one of smaller capacity, however, something can still be done to ensure a reasonable life for it.

First, you can look round for one of the more economical pentodes. For example, there is the Lissen type which comes nearer to the "power" than the super-power class as regards anode current, though not in magnification, of course, in which it is still very much a pentode.

This valve can be kept down to some seven milliamps at normal H.T. voltages and with grid bias correctly adjusted. This, of course, is well within the powers of quite a medium capacity H.T. battery. Then, again, it is possible so to adjust the working voltages of even the more greedy kind of pentode that the anode current is cut down considerably. Naturally, you have to sacrifice something to get this economy, and what you lose is the ability to handle very powerful signals without distortion.

Economical Running.

It simply means that the valve will now overload more easily, so that you must be careful to keep the volume down to reasonable limits on the local station. On more distant stations the question naturally does not arise, and you can assume that you are losing nothing.

This is how you make the adjustment. First, observe that there is a little piece of flex in the set which is intended for connection to the "priming grid" terminal on the pentode valve base. Remove this, because it will not be used and may fall across something and cause a short if left unconnected.

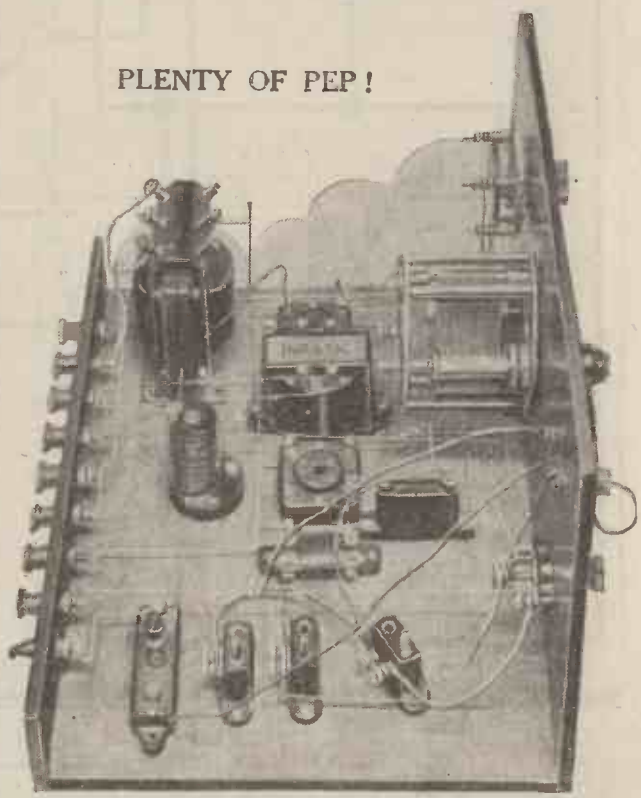
Instead take a flex lead from the terminal on the pentode out to the H.T. battery and insert this at about the 70-volt point. Reduce the grid bias by about 1½ volts, and there you are.

By the bye, we should just mention that some of the pentodes on the market have no terminal on the side of the base, but instead have five pins. The centre one is the priming grid in this case.

What you have to do with one of these valves, of course, is to provide it with one

(*Continued on next page.*)

PLENTY OF PEP!



You have plenty of punch and a bit to spare in the reception of many of the Continentals on the "Pentode" Two.

THE "PENTODE" TWO.

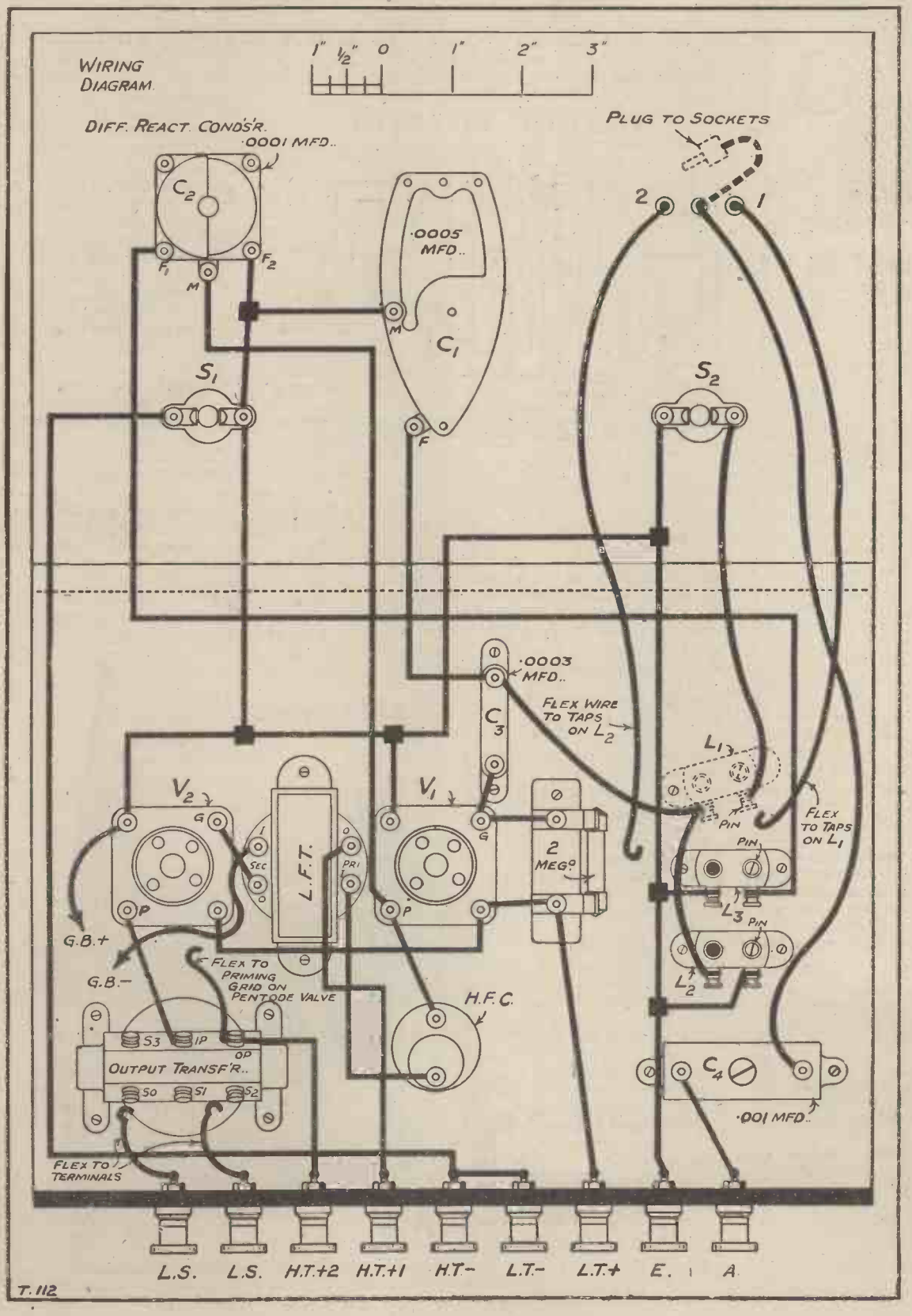
(Continued from previous page.)

of the new five-pin sockets. Wire up the grid, plate and filament points on this just as you see it done in the wiring diagram and treat the fifth point as the connection for the priming grid.

A point which should perhaps be explained for the benefit of those who have not used a pentode before concerns the output transformer. This is a variable ratio component, as you in all probability have gathered at an early point in your inspection of the design.

The object in providing this variable ratio effect is to enable you to suit the high impedance of the pentode type of output valve to different loud speakers. The choice of the right ratio is decidedly important, because it affects both tone and volume.

You will probably find that the most noticeable effect is on tone, the change in volume being comparatively slight as a rule. It is worth experimenting carefully with the different ratios, however, because it all depends on the particular speaker. With some the effect on volume is quite distinct if you make your tests on a fairly weak station.



L S. Leads.

To carry out the test is quite simple. Observe that in the wiring diagram two flex leads are indicated coming from the loudspeaker terminals. It is intended that these shall be attached to a pair of secondary terminals on the pentode output transformer, and you just try out the different pairs in succession until you find the combination best suited to your particular loud speaker.

Try all the secondary terminals in turn, e.g., S_0 and S_1, S_0 and S_2, S_1 and S_2, and so on. You will soon run through all the possible combinations and locate the best one.

RADIO JOTTINGS

A few experiments in placing the loud speaker in different parts of the room will show how greatly reproduction depends upon the position of the speaker itself.

If you are going to use an H.T. mains unit or similar apparatus remember that generally the electric light company require that the particulars of such apparatus should be notified to them before it is used.

THE "MAGIC" THREE.

The Editor, POPULAR WIRELESS.

Dear Sir,—I feel it is my duty to write to you in praise of my "Magic" Three. Anyway, the results are extraordinary, for so simple a set. I am not sure what distance I am from Brookmans Park; but I believe it is somewhere round forty miles. Anyway, on a 50-ft. aerial (including lead-in), I receive the Regional transmitter so strongly on a moving-coil speaker that the volume control has to be set at minimum. The National is not so strong down here, and quality is often bad. The "rejector" completely pushes out the Regional, and at the same time brings up the foreign stations, a list of which I append, which is an evening's usual "bag," and which excludes the usual long-wave stations. I have also received about 30 stations below 100 metres, excluding amateurs. Quality seems just as good on foreigners as on the local, provided they are not heterodyned, etc. I have not yet used headphones. As regards the pick-up side, the two valves provide ample volume for dancing (from a Lissen needle armature pick-up), and quality is perfect. Am thinking of changing over to 6-pin coils soon, as I have some spare ones by me. I have lately added another P.M.2 in parallel, and find it gives me slightly more volume and a rounded tone. This is a great advantage when using the pick-up. I won't waste any more of your time, for I feel sure that this must be about the two-thousandth letter you have had re "Magic" Three.

Budapest*	Breslau*
Sundsvall	Gorteborg
Riga	Bordeaux-Lafayette
Vienna	Turin*
Milan	Bratislava
Langenberg*	Barcelona
Lyons (La Doua)	Moravska-Ostrava*
Rome*	Leipzig*
Katowice*	Horby*
Bucharest	Gleiwitz
Frankfurt*	Nurnberg*
Hamburg*	Cologne*
Stuttgart*	

* Full loud-speaker strength.

Yours truly,

C. GAY.

S. London.

"MAGIC" THREE IN DURHAM.

The Editor, POPULAR WIRELESS.

Dear Sir,—Herewith photograph of a "Magic" Three which is working excellently.

I made it primarily for quality on one or two stations, but was surprised to get quality on distant stations.

Incidentally it is the first set I have constructed without H.F. stages. I started on super-hets. and am working down the scale apparently.

Yours faithfully,

W. KILVINGTON.

Durham.

CORRESPONDENCE.

THE "MAGIC" THREE.

THE "ECONOMY" THREE—THE "P.W. UNITED."

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.

He Built it for Quality Results from "The Local—"

—But it gave Him Distant Stations as Well!

This is the "Magic" Three built by Mr. Kilvington.

THE "ECONOMY" THREE.

The Editor, POPULAR WIRELESS.

Dear Sir,—It gives me great pleasure to give you my report on the quality and performance of your "Economy" Three, this being the first valve set I have ever had the pleasure of assembling or working. Assembling, wiring, and operation are simplicity itself, and the tone and performance on a good loud speaker are all that can be desired. I have adhered strictly to your specification, for which you have my many thanks.

An old reader of your valuable "P.W."

Yours faithfully,

FRANK LAW.

Essex.

THE "P.W. UNITED."

The Editor, POPULAR WIRELESS.

Dear Sir,—Many moons have passed since I scribbled my last few lines to you, so I thought I would just give you a few details of some experiments I have been making with my set.

Well, to cut a long story short, you probably may remember my last hook-up was your "Duo" One, with Pentode output. Since then I have altered my set until to-day I am using S.G. detector, L.F. and Pentode—four valves in all. This consists of various circuits out of "P.W."; a bit here and a bit there. The best name I think I could call it now is the "P.W. United." This arrangement is just "the berries" for long-distance work and a treat on the short waves. G 5 S W, Zeesen, P C J, 7 L O, the Philippine Islands, Kootwijk, Huizen, Java, and Rome simply roar through the loud speaker, and of course J B, Durban and Cape Town are simply TERRIFIC. Even with reaction almost at zero it is absolutely necessary to use a volume control, otherwise the loud speakers would never carry the volume. The second transformer 2 mfd. bypass condenser, is only used on the S.W. On the broadcast it has a muffling effect. Next week I am going to make up your Brookmans Rejector. So that I will be able to cut out J B and bring in Rome, which is very powerful at the present time. The only way I can get Rome on the broadcast band is to wait for J B to close down. I would have made the Rejector before only our wireless supply stores will not have the Formodensors in before next week.

Now about short-wave reception. I am very sorry to have to say that G 5 S W is miles behind either Zeesen or P C J for consistency and steadiness. Night after night Zeesen particularly is on the same spot on the dials. The nights P C J is on it is the same—right alongside Zeesen.

Just below them is 7 L O. But this station—7 L O I mean—suffers from a swamping effect from the other two stations. Now G 5 S W is never in the same place two nights in succession. They have a wandering wave-length within eight degrees. This is very disconcerting, because there are several amateurs and commercials within those degrees. This, unfortunately, gives you a very noisy background.

I have rather been taken up with your latest "Magic" series. I suppose one of these days I will have a go at it, unless you manage to dish up something better. Again, I have to wait for stocks of differential condensers. In East London we have only one establishment supplying wireless parts, and they are never very much up to date.

Well, I will dry up now. Wishing you and "P.W." the best of luck.

Yours faithfully,

L. J. MOGRIDGE.

East London, South Africa.

P.S.—Coils for short waves: Home-made, No. 18 gauge D.C.C. wire, wound on 2-in. former.

Metres	Aperiodic.	Aerial.	Grid.	Reaction.
15–35	8	3	3	4
20–45	8	4	4	6
30–60	8	6	6	4

SHORT-WAVE NOTES.

By W. L. S.

JUST as the weather is the usual opening subject for conversation between casual acquaintances who meet in the street (and elsewhere), so are "conditions" becoming the sole topic of discussion between short-wave fiends.

My present report is that they must have improved quite a lot, as I heard, *in one evening*, two South Africans, four South Americans and about three United States people! This would have been a record on the "minimum" side last year, but just now it is quite good going for one evening.

Seriously, though, I think things are on the turn, and sincerely hope that the eleven-year cycle enthusiasts will be confounded by a long run of good DX conditions.

20-Metre Harmonics.

The amateur 10-metre wave appears to be quite dead still. It is at its best only from late autumn to early spring, and apparently nothing happens at all during the summer. Incidentally, G 5 M L asks me to mention that his harmonic from a 20-metre transmission has been twice logged on 10 metres in Australia.

This is interesting, as I myself have just received confirmation of my reception (also on harmonic) of Australian V K 3 G O on 10 metres. Now if harmonics can get right across the world on 10 metres, just why is it that no one among the star transmitters has yet worked across genuinely?

"R. C. A.," my regular supporter from Devonport, is among those who mention a sudden improvement in conditions, but I think, as a result of his letter, I can give him a piece of good news. He logs V E 1 Y B (Canada), and as I do not believe there is a Canadian with such a call-sign, I should imagine that the station heard was V 1 Y B, who is located at Barbados. He is often heard on 20 metres nowadays and has added another country to the "bag" of several short-wavers.

"R. C. A." also has been logging South Africans and South Americans on 20 metres, and, once or twice, V U 2 Z X of India. We only want an Australasian to come over again and we shall be hearing all Continents; it will be quite like old times again.

The "Homeric."

Several friends of mine have mentioned from time to time that these sudden changes on 20 metres coincide with changes in the opposite direction on 40 metres.

"R. C. A." confirms this. Has anyone else noted it?

G 2 G L of the "Homeric" seems to have been creating almost as much of a stir as G 2 G N on the "Olympic." He has been heard again working E A Q and W O O. The latter station is, I believe, either at Rocky Point or Bound Brook. It looks to me as if the time is coming when these liners and their traffic will be as interesting to listen to as Croydon and his flock on 900 metres.

Incidentally, in the future we can certainly expect some sort of a regular service across the Atlantic by air, and what will happen to 900 metres *then*? The day must certainly come when the 'planes will be equipped with short-wave crystal-controlled transmitters.

Cross-Channel 'Planes.

I have often thought how much simpler and better it would be even for the cross-Channel 'planes to carry something of the sort. They would not want as much power as they use at present, provided they picked on a wave-length that did not give "skip distance" bother between London and Paris.

A reader at Rawalpindi, India, mentions the excellent reception of G 5 S W that he gets with his "Magic" Three. He says that for quality and, on some occasions, signal-strength, G 5 S W's 15 kw. beats Zeesen's 40 into a cocked hat. So G 5 S W has one staunch supporter out there. It certainly is extraordinary to note how "patchy" reception is of this station.

CAPT. ECKERSLEY'S QUERY CORNER

VOLUME CONTROL AND QUALITY REPRODUCTION — THE ANODE RESISTANCES—THE LEAKY GRID CONDENSER —ALTERING THE DESIGN

Under the above title, week by week, Captain P. P. Eckersley, M.I.E.E., late Chief Engineer of the B.B.C., and now our Chief Radio Consultant, comments upon radio queries submitted by "P.W." readers. But don't address your queries to Captain Eckersley—a selection of those received by the Query Department in the ordinary way will be dealt with by him.

Volume Control and Quality Reproduction.

K. H. (Romford).—"In a recent article by Capt. Eckersley on 'Quality Reproduction' he rather stresses the advantages of a remote volume control. Would it be possible for your Chief Radio Consultant to give some suggestions as to how the remote control of volume can be achieved with conventional receivers?"

I always think that by far the best way is to use a resistance as a potentiometer, or as a series resistance, actually in the loud-speaker leads themselves.

This is convenient, inasmuch as there is only one wire running out from the set, whereas any other method must involve two. This is badly put—I mean the loud-speaker lead idea does not involve extra wires running from the set.

There are all sorts of ways in which the resistance can be used, but I shouldn't wonder if the best compromise is to use a potentiometer. But make sure that the high tension is not directly applied to the loud-speaker leads. You must block it off somehow—either transformer or choke-capacity feed.

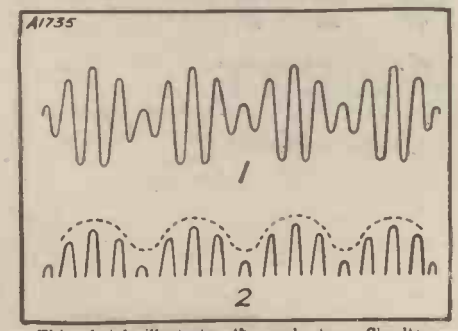
* * *

Anode Resistances.

J. G. R. (King's Norton).—"Whilst fully appreciating that there must be some definite advantage to be gained by the use of non-inductive, wire-wound resistances in L.F. circuits, I am rather at a loss to understand why ordinary wire-wound resistances should not prove equally effective."

I do not think there is anything much to be gained in using *completely* non-inductive resistances in a low-frequency system; but it's all a matter of quantitative degree and a definition of terms.

GRID-LEAK DETECTION



This sketch illustrates the reply to a Charlton reader's question.

I mean, in an ordinary resistance-capacity low-frequency system the resistances should never have an inductive reactance comparable with their ohmic resistance at the highest frequency. In a 100,000-ohm resistance we should not have a reactance greater than, say, 10,000 ohms.

At a frequency of 5,000 this reactance is given by an inductance of one-third of a henry; and provided, therefore, the resistance has not got an inductance much greater than this value, all should be well.

What, in my opinion, is to be deplored is self capacity in wire-wound resistances, as this is much more likely to cause deleterious effects.

* * *

The Leaky Grid Condenser.

H. L. (Charlton).—"What is the object of using a ·0003 mfd. fixed condenser as a grid condenser for a detector valve instead of some other value. Has it something to do with the bass frequencies?"

A grid leak detector is working quite differently from other valves. Cumulative grid rectification exists to chop off one-half of the high-frequency oscillations and leave the other half.

Thus, in my picture, the oscillation potential across a given circuit before rectification is like that shown in picture 1. After rectification we have picture 2.

In a grid leak detector, in spite of this chopping off, the high-frequency currents have to get into the grid—so they don't like a resistance, but they'll do with a condenser.

The condenser lets them get at the grid, the resistance only makes half of the oscillations effective in producing anode current.

If, however, the condenser were too big it could start cutting off the higher of the frequencies which are present after rectification.

With a given grid leak, if the condenser were too small you would lose in sensitivity.

* * *

Altering the Design.

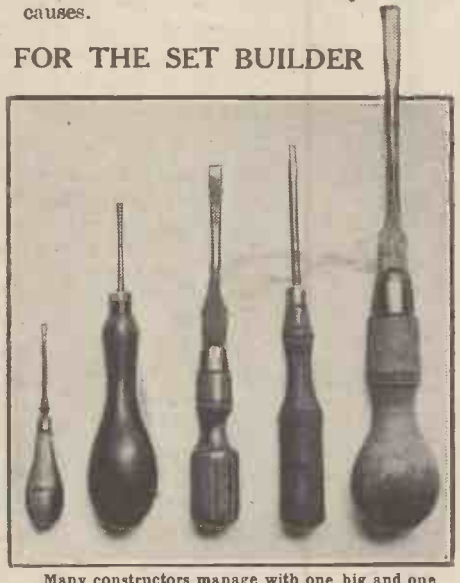
A. McL. (Dundee).—"I recently made a receiver from a published design which incorporated one screened-grid stage of H.F. amplification. I departed, however, from the designer's specification in respect of the aerial coil and the screen-grid tuned anode coil.

"These I wound with Litz wire on 4-in. formers. Although no reaction is used terrific oscillation ensued when I first tried the set, and I have been unable to cure this, even by completely enclosing the H.F. stage in a screening box.

"What is my trouble?"

It is very difficult for me to answer such questions as yours without being able to experiment on the set myself. Spurious oscillation can be due to so many different causes.

FOR THE SET BUILDER



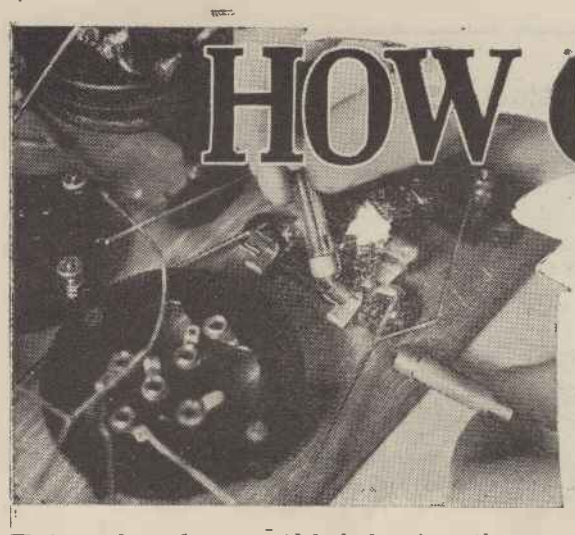
Many constructors manage with one big and one small screwdriver, but a variety of sizes for the different jobs that come along is the ideal way.

You have changed the specification by using, I should suspect, rather lower resistance coils than were specified. This, of course, may increase the tendency to oscillate. Furthermore, you may have altered in some degree the load to the set; and this, again, may introduce complications that the designers were at pains to eliminate.

Have you tried series resistance in one or other or both of the circuits—200 or 300 ohms would do—variable essential? Have you tried moving the positions of the coils so that they de-couple?

I think that the most fruitful line of investigation would be to try the resistance—and, by the way, are the inductances of the coils correct? If you have departed from the specification, maybe your inductance values are wrong.

Is it not better to go back to the specification and, if the trouble still occurs, buy some red ink and communicate with the designer?



HOW GRID LEAKS WORK

Detection with a grid leak and condenser is quite a simple business, as you will discover if you read this interesting article.

By H. A. R. BAXTER.

DO you know how a grid leak does its job? It is a rather fascinating process, and I will endeavour to explain it in a simple manner.

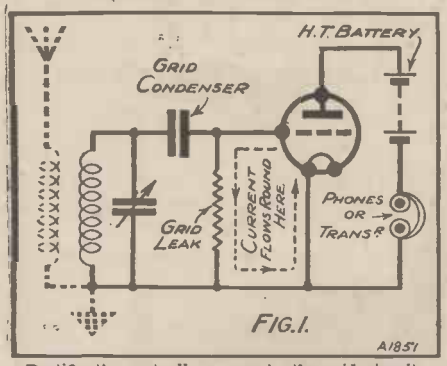
The grid leak joins the grid of the valve to the filament (Fig. 1). A certain amount of current flows through the grid leak. It is only a small current, merely a matter of microamperes which are, as you no doubt know, millionths of an ampere.

The actual value of the current depends upon several things, primarily the valve used and the amount of H.T. that is applied to it. But these are, from an operating point of view, fixed factors.

But when the circuit is working, the grid current is varied by the voltages impressed on the grid of the valve. The more negative the grid is made, the less the grid current: and the less negative the greater the grid current.

You will remember that the H.F. energy

WHERE IT HAPPENS



Rectification actually occurs in the grid circuit.

developed in the grid circuit by the aerial is dashing backwards and forwards, and it must, therefore, tend to make the grid voltage vary in this way.

So the grid-current swings up and down in value in time with the H.F. oscillations.

The Grid-Current "Bend."

But the grid-volts/grid-current curve is not a straight one. As you see at Fig. 2, it has a kink in it just like the "bottom bend" that you encounter in the grid-volts/anode-current curve of practically every valve.

Therefore, if you arrange so that you are sitting on this kink or bend when there is no energy to rectify, it is clear that when this does come along it will be "distorted."

Instead of the increases in the grid current exactly equalling the decreases they will be much greater. The other "half waves" of the H.F. are still represented, but their effect is slight in comparison with that of their brothers.

The grid current fluctuates at low frequency. And the purpose of the grid condenser is to prevent the tuning coil providing a virtual short circuit to these low-frequency fluctuations. If it were a big condenser and had a low resistance to L.F. impulses it would not do its work properly.

Remembering your Ohms law, you will realise that no fluctuating current can exist without a corresponding fluctuating voltage. By causing the current that flows through the grid leak to swing up and down you produce a varying difference of potential (voltage) between its two ends.

Where Amplification Occurs.

The grid leak is joined across the grid and filament of the valve so that these have L.F. impulses impressed across them, and the anode current is accordingly made to vary. And so the process is complete.

Don't make the mistake of thinking that there is any amplification in the first part of the business—the production of a rectified grid current. The amplification takes place when the grid voltage is varied at L.F. Then the valve does its additional work.

It is because there are these more or less distinct operations that the grid-leak method scores in sensitivity over the anode-bend scheme when weak signals are dealt with. In the case of "anode bend" the anode current is varied at high frequency and rectification takes place because the anode current increases are greater than are the decreases, you are again working on "a bend." But the grid-leak detector overloads more easily, so that anode bend is more sensitive to strong signals.

There Is Still H.F.

But there is not much amplification of high-frequency energy in a detector circuit (apart from reaction) because its make-up is not suited to it. But it can give you L.F. amplification, and this it does in some measure when you use a grid leak and condenser.

You may wonder how there can be any H.F. energy at all in the anode circuit in view of my explanation of rectification, whereas reaction depends for its success on the feeding back of H.F. energy to the grid for further actuation of the valve.

I (and others) have covered the point before in "P.W." in connection with various things, but I will just run through the crucial points again.

H.F. energy such as is received on a radio aerial and amplified by H.F. stages (if any) consists of current that dashes backwards and forwards at a frequency depending upon its wave-length.

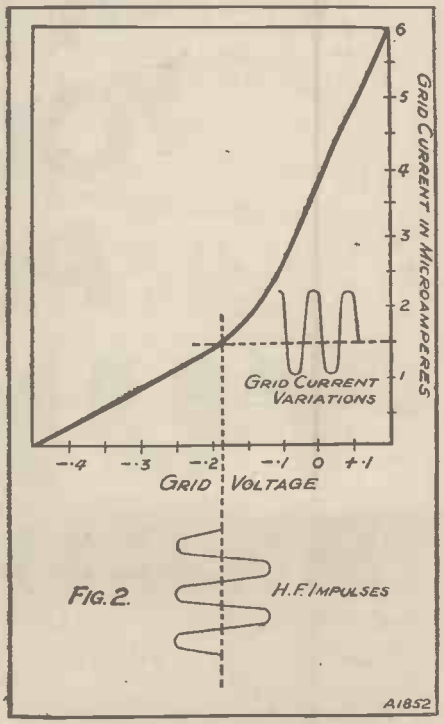
Just as much current flows in the one direction as in the other. The energy increases and decreases are absolutely equal in both directions. Thus if you tried to make this H.F. energy work a loud speaker, it couldn't do it, because no sooner had the current built up to its maximum in the one direction, than it would be followed by a completely opposing current flowing in the other direction. The one would, for all practical purposes cancel the other out.

Complete Rectification Impossible.

By suppressing the current that tended to flow in the one direction you would leave the other free to work devices such as loud speakers and ordinary meters. You cannot achieve complete rectification such as that, but what you can do with either a valve or crystal rectifier is to make the current flowing in the one direction much weaker than that which flows in the reverse direction.

The effects of the weaker part of the H.F. are still there in the anode circuit of a detector valve and the anode current is, in fact, rising and falling at high frequency—although, I repeat, the rises (or falls) will be much greater in extent.

QUITE SIMPLE!



This picture tells the whole story—if you can read it—and you certainly should be able to do so after perusing the accompanying informative article.

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

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

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

HAND-CAPACITY TESTS.

R. E. P. (Wokingham).—"In my set I use three plug-in coils. One for aerial, the second being the grid-coil and the third reaction.

"The only trouble with this circuit for long-distance results is that though very sensitive it is affected by hand-capacity and liable to make smooth oscillation control difficult. The reaction condenser is of ·0001 mfd. and at present one end of the reaction coil goes to the reaction condenser the remaining side of the condenser going to the plate of the detector valve.

"I mentioned this hand-capacity trouble to a friend, and he told me I could place the reaction condenser the other side of the reaction coil, and I should like to try this if you think it would be O.K. What would be the alterations in wiring?"

Disconnect the reaction coil from the grid coil and remove both the connections to the reaction condenser. Now re-wire as follows:

Moving vanes of the reaction condenser go to earth, etc., and to that end of the grid coil which was formerly connected to the reaction coil. Fixed vanes of reaction condenser go to the aforesaid end of the reaction coil, and the remaining side of the reaction coil (formerly going to the reaction condenser) now goes to the high-frequency choke and plate of the detector valve.

This completes the alterations and should stop all hand-capacity effects.

DOING WITHOUT THE CONDENSER.

C. R. A. (Buntingford, Herts).—"When rewiring the set I accidentally forgot the ·001 fixed condenser which was joined between the plate of the detector valve and the reaction condenser. The set works just as well without it!

"In fact, I did not notice that it had not been joined up until I came across it with the parts put aside from the other set. Why is it

(*Continued on page 756.*)

RADIOTORIAL QUESTIONS AND ANSWERS.

(*Continued from page 754.*)

that leaving out the ·001 makes no difference in operation ?"

This condenser is merely used as a precautionary measure, so as not to allow the full high tension from the battery to be applied across the reaction condenser.

One side of this, you will find, is joined to the filament end of the valve circuit, and the other side of the reaction condenser to the plate of the valve, and consequently to the H.T. which is applied to the plate.

In the event of one of the vanes of the condenser becoming slightly loose or bent, this battery would be shorted, with disastrous results to it and possibly to other parts of the set as well.

All such risks are entirely obviated if that ·001 fixed condenser is inserted between the two, as was the case with your original circuit.

SWITCHING OFF H.T.

L. D. G. (Devon).—"I want the high-tension battery switched off at the same time as the low tension, and I understand this can be done by altering the wiring to the L.T. switch. What are the connections ?"

With the ordinary on-off switch, no matter how you connect the L.T. leads, it is impossible to definitely break both circuits (this, of course, is apart from the fact that when the L.T. circuit is broken the cessation of the filament current automatically "cuts off" the H.T.).

If you require to break the actual lead from the high-tension battery as well as that from the low-tension battery, you require *three* contacts. You can use a switch of the type used for wave-changing—that is to say a switch to which three wires may be joined, all of which are disconnected from each other when the switch is off, and all joined together when the switch is on.

Many of the simple wave-change switches have two terminals and a connection on the plunger which serves as a third terminal. With this type of switch the H.T. wire is taken to one terminal and the remaining two terminals joined to the two sides of the filament circuit. When the switch is "open" H.T. is disconnected from both sides of the filament, and these are disconnected from each other. When closed both circuits are restored.

FAILURE TO OSCILLATE.

D. F. P. (Bedford).—"What is likely to be the cause of a set refusing to oscillate ?"

If it is a *new* set, possibly the reaction coil has its windings round the wrong way, and a reversal of these will put the trouble right.

If, however, the set worked previously with proper reaction, failure to oscillate may be due to the L.T. or H.T. having deteriorated, for a drop in voltage is often sufficient to cause the trouble. Another cause is the loss of emission of the detector valve, and yet another cause is alterations to the set or layout such as a large new aerial, an alteration in the earth wire, or an alteration to coil sizes, screening, etc. So you see to definitely locate such trouble for you we should require to know a little more about the set and the conditions under which you are working it.

TECHNICAL TWISTERS

No. 26.—THE VALVE.

CAN YOU FILL IN THE BLANKS ?

The Filament, Grid, and Plate (or Anode) of a valve are called its . . . . . .

The grid is always placed . . . . . the filament and the plate.

All the . . . is excluded from inside the glass bulb of a valve because it works only if its electrodes are placed in a . . . . . .

The valve functions as a rectifier because . . . . . can be made to pass from . . . . . to . . . . . but not in the reverse direction.

Last week's missing words (in order) were : Frequency, Wave-length ; Capacity, Inductance ; Received ; Maximum.

"FORMIDABLE POSERS."

"THE BOOB" (Glasgow).—"I know absolutely nothing about wireless, but have plenty of enthusiasm, also a crystal set.

"Naturally, I am not at all satisfied with the one station which I get with the crystal set, and am thinking of making a valve set. I am interested in foreign reception, and would like to know if you could advise me (if it is possible) of a one-valve set ('phones) which could receive a few foreign stations with some measure of regularity, also where I could get instructions for making it.

"Can a crystal set be fitted with short-wave coils for foreign reception ? I should also like to know if a crystal set can receive on a frame aerial and no earth ?

"These, to me, are formidable posers. Another one before I close down ! Is Glasgow reception louder than in other parts of the British Isles ?"

For a good reliable one-valver you won't beat a Blueprint set. The "P.W." Blueprint No. 30 is extremely simple, and the "M.W." Blueprint No. 3 is more elaborate, incorporating a Rejector to cut out the local station. (Blueprints are obtainable from the Query Dept., price 6d. each, postage 1½d. extra.)

Although we have known of freak cases where short-wave reception has been attained on a crystal set, it is not possible as a rule. The heavy damping of the crystal detector doesn't give weak short-wavers a chance, and in successful short-wave work *reaction* is of the utmost importance. And, of course, you need a *valve* for reaction.

As for a crystal working from a frame and without earth—well, again, it *can* be done, in a limited way ; but a decent outdoor or "indoor" ordinary aerial is five or six times as good as a frame aerial.

A man *can* keep himself alive on water for weeks, but he really needs a good round of beef now and then, to be healthy (with carrots, if possible !). In the same way a crystal set *can* get a weak whisper of

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RADIOTORIAL QUESTIONS AND ANSWERS

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life from a frame, but a bigger aerial really *feeds* it. Much more satisfactory!

About your final query—is Glasgow reception remarkably good? We don't think so.

Very often one of the "P.W." readers in Glasgow writes in to tell us of some phenomenally good long-distance reception work on a simple "P.W." set. But then so do the Edinburgh readers, and the men of Dundee, and the Ecclefechan boys, and all the rest of them! Glasgow is *good*—yes. But probably the rest of Scotland is not a whit behind.

DOES A SET WEAR OUT?

"CURIOUS" (Natal, South Africa).—"As an enthusiastic reader of POPULAR WIRELESS, I am writing to ask you a question my brother and I have often argued about. The question is: Does a wireless receiving set wear out if in constant use for three sessions daily? My brother says they last for many years, and I should very much like to know if this is true. Ours is an all-electric receiver.

The receiving set itself, and the various wires, etc., are in the "everlasting" class. Apart from the slight wear due to moving parts—which is negligible—and the possibility of breakage of a wire by constant swinging or moving of something that should not swing or move, there is really nothing to wear out in an all-electric set. Nothing, that is, *except the valves.*

Valves are in a class by themselves, for the filament of each is specially treated by the makers so that it will freely emit the necessary electrons when heated by the L.T. current. The filament wire, as a wire, is virtually everlasting, but its specially-imparted properties *do* wear off with use.

When this happens—generally not before twelve months, and often not for several years—the valve is said to have "lost emission," and a new valve becomes necessary.

Often it is not too much use that causes lost emission, but improper use, such as wrong grid bias, and excessive H.T. or L.T. If the valve is being run as it should be, with proper H.T., L.T. and grid bias applied to it, it can be switched on three times or more a day without the slightest apparent detriment, and will last for a very long period. But treat it wrongly with voltages and it will have a comparatively short life, losing its emission within a year and thus requiring renewal.

DUD H.T. CELLS.

Commenting upon a query raised recently by E. M. (Letchworth, Herts), in connection with shorting a dud cell in an H.T. battery, a well-qualified and keen-eyed reader of "P.W." writes as follows, in a letter to the Editor:

When a cell or section of cells is shorted, especially if fairly active, the jelly electrolyte becomes liquid, expands, and forces its way either out of the top of the cell, or, if the zinc is inclined to be thin, through the side. Once outside, it is liable to work its way through to the next cell in the row, or, worse still, to the adjacent cell in the next row, thus shorting another cell or row of cells, and spreading the trouble. It may get through the division card, or under the bottom (the distance between the zincs of adjacent cells is quite small).

That this danger is realised by manufacturers is evidenced by the various precautions taken to prevent it. Thus, some firms pour about a quarter of an inch of paraffin wax into the bottom of the box, others use sawdust between the cells, and one uses a bottom card with bumps designed to raise the cells from the bottom of the box. Unfortunately, in the case of paraffin wax, the heat generated by a short often melts it away.

I give this explanation because I believe it is not generally known. I even heard a speaker on the wireless advocating bridging over a run-down section with wire.

The fact is that one section shorted in a battery can, and often does, affect its neighbours, and ultimately most of the battery, except in cases where the cells are so run down and the electrolyte dried up that the risk of liquid spreading is negligible.

MORE BURNT-OUT VALVES.

P. J. P. (London, E.8).—"As I had the chance to pick up a D.C. battery eliminator cheap I thought I would save money on batteries by taking advantage of the opportunity. It has proved anything but a money saver.

"As soon as I connected it up, bang went all the valves in the set, so I am thirty-five shillings out of pocket, and dejected, to say the least.

"I mentioned it to the man I bought it from, and he said, of course, I should have connected it up with a condenser in the earth lead. Is it true that this would have stopped my trouble, and, if so, what kind of condenser should I use?"

A D.C. mains unit should be connected to earth through a fixed condenser having a capacity of about

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WHAT DO *YOU* THINK ABOUT THIS?

A Leeds reader of "P.W." (who evidently had failed to notice the queer case of similar trouble reported in our columns some months ago) was greatly puzzled by the behaviour of his portable set.

It worked well at all times except in one room, where it was very weak when stood on the sideboard, and where its directional properties seemed affected. There was no metal in the wall to account for this, yet it always seemed as though the set was in some way screened when using its frame aerial. (It was O.K. with external aerial and earth connected.)

Could you have said

WHAT WAS WRONG?

N.B.—There is no prize for answering this, but from time to time we shall give a radio problem (followed the next week by the answer) in the hope that readers will find them both interesting and instructive. (Look out for the solution to the above next week.)

Last week's trouble (experienced by a Bournemouth reader) was found to be due to a faulty coupling condenser, that allowed the H.T. from the preceding valves' plate to make the grid positive.

RADIOTORIAL QUESTIONS AND ANSWERS

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1 mfd. Usually such a condenser is embodied in the unit; but if there is no such condenser in your unit, and your positive mains is earthed, it is obvious that when you connect up you are short-circuiting the supply.

A fixed condenser in the earth lead prevents this, but, of course, it must be of good quality (tested to 500 volts or so).

THE LAST OUNCE.

P. P. J. (Stafford).—"I am very keen on getting the last ounce of efficiency from my crystal set, as in any case signals are weak at this distance from the nearest station. I find great improvement by raising the aerial and still further improvement when a new earth was put in with a more direct run and deeper burying.

"It is now suggested that I might still further improve it by using insulated wire instead of bare wire for the earth. (I always thought this latter was quite O.K.)

"Do you think that it would be an improvement if I insulate this, bearing in mind that I cannot possibly improve it in other ways, as I have now the very best earth possible in the circumstances in which I am situated?"

We do not think insulation of the earth lead would be advantageous. The thing is to get as efficient an aerial-earth system as possible, taking advantage if you can of height in the aerial, good spacing for aerial and lead-in and direct run for the earth. Good conductivity wire should be used, and the insulation of the aerial and lead-in must be good, whilst contact at the buried plate or water-pipe, etc., must be the best you can obtain.

If you have attended to all these points and boosted the signals up in that way, you will probably find that no improvement whatever is gained by insulating the earth wire.

USING A PENTODE.

S. S. L. (Aberystwyth).—"Step by step I have progressed from the telephone earpiece as the base to the loud speaker to a moving-coil, and even now I am not satisfied.

"It has been a long and expensive journey to go, stage by stage, and all the time cash has been a big consideration, so that I do not want to spend any more if I can possibly help it.

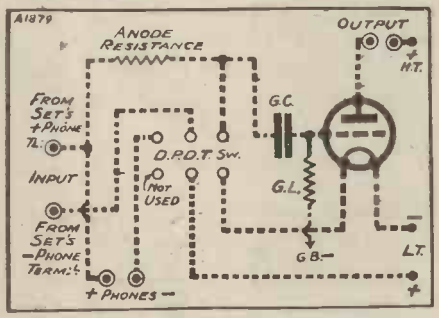
"But although at first I thought my present outfit was perfect, I realise now that it is just a trifle low-pitched, and I am told that a pentode in the output would assist in removing this tendency. I should certainly like to try it, but I understand that in addition to the pentode I should have to get an output transformer to work with this (special pentode) type.

Do you think that if I chanced it and tried the pentode without the transformer I should be 'spoiling the ship for a ha'porth of tar,' or ought I to wait until I can get the transformer as well as the pentode in order to try them together? Do you think it would be worth it?"

Other things being equal, you will get more "lift" using a pentode valve with no output transformer than you would if such a transformer were in use, so for your purpose we think the pentode would probably be a final and worth-while improvement. Why not try it before purchasing one, if you can persuade a friend who has one to lend you his for a little while?

It can be placed in circuit like the ordinary output valve, the only additional wiring being the necessary H.T. voltage on the extra terminal on the pentode base (possibly with a bypass condenser). If you can do this, it is certainly a stunt worth trying.

POPULAR "WIRELETS" No. 18



The dotted lines above indicate the connections for the amplifier, the components of which were given in last week's "Wirelet."

It will be seen that when joined to the set (same batteries) the amplifier is brought in or out of action by throwing over the D.P.D.T. switch.

A GOOD LONG-DISTANCE TWO-VALVER.

D. A. A. (Newbury, Berks).—"What I am looking for now is a good long-distance two-valve set employing one screened-grid stage for the H.F., and ordinary 'H.F.' valve for the detector.

"I should prefer to use plug-in X-coils, of which I have a good supply, and differential reaction. Is there an up-to-date design of this kind coming along in 'P.W.'?"

If you were looking for a really simple and yet truly efficient circuit of this type you must have been on holiday when our August 9th issue was published. For in that issue a circuit of exactly the type you mention was given.

It was called the "A.P." Two. As a distance getter this set would be very hard to beat, and it is quite easy to build though it has an efficient system of screening.

Good as it is by itself, this particular set has the further advantage that it can be used as a four-valver when connected up to the "A.P." Amplifier which was specifically designed for use in conjunction with this set, to enable readers to make either a two- or a four-valver of outstanding merit for long-distance quality reception. You should certainly get the back number dealing with this set.

BACK NUMBERS OF "P.W."

Readers who wish to obtain a back number of "P.W." should apply to **The Amalgamated Press, Ltd., Back Number Dept., Bear Alley, Farringdon Street, London, E.C.4.** The price is 4d. per copy, post free.

FOR THE LISTENER.

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Here, again, truth and plainness of speech are wanted.

It is so easy to wrap things up in deceptive words. There is some sort of "conflict" between Religion and Science, in the sense that, if we believe what Science tells us, it is not easy to believe all that we have learned from the Church.

For this reason panic-mongers are having an easy time. The best remedy against panic is the truth.

Most of us will be grateful to these gentlemen if they will tell us the truth. We are not exactly babes and sucklings.

Mixed Symphony.

A Symphony Concert—and a very good one, too—was broadcast from Rome, the other night, with "humorous talks" interleaved between the music. This is one way certainly of making the best of both worlds.

The musical standard at Rome, too, is pretty high. I wonder what the Queen's Hall fans would think about it?

If, for example, between Beethoven and Brahms there was an interlude by Clapham and Dwyer; or if George Clarke wrestled imaginatively with his motor-car just before Sir Henry Wood raised his baton on the Mahler Symphony No. 1 in D.

I imagine there would be plenty of D's flying about! But they arrange things differently here, you see.

Salzburg.

We have had a glut of good music this week. Our listening is mostly to music, for the talks from London are not very clear, and the continental talks are a strain on our knowledge of the language.

Personally, I get a bit fed-up, and would give the price of a long drink to hear Harold Nicolson talking saltily, or even Mrs. Fawkes Ansell on "Making Indian Eggs Fit English Cups." But we have had the Proms, and the "Iphigenia" from Salzburg, and "The Barber of Seville" from Rome, and a gorgeous Song Recital one Monday from Vienna.

Glow Worms.

An American lady was spending the night here on her way to the other show-places of Europe. She was smoking a cigarette down the lane under the stars.

It was a warm and fragrant night. The hedge was thick with glow worms. She put a second cigarette between her coral lips, and then found that she hadn't a match. Neither had I.

So she picked up a glow worm to light her cigarette at its lamp. The worm was peeved and ceased.

But if it had turned out that you could light cigarettes here by the glow worms, it would be a popular place with Scotsmen!

NORTHERN NOTES.

FROM OUR CORRESPONDENT.

Moorside Edge.

Mr. Noel Ashbridge, the Chief Engineer of the B.B.C., has just paid a visit to Moorside Edge, and it is understood that he expressed delight at the very satisfactory progress that has been made during the past few weeks. The work is going ahead so well that it is possible that test transmissions may start earlier than has hitherto been anticipated, and if this is so the station may be in complete service before the end of the year.

The three aerial masts are growing rapidly and are each about 200 feet high now.

Group Listening.

Group listening to talks, followed by discussions, is spreading in popularity in the North. The Carnegie Trustees have made a grant of £1,000 to the Yorkshire Area Council for Broadcast Adult Education for experiments over two years in the development of group listening, and some of this money was used to help to pay the expenses of a summer school training course

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NORTHERN NOTES

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for wireless group leaders at Saltburn. Mr. H. J. Dunkerley, of the B.B.C. (Manchester), who acts as Secretary to the Yorkshire Area Council, tells me that the summer school was a great success. Thirty-four group leaders attended, coming from all parts of Yorkshire. They practised discussion-leading under "service conditions" and heard lectures by Professor T. H. Searls (Professor of Adult Education, Hull University College), Mr. A. J. J. Ratcliff (Sheffield Training College), Mr. G. H. Thompson, of Leeds (Secretary, Workers' Educational Association), Mr. Dunkerley, and one of the B.B.C. engineers specially detailed to see that listening groups have suitable receiving equipment. Mr. C. A. Siepmann, of Savoy Hill, visited the summer school.

It is expected that, as a result, there will be considerable growth in the group listening idea this autumn and winter. Mr. Dunkerley estimates that there are on an average a dozen people in a group and he expects that some 150 groups will be in action in the North, so the number of "organised listeners" to educational talks will be nearly 2,000.

COLUMBIA H.T. BATTERIES.

In our August 30th issue we made the statement that the cells of Columbia H.T. batteries are not of the usual tubular construction.

This statement is a trifle misleading because, although there is a Columbia H.T. battery type known as the "Largerbilt" whose cells are certainly not tubular but are made in compact layers, there are other Columbias possessing cells of tubular construction. But these last are, of course, specially constructed so as to give long and reliable service, as is well-known.

TECHNICAL NOTES.

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

Use a Choke.

WHEN setting up a smoothing circuit for a mains unit it is important to remember that if the positive pole of the supply happens to be earthed, you should introduce a heavy choke into each of the leads of the smoothing circuit, whilst if the negative pole is earthed, a choke in the positive lead only will probably be sufficient.

If your mains happen to be particularly bad, it may even be necessary to introduce two chokes in series (having the necessary current-carrying capacity) into one of the leads, preferably the positive.

In view of the potential gradient or voltage drop that must inevitably exist along the so-called neutral cable, you cannot assume that this pole of the supply can be directly connected to the earthed parts of your circuit.

The earth of your receiver will be more or less true earth, and therefore the electric supply earth should only be connected to it via a condenser. The condenser should be a reliable one, tested to a much higher voltage than that of the mains, and should have a fairly high capacity, say, 2 or 4 microfarads.

Light Cells.

When the discovery of the electrical light-sensitivity of selenium was first made the fact was regarded as being of purely scientific interest, and there seemed to be little scope for its industrial application.

Incidentally, it is interesting to note that the discovery was made by a cable operator at Valentia in the year 1873.

He was using some special resistances made of selenium, and he noticed that whenever the sunlight played on these resistances one of his galvanometers, to which the resistances were connected, began to give indications of current.

Question of Efficiency.

It is commonly supposed that selenium is inefficient as an electrical light-sensitive agent, probably owing to the fact that it has been superseded, at any rate for many purposes, by "photo-electric" cells of other kinds.

As a matter of fact, selenium is particularly efficient in converting incident light energy into electrical energy (or, rather, in the variation of its electrical resistance when a given amount of light falls upon it), and it is in some ways much more robust and reliable than some of the more recent types of photo-electric cell.

The reason it has been superseded for such purposes as television, talking pictures, and so on, is not on account of any question of efficiency or otherwise, but because it unfortunately exhibits a certain "lag"—that is, there is an appreciable time-interval between the incidence of the light and the resulting change in electrical resistivity.

This lag is so small as to be unimportant where ordinary mechanical operations are concerned (the lag is usually less than 1-1000th of a second), but where it is necessary for the light-cell to respond to extremely rapid variations, as it is in television and in the reproduction of optically-recorded talking pictures, it is found that the lag of the selenium cell renders it unsuitable for use.

Television Pick-up.

Modern photo-electric cells usually depend upon the light-sensitivity of sodium, potassium, lithium, rubidium, caesium, or some similar element (or alloy), but the precise nature of most modern photo-electric cells is a closely guarded secret.

I have been asked what is the feature of the Karolus cell in particular.

This cell has been mainly used in photo-telegraphy, and is simply arranged in such a way that a clear space is left in the centre of the sensitive plate (a potassium or other light sensitive material being coated on the back) so that the light passes through the clear centre, or "pupil," falls upon the print or photograph or whatever is to be transmitted, and is then reflected back upon the potassium surface. There are now, of course, many varieties of the Karolus cell, but the above is the basic principle.

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TECHNICAL NOTES.

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Radio Transmission.

A good deal of controversy has been created by some theories put forward by Dr. A. S. Eave, of McGill University, Montreal, at a meeting of the Royal Society of Canada, relating to the problem of the Heaviside Layer.

As you know, the Heaviside Layer is now believed to exist at a height of from 200 to 400 miles above the surface of the earth (varying in its position and properties at different times and in different conditions).

It has since been discovered that there are at least two further electrical layers, estimated to lie at distances respectively of about 150 miles and 75 miles above the earth's surface.

Heaviside Theory.

The Heaviside Layer formed a very convenient peg upon which to hang the theory of the zig-zag transmission of radio waves around the curved surface of the earth.

It seems, if Dr. Eave's theory is correct, that our views on the question of long-distance radio transmission will have to be considerably modified, as it would seem fairly certain that for practical purposes the radio waves would not be able to penetrate even the first electrical layer, and so could not be affected to any appreciable extent by the Heaviside Layer, which is at a much greater distance.

Messages to Mars.

It has been said that the presence of these electrified layers in the upper atmosphere must be an absolute bar to any possibility of transmitting radio signals to another planet (Mars, of course), but I do not think that this is quite a proper view to take, for it must surely depend upon the wave-length and nature of the waves.

Inasmuch as light waves and heat waves (which are closely related to radio waves) pass freely through these electrified layers, whatever they may be, it is certainly not inconceivable that some type of radio waves may be found which may not be absorbed by the electrical layers.

Present Limitations.

At any rate, considering only the types of radio waves with which we are familiar at present, it seems that these are almost completely reflected or absorbed by the electrical regions in the upper atmosphere and therefore unable to be projected into inter-planetary space.

Radio-Gram Cabinets.

"What precautions should I take in fitting a loud speaker into a radio-gramophone cabinet in order to prevent 'boominess,' valve ringing, and similar annoyances?"

This question from a reader includes many others which I have received from time to time bearing on similar points.

At first sight it seems a very straightforward matter to incorporate a loud speaker (for preference a cone type, of course) into the cabinet along with the radio gramophone; but, having got it in, you may find that you are up against

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TECHNICAL NOTES.

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all sorts of minor troubles when you start to operate the set.

For one thing, the sound waves from the loud speaker may act directly on the glass bulbs of the valves and set up microphonic noises which quickly develop into a low-frequency howl.

Frame Efficiency.

Again, the presence of the loud speaker, particularly if there is a metal ring round the edge of the cone forming part of the chassis, may interfere seriously with the efficiency of the frame aerial, assuming a small frame aerial is included in the set.

Incidentally, in these cases it is better to use some sort of an external aerial, partly on account of the limited space available within the cabinet, and partly owing to the large amount of metal parts which are necessarily in close proximity to an enclosed aerial.

Acoustics of Cabinet.

Thirdly, you may find yourself in trouble with the actual acoustic properties of the interior of the cabinet, and, apart altogether from what we might call ordinary interaction between the loud speaker and the valves, you may get a reverberation or "boomy" effect of an entirely acoustic nature which, nevertheless, makes the sound reproduction very unsatisfactory.

Using a Reflector.

So far as the direct effect of the sound waves upon the valves is concerned, this can, as a rule, be overcome by screening the back of the loud speaker (I am assuming that the "forward" side of the cone is towards the grille), so that the sound waves coming from the back of the cone, and also those reflected from the back of the grille and surrounding parts, may be prevented from reaching the valves. Alternatively, the valves themselves may be protected by suitable shields.

It is, in fact, often simpler to shield the valves than to shield the loud speaker.

Loud-speaker Chassis.

The second effect I mentioned—the reduction of the efficiency of the enclosed aerial—is one which is not always very easy to remedy.

The only thing you can do is to place the loud speaker as far away from the enclosed aerial as possible, and also to place the cone of the loud speaker and the aerial in planes at right angles to one another.

Curing Boominess.

As to the boominess due to the cabinet, this is a matter which depends upon the actual dimensions and shape of the cabinet, as well as upon the placing of the parts which are enclosed within it.

If you have trouble from this cause, try putting a sound reflector (such as a sheet of three-ply wood) in different positions inside the cabinet; and, also, you might try the effect of using a more open-work grille.

In fact, if the cabinet acts as a boomy "resonator," it is best to start your investigations by removing the front—the

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TECHNICAL NOTES.

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part covering the loud speaker—altogether, and see how much of the effect is due to internal reflection.

It is impossible to lay down any hard and fast rules with regard to the acoustic properties of the cabinet, and each case must, so far as this effect is concerned, be taken on its own merits.

The Reflex.

I have more than once received suggestions from readers that the reflex type of circuit might be revived and, with modern valves, made to operate more efficiently than it used to do in the days of three or four years ago.

Probably some of the newcomers to radio may not be familiar with the reflex principle, so perhaps I should mention that it consists, briefly, in making one valve do the work of two.

The valve in question may, for instance, be used in the first case as a high-frequency amplifier, and then, after the signals have been rectified, they are passed through the same valve, which now acts as a low-frequency amplifier.

In the days when the reflex circuit was popular there were certain reasons for its popularity which do not altogether hold good to-day. For one thing, it was a great advantage to be able to make one valve do the work of two, since the filament current consumption was relatively very high in those days, and to cut this down to half was an important economy in the running of the set.

The various battery chargers and eliminators which are now so widely used were not then available to any great extent, and this still further rendered economy in filament consumption an important consideration.

Is It Worth While?

In these days, however, valves consume only a small fraction of the former current and also the problem of filament current supply has been greatly simplified. Consequently the question of filament

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TECHNICAL NOTES

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consumption does not to-day matter very seriously, and if this were the only advantage of the reflex circuit it would not cut very much ice.

But the actual outlay upon the valves is little different from what it was formerly, and here the reflex circuit has some advantage. The real point, however, about the reflex circuit is not so much any advantage which it may (or may not) possess but the fact that it is based upon a very interesting principle and offers ample scope to the ingenious experimenter to exercise his skill in getting the circuit operating correctly and—what is more—in keeping it from going off into all manner of howls and whistles.

Suggestions for Experimenters.

A point which is well worth investigation in this direction is the question of adding low-frequency amplification. In the old days it used to be found that the addition of a stage of L.F. amplification on to a perfectly working reflex circuit would sometimes upset the whole business completely, and was not at all the straightforward matter which you might at first have thought.

At any rate, with these remarks I pass on the suggestions which, as I say, I have received from readers from time to time, for the benefit of those keen experimenters who are always on the look-out for an interesting field of radio investigation.

Radio or Gramophone.

When making up a combined radio receiver and gramophone amplifier, constructors often find that whereas the set works efficiently in one way, say as a radio receiver, it does not work nearly so efficiently when switched over to the gramophone pick-up. There are a number of causes which contribute to this effect.

When connecting up a pick-up this may be brought directly into the grid circuit of the first amplifying valve, this valve being normally the detector of the radio set. A volume control is necessary in practically every gramophone amplifier, and you will generally find that one of the best methods of connecting this volume control is between the pick-up and the grid.

Potentiometer Precautions.

This is the first place where care is necessary in connecting up, because if the pick-up is not connected in the right way to the potentiometer (which forms the volume control) the actual tone may vary as the volume is varied. As a matter of fact, in many of the earlier radio-gramophones you will find that this trouble is present, and the quality varies as the volume is controlled.

The simplest and one of the best ways to included the volume control is to connect one end of the volume control through a fixed condenser (say 0·005) to one terminal of the pick-up, the other end of the volume control going to grid-bias negative, whilst the slider is connected to the grid of the valve.

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76 PAGES

RADIO AT OLYMPIA

76 PAGES

Popular Wireless

Every Thursday PRICE 3d.

No. 433. Vol. XVIII. INCORPORATING "WIRELESS" September 20th, 1930.

SPECIAL EXHIBITION NUMBER

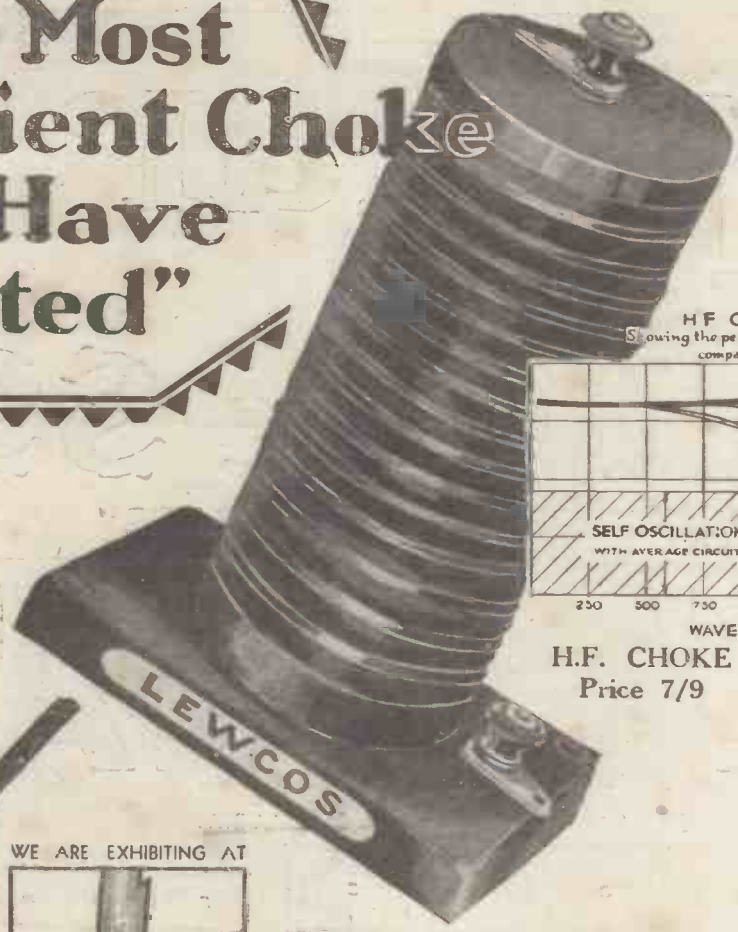
OLYMPIA

PLAN OF GROUND FLOOR & GALLERY.

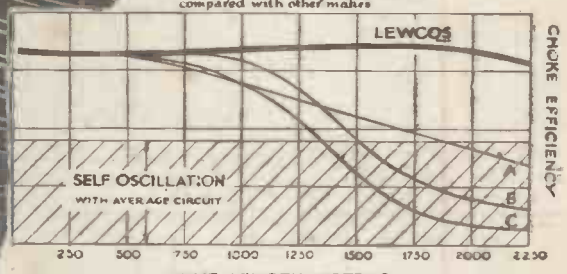
The EXHIBITION FOUR

See it here!

"The Most Efficient Choke We Have Tested"



H F CHOKE CURVES
Showing the performance of the Lewcos HF Choke compared with other makes



WAVE LENGTH METRES

H.F. CHOKE
Price 7/9

"We are pleased to report that the Lewcos H.F. Choke is, in our opinion, the most efficient Choke we have tested, there being no sign of instability even when using 150 volts H.T. on the Anode of the S.G. Valve. The construction is massive and well-finished, and its design places it in the front rank of high-class components."

An appreciation from Industrial Progress (International), Ltd., Bristol.

WE ARE EXHIBITING AT

YOU ARE CORDIALLY INVITED TO VISIT OUR STAND, NO. 41, AT THE RADIO EXHIBITION, SEPTEMBER 19 27

The above letter is a further appreciation of the unique qualities of the Lewcos H.F. Choke. The fine materials and high-class workmanship used in its manufacture make it supreme. 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.

The H.F. Choke curves illustrated above show the astonishing performance and advantages of the Lewcos Choke over other makes.

FULL PARTICULARS OF THE LEWCOS H.F. CHOKE WILL BE SENT ON REQUEST.

LEWCOS

Regd.

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Stocks held at the following Branches:—
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THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED
CHURCH ROAD, LEYTON, LONDON, E.10

A

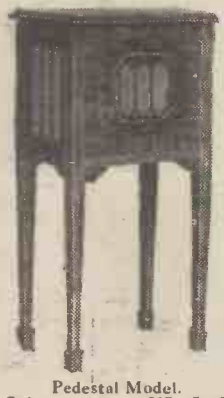
The latest development in Dynamic Speakers!

—and as usual the latest development comes from Ferranti. The new magno-dynamic (moving coil) speaker embodies years of experience and research work. It is likely that the full possibilities of permanent-magnet speakers have now been exploited and incorporated in the Ferranti model.

It combines super-sensitivity with an amazing faithfulness of reproduction and requires no energising current from batteries or electric mains. The Ferranti Magno-Dynamic Speaker may be operated by any good receiver, and is built for a lifetime of undiminished satisfaction and service.

Price: Chassis, as illustrated above, £9 : 10 : 0.

Gradual payment terms can be arranged direct, or through your local dealer. Particulars will be sent on request. Ask for List W408.



Pedestal Model.

Oak	..	£18 5 0
Mahogany	..	£20 0 0
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Table Model.

Oak	..	£15 5 0
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Table Model.
Metal case, covered with Rexine in choice colours, nicely figured in Brown, Blue or Grey .. £12 10 0

FERRANTI

FERRANTI LTD. HOLLINWOOD LANCASHIRE

NEW

INCREASED RANGE of the famous TELSEN COMPONENTS

WITH NEW FEATURES

New and Cheaper Radio awaits you on the Telsen Stand at Olympia! There you will see the latest designs in Radio Components—components which have been designed to meet modern broadcasting conditions for several years ahead.

Every component is the result of careful research into modern radio engineering—manufactured by one of the largest and most up-to-date Radio Works in the country.

The new Telsen Range is also the natural outcome of research into the manufacture of "First-Class Components" at a "Popular Price" . . . . it is now possible to build the finest set in the world and yet keep the overall cost well within the reach of your pocket . . . . no more costly sets—but greater and better sets! . . . with Telsen Components.

The complete Telsen Range includes Transformers, Variable Condensers, Fixed (mica) Condensers, Valve Holders and H.F. Chokes, etc.

The Range is so scientifically designed right down to the smallest detail and have a beauty of finish only associated with the highest-priced components, that no real enthusiast will ignore their claims . . . as "Radio's Choice" . . . for "Better Radio Reception."

Telsen "Radiogrand" Transformer, new model, shrouded in genuine Bakelite with new windings and core, fitted with earth terminal. Made in ratios 3-1 and 5-1.

Price 12/6 each.

Telsen "Ace" Transformer, the ideal model for all Portable Sets and where space is limited, gives perfect reproduction throughout the musical range Shrouded in genuine Bakelite, with new windings and core, fitted with earth terminal. Made in ratios 3-1 and 5-1.

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Price 2/6 each.

Red Star RADIO RECEIVERS

Telsen Valve Holders Pro. Pat. No. 20286/30.

An entirely new design in Valve Holders, embodying patent metal spring contacts, which are designed to provide the most efficient contact with the valve legs.

Low capacity, self-locating, supplied with patent soldering tags and hexagon terminal nuts.

Price 1/- each.

INCORPORATE TELSEN COMPONENTS

H.F. CHOKE

VALVE-HOLDERS

GRID LEAK

TRANSFORMERS

MICA CONDENSER

ADVT. OF TELSEN ELECTRIC CO., LTD., BIRMINGHAM.

TELSEN COMPONENTS

EVERY WIRELESS USER SHOULD GET THIS CATALOGUE

WHETHER you are buying a new set this year, or adapting your present set, or if you are needing components to construct your own receiver, you should not fail to get the Lotus Catalogue. In this attractive booklet are described all the new Lotus Models; a wide range of Electric and Battery Sets to suit every taste and purse. The Catalogue also gives particulars of the Lotus Components, famous amongst constructors for accuracy, finish and workmanship.

One minute spent filling in the coupon below will assure you of perfect wireless reproduction for the season.

** The Lotus Stand at Olympia is No. 30*

To GARNETT, WHITELEY & Co., Ltd.,
Lotus Works,
Mill Lane, LIVERPOOL.

Please send me free of cost the new Lotus Catalogue.

Name.....

Address.....

.....

P.W./X

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SETS & COMPONENTS

GARNETT, WHITELEY & CO., LTD.,
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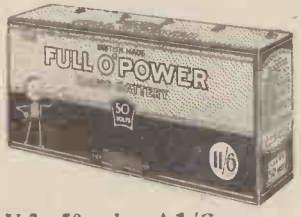
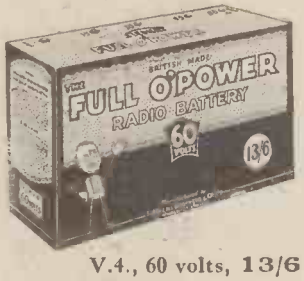


V.3., 50 volts, 11/6



V.4., 60 volts, 13/6

Mr FULL O'POWER ANNOUNCES

the introduction of an entirely new range of Full O'Power Radio Batteries, which includes models suitable for every type of battery operated radio set; and each battery will prove a revelation in performance. Made under patented modern processes, Full O'Power Batteries definitely give longer service and larger output, yet they cost no more.

The new Full O'Power Range will now include: POPULAR TYPE, POWER TYPE, SUPER RADIO TYPE, SPECIAL TYPE (for Portable Sets), GRID BIAS BATTERIES.

VISIT SIEMENS
STAND No. 70
NATIONAL RADIO
EXHIBITION,
OLYMPIA.

Ask for them to-day at your dealers—these wonderful new batteries in the attractive new-style cartons. They are fully described in the Full O'Power Booklet just issued.

SIEMENS

FULL O'POWER

BATTERIES

SIEMENS BROTHERS & CO., LTD., WOOLWICH, S.E.16.

Highest actual amplification!

—due to its abnormally low inter-electrode capacity

The effective H.F. amplification per stage that can be obtained in any Screened Grid Set is largely controlled by the inter-electrode capacity of the S.G. Valve. It is well known that the lower the self capacity of the valve the greater its effective stage amplification. Important features in its design and construction permit the inter-electrode capacity of the new Cossor 215 S.G. to be reduced to the order of .001 micro microfarads. This is substantially lower than the self capacity of any other Screened Grid Valve on the market. It follows, therefore, that this new valve permits a big increase in effective amplification. In fact, results are obtained which, a year ago, would have been considered quite impracticable.

Cossor 215 S.G. 2 volts, ·15 amp. Impedance 300,000. Amplification Factor 330. Mutual Conductance 1·1 m.a/v. Normal working Anode Volts 120. Positive Voltage on Screen approx.) 60. Price **20/-**

THE NEW COSSOR 215 S.G.

GREATEST *EFFECTIVE* STAGE GAIN

A. C. Cossor Ltd., Highbury Grove, London, N.5.

5821 ♡

Popular Wireless

LARGEST NET SALES

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Assistant Technical Editors: K. D. ROGERS,
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THE RADIO SHOW
5 S W IN U.S.A.
A QUEER CASE
CAN YOU EXPLAIN ?

RADIO NOTES & NEWS

WHO WAS IT ?
WORLD'S BIGGEST L.S.
NO B.B.C. INCREASE
" WIREMAN'S MATE "

The Radio Show.

THE Radio Exhibition is on us once again—September 19th to 27th, Olympia, London, W. Admission 1s. 6d. And a good show it is going to be, apparently, for this year we are going to have a real solid radio show without any of the stunts that look so good on paper and sound so punk at the try-out.

Capt. Eckersley hits the nail on the head when he says that it's service you want from your wireless set, and that's why I am glad that staggering eye-openers are taking something of a back seat at Olympia this year, and chief attention is being paid to technical excellence.

A Valve Cell

AT the recent Radio Exhibition in Berlin great excitement was caused by the announcement that a wireless receiver would be on show fitted with valves of a new non-filament type. I don't think we shall see them in London.

The earlier particulars led Berliners to believe that the valves were operated by reflected light, the electron stream being obtained not from a filament but from a light sensitive cell inside the valve. Some years ago the Americans tried out this idea pretty thoroughly, but the energy available was so very limited that interest in the scheme fell off.

For the Constructor

CONTRARY to the earlier reports, there will be special attention paid at Olympia to the set-builder and home-constructor. Instead of dying-out, that worthy is digging-in!

Amazing value in kit sets is to be shown this year, and the G.E.C., in addition to the new Music Magnet, is running a special "service" stand for home-constructors (No. 235).

5 S W in U.S.A.

SO much scorn has been poured upon poor old G 5 S W that I was particularly pleased at a strong and spontaneous tribute paid to the British Empire short-wave station from America. Apparently they are getting the same sort of short-wave "deadness" and poor range of reception as we have been doing in Europe, and in a cheery letter from Chicago a U.S. short-wave listener tells me that of all the Europeans he tunes in, only one is worth listening to, viz. 5 S W. He suggests results might be better still on an altered wave-length with different power, and this I believe is the view which will, in the end, appeal to our authorities.

GOING AFTER THAT CUP !

America's interest in Sir Thomas Lipton's bid for the America Cup has been intense from the start, and this photograph shows the broadcasting of his arrival as he stepped ashore from the "Leviathan."

A Queer Case.

FAMILIAR as I am with queer cases I must admit I had a bit of a shock when I had a letter from W. H., who lives at Higham Ferrers, Northampton way Without any preliminary "How-d'ye do" or beating about the bush of any kind, he plunges straight into the facts. And this is what he says :

'Phones Work When Disconnected.

"ON Monday, at 10 p.m., when listening-in to the programme from 5 G B, using a "P.W." Knife-Edge crystal set, 5 X X would persist in coming through at the same time, which was most unusual. I then put on a Hundred Per Cent crystal set and had the same results. I then *disconnected 'phones from set* and found that it still came through on 'phones. Perhaps you can say why ? "

Can You Explain It ?

THAT, my friends, is what I should term a snorter! And instead of lying awake at nights worrying about it, or pulling handfuls of hair out of my head, I am not going to "say why." I am going to "pass," like they do in nap. It's your turn, now, all of you. Can anyone explain it ?

Listeners Are Heathens.

OH, dear ! Sir John Reith has been at it again !

According to a report in the "United Methodist," the Director-General of the B.B.C. addressed a missionary gathering, and suggested that there were many connections between broadcasting and the missionary enterprise.

And if that means what it appears to mean, you are a heathen, I'm a heathen, all us chillun are heathens. And the good, kind, generous, and noble broadcasters are going to lighten our darkness.

(No good kickin', Rastus. We jes' gotta be good niggers, and do what they tell us.)

Light on Thyrite.

I SAY. Have you heard about Thyrite ? Nothing to do with thyroid glands, but it certainly has some monkey tricks. For Thyrite is a new compound that

(*Contined on next page.*)

RADIO NOTES AND NEWS.

(*Continued from previous page.*)

functions as an insulator for ordinary purposes such as the insulation of wireless aerials. But if a sudden surge of high voltage electricity comes along, such as from lightning, Thyrite becomes a conductor, and provides a path to earth!

This obliging substance—which would probably have broken the heart of the late Mr. Ohm—has recently been announced to an astonished meeting of the American Institute of Electrical Engineers.

Within the Vacuum!

MY contemporary, Mark Potter, has been letting himself go in the "Leeds Mercury" about the exhaustion of valves, "a state of nothingness" and "empty space." Having brought his readers to the point where "out of every 700 million particles of air originally there, only one remains," he adds that nothing could live within such a vacuum. We are now on the merry-go-round, for immediately something was in the thing, the vacuum would no longer exist; and as no living thing can possibly get into empty space, who can say whether it could live? It's all a contradiction of terms. Besides, who is sure that no micro-organism can live inside a valve?

Marconi on Television.

THE "Daily Despatch" publishes an interesting statement by Marconi in reply to the question, "What do you want most out of life?" in which the following passage occurs. "I do not demand wireless communication with Mars, wireless-controlled machinery, or even television. These things will not successfully operate in a perfect manner for many years to come. But I do think that I have time and the knowledge for making wireless transmission better than it is." Marconi's concentration on the problems of improving signalling is remarkable. He is never diverted from his progress.

Who Was It?

BACK in June a Rotherham reader of "P.W." was searching round about 75 metres when he heard a liner speaking to an American in Buenos Aires.

The liner was about 400 miles from Land's End, and its operator and the captain spoke to the American who said he had crossed the Atlantic in that same ship. After a bit the captain remembered him, and now this Rotherham reader wants to know whether he was listening to that 8,000-mile hook-up I referred to in "P.W." No. 428.

It all sounds a bit complicated, and, unfortunately I cannot now be sure, but the little incident just goes to show that you never know what you *will* pick up if you listen in on short waves!

The Biggest Loud Speaker.

WHAT is supposed to be the world's biggest loud speaker is fixed on the roof of one of the Berlin radio exhibition buildings. It is so powerful that words can be heard quite distinctly at a distance of six or seven miles!

They say that when it was nearing completion some small but important part could not be found and one of the mechanics on the job was despatched on a motor-bike to get it. About ten minutes afterwards he was scorching along a country lane half-way to his destination, and miles from anywhere, when a voice like a clap of thunder said: "It's all right, Carl. You can come back now. We've got it."

Most Powerful Station in the World.

WHICH is the world's most powerful broadcasting station? The question is not so easy to answer as one would think because of the doubt about some of the Russian transmitters and of the secrecy surrounding double and treble power tests with certain American and Continental stations.

Whatever the present position may be the palm is likely to go soon to KDKA, Pittsburg, which has made application to use 400 kw. in experimental broadcasts from 1 a.m. to 6 a.m. for scientific purposes. This would be on a wave-length of 306 metres, and it is quite likely that such broadcasts will be picked up fairly comfortably in this country.

SHORT WAVES.

Radio Morse for Police: Dot and dash, then dash and dot.—"Star."

* * *

Falkirk has been chosen for the new B.B.C. station. Although it is right in the midst of the "bairns," the programmes won't merely consist of a series of children's hours.—"Glasgow News."

* * *

"Kitchen tables, work-baskets and clocks fitted with wireless sets are to be features of the Radio Exhibition at Olympia," we read.

We are still awaiting confirmation of the report, however, that Singing Kettles have now definitely gone on strike.

* * *

"It is a mean and contemptible act to try to defraud the country of a few shillings by using a wireless set without a licence," said a Judge recently.

Contemptible Radi-owe!

* * *

Young man (to girl friend, as a large wave knocks down his holiday rival): Look, there's your dear friend the B.B.C. Announcer being transmitted on a long wave length.—"Humorist."

* * *

MAKING IT WORSE.

"My set whistles and groans and howls and chirps and shrieks," writes a Scotch reader, "so I have decided to get more H.T. What is likely to be the result?"

Hoots, mon!

* * *

Tommy: "Teacher gives me aerial work at school now, dad."

Father: "Aerial work! What's that?"

Tommy: "I blow up the footballs."—Sunday Express.

* * *

SONG OF THE PIRATE.

There was a jolly pirate once,
Yo ho, my boys, yo ho!
Who sailed upon the ether waves,
Yo ho, my boys, yo ho!
The good ship, "Tuner-In", his craft;
A mast was set at fore and aft,
And on the deck the pirate laughed:
"Yo ho, my boys, yo ho!"

He is a wiser pirate now,
He is indeed, yo ho!
For he has learned that piracy
Is out of date, yo ho!
"I've joined the great majority
Who pay for what they get," says he
"So toodooloo to piracy,
Yo ho, my boys, yo ho!"

The Hague Power Rating.

TALKING of power, reminds me that an important step forward in the matter of grading the power of a station should have come into force on the first of this month all over Europe. Realising the absurdity of present power figures for different European stations, the Union Internationale de Radio Diffusion last year recommended a new power rating.

At that time some stations reckoned their power as the power taken from the mains, others the power taken by the plates of the main power stage of the transmitter, others the mean H.F. power radiated from the aerial, and so forth. Reckoned one way the power could be about ten times as much as that for the same station reckoned another way! So an attempt is to be made to standardise new figures which will give us a real basis of comparison.

No B.B.C. Increases.

UNDER the new methods of rating London and the other British stations will show higher power figures. Don't expect louder programmes, because actually the power itself will not be altered in the slightest.

It is only the method of reckoning that will be altered and brought into line with the method employed by all other European stations represented in the Union Internationale de Radio Diffusion.

The Wireman's Mate.

ENCLOSED with a newspaper cutting, I have received from H. B. (West Kensington), a letter which holds the electrical expert of a famous newspaper up to ridicule, tears him to bits, and scornfully throws away the pieces. Suggesting that the said electrical expert must have been a wireman's mate, H. B. buries him with scorn and then turns to me and says: "P.S.—Could you inform me where I could purchase a couple of Morse keys?"

Londoners should have no difficulty in picking up Morse keys, for I often see them on the electrical junk stalls, and they can be obtained quite cheaply at any of the big stores, as well as from a firm like Leslie Dixon & Co., 218, Upper Thames Street, E.C.

Radio in the U.S.A.

M. W. B., of 54, Purley Avenue, N.W.2, takes me to task concerning radio in the U.S.A. He says: "On page 657 you state that the number of amateur transmitters in the U.S.A. reaches 2,000. It does. Very much so, in fact. There are approximately 18,000 amateurs in the States, but not all of these belong to the U.S.N.R." These last few words leave me a nice little loophole, of which I gladly take advantage!

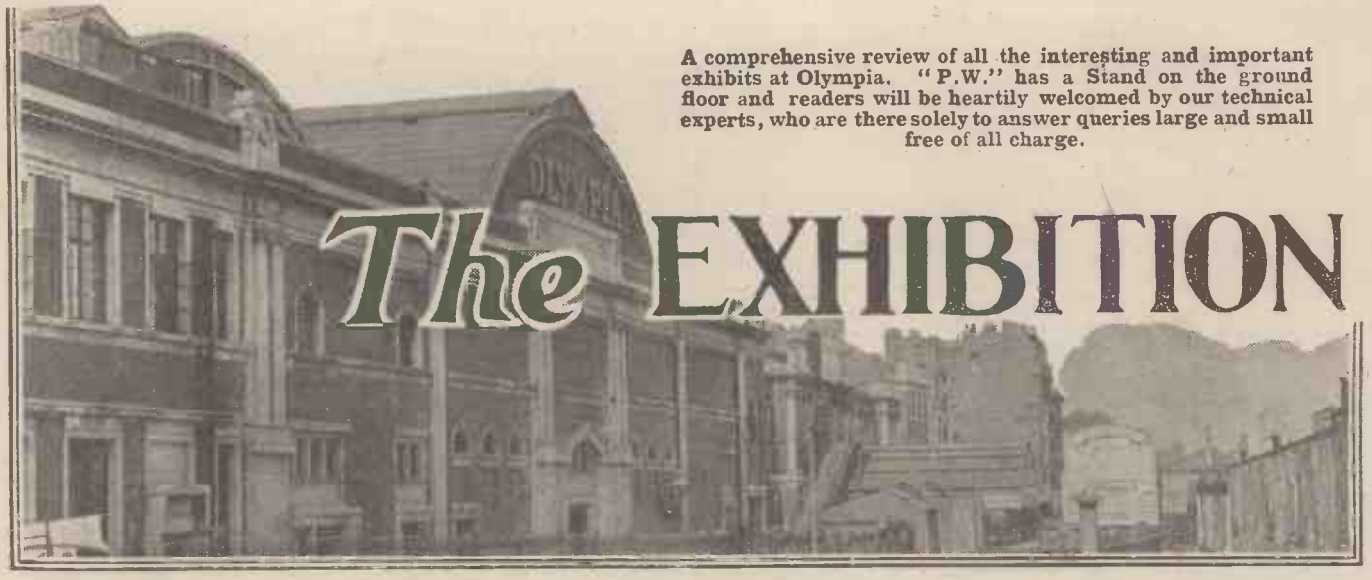
In the same issue of "P.W." D. M. complains of his difficulty in learning Morse, and M. W. B. kindly says that he may be able to help him. Whether D. M. takes advantage of it, or no, I think this is a jolly sporting offer.

An Astronomical Announcement.

LONDON listeners may have noticed that when the Science Museum at South Kensington has a specially attractive scientific exhibit the B.B.C. announces the fact. The museum is going to reciprocate this friendly act by providing a temporary display in the main entrance hall to illustrate the popular lectures on astronomy which Sir J. H. Jeans is giving in November.

This seems to be a very sound idea with considerable possibilities of extension.

ARIEL.



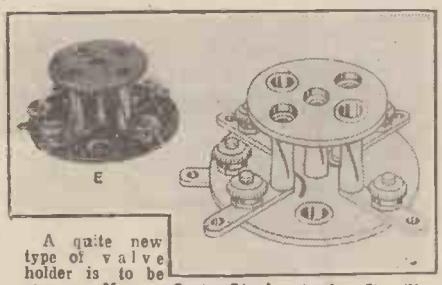
A comprehensive review of all the interesting and important exhibits at Olympia. "P.W." has a Stand on the ground floor and readers will be heartily welcomed by our technical experts, who are there solely to answer queries large and small free of all charge.

The EXHIBITION

AMALGAMATED PRESS, LTD.
Stand No. 5.

If you turn to the plan of the exhibition which appears on another page of this issue, you will find that our stand is very conveniently placed on the ground floor. This being the case, readers should experience no difficulty at all in finding us.

We want every "P.W." reader, old and new, who visits Olympia, to make a special point of coming along to Stand 5. It is the one golden opportunity of the year for us to get into really close touch with a very large number of you, and it is an occasion to which we do really look forward with very great pleasure.



A quite new type of valve holder is to be seen on Messrs. Lectro-Linx's stand. It will accomodate either four or five pin valves.

If you happen to be only a casual reader of POPULAR WIRELESS, or even one who has only recently purchased his very first copy, do not let that make you hesitate to come along to our stand.

Everyone is welcome and there will be plenty of things to interest all classes of radio enthusiasts. For instance, the "Exhibition" Four receiver, which is described in detail in this particular issue of "P.W." will be on show, and there will be a "P.W." Safe-Power Unit displayed.

Also, we must not forget to mention that technical experts will be in attendance all the time to answer radio queries. This service is, of course, absolutely free and its acceptance places you under no obligation whatever. However small or however large your problems, our experts will be delighted to help you.

Further, on Stand No. 5, "Modern Wireless" and "The Wireless Constructor" are represented, both by original models of current receivers and by blue prints, etc. And although copies of the current issues of the leading three radio journals will be on sale at Stand No. 5, visitors who already have copies will not be expected to buy others before they can ask questions or closely examine all the fine gear on show.

Visit Olympia at all costs, for it is a great exhibition, and having arrived there, for goodness' sake, do not forget Stand No. 5.

The Ekco people are showing some fine mains units and sets, including the above 3-valve all-mains outfit.

ARDING & HOBBS, LTD.
Stand No. 262.

Well known as retailers of domestic goods, these people are now selling attractive radio receivers, and a representative range of them is on view at this stand.

ATALANTA.
Stand No. 232.

Tools and other appliances that should prove of interest to radio enthusiasts.

AUTOMATIC COIL WINDER & ELEC. EQUIPMENT CO., LTD.
Stand No. 107.

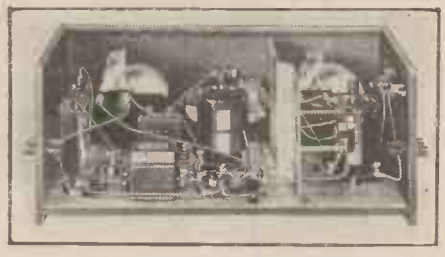
A display that indicates something of the modern mechanisation of the radio industry in at least one aspect.

BAIRD TELEVISION CO., LTD.
Stand No. 216.

Here radio enthusiasts will have an opportunity of seeing the latest televisors, and of collecting descriptive literature concerning them.

BAKELITE, LTD.
Stand No. 255.

Mouldings and various insulating materials, sheet Insulators, rod, etc.



A prominent feature of the Cossor display is the new Cossor "Empire Melody Maker," of which the above is a view of the interior.

BAKER'S SELHURST RADIO.
Stand No. 137.

These moving-coil people are showing a new moving-coil speaker of the permanent magnet type, and one which is said to have an extraordinarily high sensitivity. There are two other moving-coil speakers, which are of the current actuated variety, on this stand, and these too are very well worth inspection.

BEAVER ELECTRICAL SUPPLY CO., LTD.
Stand No. 206.

The Corona portable set and Elite coils are to be seen here.

BEL-CANTO RADIO CO., LTD.
Stand No. 264.

Loud speakers, amplifiers, sets, radio gramophones, etc., all attractively arranged for examination by visitors.

BELLING & LEE, LTD.
Stand No. 134.

Practically every set must have terminals, so there can hardly be a radio constructor unable to find at least something of interest at the Belling-Lee stand, for the Belling-Lee people specialise in terminals and similar devices, and have many that are of outstanding design. They are, of course, showing their well-known standard terminals and also their terminal indications, which are now available in 36 different markings.

Of particular interest is the new Belling-Lee safety plug and socket, while the Belling-Lee indicating spade terminals, flexible lead fuse holders, radio fuses and S.G. anode connectors are all very interesting as well as being useful.

The G.E.C. Stand carries a fine display, including H.T. batteries, and, of course, the new "Osram Music Magnet Four" set.

You should take note of the Belling-Lee "Radiolegs," an ingenious device which transforms any table gramophone or radio set into a pedestal model.

We must not forget to mention the Belling-Lee Spadenser, which is a quite unique device. Its purpose is to increase a set's selectivity, and it comprises a small condenser with a clip-on spade terminal at each end, so that it can be fixed into position in a moment on any outfit.

(*Continued on next page.*)

Ever Ready are exhibiting a representative range of their world-renowned batteries.

THE EXHIBITION.

(Continued from previous page.)

BENJAMIN ELECTRIC, LTD.
Stand No. 115.

The name of Benjamin is very closely associated with valve holders, for the Benjamin valve holder has achieved an extremely wide popularity. We say THE Benjamin valve holder, but that, perhaps, is rather misleading, for there have been several Benjamins keeping pace with the march of progress, and radio constructors should not fail to pay a visit to this stand in order to examine the latest products of this famous valve-holder firm.

The Donotone loud speaker is one of the most interesting exhibits of its kind. It embodies a system of tuned gongs.

T.C.C. are showing all kinds of fixed condensers from grid types up to electrolytics.

The activities of the Benjamin concern do not stop at the making of valve holders, well though they must be repaid for this particular branch of manufacture.

A quite recent Benjamin product is their turn-table, which is a device for use with portable sets.

The chief feature is that it has legs that fold up when not required. There are rubber buffers, which are brought into use when the turn-table is placed on a polished table.

An even more recent Benjamin innovation on show is a rotary switch having particularly attractive qualities and available in D.P. and S.P. models.

S. BIRD & SONS, LTD.
Stand No. 73.

Here are to be seen all kinds of condensers of the variable variety, including ganged, drum-drive types, and so on.

BRITISH EBONITE CO., LTD.
Stand No. 253.

"P.W." readers will know what to find on this stand, and that is a fine range of "Becol" products. There are ebonite panels, matt, polished, black, and mahogany grained; and a fine range of ebonite formers mostly for H.F. chokes and coils.

Also there is an improved type of the famous "Becol" six-contact former and base. The coil former and base mainly comprise mouldings of first-grade ebonite. The former plugs very easily into the base, a special system of spring contacts being arranged. These provide efficient contact and are decidedly of the self-cleaning variety.

Messrs. Siemens are able to exhibit their new Full O'Power H.T. batteries.

BRITISH GENERAL MFG. CO., LTD.
Stand No. 59.

An L.F. transformer that retails at 6s. 6d. is one of the main features on view here, and there is an anode unit for coupling H.F. valves, the British General H.F. choke, and the B.G. tuner. This last appears in a new design which has a tapped aerial coil loosely coupled and five different methods of coupling are made possible, all of which are controlled by a small lever.

BROWN BROS., LTD.
Stand No. 17.

These people are wholesalers, and they are exhibiting a selected range of the best lines.

S. G. BROWN, LTD.
Stand No. 78.

A stand over which all real radio enthusiasts will doubtless linger for some time, for here there is an exceptionally interesting display. And regarding the moving-coil unit that Messrs. Brown are exhibiting, it is interesting and significant to remember that Mr. S. G. Brown included the principle of the moving-coil loud speaker in patents he took out as far back as in 1910.

Even so, exhaustive researches were carried out in recent years before these Brown moving-coil movements were placed in production.

There is a permanent model and this is fitted with a 12-inch duplex diaphragm, similarly to the A.C. variety. The Brown "Grosvenor" moving-coil speaker is on show and this is an entirely new model.

It incorporates a pitch control and, made in walnut with a high-class French polish, it has a cabinet which can be slid down into the legs to facilitate packing and storing. It is of magnificent appearance.

The Brown screened-grid sets, which include both kits and complete outfits, are now provided with valves. You should make a point of examining the Brown Screened-grid Four-valve Portable set, and the Brown No. 4 electric pick-up and tone-arm, another entirely new product.

There are a number of new Telsen components to inspect, including the above valve holders, H.F. chokes, and L.F. transformers.

BROWNIE WIRELESS CO. (GT. BRITAIN), LTD.
Stand No. 102.

The sets that are on show here will no doubt be examined with particular interest by all those who remember the famous patent action that occurred not so very long ago.

A Mullard H.T. Unit is to be found in a particularly important array of apparatus on Stand No. 36.

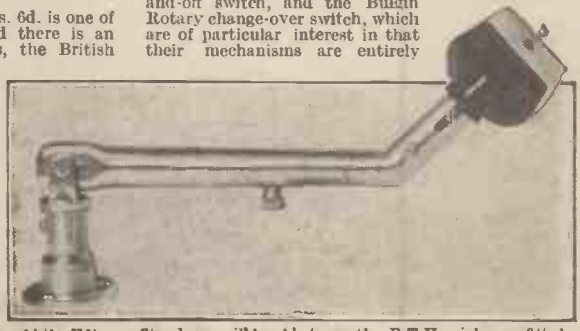
The "Brownie" people often strike a very unconventional note in their set designs, although no one can accuse these of being bizarre or ugly. And when examining the Brownie apparatus closely we are sure you will be struck by another point, and that is the wonderful bakelite and ebonite mouldings that the instruments embody.

There is no one in America, which is the "home" of bakelite mouldings, who could teach the "Brownie" people anything of this art.

Of course, the Brownie L.F. transformers are on view. The Dominion "Mainset" Two and the Dominion "Mainset" Three are sets that will attract considerable attention.

BULGIN & CO., LTD.
Stand No. 103.

Here are gadgets to delight the heart of every constructor. The Bulgin people must surely have more "essential novelties" in the way of radio than any other concern at Olympia. Among the new lines to be seen are the Bulgin on-and-off switch, and the Bulgin Rotary change-over switch, which are of particular interest in that their mechanisms are entirely enclosed in bakelite mouldings.



At the Ediswan Stand you will be able to see the B.T.H. pick-up, fitted to the new swivel-head tone-arm, among heaps of other interesting gear.

They are of the snap-action type, and quite suitable for mains use. Then there is a new Bulgin device for radio-gram outfits. It indicates when the amplifier is switched on, and, at the same time, throws a beam of light on the record so that the needle can easily be placed in the first groove.

The Bulgin safety mains plug and socket, and the Bulgin mains connectors are other items worthy of special mention, although this stand abounds in really interesting gear.

(Continued on next page.)

The Formo Co. has an attractive array of variable condensers, etc.

THE EXHIBITION.

(*Continued from previous page.*)

BULLPHONE, LTD.
Stand No. 33.

A special item on show at this stand is the "Bullphone" loud-speaker unit, which has a particularly efficient reed action. There are also complete loud speakers exhibited.

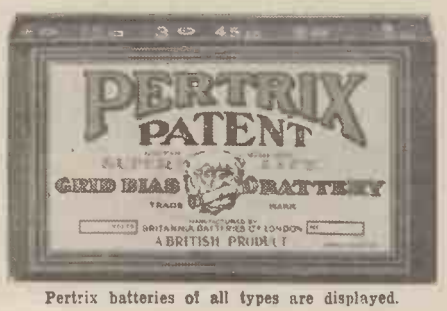
BURNDEPT WIRELESS (1928), LTD.
Stand No. 56.

The Screened Ethophone, the Screened Four, the Screened Portable, the Super-Screened Portable, the A.C. Ethogram, the Universal Screened Five, in D.C. and A.C. models, are among the sets exhibited.

There are also high-tension units and cabinet cone and moving-coil loud speakers. If we were asked our opinion as to the most interesting exhibit in this particular display we should plump for the Empire Screened Ethophone, which is described as an inexpensive receiver with a world-wide range. This set covers short and medium waves without interchangeable coils. It is a three-valver.

BURNE-JONES & CO., LTD.
Stand No. 121.

A wide range of Magnum components and Magnum sets. The new "Band Pass" Four makes its appearance. This is an all-mains A.C. receiver employing



Pertrix batteries of all types are displayed.

two screened-grid valves, a detector and one power valve, with provision for a gramophone pick-up.

Then there is the Magnum A.C. Radio-Gramophone, which is of entirely new design, built into a mahogany cabinet. And visitors should not miss the opportunity of examining the Screened-Grid Four Suitcase Portable, which is another entirely new design claimed to have a wonderful range of reception.

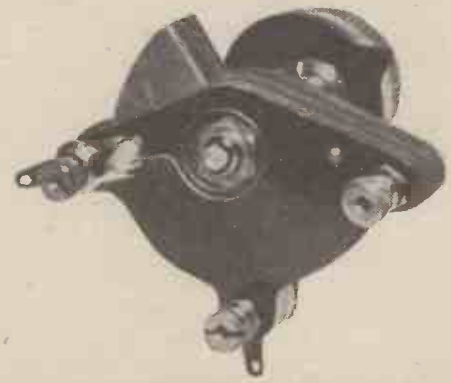
An improved model of the Suitcase Five and an improved model of the Transportable Five are shown, as well as the Magnum Short-Wave Converter, a device which transforms any ordinary broadcast receiver into a short-wave set.

C. F. & H. BURTON.
Stand No. 44.

The Burton people have some fine stuff on exhibition this year in the way of sets, components and of accessories. There are on-off switches, reaction condensers, a number of plug-and-socket connector devices and a range of new receivers.

BRITISH BLUE SPOT CO., LTD.
Stand No. 217.

Wherever loud speakers are to be heard, Blue Spot is, at least, a familiar name. Indeed, the popularity of the Blue Spot loud-speaker units is amazing. At this show Blue Spot makes its appearance as an all-British product. All the original merits of the Blue Spot accessories are retained in the English versions with, perhaps, even improvements here and there.



A component due to famous suppliers of kit sets, The Ready Radio Brookmans Condenser—a very compact and inexpensive variable.

The fact that most of the Blue Spots are now all-British made, should give them an immense fillip, and their popularity should still further increase. By the way, visitors should pay particular attention to the construction of the new Blue Spot Unit No. 66, and note the massiveness of the magnets and the clean finish of the movement.

CARRINGTON MFG. CO., LTD.
Stand No. 140.

Here is staged what is claimed to be one of the most comprehensive and largest ranges of cabinets

At the R.I. stand you will see one of the innovations of the year, the above L.F. choke, which has a nickel-iron core.

for the constructor that has ever been shown. All kinds of "Camco" cabinets from inexpensive crystal cases to large, luxurious radio-gram pedestal cabinets are included.

There is a new pattern moving-coil loud-speaker cabinet which is called the "Truetone," and a Camco "Mayfair" pedestal loud-speaker cabinet which is specially veneered.

The Camco "Waverley" radio cabinet deserves particular attention in that it is a real value-for-money proposition, designed to take a panel as large as 18 in. x 7 in., with a 15-in. baseboard. There is a loud-speaker compartment in it.

CATESBYS, LTD.
Stand No. 260.

Various sets and cabinets.

CELESTION LTD.
Stand No. 53.

These enterprising manufacturers of high-class loud speakers have two very special new instruments

Lissens are showing practically everything in the way of radio sets, accessories and components.

on show. Both of these incorporate outstanding features that will undoubtedly cause a stir in sound-reproduction circles. We are unable to give full details, but visitors should make certain they do not miss these important exhibits.

The Celestion C.12 loud speaker and the C.10 have been replaced by two new models of extremely high sensitivity, with ability to handle quite heavy volume. They are most attractively priced.

Another new Celestion instrument that makes its appearance is the D.50, which is a handsome cabinet model capable of dealing with frequencies below 100 as faithfully as it does with the really high ones.

The Celestion Tiltatone and the Celestion Woodruffe pick-up, the latter is now fitted with a tone arm specially designed for correct tracking, are on show, as well as the famous senior, standard and junior models of Celestion radio-gramophones. Altogether, this is a stand nobody can possibly afford to miss.

CHLORIDE ELECTRICAL STORAGE CO. LTD.
Stand No. 54.

Exide has penetrated to the farthest corners of the earth, and Exide accumulators are to be found in the submarines of foreign navies, and driving radio outfits in the loneliest outposts of the Empire.

The Exide show at Olympia gives some indication of this, although, naturally, the exhibits are mainly confined to accessories of a purely radio application.

An entirely new departure is marked by the introduction of Jelly Acid cells. Known as the Exide Gel-Cel, this type is available in an exceptionally comprehensive range for portable receivers, and practically duplicates the corresponding Exide range of liquid acid cells.

Exide jelly electrolyte cells are available in sizes suitable for all the popular portable receivers. Another new Exide production is an unspillable cell with a liquid electrolyte having a celluloid container which has many refinements in design, including a specially moulded lid and double base.

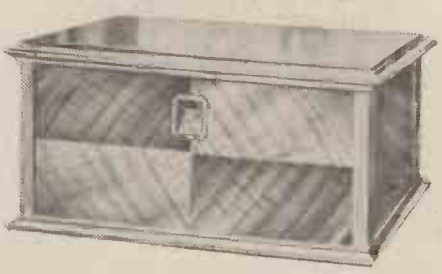
An improved Exide acid trap and a very large ampere-hour capacity as compared with the small size and weight, are other features to be found in this type.

Exide H.T. batteries are displayed, as well as Exide H.T. battery units assembled together in batteries of 60 volts and contained in polished wooden cases.

The Exide display also includes a collection of loose plates, separators, and other component parts illustrating the technical details of construction of Exide cells.

CLIMAX RADIO ELECTRIC, LTD.
Stand No. 27.

Aerial and earth equipment, and mains units and components are to be seen here.



There is only one Regentone set, a mains four-valver, and in its design and construction are concentrated the whole resources of a firm noted for its mains devices.

E. K. COLE, LTD.
Stand No. 48.

If you have the power mains laid on to your house, you will find plenty to interest you in this display. Messrs. E. K. Cole claim that they supply 80 per cent of the radio mains gear in this country. That in itself indicates that their range must be wonderfully comprehensive.

They have H.T. units for both A.C. and D.C. mains suitable for every possible set. Even a portable can be catered for. As a matter of fact, the "Ekco" unit for portables is a particularly interesting little chap.

It is designed to take the place of the H.T. battery when the set is being used indoors. There are also Ekco combined H.T. units and L.T. chargers, but we must not forget to deal with the Ekco sets which are on view.

There is the Ekco S.G.P. Three, which employs A.C. valves, and is particularly economical in regard to current consumption. It embodies wave-change switching, provision for the attachment of a gramophone pick-up—and, indeed, is modern in every respect.

COLUMBIA GRAPHOPHONE CO., LTD.
Stand No. 71.

Here are to be seen the Columbia radio-gramophones which are particularly notable productions. Also on

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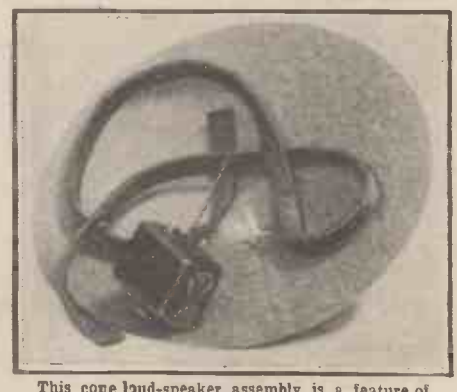


This cone loud-speaker assembly is a feature of the Six-Sixty display.

THE EXHIBITION.

(Continued from previous page.)

view is the new Columbia three-valve set which uses an S.G. and a pentode. This set also forms a part of the new Columbia radio gramophone.

COLVERN, LTD.
Stand No. 45.

Readers should take the opportunity of examining the new Colvern switches. These are of the rotary type and embody rather ingenious movements. Then there is a new type of screening box in aluminium, and new types of coils with switches incorporated.

The Lewcos L.F. transformer has distinctive bands around its structure.

These coils are of the dual-range type and are available complete with an ingenious switching movement, so that any number of them can be ganged together and operated by one control. Wire-wound resistances, in which the windings are on glass, wire-wound variable potentiometers, coil bases and many other components and accessories are displayed.

H. CLARKE & CO., LTD.
Stand No. 211.

Here is to be seen a range of Atlas mains units and Atlas radio components. There are some particularly fine H.T. units, while short-wave fans should not forget to examine the Atlas short-wave coils. These coils are wound with heavy gauge wire, air spaced, and fixed to porcelain bases.

There are also some "Atlas" mains unit components on view, including new chokes and transformers. Further, there is the new Atlas coupling unit, a device which replaces the L.F. transformer and is claimed to give striking results.

D.X. COILS, LTD.
Stand No. 237.

D.X. coils for long and ordinary waves, and for short-wave reception, are exhibited, together with various other items of interest.

DAYZITE, LTD.
Stand No. 25.

A very fine show of radio apparatus of all kinds. Special reference must be made to the new Inductor loud speaker, an instrument which operates on novel principles. It is claimed that it gives moving-coil quality, although it incorporates an electro-magnetic movement and does not need power mains or accumulator actuation.

The Dayzite people pay particular attention to gramophones and radio-gramophones, so that radio-gram enthusiasts should allow a fair amount of time to linger over these exhibits.

A. J. DEW & CO., LTD.
Stand No. 15.

These wholesalers are showing a representative selection of all makes of radio sets and accessories.

DONOTONE (REGD.) LOUD SPEAKERS, LTD.
Stand No. 139.

The Donotone loud speaker always creates a great deal of interest at Olympia. The Donotone stand is invariably surrounded by enthusiasts eager to examine the Donotone loud speaker at close quarters.

The Donotone is one of the most ingenious loud speakers ever designed. It incorporates a number of tuned gongs, but the object of these gongs is not to produce musical sounds, but to absorb resonances.

This loud speaker also incorporates a special composite diaphragm built in layers. Donotones are not queer in appearance, but are particularly handsome instruments, and they do give fine results.

A "Junit" soldering outfit shown by the well-known Junit wire people.

An important Whiteley Boneham exhibit, a new moving-coil unit.

DUBILIER CONDENSER CO. (1925), LTD.
Stand No. 50.

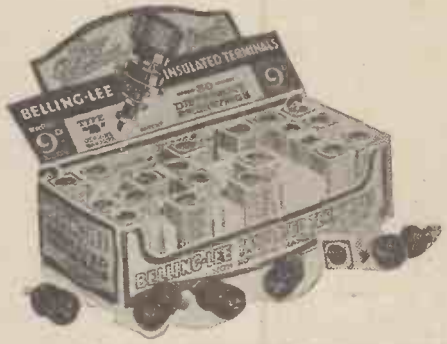
Three models of Dubilier radio-gramophones that are entirely new are on view. The largest model comprises a power amplifier, a moving-coil loud speaker, and all-electric equipment.

Another model is the three-valve radio-gramophone which similarly embodies a moving-coil speaker, and all-mains drive. There is a two-valve radio-gram which is all-electric except the speaker, which is of the balanced-armature type. The Dubilier people are also showing their "Westminster" Screened-Grid Portable Radio-gramophone.

DUNHAMS, LTD.
Stand No. 2.

Visitors will have an opportunity of seeing at this stand a Dunham portable set similar to that which Oldfield, the Australian wicket-keeper, is taking back with him to Australia. In doing this, Mr. Oldfield showed sense, for every Dunham radio set is guaranteed for five years.

The Dunham people are also displaying a three-valve S.G. and pentode all-electric non-aerial set. This set is housed in a handsome walnut cabinet with totally enclosed valves and equipment.



Terminals and such-like devices comprise the main body of the Belling-Lee display.

The Dunham Five-Valve Portable and the Four-Valve S.G. Suitcase Set are to be seen in addition to the Five-Valve Transportable, and various all-mains units and chargers. There is also a Dunham combined charger and H.T. unit for portables and other sets.

DYSON & CO. (WORKS), LTD.
Stand No. 104.

Godwinex mains units, suitable for all sets and purposes.

EAGLE ENGINEERING CO., LTD.
Stand No. 42.

A new range of Chakophone radio-grams suitable for A.C. or D.C. and all-mains, as well as all battery-operated, is shown. These incorporate moving-coil loud speakers.

Chakophone "Colassi" speakers are exhibited, a fine series including models ranging from 45s. to £12.

The well-known tuner in its latest improved form is shown.

A new all-in series of sets is exhibited, and this comprises two- and three-valvers with built-in frame aerials. The two-valve set is a detector and pentode, the loud speaker and all the batteries being housed inside the cabinet.

The complete range of Eagle H.T. dry batteries is shown.

(Continued on next page.)

PLAN OF STANDS IN EMPIRE HALL (FIRST FLOOR)

Such is the progress of radio that this year's exhibition is larger than ever, and the first floor of the Empire Hall has had to be taken, additionally to the usual space, in order to accommodate the stands.

A. C. COSSOR, LTD.
Stand No. 52.

There will be a great crowd around the Cossor stand owing to the Cossor Empire Melody Maker which makes its appearance at this show. The "Empire Melody Maker" is entirely new. It incorporates a screened-grid valve and retails at a remarkably low price. It is, of course, supplied in kits of parts, but it seems to be so easy to assemble that it almost stands as a complete outfit!

A fine plan of this receiver is being given away, a plan that shows every wire life size.

The Cossor people are also showing mains and battery valves, and we think visitors will be surprised at the comprehensiveness of these ranges.

Then there is a very neat little Cossor two-valve set on view, a set designed for battery operation. It is a wonderfully compact little outfit, and its controls are grouped on an ornamental escutcheon on the front of the all-metal cabinet.

THE EXHIBITION.

(Continued from previous page.)

J. J. EASTICK & SONS, LTD.
Stand No. 236.

New lines shown include the Eelex prods, which are made in two colours, red and black. These prods should prove invaluable to traders and radio

Tannoy Products exhibit a selection of excellent mains units including this one that employs a chemical rectifier.

experimenters. The object of the prod is to make rapid connection to different points in a circuit, taking voltage or current measurements on a meter, and as the prods are heavily insulated, the tests can be carried out with the current switched on. There should be no possible chance of a burn-out through shorting.

One of the excellent Varley mains sets that are on show.

A full range of Eelex terminals and other devices is shown, and we are sure readers who see grouped together all the various Eelex productions will be surprised at their diversity and usefulness.

They should pay particular attention to the Eelex standardised plugs and terminals. The terminals are able to cope with any kind of connection, including spades and hooks, pins and wire and even wander-plugs. There are also quite a number of Eelex switches suitable for all kinds of radio purposes.

EAST LONDON RUBBER CO., LTD.
Stand No. 20.

These people are wholesalers.

EDISON BELL, LTD.
Stand No. 29.

Here are to be seen the Edison-Bell combined H.T. and L.T. mains units, the Edison-Bel electrical gramophone reproducer, the station rejector and a scratch filter and volume control.

EDISON-SWAN ELECTRIC CO., LTD.
Stand No. 67.

The most outstanding exhibits are Mazda valves. There are mains, battery and rectifier types. The new Mazda mains pentode, and the Mazda P.220A are two very new arrivals that are to be seen.

The new Ediswan receivers are also playing a prominent part, and the 1931 model Three-Valve battery receiver, a modified version of the Ediswan Three-Valve Battery set which achieved such success last season is a central object.

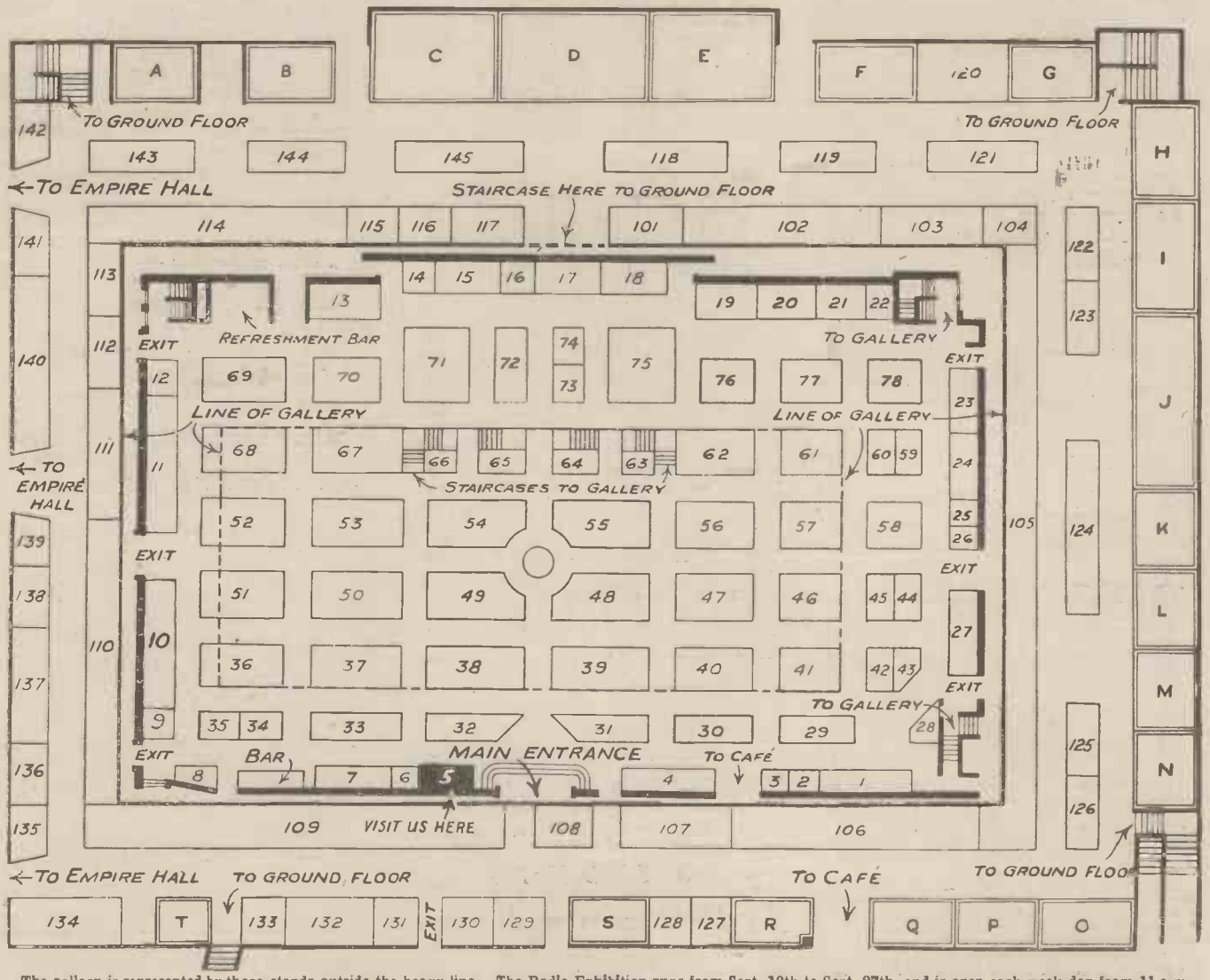
There is also the Ediswan Power Pentode Three, which employs the new Mazda A.C./Pen. in the last stage; the 1930 Ediswan transportable, and a complete departure in the shape of the Ediswan

(Continued on next page.)

The Gambrell Volu-vernia appears in a new and improved form.
Other items on Stand 106 include the "Novotone" device and mains receivers.

NEW HALL

PLAN OF GROUND FLOOR & GALLERY.



The gallery is represented by those stands outside the heavy line. The Radio Exhibition runs from Sept. 19th to Sept. 27th, and is open each week-day from 11 a.m. to 10 p.m. Note the position of "P.W.'s" stand, and don't forget to make it one of your "ports of call."

THE EXHIBITION.

(*Continued from previous page.*)

Power Pentode Two, an all-mains set designed for Regional work.

The new permanent magnet R.-K. loud speaker can also be examined, in addition to the senior and junior R.-K.'s, B.T.H. pick-ups, tone-arms, eliminators, loud speakers, chargers, and other famous gear. A fine array of first-class radio apparatus.

EPOCH RADIO MFG. CO., LTD.
Stand No. 203.

Here are moving-coil speakers of various kinds, including an entirely new production called the Domino. Also the Epoch super-cinema speaker is shown. Then there is the Cross Type Permanent Magnet Speaker which retails at an attractively low price.

EVER READY CO. (G.B.), LTD.
STAND No. 49.

Should you be about to replace your batteries you will be particularly interested in the Ever

Benjamins, of valve-holder fame, show this novel turntable for portables.

Ready display, in that those famous batteries have recently been reduced in price in a large number of cases.

A very comprehensive array of H.T., G.B., and L.T. batteries is displayed, and is well worth critical examination.

Ever Ready batteries hold a very high place for general reliability, and the radio enthusiast will be able to see for himself exactly what is being done by a leading concern in this branch of the industry.

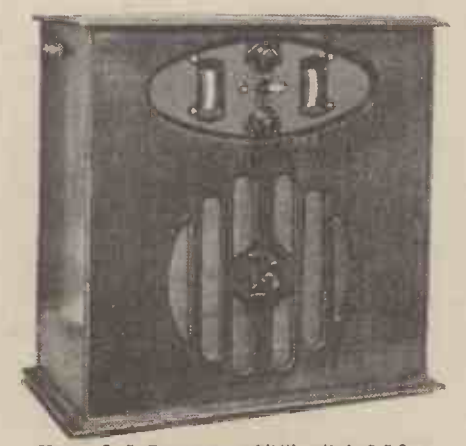
FALK, STADELMANN & CO., LTD.
Stand No. 119.

The Efescaphone receiving sets exhibited include portable receivers, and all-mains outfits. One of the most interesting is the portable Efescaphone combined radio-gramophone.

There are also Efesca H.T. units for A.C. and D.C. mains, and an Efesca all-power unit which, operating from A.C. mains, provides L.T. and H.T. Puravox loud speakers and loud-speaker units are shown, and there is a range of Efesca components, and H.T. and G.B. batteries.

FERRANTI, LTD.
Stand No. 47.

An excellent show, and one over which an hour or so can easily, profitably and pleasantly be spent. The Ferranti sets exhibited include the model A.C.4 Regional Receiver, which is quite unique in appearance. There is something almost futuristic about this, although, at the same time, it has graceful lines and an artistic simplicity which would enable it to fit in with any type of furnishing tastefully and unostentatiously.



Messrs. S. G. Brown are exhibiting their S.G.3 as well as a number of other distinctive sets.

This set is sent out permanently tuned to the two regional wave-lengths, choice of programmes and of volume being made simply by turning a knob. You can make a slight adjustment to suit different aerials, but after that no further adjustment is required. Of course, the well-known Ferranti three-

Here is a cute idea seen at the Burne-Jones stand. It is the new Spaghetti resistance.

valve A.C. mains receiver is shown, and it is much the same in appearance as last year's model, except that it is provided with only one window, the dial being illuminated as previously.

This receiver is calibrated in wave-lengths, and by means of an ingenious patented system it is impossible to see the short- and long-wave readings simultaneously. Undoubtedly this is a set worth singling out for detailed inspection.

The Ferranti display also includes A.C. and D.C. dynamic loud-speaker chassis, as well as table and pedestal speakers.

As "P.W." readers probably know, the Magno-Dynamic is Ferranti's latest loud speaker, a moving-coil instrument incorporating a special permanent magnet system.

The various types of Ferranti L.F. transformers are shown, and among the constructional receivers is a new Ferranti Screened-Grid Three, as well as a New Screened-Grid Four employing push-pull.

THE FORMO COMPANY. LTD.
Stand No. 72.

Here visitors will see the concrete results of the newly inaugurated works extension of the Formo company. The Formo range of components is now very wide, and it is impossible to enumerate it in its

The Igranic A.C.2 mains set is at Olympia.

entirety. But particular note should be taken of the various ganged condensers, which are of very interesting designs.

Then there is a Reinartz Two-Range Tuner, and, of course, Formodensors in their various capacities. Mikadensors, an entirely new design of condenser, make their appearance, as do the Formo Co.'s mains condensers.

FULLER ACCUMULATOR CO. (1928) LTD.
Stands Nos. 221 and 261.

L.T. and H.T. accumulators and H.T. and G.B. dry batteries form the bulk of this display. There are also trickle-chargers.

GAMAGE, LTD.
Stand 244.

The famous Holborn firm has its usual interesting sets and accessories on show.

DON'T FORGET TO VISIT "P.W." AT STAND No. 5

GAMBRELL RADIO, LTD.
Stand No. 106.

There is some really fine gear on this stand, including all-electric receivers, and a radio-gramophone. The Gambrell Radio Novogram for D.C. and A.C. mains is a four-valver employing an S.G. and seems to embody every modern refinement.

There is a moving-coil loud speaker, a B.T.H. pick-up, a Garrard double electric motor, drum-control tuning in connection with special selectivity circuits, the whole being enclosed in a handsome cabinet with two doors.

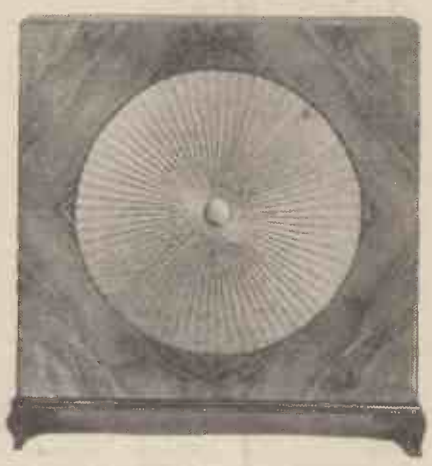
The Novotone compensating device is built into the Novogram and is also exhibited as a separate unit. The Novotone, as "P.W." readers no doubt know, increases both amplification and low-note response when used with a pick-up. It is quite magical in its effects.

A small item, but none the less interesting for that, is the Gambrell Voluvernier, a variable resistance having special qualities.

The Machachlan station finder is also exhibited, this being a wave-meter combining the advantages of the buzzer and heterodyning types, and in which a screened-grid valve is made to oscillate at both high and low frequencies, giving a high-pitched note which is constant and easily tuned.

GARNETT, WHITELEY & CO., LTD.
Stand No. 30.

The famous Liverpool people have added considerably to their range of receivers, and, among those exhibited on their stand are the Lotus Three-valve all-mains transportable, two types of three-valve all-electric receivers and a particularly interesting three-valve battery set.



One of the excellent loud speakers to be seen at the Loewe stand.

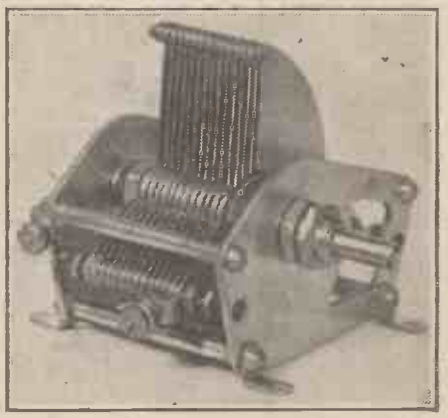
They are also displaying an all-mains unit for converting the G.E.C. "Music Magnet" into an all-electric outfit.

Among the latest components on view is a drum-dial for ganged condensers. There are also Lotus jacks and jack switches, transformers, chokes, variable condensers, and so on, contributing to a really first-class display.

GARRARD ENGINEERING AND MANUFACTURING CO., LTD.
Stand No. 256.

These people are represented in many of the radio-gramophones on view at Olympia by their very well-known gramophone motors.

As well as various clockwork models they are exhibiting their new electric-drive types.



The Polar "Universal" variable is one of the new components shown this year at Olympia.

(*To be concluded next week.*)

If you live in a flat or for other reasons cannot or do not want to erect an ordinary aerial, one or other of the schemes suggested in this article by our Chief Radio Consultant will solve your problem very efficiently for you.

INDOOR AERIALS

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

I THINK it becomes increasingly difficult to advise people on aerial installation as the flat habit develops. It is not everyone who puts up with a portable, convenient and excellent as it may be, and where there is mains supply it seems ridiculous to use high-tension batteries.

But with the conventional type of mains set, what is to be done for an aerial and an earth when one lives ten stories above the earth level, and everything one touches is alive with high frequency ?

It is obvious that the mains themselves resemble a network of wire standing off the ground and earthed at one end, steel girders must be at high-frequency potential, the field is a distorted and twisted thing.

The Principle Involved.

More than this, flats have lifts, electric cookers, and people here, there and everywhere are switching on and off lights, making horrid clicks, altering electric field conditions, and generally spoiling reception.

I believe, from my own experience, that distant listening in flats is probably, in the majority of cases, pretty difficult. It's not that one cannot get a fair "pick-up," it's the terrible background noise caused by lifts, switching, etc., etc. So one concentrates on the local station if one wants fair reception. But what sort of an aerial ought one to use ?

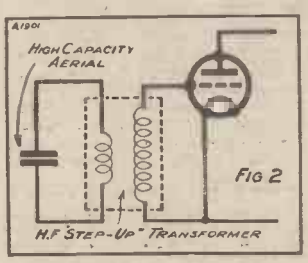
I have found that almost anything works after a fashion, but that there are better and worse ways of tackling the problem. Let us examine a little more closely the whole principle of the receiving aerial.

Consider Fig. 1a ; this is a conventional aerial. Current flows through the inductance L because of a difference of potential between the aerial and earth. Re-draw, as in Fig. 1b, which shows that the aerial may be represented as a whole lot of little elemental A.C. generators.

Matching the Impedance.

As the aerial has capacity, the little generators, e_1, e_2, etc., pass current to earth through the little elemental capacities c_1, c_2, etc., or through the aerial to the inductance itself. The capacities c_1, c_2 are essential to the principle of reception as they complete the closed circuit. Because if we neglect the distributed capacity and think of the sum of the voltages of all the little elements as one voltage, E, we see at once that it is, in effect, a closed circuit.

THE NEXT STEP



Coupling the grid to the aerial.

But the subtlety of point is that, as there is distributed capacity, each generator has, in fact, a branch path. If the impedance of the inductance is large compared to the impedance of the shunt capacities, then current passes to earth via these shunt capacities.

So it is a question either of avoiding an aerial which has a large shunt capacity to earth, or of making the impedance of the inductance low compared to the capacity. In fact, it's a case once more of matching impedance.

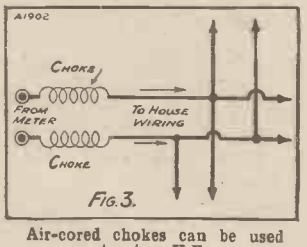
With a conventional set of the direct-coupled kind you are always adjured not to bring your lead-in close to earthing objects. But you need not greatly fear to do this if you design your input circuit rightly.

There are cases where it is impossible to avoid an aerial with large self capacity. In this case, the aerial inductance must be small. But here is a snag, because, take it from me, if the aerial inductance is small while the current for a given field created by the transmission is large, nevertheless the voltage across the inductance will be smaller than if the aerial self capacity is small, and therefore the inductance large.

In other words, if the grid is to be directly connected across the aerial inductance, it is well to avoid a capacitative aerial and to use a large inductance.

We can, however, overcome this trouble by using a transformer and with a highly-capacitative aerial ; Fig. 2 shows the conventional arrangement.

BLOCKING THE MAINS



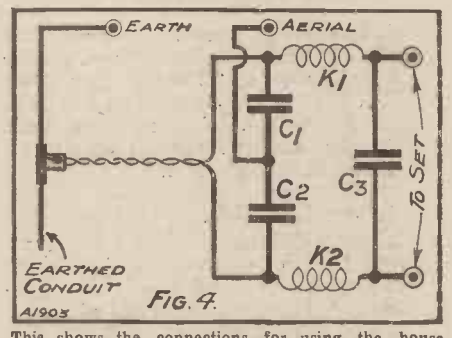
Air-cored chokes can be used to stop H.F.

Coming back to our flat, then—what have we to choose from ? Firstly, we can hang something out of the window, and avoid capacity in the lead-in. But what of the earth ? Quite likely, if we choose a girder, this is trying to act against our aerial ; producing no volts and no nothing ! So when hanging out of windows, do not think that it's absolutely essential to use an earth, you may find that to leave off the earth gives quite fair local station results.

Using a Mains Set.

Then, if yours is a mains set, there are very nasty complications. The mains are acting as aerials, casing wires, and all ! If you have an upstairs flat, it's worth while getting someone to give you permission to block off your electric-light system where it comes in with air-cored chokes. Also, your electric-mains lead must be screened.

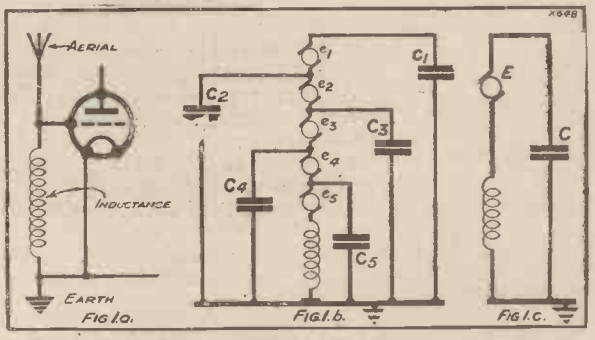
A FINAL SCHEME



This shows the connections for using the house wiring to pick up broadcast energy.

(Continued on page 62.)

HOW THE AERIAL WORKS



Here Capt. Eckersley illustrates the operation of the average receiving aerial.

LATEST BROADCASTING NEWS.

SOME PROGRAMME "PLUMS."

NEW ORCHESTRA BEGINS—
A BERLIN MUSICAL COMEDY—
NOTTINGHAM GOOSE FAIR—
A CIRCUS ENTERTAINMENT—
COUNTESS HAIG'S APPEAL

HERE are some items of general interest to listeners who depend on the National and London and Midland Regional transmitters.

The famous Don Cossack Choir is giving a programme on Sunday, October 12th, at Queen's Hall. It will be relayed for National listeners.

An anonymous author is responsible for "Red Tabs," a war play which is to be broadcast on Thursday, October 2nd.

Excerpts from performances by the Covent Garden Opera Company will be relayed to National and other listeners during the autumn, while the company is engaged on a tour of the Provinces. "La Bohème" is down for Friday, October 10th, and "Turandot" on October 18th. Both will originate in Glasgow.

Sir Walford Davies makes his re-appearance in the evening programmes during the autumn, when he gives his tenth series of talks under the title of "Music and the Ordinary Listener."

October 6th, 8th, 17th and 18th are the dates chosen for further editions of "The Ridgeway Parade."

Lady Tree is arranging a "League of Mercy" programme for National listeners on Tuesday, October 14th.

New Orchestra Begins.

The new B.B.C. Orchestra will be heard for the first time at full strength on the opening night of the winter series of twenty-three Symphony Concerts, which is to take place at the Queen's Hall towards the end of October. The season continues until the beginning of May, and among the conductors who have been engaged are Albert Coates, Sir Landon Ronald, Oskar Fried, Ernest Ansermet, Sir Henry Wood, Hermann Scherchen, and Adrian Boult.

A Berlin Musical Comedy.

It is hoped to include in the programmes a radio adaptation of "Evelyne," a Berlin musical comedy success, the original libretto of which was based on E. Phillip Oppenheim's novel, "The Amazing Quest of Mr. Bliss." The adaptation has been prepared by John Watt and the lyrics written by Gordon McConnel with music by Bruno Granickstaedten.

Nottingham Goose Fair.

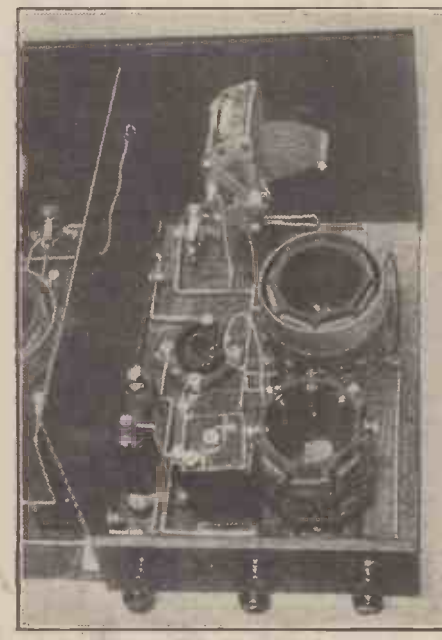
Reference was made in these columns a few weeks ago to several outside broadcasts from the Midlands which have been arranged during the autumn and winter for Midland Regional listeners.

One of these takes place on Thursday, October 2nd, when the opening ceremony of the Nottingham Goose Fair, reputed to be the oldest in the country, and which has been going on for probably a thousand years, will be broadcast. Certainly the Fair has been in existence since Saxon times, and King Edward I, in 1284, confirmed the right of the Burgesses to hold the event.

In those days it was probably quite small, consisting, maybe, of the sale of geese brought in by farmers from the Fens of Lincolnshire, but to-day it holds a premier place among the fairs of England. The records show that the Fair has been suspended on certain occasions, among them being in 1646, the year of the Great Plague, and in 1752, when the calendar was revised; the Great War also caused several breaks.

The Opening Proclamation, which listeners will hear, is very ancient and has been handed down for many centuries. It specifies that all cattle, goods, wares, and merchandise shall be exposed to public view and sold only in open fair. The Chief Magistrate of the City is present at the ceremony, perhaps as an indication that the laws must be respected.

THE "EXHIBITION" FOUR



This is the high-frequency end of the "Exhibition" Four which is chiefly responsible for the enormous pulling power of the set. Note the Contradyne Coil—"P.W.'s" easily-applied solution to the very nasty problem of local station trespass on the long waves.

A Circus Entertainment.

Mr. George Lockhart, the Ring Master at the Tower Circus, Blackpool, whose whole life, together with other members of his family, has been associated with the sawdust ring, is collaborating with Victor Smyth in the presentation of a special circus entertainment for North Regional listeners on Friday, October 3rd.

The full details are not yet available, but the entertainment will include music by John Rorke and the Northern Wireless Orchestra, while the humorous element will be entrusted to Doodles, a clown whose mirth-provoking abilities have made him famous all over the country.

Countess Haig's Appeal.

All stations throughout the country are to broadcast an appeal by the Countess Haig (who has now recovered from a long illness) on behalf of the ex-Servicemen's Factories in Scotland.

The appeal will be relayed from Edinburgh and the object is to increase still further the public interest in the work of the factories, which include the Poppy Factory at Edinburgh, the Erskine Hospital Workshops, Glasgow, Lord Roberts' Memorial Workshops, Edinburgh, and Newington House, in Scotland, for Blinded Sailors and Soldiers.

FOR THE LISTENER.

This week our popular contributor—who is still holiday-making in Italy—tells of his listening experiences there with "Belinda," a portable set.

By "PHILEMON."

Musical Jokes.

A CONCERT from Langenberg the other evening was entitled "Wit in Music." It was quite amusing.

It lasted almost four hours. One had not thought there was quite so much of it; but apparently most of the big composers had holidays when they kicked a loose leg.

"A Musical Joke" for Strings and two Horns, by Mozart; Beethoven's "Fury over a Lost Groat"; and the inevitable "Song of the Flea" by Moussorgsky. I am afraid that I did not appreciate all of it. You must know music pretty well, I imagine, to enjoy the funny parts of it.

But the verve and gaiety of the singers and the orchestra were very "catching." They enjoyed themselves hugely.

Parodies.

The second part of the Concert consisted of musical Parodies. These, I frankly confess, were rather beyond me.

It was rather like looking at a caricature by Max Beerbohm, not knowing the original. I felt that it was all very clever, but also that I was probably missing most of the point.

There was a Jazz version of "The Maiden's Prayer." Not being very much attached personally to "The Maiden's Prayer," I didn't mind this; but there seems to be a tendency among these light-hearted syncopators to play their little jokes with great music.

I feel that there are limits here which should not be overstepped, for decency's sake. A Jazz version, for example, of Schubert's Unfinished Symphony would, I think, be indecent.

A good parody, or a good caricature, is always valuable as an interpretation of the original, by exaggertion, for, as Mr. Chesterton has said, "if you turn a thing upside down, something is sure to drop out"; but jokes which cross the borderline and become "profanities" should be ruled out, if only by the artistic feeling of the jokers themselves.

(*Continued on page* 68.)

A SELECTIVE CRYSTAL CIRCUIT

E. C. CRAVEN, B.Sc., A.Inst.P., describes some interesting experiments carried out with many crystal arrangements, and a new hook-up which he has devised having great possibilities.

THE problem of designing a crystal circuit of high selectivity is one of very great difficulty. The reason may be put in a nutshell. It is that the load on the tuning circuit is very great.

Consider first a simple analogy. Suppose we have a potential divider, in which a drop of 1 volt corresponds to each 1,000 ohms of slide wire. Across a 1-volt tap we put a load of, say, 100,000 ohms, then the applied voltage will be practically 1 volt, and the current in the load will be in the proportion given by Ohm's Law.

Reducing Resistance.

If now we replace the 100,000-ohm load by one of 1 ohm the result is very different. Instead of tapping off 1 volt, the voltage across the whole tapping will be only 1-1,000 of a volt.

The fact is that, as the resistance of the load is reduced, so more power is required if the voltage is to be maintained constant. We assume the potentiometer is not capable of supplying the power required, and so the voltage drops.

Now a similar state of affairs obtains when we place a detector across a tuned circuit. If the detector is a valve, its equivalent resistance is very high, of the order of some hundreds of thousands of ohms and, therefore, imposes but a small load on the tuning circuit.

The effect of a heavy load like this, is to damp the oscillations in the tuned circuit, which is merely another way of saying that the circuit becomes less selective. Where, therefore, we have a crystal detector across a tuned circuit the tuning curve is bound to be of a broad type.

Let us examine some curves which have been obtained at a distance of six miles from Brookmans Park.

In Fig. 1 we have a simple single tuner circuit of which the characteristics are good volume and poor selectivity. It will be observed that the minimum signal strength between the two 2 L O transmissions for this circuit (upper curve) is about one-half the maximum.

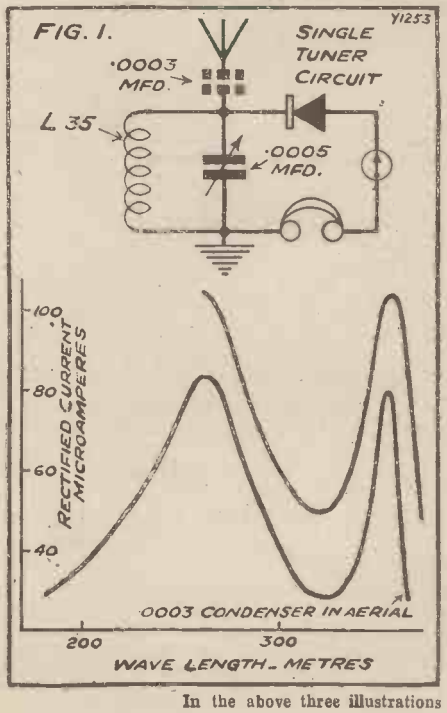
Increased Selectivity.

The introduction of a ·0003- mfd. aerial series condenser cuts down the strength by about 20 per cent, but the minimum is now only one-third of the maximum. There is thus a very definite increase in selectivity, but it is far from being sufficient to permit of really satisfactory separation.

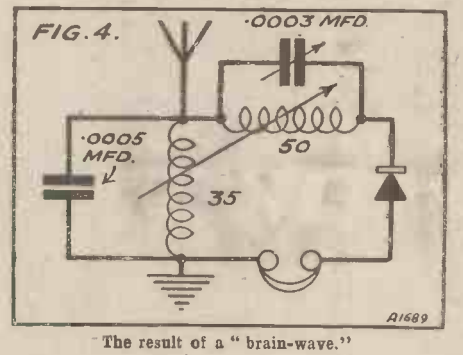
Much more satisfactory results were obtained with one of the special circuits

(*Continued on page* 67.)

SIMPLE SINGLE TUNER

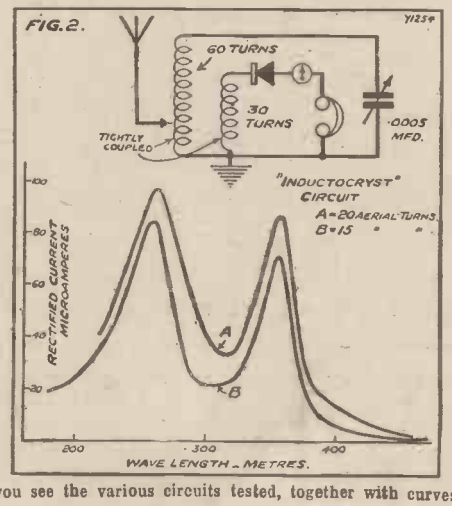


COUPLED COILS

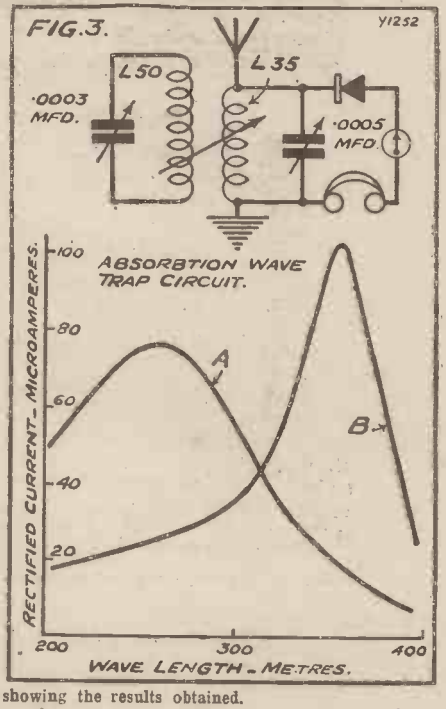


The result of a "brain-wave."

THE "P.W." "INDUCTOCRYS"



WITH A WAVE-TRAP



In the above three illustrations you see the various circuits tested, together with curves showing the results obtained.

MORE SCHOOL BROADCASTS.

All about the new programme—a remarkable transatlantic talk—six Prime Ministers to meet "Mike."

By A SPECIAL CORRESPONDENT.

THE B.B.C. announces that the new programmes of broadcasts to schools for the Academic Year 1930–31 will be published on September 6th, and full details of the first term of the year are given in the Syllabus, which can be obtained free on application to the B.B.C., Savoy Hill, London, W.C.2, postage one penny. A detachable timetable is included. The courses have been planned by sub-committees of the Central Council for School Broadcasting, which include teachers from listening schools in their membership.

A New Period.

As in the past, the times of broadcasting range from 2 p.m. to 4.30 p.m., but a new schools period has been inserted between 4 p.m. and 4.30 p.m. on Thursdays. On Mondays there are History lessons and stories for younger pupils; on Tuesdays, Nature Study, Music and French, together with special talks for Secondary Schools. On Wednesdays there is a new course in Biology and Hygiene, followed by an English Literature talk; on Thursdays, following the German, there is a course on English Speech, and a new series of music talks for preparatory schools. On Fridays, two courses in Rural Science, on the soil and the school garden, alternate with one another, and following this period there are firstly Travel Talks, secondly a new series of stories and thirdly an alternation between concerts and dramatic readings.

Readings and dialogues in foreign languages have been reinstated in the programme for the two winter terms, French on Mondays and German on Thursdays: dialogues alternate with the readings, so that in any one week there will be either a French reading and a German dialogue, or vice versa.

French lessons on Tuesdays will again be in the hands of Monsieur Stéphan, who will be assisted at times by his colleague, Mlle. Coustenoble. French readings on Mondays will be given by Mlle. Camille Vière, who will also take part, with Monsieur Stéphan, in the fortnightly dialogues.

Interesting Series.

Miss Rhoda Power will begin a new year of History broadcasts with the first term of "Children of Other Days," extending from 590 A.D. to 1453. She will also tell weekly a very simple story from Folk Lore of other lands; this series is of great value in training the younger pupils of nine and ten to listen to the loud speaker in school.

On Tuesdays, Mr. Eric Parker, one of the editors of "The Field," and a notable field naturalist, will return to the microphone after an absence of some years to give a quarter of an hour talk on Nature Study, in the series "Out of Doors Week by Week." Sir Walford Davies' well-established music broadcasts for elementary and advanced pupils need no recommendation. Special talks for secondary schools comprise two series: one on various careers for boys and girls, such as Nursing, by Lord Knutsford; Salesmanship, by Lord Riddell; Agriculture, by Major Walter Elliot; and Electrical Engineering, by Captain P. P. Eckersley; and the other on Modern Scientific Achievements, by six scientists with a specialised interest in such varied subjects as the Origin of Talking Pictures, Bridge-Building, Explosives, Cold Storage, and the Science of large-scale Kitchens.

An entirely new course in Biology and Hygiene, entitled "Your Body Every Day," will be given by Professor Winifred Cullis, C.B.E., who will introduce children to the elements of Physiology in the simplest possible language.

English Literature for the year is divided into three one-term courses, the first of which, called "Children in Books," will be given by Mr. J. C. Stobart and Miss Mary Somerville, when extracts from the Bible, such classics as "David Copperfield," "Jane Eyre," and "Tom Brown's Schooldays" will form part of the half-hour lesson.

On Thursdays, the same day of the week as the German broadcasts, Mr. A. Lloyd James will begin a new series of Talks on English Speech, for which he has written a rather larger booklet than usual, which will be used throughout the year, and on that afternoon, too, a new departure for preparatory schools will be made in a course of twenty-minute talks by Mr. C. Armstrong Gibbs, the distinguished composer, who has himself been a preparatory schoolmaster. The course, which bears the title "The Music of Some Great Composers," will be generously illustrated with piano and gramophone, and also by small concerts.

In Rural Science there will be two new microphone speakers in two new courses. Mr. D. W. Cutler, of Rothamsted Experimental Station, will amplify the previous courses on Farming with practical talks on animals and plants living in the soil, while Mr. C. E. Hudson, of the Hertfordshire Agricultural Institute, will alternate with Mr. Cutler by broadcasting on the seasonal operations in the school garden.

Travel Talks.

This year the Travel Talks have been planned by the two specialists of the Geography Sub-committee of the Central Council for School Broadcasting, Mr. James Fairgrieve and Mr. Ernest Young. The talks for the first term of "Peoples and Lands of the British Empire" will deal with Canada, the West Indies, the Pacific, Australia and the Antarctic, and will in each case be given by travellers such as Mr. Alan Sullivan, Mr. Clifford Collinson and Mr. J. S. Hodgson; Lord Morris, an ex-Prime Minister of Newfoundland, will broadcast on "The Deep Sea Fishermen of the Grand Banks." Mr. Frank Roscoe, secretary of the Royal Society of Teachers and Vice-Chairman of the Central Council for School Broadcasting, will have charge of a new series of Friday afternoon stories and talks, which will precede the weekly concert or dramatic reading. The dramatic readings will be all Shakespearean.

* * *

One of the most remarkable transatlantic telephone talks so far accomplished took place the other night at 8.45 between a house in London and a man travelling at 65 miles an hour on a train in Canada.

This is the first time a commercial telephone call has been put across the Atlantic from a moving train. The conversation took place between M. R. Bell, Assistant General Manager of the London and North Eastern Railway, and Mr. C. E. R. Sherrington, secretary of the Railway Research Service of Great Britain, who was travelling at the time on "The International Limited" of the Canadian National Railways just outside Montreal.

Perfectly Simple.

According to Mr. Bell, who is Chairman of the Railway Research Service, his first intimation that a call was coming through was when the post-office rang him up at his home. "They told me to hold on for five minutes for a call from Mr. Sherrington in Canada," said Mr. Bell. "After a very short delay I heard Mr. Sherrington's voice as clearly as though he were talking to me from his office in London. He said that he was then travelling at well over sixty miles an hour, and, thanks to the enterprise of the Canadian National Railways, he was able to telephone London from his chair in the railway coach as easily as though he were using the lines in the ordinary way."

(*Continued on page* 60.)

WIRELESS AT WHITEWAY

Mr. Barker, one of the members of the "simple life" colony at Whiteway (near Stroud), and his home-constructed radio outfit. The loud-speaker is fashioned mainly from plaster. You will notice that Mr. Barker has plenty of books, as well as his radio, as companions in his "simple life."

She can't sing if she's gagged

neither can your set pass the full volume and exquisite tone of that glorious voice perfectly unless:—

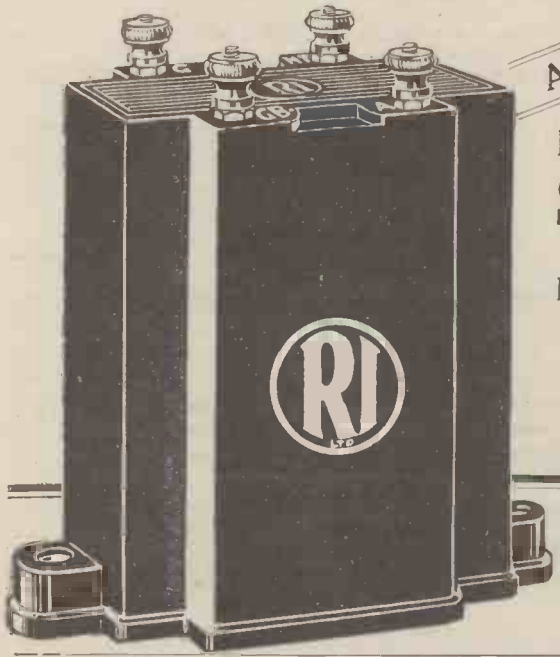
your transformer is capable of giving the maximum amplification plus the uniformity that modern valves demand. Nikalloy, the marvellous metallurgical discovery, applied in a specially designed core makes the "Hypermu" absolutely unique in its performance and suitability for modern circuits. If you want to hear your radio favourites' voices reproduced louder, purer, better than ever before, fit

HYPERMU

the

L.F. INTERVALVE TRANSFORMER with the NIKALLOY CORE

Ask your dealer or write to us for leaflets giving full particulars of the "Hypermu" and the other famous R.I. Nikalloy components. Components that set a new standard of radio efficiency.



AND HYPERMITE

Be Sure You Visit

STAND 61

at the

RADIO EXHIBITION

!

HYPERMITE Presents to everybody an opportunity to test the superiority of R.I. Nikalloy core transformers at a price within the reach of all. Extremely small ($2\frac{3}{8} \times 1\frac{3}{8} \times 2\frac{1}{4}$ ins.) for compact set building. Eminently useful when used in conjunction with "Hypermu" in further stages of amplification **12/6**

Hypermu, the world's best transformer — proved alike by amateur and expert

21/-

RADIO INSTRUMENTS LTD., "MADRIGAL" WORKS, PURLEY WAY, CROYDON

B

FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found—?

THE FERRANTI PANEL CUTTER.

I AM convinced that vastly more radio constructors would build meters into their sets quite as a matter of course were it not for the attendant complications of fixing them into position. Nothing looks more attractive than one or more panel-mounted meters, but such items require holes of sometimes more than three inches

A handy device for cutting meter holes in panels.

in diameter, and cutting neat apertures of such dimensions in ebonite panels requires the skill of a trained engineer.

However, the Ferranti people now offer a solution to this problem in their panel-cutter, which makes it an easy matter to score out the holes required at least for Ferranti panel-mounting meters. A detailed description of this device would be unnecessary in view of the photograph given on this page, and suffice it for me to say that it does its job easily and neatly in combination with a brace.

This cutter will undoubtedly do great work in furthering the popularity of Ferranti meters.

NEW VARLEY CHOKE.

The latest Varley contribution to better quality radio is the new Varley 300-henry L.F. Choke.

That is to say, it has that colossal inductance when no D.C. is flowing through its winding, but it still has two hundred henries when as much as 8 milliamperes is flowing.

Its D.C. resistance is 3,000 ohms, which is low for a choke of this particular kind. And the price is 25s., and that is not, in the circumstances, a high figure.

This new Varley Choke was designed for a special task, i.e. for operating in the plate circuit of a power detector.

And what is a power detector? "P.W." readers may well ask. It is a detector valve having heaps of H.T. and with a plate current reminiscent of a small power amplifying valve.

It can handle heavy inputs without distortion occurring, and is the sort of thing to which moving-coil enthusiasts are turning their attention these days.

Obviously a detector valve taking up to 7 or 8 m.a. of H.T. cannot be followed by an ordinary L.F. transformer coupling, for the ordinary L.F. transformer primary couldn't handle such a current without saturation and other troubles occurring.

Thus the Varley Choke! This can handle such a current very well, and its circuit connections are such that it takes all the D.C. H.T., and only the L.F. impulses are shunted through a fixed condenser to the L.F. transformer.

It is interesting to note that the choke remains inductive up to 800 cycles, after which it becomes a capacity load. Most transformers "change over" at a much lower figure.

And to retain such an inductance at 8 m.a. (200 henries) is a wonderful performance. You haven't to look to purely power detection before you can see a real use for the choke in bearing the brunt of the D.C. in a shunt-fed transformer scheme. We have tested the choke in power detector circuits as well as in shunt-feed transformer systems later in a set, and find it does give excellent results and is very well worth while. Needless to say it is very well made.

NEW BULGIN LINES.

More new lines from Bulgins! Not many weeks seems to pass but that I have to say something to that effect. Moreover, they are generally most useful lines—just the sort of things that we need for this or that important little job.

Take their new "Safety Plug," for instance: it is just the thing for a job of connection in a mains unit or set.

There is a neat little pin plate for fixing on to the unit or set and an equally neat socket for joining to the mains flex lead—or any other flex, for that matter.

The great point is that the metal parts of the socket are "buried" so that accidental short and shocks cannot happen. The price of this safety plug is 3s. 9d., and it is fine value for money, in my opinion, being well made and nicely finished.

Then we have the Bulgin Junior Three-spring Switch, a most useful and most competitive little line at 1s. 3d. For wave-changing, L.T. or other single switching it is just the thing amateurs are always wanting. It has the action of a three-point switch such as is used in many "P.W." wave-change sets.

Finally, I have selected from this latest Bulgin batch, a "Deckorem" panel-mounting fuse holder which is as good as anything of its kind possibly could be. It is designed to take cartridge fuses, and it does this neatly and effectively. At 2s. 6d. this, too, is a radio bargain.

It comprises a neat panel-fixing arrangement into which the fuse part plugs. To swap fuses is the work of but a moment. For 2s. 6d. you get the whole outfit complete with fuse.

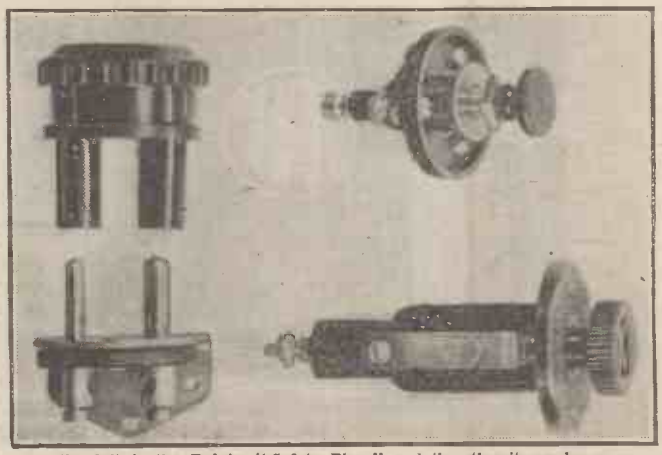
Manufacturers and traders are invited to submit radio apparatus of any kind for review purposes. All examinations and tests are carried out in the "P.W." Technical Department, with the strictest of impartiality, under the personal supervision of the Technical Editor.

We should like to point out that we prefer to receive production samples picked from stock, and that we cannot guarantee their safe return undamaged, as it is our practice thoroughly to dissect much of the gear in the course of our investigations!

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

THE FULL O'POWER BOOKLET

This is a useful little brochure that Messrs. Siemens are circulating. It contains details of their batteries and several helpful and informative articles on the correct use of batteries. Copies are available at retailers, and are well worth securing.



On the left is the Bulgin "Safety Plug," and the other items shown are the three-spring switch (top) and the panel-mounting fuse-holder.

TWO POINTS OF VIEW

A Unique Contrasting of the opinions of Rev. B. G. Bourchier, M.A., and the "Vicar of Mirth," Vivian Foster, on some New Ideas for the B.B.C.

From the REV. B. G. BOURCHIER, M.A.

I AM not a highbrow listener; so I know my point of view won't bore you. At least, I take it that a "highbrow" is one who spells culture with a capital C, and likes his broadcasting to be all Bach, Byron and Higher Mathematics. I am not one of those.

Now here is Point of View Number One: *I haven't any immediate grouse against the B.B.C.* Why? Because a ten-shilling-a-year radio licence isn't bad value for money, when you consider that only one good 12-in. and one good 10-in. record can be bought for that amount of money.

"YES, I THINK SO!"

Vivian Foster, the "Vicar of Mirth."

But the plain fact is that the present programmes are not to everybody's taste, and I want to give you my point of view.

The first point is that I think the experiment might be tried of not having "programmes" at all! I don't mean that there should be no broadcasting! No, not quite so drastic as that. Just simply that the idea of a carefully-prepared programme, made out a month in advance, should be dropped for a while.

Monotonous Arrangement.

Broadcasting should be vividly interesting—gripping, and with a constant appeal—and if broadcast items are herded into stereotyped programme groups on certain days, as they now are, I'm sure this tends to monotony.

The present arrangement is a sort of "brass-band Thursdays, symphony concerts Fridays and vaudeville Saturdays" idea. While this is nice and orderly, and you always know what to expect, it entirely cuts out the possibility of an anti-brass-band musician enjoying his listening on Thursdays or of a real highbrow taking kindly to his set on Saturdays.

No truly sensible person listens-in for hours at a stretch. Even the B.B.C. counsels us to pick and choose, and to switch off when there is nothing on that appeals. Therefore, if my idea of splitting the programmes up to give more variety were adopted, I don't think it would lead to confusion.

What a consolation it would be to know that if, after chance switching-on of the set, there was something *perfectly horrible* going on, there would be something *really nice* on within half-an-hour!

Alternatives Help a Little.

Of course, the man next door might be using his set when yours was switched off, and per contra, but that wouldn't matter.

As things stand at present, if you switch on to find a symphony concert in progress, then you know it will last all through the evening till ten o'clock. If you don't like this kind of music, then it means a whole blank radio evening.

Alternative programmes help such troubles a little, but not much, because accurate timing of items is impossible, and it is very infrequent that one finds one station broadcasting something that is a real alternative to the other.

If the B.B.C. did not control both the alternatives, then there would be more opportunity for real alternative programmes.

The second part of my point of view is that many present programmes don't *mean* very much; that is, they consist simply of light entertainment which is dissipation of good taste rather than improvement.

Direct education is objected to by adults, and rightly so, because it is evidence of personal pride; perhaps that is why some radio talks are unpopular. But when you come to think of it, we are all subjects of "subtle" education.

The reading of an ordinary novel really *teaches* something at the same time as it entertains; perhaps some new insight into character, or the habits of a strange land.

Sitting in a cinema is productive of "subtle" education—even if it is only how to speak American, now that "talkies" are here!

The daily newspaper is a wonderful educator, without the reader being aware of it, and even advertisements in the paper, on the 'buses and tubes, teach new facts.

Subtle Education.

All these everyday things are subtle educators, but to my mind radio entertainment lacks in this: either we are given "direct" educational talks, which cause many listeners to shut down, or else the entertainment is—not always, of course—vapid and non-educational.

The B.B.C. programme people should try to make the educational items a little less blunt. There is a gentle art of combining subtle education with vividly-interesting entertainment, and this the B.B.C. has yet to learn.

(*Continued on next page.*)

"NOT A HIGHBROW"

The Rev. B. G. Bourchier, M.A.

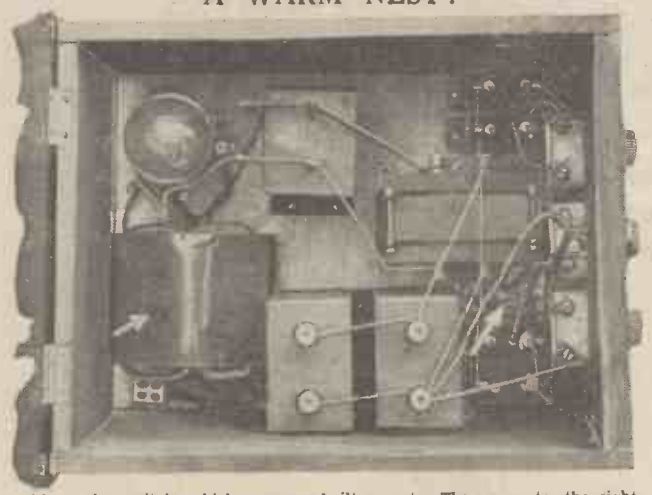
MICE AND MAINS.

By J. R. WHEATLEY.

IT is often being found that a rat or a mouse eating through the insulation of a cable, and causing this to come into contact with an earthed object, has been the source of dangerous conflagrations. Since fair numbers of sets are operated either directly or indirectly by the mains this is a fault that could readily arise through radio, especially since it is customary to place high-tension units in secluded corners so as to obviate the danger of shocks being received by persons unfamiliar with such apparatus.

The photograph on this page is a bird's-eye view of a high-tension mains unit capable of delivering a voltage of approximately 400 volts at 60 m/a. This unit, together with the set, rested on a table close to the wall of a house in the centre of London. Mice were practically unknown in this house, but after the set had been in use for several months it was noticed that, should anyone walk across the floor of the room, loud crackles were emitted from the loud speaker.

A WARM NEST!



The mains unit in which a mouse built a nest. The arrow to the right indicates the shreds of paper carried in to form the nest, while the left-hand arrow points to the transformer, on the case of which the foot-prints can be discerned.

Investigation revealed that in a corner of the cabinet containing the eliminator a mouse had built a nest of paper, taken from a drawer in the table on which the set and eliminator rested.

Mrs. Mouse had obviously made a careful survey of both the set and unit, because there were several places where the insulation of the wires had been chewed off, apparently in an effort to remove these obstacles in the way of a new home.

Cause of the Crackling.

The source of the crackling was definitely traced to one corner of the eliminator, and here was situated one of the high-tension smoothing chokes. The corner of this choke protruded over the spot chosen for the nest and had been removed together with the insulation of several turns of wire. Partial corrosion had set in, and thus produced an intermittent contact.

If you examine the photograph carefully you will distinctly see the footprints made by the mouse during its journeys to and from the drawer with its burden of paper.

No damage was done except to the components in the eliminator. It is surprising that the mouse did not receive a fatal shock, but it can only be assumed that the work was carried on when the unit was not switched on.

It was rather fortunate that the mouse should have chosen this spot instead of a spot nearer to the mains input leads, for if it had removed any of the insulation at this point a fire might easily have been the result or, alternatively, a periodic blowing of mains fuses.

Look out for Mice.

If, therefore, you have in use a mains-operated receiver or, for that matter, any kind of wireless set, it would be wise to keep your eyes open for signs of mice. And all your high-tension and mains wires right up to the point where they enter the set or eliminator could usefully be encased in steel tubing or lead covered wire used.

And it is strongly recommended that a metal safety box should be employed for any unit, on the lines of those specified for "Safe-Powers."

Perhaps it would be as well to maintain that the cabinets of both the set and the unit referred to had been polished every now and then, so do not imagine that they were tucked away in a corner, and were never disturbed, for this is very far from the case.

POINTS TO REMEMBER

When adjusting a potentiometer for long-distance reception remember that the best position of the slider for sensitivity is not usually the best position for perfect reaction control, so a compromise between the two is necessary.

* * *

Do not use a baffle-board or a cabinet which has a hole smaller than the one specified for the cone you are using as this will make for muffled reproduction.

* * *

When a flashlamp bulb is used as a fuse, normally it should not light up, but if the H.T. battery "shorts" it lights brilliantly for a second and then burns out.

* * *

In simple sets the change from long- to short-wave reception can easily be made by an ordinary on-off switch shorting out the loading coil.

* * *

If your moving-coil loud speaker is one incorporating a permanent magnet do not forget that if you place your watch near it it may become magnetised, with disastrous results to timekeeping.

TWO POINTS OF VIEW.

(*Continued from previous page.*)

From the "VICAR OF MIRTH."

OF all you folk who are reading my point of view—yes, YOU—fifty per cent will not be seeing eye-to-eye with me, or with the broadcast programmes. One man's fish is another man's *poison*. Yes, I think so!

Bad Programmes?

You know, everybody tells me that the programmes are bad just now. They told me that the other day. They told me that last year, and they told me that in the old Marconi House days in 1923! So when was broadcasting worth listening to? Was it ever worth listening to? Yes, I think so!

If the B.B.C. has a fault, then it is only the good fault that it is afraid—afraid of being lowbrow—afraid of being too *popular*.

Oh, foolish perversity of those who think thus! How can a broadcast to three-and-a-half millions of licensed listeners (and others) ever succeed unless it is *popular?*

If there is a fault with the B.B.C., then it is simply that it deviates too much from what the average man thinks about and talks about. Let me explain.

The average man is neither highbrow nor lowbrow to excess. He is a cheerful chap, and he likes a laugh. He likes to hear good music (sometimes) and he likes to have a little dance music (sometimes).

He doesn't mind being told "How I did it" by a great man who really *has* done it, but he strongly objects to being educated by school-teachers. He likes his sport, his football or his golf, his shove-ha'penny or his polo.

He is the kind of man who is in danger of being forgotten by some sections of the broadcasters; *but he is the man who pays his ten "bob" a year.*

Expecting Too Much.

Even with dozens of Brookmans Parks all going at once, we can't expect to have a pleasing programme always, but we've come to expect a great deal from the wireless. We expect much more from it than from the gramophone.

The lady of the house always expects it to suit her at the lunch-time. The kiddies always want their radio school-lessons and their children's hours.

Paterfamilias always wants a programme to suit him every evening when he comes home tired, and the whole family expects the programme to suit *everybody* on Sundays, when all can listen together and at once.

The plain fact is that it can't, and doesn't, but still it ought to go on trying!

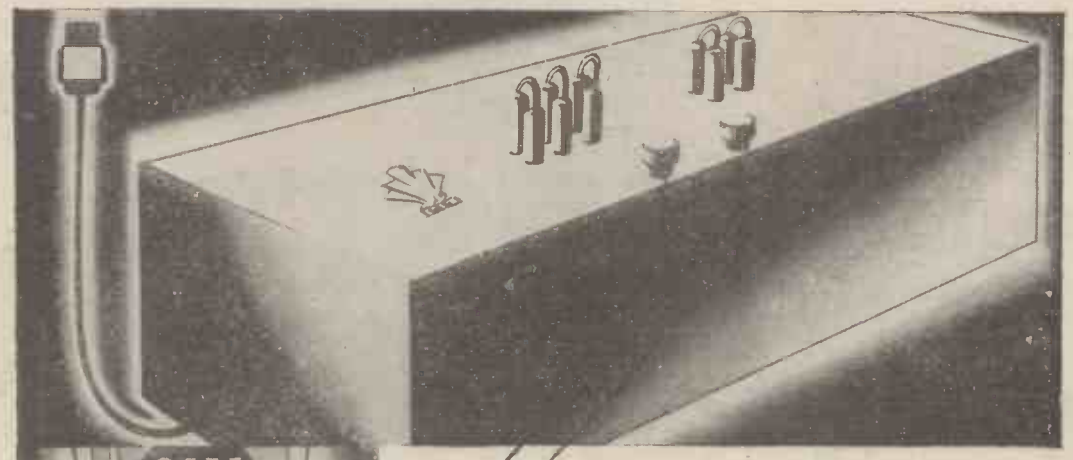
Our trouble with highbrow programmes is, largely, not that they are too highbrow, but that they are dull. Lots of people hate religion, I know, but I think religion is one of the most joyful things in life.

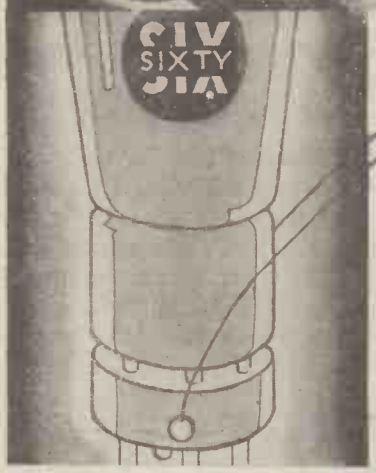
It isn't the parsons who make it dull, but the preconceived idea of the laity to treat it with stupid awe.

The same applies to some talks and highbrow broadcasts. Directly a long name is announced—*plop* goes the switch and the broadcaster is speaking to an empty home in that case. Yes, I think so!

Make your Battery Set all-electric

The Six-Sixty A.C. all-mains conversion equipment is suitable for practically any battery operated receiver.





No internal wiring alterations. Equipment includes specially selected Six-Sixty A.C. valves—and Six-Sixty 4/5 pin valve holder adaptors.

Yes, we know how you feel about it—this question of scrapping a perfectly satisfactory battery set in order to change to all-mains—so we have produced the Six-Sixty all-mains conversion equipment. To start with, you need to alter nothing of the construction of your set—the special Six-Sixty valve-holder adaptors make your present valve-holders fit the 5-pin valves supplied. Then you are buying a unit, in the fullest sense, an eliminator and a set of specially selected A.C. valves, built by *one* manufacturer to co-operate and work perfectly together.

The Six-Sixty Unit can be supplied to operate from any A.C. house mains. H.T. tappings of 50, 75, 100, 120, 150 and 200 volts are provided and G.B. tappings of 1.5, 3, 4.5, 8, 15 and 20 volts, any three H.T. or two G.B. values being available simultaneously. Grid Bias is on the ultra modern automatic principle—all risk of overloading eliminated. The dimensions (13 x 5½ x 4) of the complete equipment are not larger than your present batteries—an important point—and the H.T. leads need never be removed from the set when once inserted. Isn't that what you've been waiting for? Of course it is—but why wait any longer?

Price: A.C. Mains Conversion Equipment complete from £8 : 5 : 0
Mains Unit (H.T., L.T. and G.B.) only ... ... £6 : 6 : 0

Write for leaflet giving particulars of complete range, including new Six-Sixty Valves, Six-Sixty Cone Speaker Assembly and Cone Speaker Paper, Six-Sixty Turntable, Six-Sixty Valve and Set Tester, Six-Sixty Valve Adaptors, Six-Sixty Gramophone Pick-up Attachments, Six-Sixty Grid Leaks and Holders.

Made by the makers of the famous Six-Sixty Valves.

SAY

SIX-SIXTY

(B.V.A. RADIO VALVES AND EQUIPMENT)

STAND No. 58 OLYMPIA.

Six-Sixty Radio Co., Ltd., Six-Sixty House, 17/19, Rathbone Place, Oxford Street, W.1. *Telephone: Museum 6116/7.*

A pleasure to assemble and then the BIG THRILL

You will not experience the slightest difficulty in assembling the "OSRAM MUSIC MAGNET 4." You will be directed step by step by a full size instruction chart. Results are certain. Afterwards the big thrill. Station after station you will tune in—whenever you want and whatever you want. This is real radio enjoyment.

SPECIAL FEATURES

1. The two Screen Grid stages give extreme selectivity and sensitivity with an unrivalled range.
2. Enormous amplification with perfect stability is given by the complete shielding of H.F. Circuits.
3. Equal efficiency guaranteed on both wave length bands.
4. Change of wave length is effected by an external switch and the set need not therefore be opened.
5. Maximum ease in tuning with a single knob controlling triple gang condenser.
6. Assembly is the essence of simplicity.
7. Volume control is provided not only to act as such, but to procure extreme selectivity.

You can learn everything that is to be learned about the "OSRAM MUSIC MAGNET 4" from the full size instruction chart that will be sent you POST FREE. Study it carefully. The coupon below is for your convenience.

PRICE £11-15-0 INCLUDING
OSRAM VALVES
GECOPHONE COMPONENTS
AND POLISHED HEAVY OAK CONSTRUCTOR'S CABINET

Price applies only in Great Britain and Northern Ireland.

POST COUPON NOW for free Chart

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You can either buy your "OSRAM MUSIC MAGNET 4" for cash or on these attractive HIRE PURCHASE terms:

£1 : 3 : 6 deposit
12 monthly payments of
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Kingsway,
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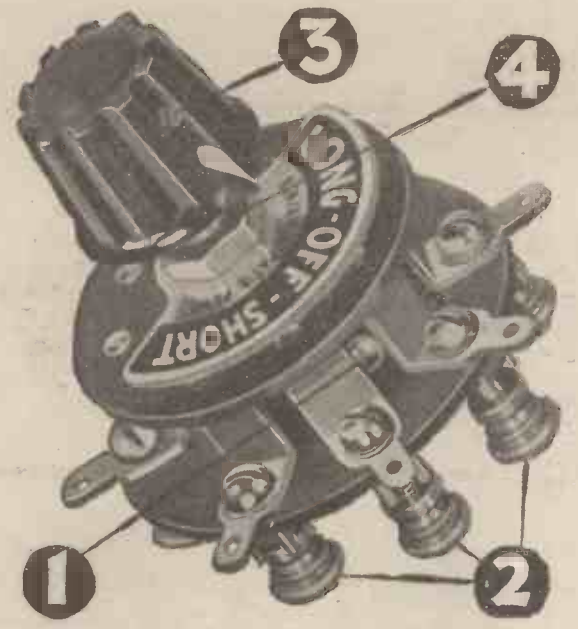
P.W.

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

NATIONAL RADIO EXHIBITION see the "OSRAM MUSIC MAGNET 4" on G.E.C. Stands Nos. 86 and 46 Ground Floor, New Hall



AN ALL ROUND SWITCH

Are you a judge of a fine piece of engineering? If so this new Benjamin Rotary Switch will make an irresistible appeal.

Both electrically and mechanically it is a first-class job, and in appearance it is fit to take its place on the most luxurious panel.

The spindle carries at one end a bakelite pointer-knob and at the other a cross-bar of bakelite into which is let two spring-loaded phosphor bronze balls. As the knob is rotated the balls snick into the gaps between the heavy gauge contact strips, and thus for any position of the switch two pairs of strips are joined by a positive, low resistance, self cleaning connection. The eight terminals, or tinned soldering lugs, can therefore be connected up to your radio circuit in a variety of ways for different purposes, and this switch will perform all the functions of a double-pole change-over switch neatly, efficiently and rapidly.

Diagrams of several typical connections for this switch, and its small brother, the Single-Pole switch, are given in our 1931 *Radio Catalogue. A postcard will secure your free copy by return.*

3/6

WITH TERMINALS. WITHOUT TERMINALS, 3/-

1 2 3 4

One of the self-cleaning phosphor-bronze ball contacts is here seen making a firm connection between adjacent strips. On test it breaks 10 amps. at 20 volts fifty times, and shows definite improvement with use.

A special feature of this switch is the novel terminal which screws down into a castellated base, holding if necessary several wires simultaneously in a vice-like grip. Soldering tags and contact strips are in one piece.

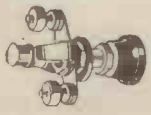
The Bakelite pointer knob is fixed to the spindle by a grub screw riding in a brass bush—no stripped female thread in the Bakelite.

The switch is fixed by drilling a single ¼-in. clearance hole in any metal or insulated panel up to ⅛-in. thickness. The indication dial reads LONG-OFF-SHORT on one side. The reverse is marked OFF only. (Your jeweller will engrave special lettering for a small fee.)

MAY WE HOPE TO SEE YOU AT STAND 115 WHERE ALL OUR PRODUCTS ARE SHOWN?

BENJAMIN

The Single-Pole Rotary Switch is similar in construction to the Double-Pole above. With terminals, 1/9. Without terminals, 1/6.



The Famous Benjamin Push-Pull Switch one-hole fixing, sells at: With terminals, 1/3. Without terminals, 1/-.

All Benjamin Switches and Valve Holders are fully illustrated and described in our Catalogue No. 1142. Free on request.

The Benjamin Electric Ltd., Tariff Road, Tottenham, London, N.17 *Tottenham 1500.*

CHOOSING YOUR VALUES

Some interesting and useful facts about component values, especially in relation to the R.C.C. low-frequency stages in a set.

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

THEORETICALLY you get the greatest amplification in a given R.C.C. stage of L.F. amplification when the anode resistance is infinity. That is to say, when it has so many millions of millions of ohms that its resistance goes beyond the limits of practical measurement!

You couldn't get an anode resistance of such a kind, and even if one were available it wouldn't be much good because of the difficulty of getting H.T. current through it.

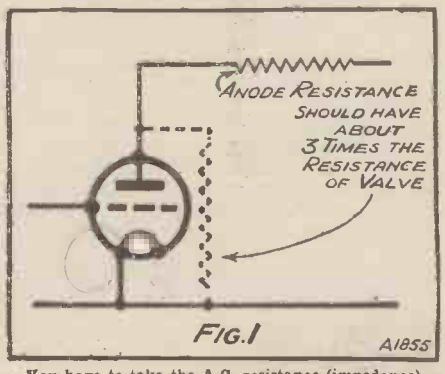
The plate of the valve demands a certain voltage, and the higher the resistance of the anode resistance, the greater the voltage it will "drop" and the more cells the H.T. battery will need to provide an adequate compensation.

Anode Resistances.

In practice this is a very serious consideration.

The purpose of the anode resistance is to act as a "load" resistance in series with the valve. There is a fluctuating current in the circuit, so you can see that the greater the anode resistance in comparison with the resistance of the valve, the greater

ANODE RESISTANCES



You have to take the A.C. resistance (impedance) of the valve and not its D.C. resistance.

will be the proportion of the fluctuating voltages developed across it (the anode resistance) for handing on to the next valve.

And the nearer you can get to confining all the fluctuations to the anode resistance the nearer you get to achieving the first step in obtaining the full theoretical amplification of the valve as indicated by its amplification factor.

Infinite resistance being quite impractical on account of the D.C. voltage drop it would cause, it is necessary to compromise and so we find that when the anode resistance has a value three times that of the resistance of the valve you can realise some 75 per cent of the Amplification Factor. And this proportioning proves, in practice, to give about the best all-round results.

But you will notice that much depends upon the resistance of the valve and you should note that this is its A.C. resistance, or impedance, and not its resistance to D.C. Knowing either the resistance of the valve or the resistance of the anode resistance, it is possible to choose the other item accordingly.

If you should have a set in which there is an R.C.C. stage you will now know the impedance of the valve preceding this stage should be at least about a third of that of the resistance of the anode component of the R.C.C. unit.

The values of grid leaks and condensers are very closely bound up with each other.

Grid Leaks and Condensers.

The grid leak in an L.F. valve circuit following an R.C.C. stage is not there merely to let electrons leak away from the grid. Its job is to develop voltage differences in conjunction with the preceding anode resistance and the coupling condenser.

Have a look at Fig. 2, this will give you a clear idea as to what happens.

Voltages are set up across the anode resistance, and are tapped off by the grid leak and condenser in series. The grid and filament of the second valve are tapped across the grid leak.

There is a certain amount of voltage lost in the grid or coupling condenser, the exact amount depending upon its reactance and the resistance of the grid leak.

But let us talk about the condenser reactance as another resistance—it is quite legitimate (the greater the capacity of the condenser the less its resistance to A.C.). But while the resistance of an anode resistance or a grid leak will remain more or less constant at various frequencies, the same thing cannot be said of our condenser resistance. The higher the frequency the less the resistance. The lower the frequency the greater its resistance.

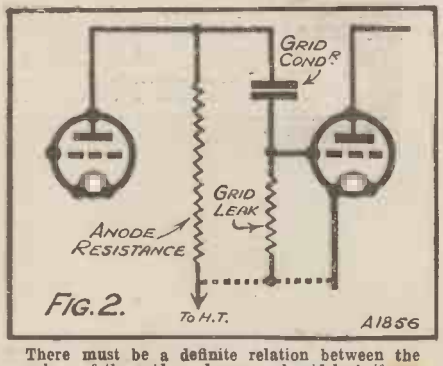
From this you might gather that the best arrangement would be a very large capacity grid condenser and a very high-resistance grid leak.

A Nasty Snag!

There would be a smaller voltage drop through the condenser right down to the lowest frequencies where the condenser resistance would be the greatest. But there is a nasty snag!

The grid leak has a frequency characteristic. That is to say, its A.C. resistance will alter at varying frequencies! That is rather surprising, perhaps, in view of the fact that it contributes nothing but ordinary ohmic resistance. However, you must not forget that it is not operating all by itself—it is working in conjunction with another

PICKING LEAKS



There must be a definite relation between the values of the grid condenser and grid leak if you want best results.

component that contributes a quite different factor—capacity.

And the impedance of that grid condenser and leak shunt-circuit takes in both factors. You must not think of the two components as having a resistance of the ohms of the grid leak plus some ohms due to the grid condenser. A.C. calculations are seldom matters of such straightforward additions!

(*Continued on page 62.*)

THE approach of the great Olympia Wireless Exhibition each year is the signal for a special outbreak of activity in the radio world in general. And it is always our ambition at this time to demonstrate that real progress is being made in the design of radio receivers for the home constructor, and to do it handsomely and unmistakably.

We always feel that our set for the exhibition issue of " P.W." marks the opening of another season, and so it must be a worthy forerunner of all the fine receivers which will follow it.

We want it to prove, among other things, that our designs have once again taken a big and decisive step forward along the road to perfection.

Always Moving Forward

Regular readers will know that this determined forward policy on the part of " P.W." has played a great part in raising our designs to the pre-eminent position they are now acknowledged to occupy. Even our worst enemy (if we have got one !) must grant that placid stagnation has no place in our programme.

We are never content to take the old circuits and the old methods of assembly, dress them up with a new hat and stick and send them out into the world as new designs. Quite the contrary; we always assume that when some old friend has been in use a certain while it is high time something better was developed !

Every one of our special designs represents a definite step in some worth-while direction.

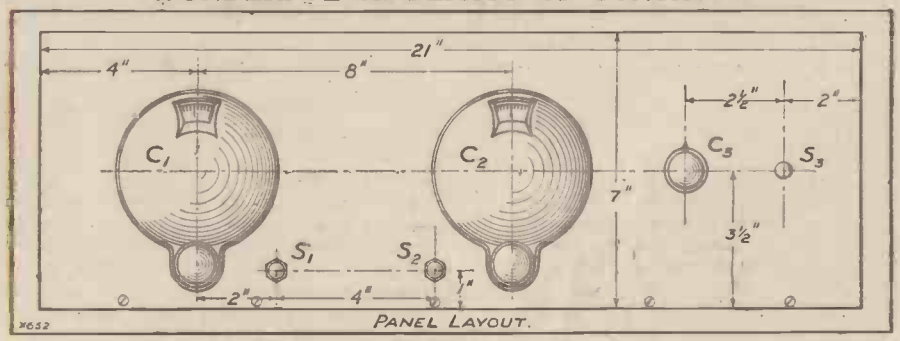
Special Problems

In some cases it may be that we have ascertained that a body of our readers want a receiver to fill a particular need, and then we set to work to produce a special combination of circuit and practical construction to meet that need better than it has ever been met before.

In other cases, and this happens still more often, we find that the normal type of receiver in common use is suffering from some defect or other in important localities. For example, it may lack the selectivity needed in the Regional area or in coastal districts, or the power to shut out the local station on long waves which is so important in all broadcasting centres.

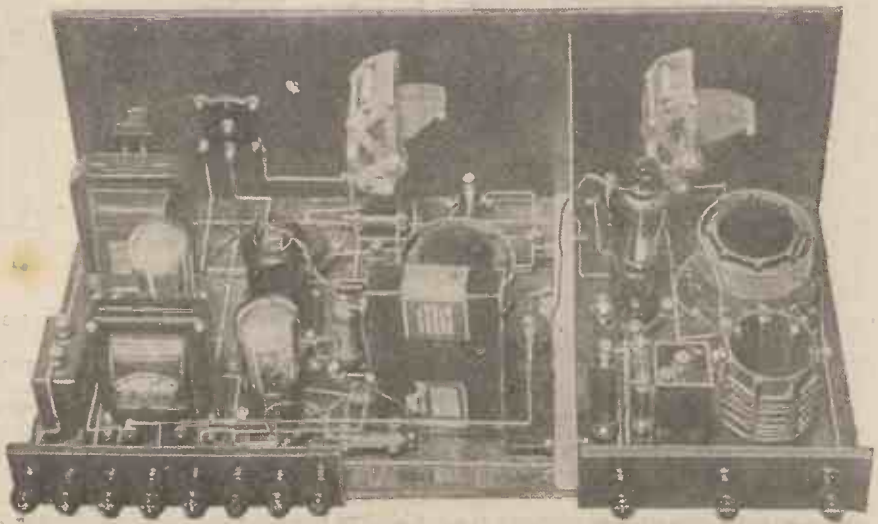
When a trouble of this sort is located research work is at once undertaken to determine its exact causes and then to develop a practical and efficient cure.

WONDERFUL SIMPLICITY OF CONTROLS



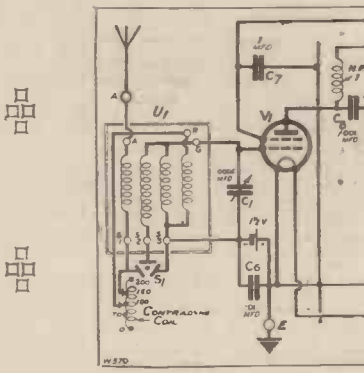
The small number of controls will give you an idea of the essential simplicity of this wonderful up-to-the-minute-after-next receiver.

MARVELLOUS SENSITIVITY AND SELECTIVITY



Here is the set with valves in place, and all ready to go on test and give you a great surprise. Such marvellous sensitivity and selectivity have never been achieved before in combination with such outstanding simplicity of construction, wiring and control.

" P.W." set designs are taking a big s switching, a new ultra-efficient dual-r long waves, and many other good thing which will startle the most experie



If you follow through the run a definite departure is marked of coup

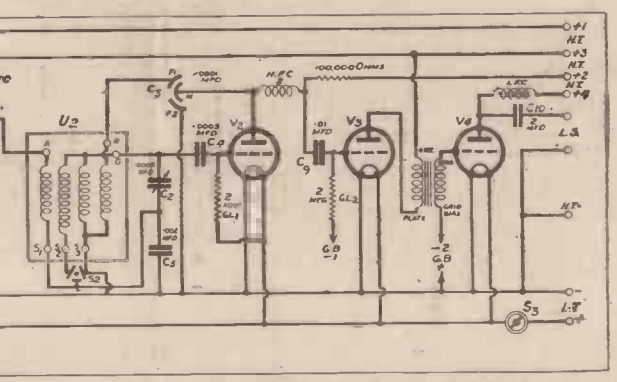
PARTS YOU WILL

1 Panel, 21 in. × 7 in. (Lissen, or Trolite, Paxolin, Becol, Resiston, etc.).
1 Cabinet with baseboard 10 in. deep.
2 ·0005-mfd. variable condensers (Lotus, or Lissen, Dubilier, J.B., Ready Radio, Ormond, Polar, Burton, Igranic, Formo, etc.).
2 Vernier dials, if condensers not of slow-motion type (Lissen, or Igranic, J.B., Ormond, Lotus, Formo, etc.).
1 ·0001- ·00013,- or ·00015-mfd. differential reaction condenser (Ready Radio, or Dubilier, Lissen, Polar, Lotus, Formo, Wearite, Ormond, Burton, Magnum, etc.).
2 3-spring on-off wave-change switches (Red Diamond, or Bulgin, Wearite, Ready Radio, Ormond, etc.).
1 L.T. switch (Igranic, or Lissen, Lotus, Bulgin, Ready Radio, Ormond, Wearite, Benjamin, Red Diamond, Junit, etc.).
4 Sprung valve holders (Benjamin, or Igranic, W.B., Lissen, Telsen,

E HIBITION" FOUR

tride forward this year, with improved and simplified wave-change range coil, a positive remedy for interference from the local station on gs. Here is the first of the new series, simple, yet giving a performance nced and hardened constructor. Designed and described by the "P.W." Research Dept.

SEE HOW THEY RUN



of the different circuits you see here, you will soon begin to realise what l by this first set of "P.W.'s" new series. Note the special methods ling and the very simple wave-change switching.

REQUIRE FOR THIS MAGNIFICENT RECEIVER.

Lotus, Dario, Wearite, Junit, Magnum, Bulgin, Precision, etc.).
2 Standard "P.W." dual-range coils (see text). (These can be made by those who wish from the specifications to be published in one of our next issues or obtained ready made from the usual suppliers, e.g. Ready Radio, Wearite, Paroussi, Magnum, Goltone, etc.)
1 "P.W." "Contradyne" coil (Full constructional details in special article next week, or ready made from usual firms).
2 H.F. chokes (R.I. and Lewcos, or Varley, Lissen, Telsen, Igranic, Ready Radio, Lotus, Dubilier, Watmel, Wearite, etc.).
1 Output filter choke (Lissen, or Varley, Atlas, R.I., Ferranti, Igranic, Wearite, Bulgin, etc.).
1 low-ratio L.F. transformer (Ferranti, or Varley, Igranic, Lissen, Telsen, R.I., Mullard, Lotus, Lewcos, etc.).
1 100,000-ohm anode resistance and holder (Lissen, or Igranic, R.I., Dubilier, Varley, Ediswan, Mullard, Lewcos, etc.).
1 2-mfd. condenser (T.C.C. or Lissen, Dubilier, Hydra, Farranti, Mullard, etc.).
1 1-mfd. condenser (Lissen, etc.).
1 ·0003-mfd. fixed condenser (Dubilier, or Lissen, Ediswan, T.C.C., Ferranti, Mullard, Goltone, Igranic, Magnum, etc.).
1 ·001-mfd. ditto (Magnum, etc.).
1 ·002-mfd. ditto (Lissen, etc.). (Note: In situations where higher magnification and slightly lower selectivity is desired on long waves make this a ·001 mfd.)
2 ·01-mfd. ditto (T.C.C., and Magnum, or Lissen, etc.).
2 2-meg. grid leaks and holders (Dubilier, or Lissen, Ediswan, Igranic, Ferranti, Mullard, etc.).
1 Standard "P.W." Screen, 10 in. × 6 in. (Magnum, or Paroussi, Wearite, Ready Radio, etc.).
1 Terminal strip, 21 in. × 2 in.
11 Terminals (Belling & Lee, or Igranic, Eelex, etc.).
Wire, screws, flex, G.B. plugs, etc.

When that has been done we produce a complete design embodying the new scheme, and then turn to the next problem, whatever that may be.

Our sets for past exhibitions have always marked a real and definite advance, but this year we have one which goes further than we have ever done before. It represents the solution not of one problem alone but of no less than three!

Every one of those problems, moreover, is an important one, with a bearing on the requirements of practically every listener. They are not just matters which interest the enthusiast who wants the last ounce out of his set, but questions relating to the nature of the service required from all receivers under modern conditions.

Points of Real Importance

When we come to explain them you will see that they are indeed fundamental matters which affect everyone. The disclosure of our solutions will give you an idea of the tremendous stride forward in receiver designs of all types which is being taken this season.

Here is a sample. For some years, ever since considerable power began to be used for broadcasting, in fact, all sets of the simpler kind have been liable to a most annoying trouble: at the shorter distances from the local station heavy interference is often experienced on the *long-wave* band.

Although the set may seem selective enough on the medium waves, on switching over or inserting the long-wave coils in comes the local programme again all over the lower portion of the dial. Just how severe the interference may be depends on circumstances, but if it happens at all it is generally a pretty considerable nuisance.

At Last a Cure

It is a decidedly freakish effect, and does not always occur, but it is very common among receivers of the detector and L.F. types, and by no means rare even with those incorporating one H.F. stage. Naturally, it is only to be expected at comparatively short distances from the local station, but here again no rules can be laid down.

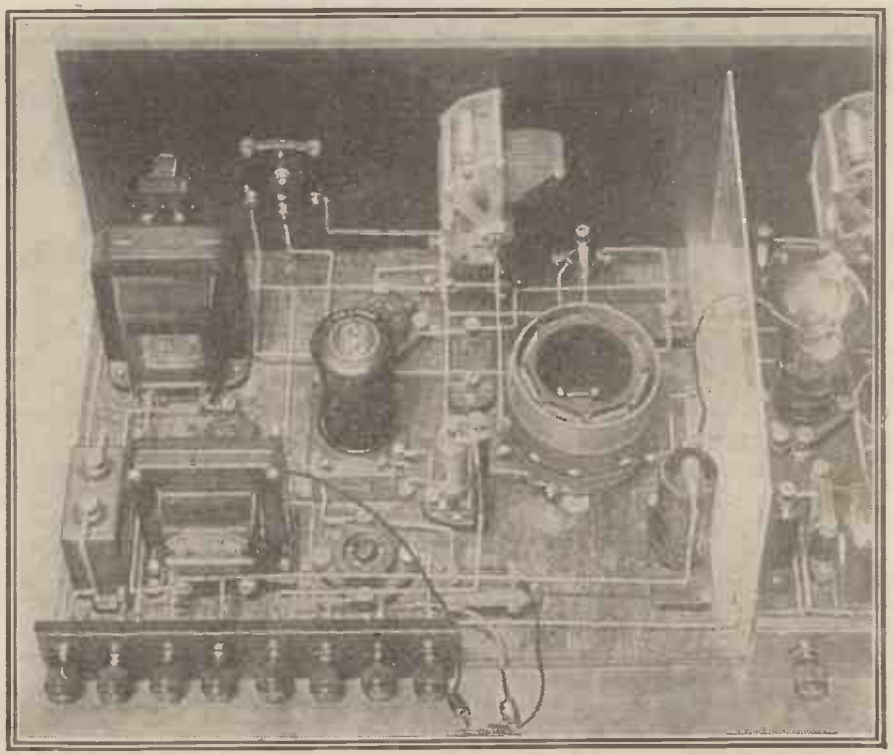
Work has been going on upon this rather extraordinary puzzle for many months in the "P.W." Research Department, and now we believe we have got to the bottom of it. Not merely that, but we have also got a complete cure for it which can even be applied to existing sets.

The new device is amazingly simple, perfectly effective, and need cost only a few shillings, while it actually *improves* the general performance of the set on long waves! How's that for merit?

The best that can usually be said for an interference-removing device is that it does not *decrease* signal strength; here is one which actually *increases* it!

(*Continued on next page.*)

SUPERB QUALITY—TERRIFIC POWER



Here is the low-frequency end of the set, which takes the clean, strong signals given to it by the detector and builds them up to really impressive loud-speaker volume. Note the simple and direct wiring.

THE "EXHIBITION" FOUR.

(Continued from previous page.)

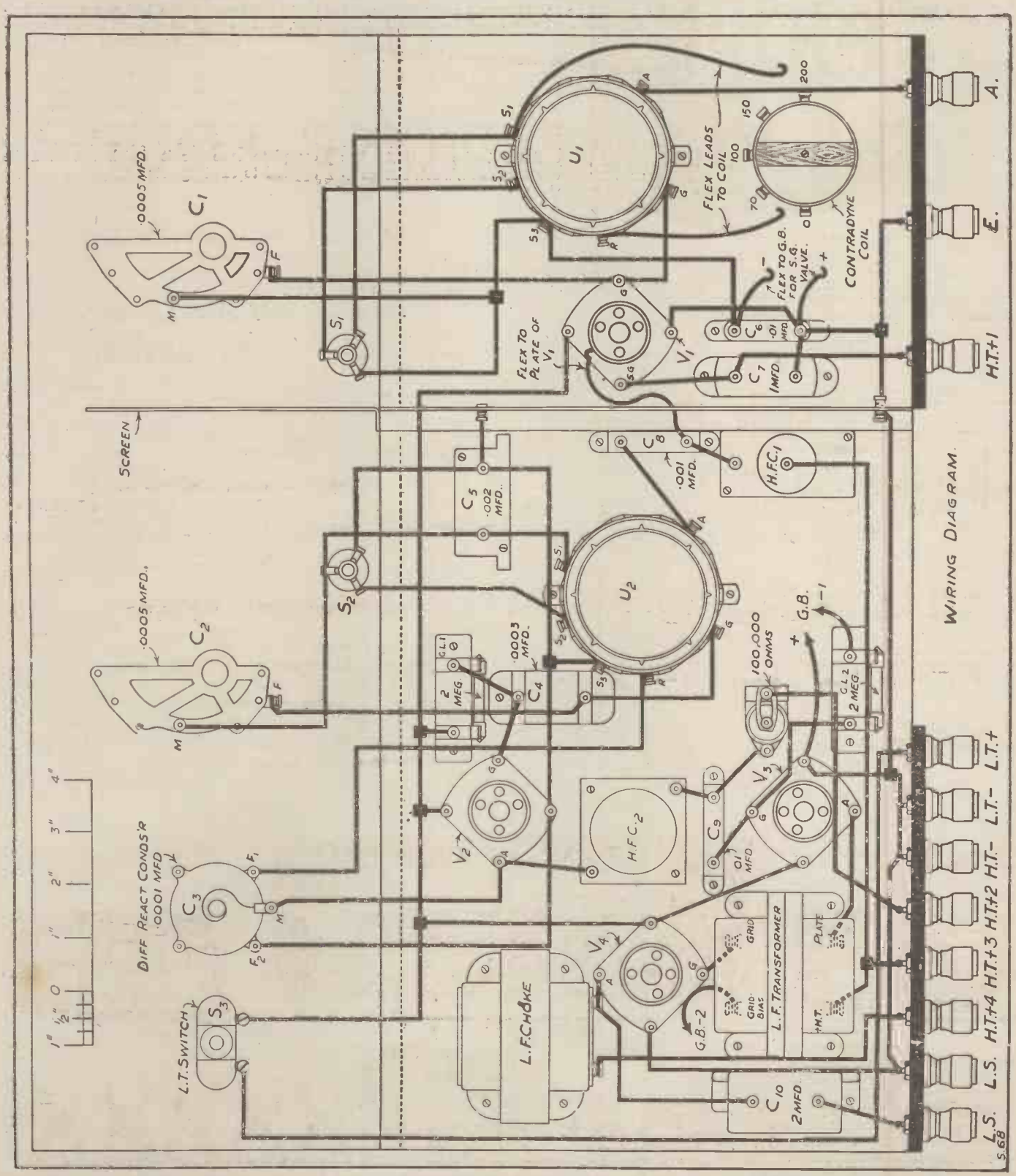
Our new scheme is called the "P.W." "Contradyne," and we shall be telling you how to make it up as a separate unit for addition to an existing set in our next issue.

Space will not permit us to tell you about it in detail here, so look out for the special article next week.

Naturally, we have incorporated the "Contradyne" in our exhibition set, so here we find the first outstanding merit of this exceptionally fine receiver; it is absolutely free from the slightest sign of interference from the local station on long waves.

It doesn't add any serious complication to the set, either; it is just a matter of incorporating a special tapped coil which you can make quite easily for yourself (see the article next week), or buy for a few shillings from any of the firms who specialise in the coils for our sets.

(Continued on page 64.)



Although the "Exhibition" Four is a large and ambitious receiver it has been so carefully planned that the wiring is delightfully clear and simple to follow out.

TROUBLE-FREE SET BUILDING

USE READY RADIO APPROVED NON-SOLDERING KITS ONLY

USE "JIFFILINX" FOR WIRING-UP

THE "EXHIBITION" FOUR

	£	s.	d.
1 drilled ebonite panel, 21 ins. x 7 ins. ..		7	0
1 Hand-polished oak cabinet with 10 in. baseboard	1	12	6
2 Cyldon Log Line ·0005 variable condensers..	1	0	0
2 Igranic Indigraph slow-motion dials.. ..		12	0
1 ReadiRad differential condenser, ·00015 ..		5	0
2 ReadiRad 3-point wave-change switches ..		3	0
1 ReadiRad on-and-off switch			10
4 Benjamin valve holders		6	0
2 ReadiRad P.W. dual range coils	1	10	0
1 ReadiRad P.W. Contradyne coil		7	6
1 Lewcos H.F. choke		7	9
1 ReadiRad H.F. choke		4	6
1 Lissen output filter choke		12	6
1 Ferranti L.F. transformer A.F.3	1	5	0

	£	s.	d.
1 Varley 100,000 ohm resistance and holder ..		7	0
1 Dubilier ·0003 fixed condenser		1	8
1 Dubilier ·001 fixed condenser..		2	0
1 Dubilier ·002 fixed condenser..		2	0
2 T.C.C. ·01 fixed condensers		6	0
2 Dubilier 2 megohm grid leaks and holders ..		5	6
1 ReadiRad standard screen, 10 ins. x 6 ins. ..		2	0
1 Terminal strip, 21 ins. x 2 ins.		2	0
11 Belling-Lee terminals		5	6
4 Valves as specified	2	7	6
2 Sets Jiffilinx		5	0
Screws, flex, G.B. plugs, etc...		1	9
TOTAL (including Valves and Cabinet)	£13	1	6

ANY OF THE ABOVE COMPONENTS CAN BE SUPPLIED SEPARATELY IF DESIRED.

KIT A less valves and cabinet **£9:1:6**
or 12 equal monthly payments of 16/9

KIT B with valves less cabinet **£11:9:0**
or 12 equal monthly payments of 20/9

KIT C with valves and cabinet **£13:1:6**
or 12 equal monthly payments of 24/-

RECOMMENDED ACCESSORIES

	£	s.	d.
1 Amplion Cone Loud Speaker	1	19	6
1 Atlas H.T. Eliminator for A.C. Mains A.C. 16 - - - - - -	4	10	0
1 Atlas H.T. Eliminator for A.C. Mains D.C. 16 - - - - - -	3	15	0
1 Fuller 2 v. 30 Accumulator - -		11	0
1 Fuller 16 v. G.B. Battery - - -		2	9

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FOR RADIOGRAM OR PORTABLE, OR IN FACT, ANY RADIO SET.

Here is the new **IGRANIC 'MIDGET' TRANSFORMER** which may be termed a **"Masterpiece in Miniature"**

Although only $2\frac{7}{8} \times 1\frac{7}{8} \times 1\frac{3}{4}$ ins in size, no refinements — electrical or constructional—have been sacrificed in producing this Transformer.

A patented bi-metal core embodying a new nickel alloy is used which does not permit other than a very small polarisation.

The **"MIDGET" Transformer** has a high primary inductance of over 60 henries. Slotted terminal nuts are provided, and all terminals clearly marked.

Write for New Catalogue R159.

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IGRANIC "MIDGET" TRANSFORMER

Inspect this "Masterpiece in Miniature" at our **STAND No. 240, NEW EMPIRE HALL, OLYMPIA.**

HOW TO MAKE A TRICKLE CHARGER

If you have D.C. mains it is a most simple business to rig up a trickle charger which will solve all your charging problems. Here is a design for one by the "P.W." Research Dept. which gives you a particularly easy change-over from "charge" to "use," and is so simple that you do not even need a wiring diagram to build it.

MOST people have a notion that to charge accumulators from D.C. mains is a very expensive business, but this seems to be one of those cases in which the changes which have taken place in wireless matters in the last few years make it necessary for us to revise our ideas a bit.

When it was a matter of giving a complete charge to a big battery quite frequently, probably the only possible conclusion was that to do it straight from D.C. mains was too wasteful, but is that quite the position nowadays ?

No Longer Extravagant.

With the present economical valves, most of us use comparatively small accumulators, and the drain upon them is so small that it becomes quite possible to employ the modern method of an overnight "trickle" charge, even on D.C. mains.

Under these conditions you never allow the battery to run right down, but restore it to a fully-charged condition with a small charge at a low rate at regular and fairly short intervals.

Thus, with a big set you might do it every night, but more often it will be enough to charge at longer intervals, say, every second or third night.

The charging rate is so low by this "trickle" method that the current used is quite moderate, and most people will agree that the small expenditure is fully justified by the great convenience which results.

To illustrate the point, we have made something like the simplest possible form of trickle charger, with the necessary convenient change-over scheme, and this we will tell you how to construct for yourself.

How To Make It.

First, take a glance at the photograph at the top of this page, and you will see that the base of the gadget is a wooden switch plate about 6 or 7 in. square, such as you can get from most electricians.

These bases have a hollow recess underneath to accommodate the wiring and the projecting shanks of the two terminals which you will see. On it are to be mounted three ordinary batten-type lamp-sockets and the two terminals just mentioned which are later to be connected across permanently to the L.T. terminals on the receiver.

Wire one of these terminals on the charger to one of the connection points on one of the lamp-sockets, and the other terminal to the remaining point on the socket, to do which you will need to bore holes in the wooden base. Wire one point on each of the other two sockets together. From each remaining point on these two sockets take off a separate lead from underneath, again through holes in the base.

These two leads should be in the form of a length of twin flex. Take this out through a hole in the side or top of the base and fit upon the further end a lamp adapter or two-pin plug for insertion in a convenient mains point.

Now attach to the terminals of your accumulator another length of flex with a lamp adapter on the end. This adapter is to be inserted in one or other of the sockets on the charger, according to whether you want to charge the battery or use it to run the set.

To run the set, place the adapter in the socket which you wired to the two terminals. To charge the battery, place it in one of the two sockets wired to the mains, and in the other of these sockets insert a lamp of suitable size.

All that is needed in future to change from "use" to "charge" is to shift the adapter from one socket to the other, and it is a good plan to mark the sockets accordingly.

When you first finish the charger, by the by, you must see that you get the battery and set connections right as to polarity.

First, get the battery on charge and see that the lamp lights up, without troubling about polarity. Then disconnect the charger from the mains altogether and take the leads off the battery. Connect the charger to the mains again and apply the free ends which previously went to the battery to a pole-finder or a piece of pole-finding paper (most dealers keep these items) and so identify them.

Some Safety Points.

Put them back correctly on the accumulator, positive to positive, and that part of the job is done. Be careful, though, to disconnect the charger from the mains while you do this last. Also, don't touch the bare ends of the wires while "pole-finding."

Having got the right connections, either mark the adapter to ensure that it goes in the same way in future, or adopt the special scheme seen in the photograph. To get the set connections right, just use the pole-finding paper again on the leads from charger to set.

By the by, you will understand that you must be careful about these polarity questions, lest your battery be discharged instead of charged. See that the connection from the charger to the mains is never reversed, keep an eye on those to the battery and set.

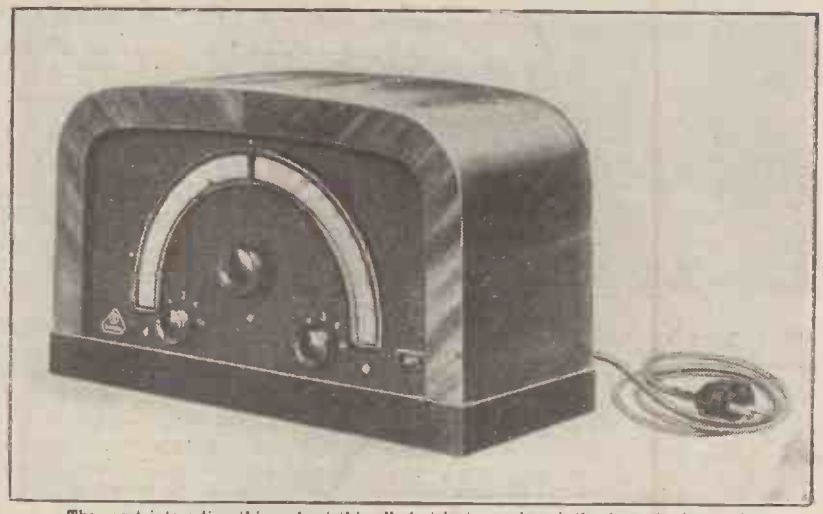
A suitable size for the lamp is 25 or 30 watts for 100- or 110-volt mains, and 50 or 60 watts for 200 to 240-volt mains.

These lamp sizes give you a charging rate of roughly a quarter of an amp. Correct sizes for other charging rates are quite easily calculated.

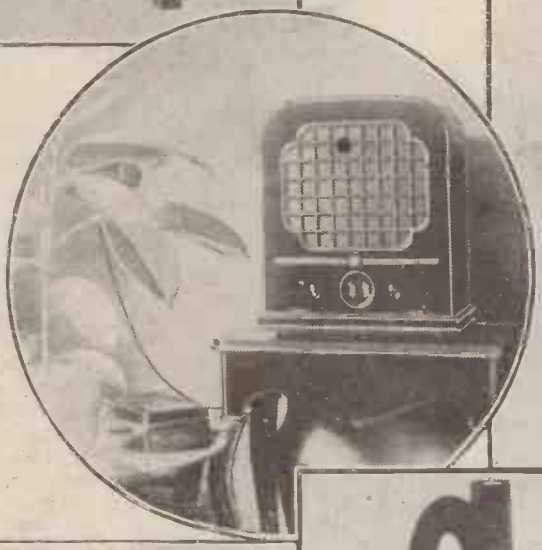
A SIMPLE SAFETY SCHEME

This view illustrates a simple method of ensuring that the adapter plug on the end of the twin flex lead from the accumulator always goes into its alternative sockets the right way round. Use an adapter of the wooden variety, and insert a small round-head screw exactly as you see at (1) above. Then file away a little of the metal of the holders as at (2) to admit the screw shank at one side only.

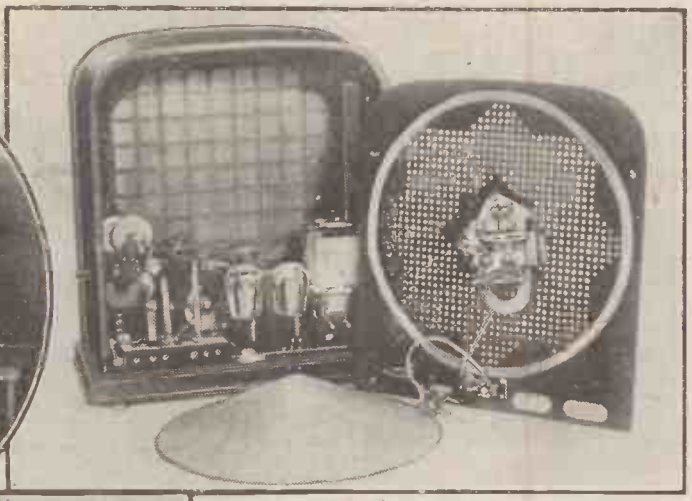
SEEN AT BERLIN



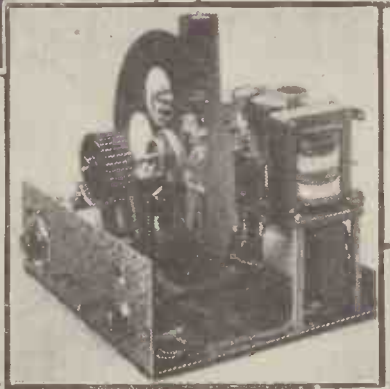
The most interesting thing about this all electric two-valver is the huge tuning scale extending over most of the front panel. Tuning is carried out by means of the knob in the centre, and extremely fine variation is possible.



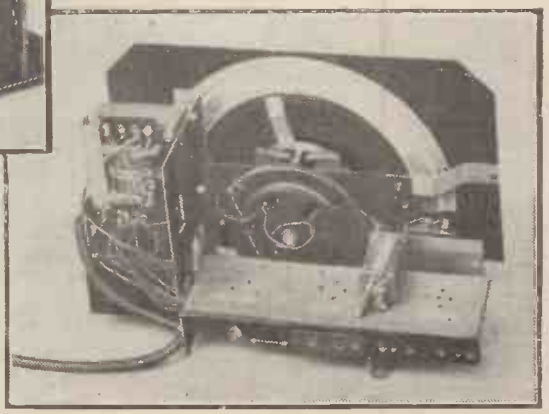
The Siemens' set above is a powerful radio-gramophone outfit, capable of working a large number of loud speakers where a big concert-hall has to be filled. Superficially it is very much like its British equivalent, and the same can be said of the all-electric Telefunken set shown to the right.



The illustration above shows the interior of the Telefunken All-Electric receiver, the front of which is shown by the picture in the circle beside it. It will be seen that a loud-speaker unit is fixed to the back of the case (the cone having been removed for the purpose of the photograph), and that a very compact layout has been achieved. To the left is an inside view of a television receiver, the instrument being capable of picking up, in addition to German transmissions, the Baird experimental television broadcasts from the B.B.C. stations.



To the right is an inside view of the large-scale all-electric set shown at the top of the page. The set to the left is a television receiver of novel design. In addition to the controls along the bottom of the panel there are three "windows," two of which are for viewing television broadcasts. The upper window is used for the reception of German television and the lower (right) window for the Baird transmissions.



A low impedance valve specially developed for use where the valve in the output stage should have a fairly high amplification factor, as, for instance, in receivers having only one low frequency stage, type P.M.256 is essentially the output valve for such sets as the Wireless World "Kilomag Four" or the "Foreign Listener's Four." By virtue of its recently improved characteristics and the increased anode voltage at which this valve can now be operated, the P.M.256 will give a large undistorted output amply sufficient for operating a powerful domestic speaker or radio gramophone.

L.T. Supply.

The filament is rated to consume 0·25 amp at 6·0 volts which may be obtained, if desired, by a step-down transformer operating on the A.C. electric light mains.

Mullard

THE · MASTER · VALVE

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LRKS.

SHORT-WAVE NOTES.

By W. L. S.

Our expert gives you all the latest news of short-wave interest, and answers some questions that are of general interest.

DURING the next week or so I hope to be touring gently round the northern part of Great Britain, calling in here and there on "hams" that I know, and so shall have a valuable opportunity of studying short-wavers and short-wave conditions from a variety of angles. Perhaps, therefore, some of those provincial readers who occasionally accuse me of thinking of everything in terms of "London" will not be able to make that criticism with so much justification in future.

From what I have previously seen of the North, and of the Midlands in particular, the general run of conditions is far better than anything ever experienced in London. Perhaps I shall be able to confirm this after my trip.

Those Mystery Stations.

From the Australian Broadcasting Co., Ltd., I have received a bulky package of descriptions of forthcoming programmes from 3 L O and 3 A R. Naturally, by the time they reached me these programmes were out of date, but they are interesting as showing the sort of stuff they get, and apparently approve of, down under.

Apart from a brighter atmosphere about their Sunday programmes, they are extraordinarily similar to the B.B.C.'s concoctions, the proportion of "highbrow" to "lowbrow" being about the same as we are used to here at home.

Incidentally, the service area of 3 L O is said to be of the order of 35,000,000 square miles—very roughly a circle with a radius of 3,000 miles! It sounds big, but doubtless the European short-wavers cover equally large areas.

"M.C." wants to know what stations they are that one hears on most receivers (short-wave and otherwise) when the aerial coil is removed completely, described as "a jumble of whistling Morse signals." I have an idea, "M. C.," that the wave-length is somewhere in the region of 20,000 or 30,000 metres (frequency of 15 or 10 kc.) and that the "signals" are received largely on the L.F. amplifier oscillating at this frequency, helped by the detector with its free grid. They are all very long-wave stations and "sub-harmonics" of some of the more powerful locals working on the 4,000- or 5,000-metre band.

Bubble and Burst.

On one of my short-wavers before I moved into the wilds, far from tramcars and the like, I used to hear wonderful noises with the A.T.I. removed, like unto the boiling of many kettles: they would gradually mount up and up in pitch until the top one went right out and a new one would start at the bottom to take its place. This demonstration was always appreciated far more among the "rich uncle" type of visitor than any programme ever transmitted. It certainly did savour of the uncanny.

Readers continue to pelt me with appreciations of the "Magic" Three when used as a short-waver: the latest letter to arrive is from a Preston listener who gets Rome on the loud speaker at better strength than Manchester at 32 miles!

Well, "H.D.," you should hear your Americans and Australians round about Rome's wave-length or just below, but you probably won't hear anything of them until conditions improve a lot. Then, with luck, they might be as loud as Rome himself.

Incidentally, "F. A. M.," of East Ham, asks for a reliable three-valve short-waver circuit. What about this self-same "Magic" F. A. M.? (Or, if you have the copy of "M. W." with the Thomas special short-waver that the Nigerian correspondent mentions, why not try that?)

'PHONES FOR THE PRINCE

When the Prince of Wales quite unexpectedly "dropped in" to see Mr. and Mrs. Lawes, of Newburn Street, Kennington, they were listening on the little crystal set Mr. Lawes has built. The Prince stayed some little time and listened to the radio with the 'phones Mr. Lawes is seen wearing.

Many readers have logged V Q Q H, the "Morrissey," now a long way up North, since I first mentioned him. He was, in those days, on 40 metres, but has now transferred to about 20·9 metres, where he is more than twice as strong and very constant indeed. He may be heard most nights at about 23.15 B.S.T. working with W H D, the station of the New York Times.

G 5 X M and G 5 V N ask me to mention that they have applied for 80-metre permits and would like reports on their signals when they get going on that wave. There does not appear to be much sign of 80-metre activity as yet, but probably by the winter some of the amateurs who are not sufficiently energetic to work through the summer will have taken the matter up.

"T. C.," of South Chingford, asked me some time back for particulars of Morse records for practice purposes. Sorry, "T.C.," but your letter slipped my memory at the time and your reminder arrived too late to catch me. I believe you can find out all about these records from the Marconiphone Co. in Tottenham Court Road. Yes, W 8 D L D is certainly one of the best American amateurs I have ever heard on 'phone, although quite a number started up in the spring, back in the days when they *could* be heard.

"Oh, Yeah!"

All that remains of them nowadays is a faint whisper round the band late at nights, particularly on 20 metres, which, if one has a really good receiver, can be resolved into hundreds of C.W. signals, all far too weak to read at all. Now and then one of them will stand out of the crowd for a few minutes, but very seldom for longer than that.

"A. B. D.," of Fort Portal, Uganda, receives 5 S W, P C J and P H I all equally well, but never a trace of the States. He hears the London side of the Transatlantic 'phone perfectly, but never the other; whereas I often get the American end at roaring strength, but never London. You can tell it *is* the American end, by the way, apart from the frequent "Hullo Londons," by the still more frequent "Oh yeah" in the approved talkie accent!

RADIO WRINKLES.

When you instal an aerial lead-in switch make sure that the contacts are firm and sound and arrange that the whole switch is covered with some weatherproof device that will protect it adequately.

* * *

If you use a 6-volt accumulator consisting of three separate 2-volt sections, keep the cells properly connected in place before handing it in at the charging station, as if the connecting bars are removed they may be replaced wrongly.

* * *

Howling is usually caused by the H.T. battery running down, L.T. running down, use of too large a reaction coil, or bad spacing of components or wiring.

* * *

Large multi-wire aerials are no better for broadcast reception than a well-insulated single wire of suitable dimensions.

* * *

There are two types of oscillation, audible and inaudible, so do not suppose that because you cannot hear a howl the set cannot possibly be oscillating.

* * *

If you wish to try for a station which you have not received before, postpone your attempt until the local station has finished working.

* * *

If your reception suddenly varies or becomes distorted without your own set having been touched, it is indicative of "wipe-out" by a neighbouring circuit.

* * *

Changing your high-tension plugs may cause an unpleasant click in your neighbour's receiver.

CAPT. ECKERSLEY'S QUERY CORNER

BAND PASS FILTER FOR SELECTIVITY—USING A DIFFERENTIAL CONDENSER—CRYSTAL CRACKLES—S.G. REACTION—NOT SO DUSTY!—RESISTANCE OF THE MOVING COIL.

Under the above title, week by week, Captain P. P. Eckersley, M.I.E.E., late Chief Engineer of the B.B.C., and now our Chief Radio Consultant, comments upon radio queries submitted by "P.W." readers. But don't address your queries to Captain Eckersley—a selection of those received by the Query Department in the ordinary way will be dealt with by him.

Band-Pass Filter for Selectivity.

M. N. (Dulwich).—"Is there any real advantage to be gained by using a band-pass filter in front of a screened-grid valve set already incorporating two tuned circuits?"

The great problem before the receiver-designer is selectivity. By the justified, and by myself much recommended, policy of fewer stations and higher power, interference between stations is becoming more and more pronounced, since the indirect ray is independent of wave-length.

Thus, anything that can be done to make a receiver more selective will make it more useful in picking up distant stations, and also eliminating interference from the foreign station on the local station. If the band-pass filter in front of the screen grid is going materially to increase selectivity, as, if it is properly designed, it will, then the filter is to the good.

It will make its usefulness more pronounced provided your desire is to pick up foreign stations free from interference one with another.

* * *

Using a Differential Condenser.

R. T. H. (Bognor).—"Recently, I fitted a differential reaction condenser to the detector valve in my set, and found that it increased the sensitivity as compared with an ordinary reaction condenser, at the same time allowing for smoother reaction control. However, it has occurred to me that the direct by-pass effect offered by the condenser between anode and filament negative of valve tends to cut off the higher frequencies.

"Is this correct, and by what amount is the high note loss likely to affect quality? I think speech, etc., seems to be very slightly more 'woolly.'"

If you have chosen the right valves, I see no reason why there should be serious loss of top due to *this* effect rather than to the much greater "top-cut-off" effect of reaction itself. I often notice people worry about top-cut-off in detail, and yet apply reaction in gross.

* * *

Crystal Crackles.

M. A. W. (Cambridge).—"My neighbour has a crystal set, whilst we have a three-valve receiver. Each time he adjusts his crystal there is a crackle in the loud speaker. Can this interference be prevented?"

Yes, but only by asking your neighbour not to keep adjusting his crystal!

This is not indeed a technical query, but I am delighted to try to help all the same. I should suggest to your neighbour that it's worth while these days either buying a single valve which will adapt very well to a crystal set or buying one of those robust non-adjustable crystals which work well, are less sensitive, but don't require fiddling with.

After all, these days we ought to be able to have a better factor of safety than given by a cat's-whisker crystal, and while I agree that the price of valves is a disgrace, nevertheless, it's fairer to all concerned to keep pace with the progress of the art.

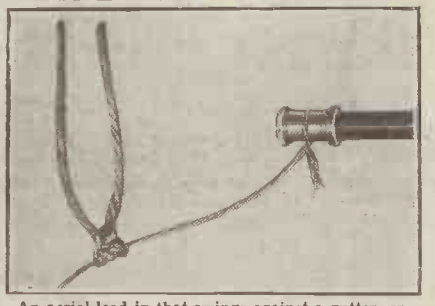
I hope I have been of some help to both you *and* your neighbour.

* * *

S.G. Reaction.

P. T. (Wanstead).—"Recently I constructed a transportable set with a frame aerial and applied reaction to the latter

A LEAD-IN TROUBLE



An aerial lead-in that swings against a gutter, or walls of a house, may give rise to scratching noises in your reception. It can be prevented, of course, by tying the lead-in away from the wall as shown above.

by means of a ·00005-mfd. variable condenser from the anode of the S.G. valve in the receiver (S.G. Det. and 2 L.F.).

"The results are excellent, but I was recently given to understand that connecting a reaction condenser from the anode of an S.G. valve reduced its magnification, since the anode was virtually joined to earth via the three-turn reaction winding and condenser. Should I obtain better results by applying reaction from the detector valve to the frame, or to a tuned circuit between the S.G. and detector?"

The shunting effect of the anode reaction circuit should not be appreciable if valves are correctly adjusted, since an inductance and condenser together form a higher impedance than a condenser. But applying reaction over a wide wave range with a high impedance screened valve involves quantitative compromises and it is better to use the lower impedance detector valve.

The essence of smooth reaction is the maintenance of a correct phase relationship between the anode current of the valve applying reaction and the applied signal voltage. If in fact reaction struggles to feed back voltage impulses to the grid which are out of phase with the signal voltage there is bound to be difficulty and you will not obtain that smooth slide in and out of oscillation so essential to good working.

* * *

Not So Dusty!

A. G. (Walkerville).—"I have been told that particles of dust between the vanes of a variable condenser reduce the efficiency of a set, and tend to make it noisy in operation. Is this true?"

Yes. If the dust is metallic or conducting dust. I have never really made much study of the conductivity of average dust.

But, of course, dust if it is non-conducting or a dielectric could by scratching about make some effect. It's much best to keep things clean in any case and keep dust away from condensers, but if you don't want to box everything, a pair of bellows makes a fine investment, and you can have great fun blowing the dust off your set on to your chairs and tables and waiting for the dust there deposited to come back to your set!

Most of the big wireless stations are periodically cleaned by blowers, and in accurate wave-meters the condensers are washed out by petrol. So keep things clean, it won't do any harm.

* * *

Resistance of the Moving Coil.

V. R. (Bournemouth).—"Is there any advantage in using a high-resistance moving coil loudspeaker with an L.F. choke filter output circuit, as compared with a low resistance moving coil and a step-down output transformer?"

The advantage could only obtain if the choke filter output circuit were better than the transformer. I do not see superficially that there is anything very different in the loud speaker itself if it uses high or low resistance operating (as opposed to magnetising) coils unless the high-resistance type appreciably increases the mass of the movement.

Speaking practically rather than theoretically there is no advantage in using choke filter output as against transformer output.

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TELEVISION BY RAYS

By J. H. Roberts, D.Sc., F.Inst.P.

The mechanical scanning methods employed in many television systems seem to introduce definite limitations. But attention is now being turned to the nimble electron as a substitute and some very interesting experiments have been carried out in accordance with the system described by Dr. Roberts.

FOR television purposes the scene or picture which is being transmitted is viewed by a moving "eye," that constantly glances from side to side across the picture at a high speed. It is possible to "view" only a small area at one glance, so the electric eye is directed first along a strip at (say) the top of the picture, next at a strip just below this, and so on in a series of strips to the bottom of the picture.

Producing the Beam.

In most systems of television, a mechanical scanning arrangement is used. A rapidly-moving mechanical system has obvious limitations and, therefore, experimenters have looked about for some television system wherein the moving part should be virtually "weightless."

A weightless object which suggests itself for this purpose is a beam of radiation; for example, a beam of light or a stream of electrons ("cathode rays," as they are sometimes called) and experiments on the use of the latter type of radiation for television reproduction have been carried on for many years.

The problem in its simplest form is this. If we have a beam of cathode rays shooting through a vacuum tube and falling upon a suitable flourescent screen, which glows brightly at the spot where the beam strikes it, then we have the necessary essential apparatus at our disposal, and what we have to do is to arrange for the beam to traverse the whole area of the screen rapidly and in a proper manner and to vary in intensity according to its position at any moment.

Cathode Ray Tube.

If we can arrange for all this to be carried out in the proper way, we have a simple method of building up a televised picture which will show up on the fluorescent screen. Some very interesting experiments in this direction are now being carried out in the Research Laboratories of the Westinghouse Electric Company of the United States.

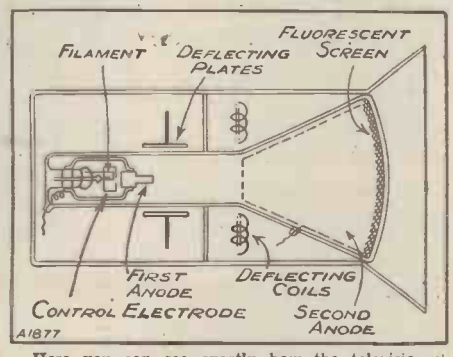
I should mention that we are not at the moment concerned with the television *transmitter* but only with the television *receiver*.

I expect most of you are familiar with the essential phenomena which takes place in a cathode ray discharge tube. You know that when the appropriate voltage (generally some thousands of volts) is applied across the electrodes of the tube, a copious stream of electrons comes away from the region of the cathode and travels towards the region of the anode.

Deflection Problems.

If the anode is pierced with a small hole, a fine stream of these cathode rays or electrons will shoot through the hole and may be made to impinge upon a suitable screen placed at a little distance beyond the anode. In this way we have a fairly sharply defined beam of electrons which produce a well-defined bright spot upon the fluorescent screen.

BENDING THE BEAM



Here you can see exactly how the television cathode ray receiver is constructed. The cathode beam passes between the deflecting plates and the deflecting coils before reaching the screen.

We now have our "weightless" beam, and we have to make this traverse the fluorescent screen in the appropriate way. Let us see how this is done.

If the beam passes, on its way to the screen, through the space between a pair of metal plates, across which an electrical potential is maintained, it is obvious that the electrons (being negatively charged) will be displaced during their passage through this electric field in a direction away from the negative plate and towards the positive plate.

Electric and Magnetic Fields.

The transverse motion thus imparted to the electrons will show itself by a shifting of the bright spot upon the screen, the direction of the shift being parallel to the direction of the transverse electric field through which the beam is passing.

Now suppose the beam also passes through a magnetic field; the effect of this also will be to shift the beam, but in this case the shift is not in a direction parallel to the magnetic field but in a direction *at right angles* to the magnetic field.

If, therefore, the electric field and the magnetic field are parallel to one another (we may assume, for simplicity, that they operate throughout the same region) the electric field will shift the bright spot on the screen in one direction, whilst the magnetic field will shift the spot in a direction at right angles to the first.

For simplicity let us call the electrical shift a shift to the *east* and the magnetic shift a shift to the *south* (as looked at on the screen). Then the resultant effect of the two shifts will be a movement of the spot to a position somewhere between east and south, the exact position depending, of course, upon the relative effects of the two fields.

Easily Controllable.

In other words the side-to-side force can be applied by the deflecting plates, while a varying magnetic field gives "up-and-down" control. Apparently the method is well suited to the purpose, as both the time and intensity can be varied as desired.

It is easy to see that by progressively increasing or decreasing the magnetic field the spot may be made to move from the bottom of the screen to the top, whilst if the electric field is progressively varied between the necessary limits, the spot may be traversed laterally across the screen. If the electric field is applied in this way with sufficient rapidity whilst the magnetic field moves the spot from the bottom of the screen to the top, it is obvious that the spot will, in fact, trace over the screen in a series of lines. This is exactly what we want for television.

1931 "EKCO" TABLE

The accepted Encyclopaedia of All-Electric Radio!

ALL-ELECTRIC RECEIVERS

		REMARKS	PRICE COMPLETE D.C.	PRICE COMPLETE A.C.
Model 312	Detector and Pentode Valves	Cabinet of "Tenacit Bakelite" in three tones; dark jade, dark mahogany and medium oak to match any furnishing scheme. Set and Speaker together form one symmetrical unit.	£14-10-0	£14-10-0
Model 313	Screen Grid, Detector and Pentode Valves		£22-10-0	£22-10-0

"EKCO" LOUD-SPEAKERS

"Ekcone" L.S.1	Incorporates balanced armature movement	£4-10-0	
"Ekcoil" L.S.2	Incorporates very latest type moving-coil unit	£8-12-6	£11-10-0

ALL-POWER UNITS

MODEL	OUTPUT H.T.	OUTPUT L.T.	OUTPUT G.B.			
C 1. A	60 m/a., 4 tappings S.G.; 0-120 var., 120/150-v. and POWER.	·3 to 1 amp. max. at 2, 4 or 6-v.	7 tappings up to 21-v.	Completely Electrify Your Radio Set with no alterations whatever to set, wiring or valves. Westinghouse Rectifier in A.C. Models	——	£17-15-0
C 2. A	20 m/a., 3 tappings S.G.; 60 and 120/150-v.	·2 to ·5 amp. max. at 2, 4 or 6-v.	5 tappings up to 12-v.		——	£10-17-6
C 2. B	25 m/a.: 4 tappings S.G.; 60; 120/150-v and 170-v.	·2 to ·4 amp. max. at 2, 4 or 6-v.	5 tappings up to 12-v.		£6-17-6	——
C P. 1	20 m.a., 3 tappings S.G.; 0-120 var. and 120/150-v.	·25 amp. at 2, 4 or 6-v. (Trickle Charger).	——	Fits quickly and snugly into any Portable Set.	——	£6-0-0
A C V	30 m/a., S.G. and 150-v.		(Raw A.C.) 4-v. from 2 to 4 amps. 6-v. from ·25 to 1 amp.	Can be built in any set to make it "All-Electric."	——	£6-0-0
CONTROL UNIT				Accessory to Model A C V	£1-5-0	

H.T. UNITS

MODEL	CURRENT OUTPUT	VOLTAGE TAPPINGS		
2 F.10	10 milliamperes. For 1-3 Valve Sets or	60 and 120	£1-19-6	——
2 A.10	those not requiring more than 10 m/amps		——	£3-10-0
3 F.20	20 milliamperes. For 1-5 Valve Sets or	S.G.; 60; 120/150	£1-17-6	£3-19-6
1 V.20 (Portable)	those not requiring more than 20 m/amps	S.G.; 0-120 var.; 120/150	£2-10-0	£4-12-6
1 V.30	30 millamperes. For Multi-valve Sets or those not requiring more than 30 m/amps	S.G.; 0-120 var.; 120/150 150/170	£2-19-6	£5-15-0
4 T.60	60 milliamperes. For Multi-valve Sets or	S.G.; 0-120 var.; 120/150;	£3-15-0	——
4 A.60	those not requiring more than 60 m/amps	POWER	——	£8-10-0

OTHER UNITS

T.500	Trickle Charger	Charges 2, 4 or 6-v. Acc. From A.C. Mains at ·5 amp.	——	£2-12-6
R.A.20	Rectifier Unit	For attaching to D.C. Units for use on A.C. Mains	——	£3-10-0
L.T. 1	L.T. Unit	2-6 volts from ·3 amp. min. to 1 amp. max.	——	£8-15-0
I. Tr.	Isolating Transformer	For isolating speaker, etc., from set when using a Power Supply Unit	15s. 0d.	

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FROM OUR READERS.

A selection from the many letters received reporting results with "P.W." sets and other items of interest.

THE "NEUTYPE" FOUR.

The Editor, POPULAR WIRELESS.

Dear Sir,—Many thanks for the excellent circuit under the name of the "Neutype" Four, which appeared a few weeks ago. I have been using a screened-grid three for some time, but I decided to change on account of selectivity. The change has rendered my 5s. Brookmans Rejector unnecessary!

My previous set was built in a cabinet 21 × 9 × 7 in. Although this is an inch too narrow, there is plenty of length, and after very careful arrangement and wiring, which only differed slightly from the original, I included a mains unit in the cabinet and hoped for the best.

As I had feared I was greeted by motor-boating, mixed up with bad mains hum, which are not pleasant as a duet! I overcame this finally by wiring a 2-mfd. condenser across the output of the mains unit, which had the desired by-passing effect.

The set is now working with excellent quality and plenty of reserve volume and is giving a far better all-round performance than my former screened-grid three, including economy in H.T. consumption. This is a benefit to me as my unit only supplies 20 milliamps maximum.

Wishing your paper, of which I am a regular reader, every success in the future.

Yours faithfully,

Middlesex. C. S. POLLARD.

THE "MAGIC" FOUR.

The Editor, POPULAR WIRELESS.

Dear Sir,—I write to thank you for a 'truly "Magic" set. I refer to the "1930 Magic Four."

I constructed it according to the circuit given in "P.W." a week or so ago, and although I did not use all the compouents you specified (because I took a lot from a three-valve set that I had previously), the set proved on test to be all that you claim for it.

You may notice by my address that I am not situated in the best part of the country, but for all that the set put up a performance that was a delightful surprise to me.

Another thing that must be considered is the time of the year which, as all wireless enthusiasts know, is just about the worst, especially for foreign reception.

I am using Mazda valves, and both the transformers are of the same manufacture (B.T.H.), a 4—1 in first L.F. stage, and 2—1 in second.

Regarding the output stage, I am using the Lissen output feed choke, and Lissen 2-mfd. condenser, and the result is very pleasing. The speaker is a "Brown" Universal Cone.

The range and selectivity of the set can be understood when I state that on the medium band of wave-lengths I receive dozens of stations between Budapest and Flensburg on the loud speaker.

Such stations as Toulouse, Algiers, London Regional, being so strong that the volume control is a necessity.

The same applies on the higher wave-lengths with 5 X X, Radio Paris, and Eiffel Tower. Hulzen and Hilversum and Kalundborg are a pleasure to listen to.

What the performance of the set will be like when conditions improve it will be interesting to learn, so I must wait and see.

I have not tried it yet on the short waves, as I have not as yet got the coils, but I have not the slightest doubt but that it will act just as good on them as on the other bands.

Once again thanking you and the Research Department for a truly marvellous set,

I remain,

Yours faithfully,

Plymouth. W. H. ROWLEY.

THE TRUE STORY OF A "MAGIC" THREE.

The Editor, POPULAR WIRELESS.

Dear Sir,—Possibly you might like to print my experience with a "Magic" Three set which I had made up for me by a friend:

A splendid set—volume tremendous, but easily regulated by volume control. Set going fine—comfortably settled in armchair, fire glowing, pipe drawing nicely, wife busily embroidering, music sweetly fills the air. Suddenly, what is that? The set is gradually fading; consternation registers on faces of husband and wife, also cat purring in front of before-mentioned fire. No doubt accumulator run down. Luckily have a spare ready charged; nothing for it but to up and change over. Change over effected, switch on, and now for it. Yes, now for it, but the "it" is no better than before; by placing one's ear to the loudspeaker the music can be heard coming through very faintly. Something wrong here! Out voltmeter and test L.T. All O.K.—two volts good. Try H.T. eliminator—all O.K. Any loose terminals? No; all well screwed down and tight. Dear, dear, dear! Must be the "earth." Go outside in the dark and dig up the earth-mat—half an hour's job, buried three feet. Earth-mat brought to light—or, rather, moonlight. Find that through yanking the earth wire it has parted company with the mat. Nothing for it but a new earth. Oh, d—— the set and everything wireless. Forth to the High Street to invest in a new earth tube. This duly installed and given a drink of Adam's ale XXX (the X's representing the gurgles as the ale flows through the tube). Earth wire attached to set and switch on—gurrrr!—only a faint response. What the dickens can it be? Ah, must be the valves! Take them out and test the filaments—all O.K. Next investigate the aerial—O.K. Finally decide it must be the grid leak—purchase new one and duly instal same. No better. Must be the L.S. Drag out headphones and fix up—result equal to crystal set. I rage—I melt—I burn! Take out the 25,000 ohms resistance, examine it—no wiser—seems O.K.—and put it back. Fix up L.S. again and switch on. Nothing doing beyond a faint whisper. Wish could meet the fellow who designed the set and ask him why the word "Magic" was coupled with the set. Stand gazing at the set in despair—idly touch grid leak—responsive whistle from L.S., and then at last, still idly touching various parts I chance to touch the clips holding the 25,000 ohms resistance and press them both inwards—result perfectly amazing—the Wireless Symphony Orchestra is playing, and the volume dislodges a dozen slates from the roof of the house—Eureka, I dance a hornpipe, and receive an urgent S.O.S. from the wife to reduce the volume. This done, sweet music fills the air once again, we settle down again, the cat stretches himself and says "Thank goodness that's over!" Contentment reigns again—all is right with the world—and THREE CHEERS FOR THE "MAGIC" THREE!

Yours truly,

Sidcup, Kent. L. R. MADGETT.

THE "NEUTYPE" FOUR.

The Editor, POPULAR WIRELESS.

Dear Sir,—Being one of those who asked for a set of the "Neutype" Four type, I was naturally anxious to get it going as soon as possible. Using mostly old components on hand I have it now working.

It is perfect according to my ideal of a set. 5 X X transmitter is approximately 250 miles from here, and is, I may say, our local station. It comes in with all the undistorted volume a small power valve can give on the "Neutype" Four without any reaction whatever.

If I could "rise to" the luxurious H.T. a super-power valve requires I am sure it would be wonderful. 5 G B, Reg., Nat., and Manchester come in at good volume L.S. in full daylight. Kalundborg, Motala, Eiffel Tower, and Radio Paris also good volume in full daylight. Zeesen very good after dark has fallen. Dublin, only 50 miles away, is very difficult here, probably on account of screening from the Wicklow Mountains, but it comes in better on this set than on any I have heard in this district.

Thanking you for such a good set.

Yours faithfully,

J. BORTHISTLE.

Effernogue, Ferns, Co. Wexford.

THE "MAGIC" TWO.

The Editor, POPULAR WIRELESS.

Dear Sir,—A word in warm praise of your "Magic" Two set. Until recently I had the "All-Wave" Two, constructed from the description in "P.W." of April 23, 1927. That was an excellent set, but by no means selective, and the newer conditions seemed to demand something more up-to-date. So I set to on the "Magic" Two—it is certainly all the article claimed for it—and a bit more. With a pentode valve in the second socket, the volume is more than sufficient; the "tone" of the speaker beats all the big, powerful sets with their gigantic cone loud-speakers that I have heard; the selectivity is perfect and, best of all, the simplicity of operation is a real boon, because the ladies like to switch on when they choose, and pick their programme, but never could fathom the mysteries of reaction. In the "Magic" Two this does not require adjustment, and all three of our principal low-wave stations come in at equal strength by the simple movement of the one dial. That is the great merit of the set. I can get several "foreigners" at good loud-speaker strength, but the great thing is that it can be left with perfect safety to others who don't possess the "wireless touch."

There was just one snag in the construction. When first tried, the set was most unstable, simply choking with too much reaction. The dealer had given me a 75 reaction coil, instead of 50, saying it would do just as well. Of course I blamed this, but on obtaining a 50 coil it was no better, and no altering of potentiometer or H.T. would cure the trouble. I had placed the coil-holders 1¼-inch apart (from centre of pins), as in the "Magic" Three blue-print, and it struck me perhaps the coils were too close. I shifted them a further ¼ inch apart, and the set was at once ideal, and is now!

I am wondering whether this too-tight coupling was really the cause of the trouble, or whether some other error on my part may have accounted for it? However that may be, it is a wonderful little performer, and as its elder brother, the "Three," has been so much praised in "P. W.'s" always interesting pages, I cannot resist the temptation of paying like tribute to the "Magic" Two even at the risk of boring you!

Yours faithfully,

Oxford. W. E. PARKER.

STRAIGHT WORDS FROM NEW ZEALAND.

The Editor, POPULAR WIRELESS.

Dear Sir,—Being a regular reader of your valuable paper, I thought I would write you a few lines re wireless, etc., in New Zealand.

A correspondent signing himself L. B. (W. Australia) in your issue for April 5; just to hand, has hit the nail on the head when he says 90 per cent of Australians use Dutch valves. Now, sir, right here in Auckland one has only to go into a dealer's shop and ask for a good valve and the first thing put in front of him is either a Philips or an American radiotron.

Mullards are here, also Osram (English valves) but they don't suit the American-built sets, which, by the way, have collared the market here. The whole responsibility lies with the English manufacturer, who is too slow to grasp an opportunity. What is the use of the slogan "Buy British-made Goods," when they are not here to buy?

What is more, the American manufacturer is turning out what we require. It's a fact the American knows how to boost his goods, it's paid him in New Zealand. Everywhere one sees new American all-electric sets (dozens of them), and so far I have seen one English, and its pedigree is a little doubtful.

I am an Englishman resident here for eighteen years, and a keen wireless enthusiast. It makes one's blood boil to see the way the (foreign) wireless goods are selling. You people at home should send representatives out here to investigate, than perhaps you would be convinced that you have been too slow.

By way of a change I have made up your "Brookmans rejector," which has proved a real success. Myself and two or three friends are anxious to build your "Magic" Three, but here you are again, we cannot purchase a differential condenser. The dealers don't intend to stock them. The same applies to X coils.

Well, sir, I trust you will give a little space in your columns to a little comment such as this, and maybe a little good will come of it.

I remain,

Yours faithfully,

ENGLISH, N.Z.

Auckland, New Zealand.

MAKING A LOUDSPEAKER UNIT

An easy modification for "filtering" the output and improving your reception.

IT is well known that it is almost impossible to over-emphasise the advantages conferred by the addition of a choke output filter to a receiver where normally the loud speaker is connected directly in the power-valve plate circuit.

The evil effects of unwanted couplings on the L.F. side are often completely overcome by the use of a choke output filter.

You ought to read this article, which is of interest to every owner of a loud speaker.

By T. B. SANDERS.

To this can be added the additional benefit which the output filter confers of keeping the steady anode current of the power valve from flowing through the loud-speaker windings.

Moreover, when a loud speaker is connected to the set via a filter, there is a considerable gain of volts actually on the plate of the power valve.

To many owners of wireless sets, although they may be aware of its advantages, the addition of a choke output filter presents considerable difficulties on account of lack of space in the set wherein to accommodate the necessary components.

Many such have reposing gracefully on the top of their receiver cabinet a loud speaker of the cone type. This instrument will, almost without exception, be housed in a highly ornamental casket, the interior of which contains more than sufficient space for a choke and a condenser. Why not, then, make the loud-speaker cabinet a receptacle for the choke output filter? Why not, indeed?

Packed Inside the Speaker

The idea is a good one, and would appear to be applicable to more than a few owners of wireless sets.

Fig. 1 is a theoretical diagram of the last valve of a receiver which normally has the speaker connected directly in the power valve plate circuit. To the right of the dotted line are shown the components which have to be connected externally to the receiver in order to incorporate a choke filter circuit.

The diagram shows that the following apparatus is required: Three terminals, one suitable choke, a 2-mfd. condenser, and, of course, the loud speaker.

Reference to the photographs which accompany this article will reveal the manner in which all these components are accommodated within the interior of a well-known commercial cone type loud speaker.

The three terminals are marked L.S.+, L.S.− and L.T.−, and are for connection to the similarly marked terminals on the receiver.

When the terminals have been fixed to the back of the cabinet and the choke and condenser fixed inside, connections are made as follows:—

1. The two choke terminals are connected to the L.S. plus and minus terminals.
2. The choke terminal which is connected to the L.S. minus terminal is joined to one terminal of the condenser.
3. The other condenser terminal is joined to either one of the actual loud-speaker terminals fixed to the back of the cabinet by the maker.
4. The other actual speaker terminal is joined to the L.T. negative terminal.

The practical arrangement of the components will, of course, vary with individual speakers, but the connections will not differ.

It will be seen from the photographs that the connections to the terminals are made with flex wire, with the back board of the speaker cabinet laid down before the opened speaker. This enables the back board to be replaced without fear of breaking the connections.

HOW IT IS DONE

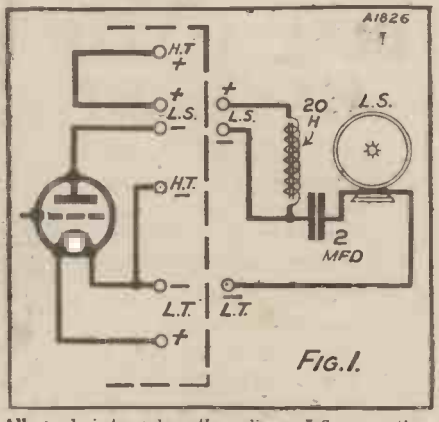


FIG. 1.

All you do is to replace the ordinary L.S. connections by those shown to the right of the dotted line.

THIS SIMPLE ALTERATION WORKS WONDERS

This photograph and the diagram above show how easy it is to filter the output.

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

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

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

RECORD REPRODUCTION

W. J. P. (Whitechapel, London, E.).—"Since fitting the pick-up I have been giving the family a musical treat. They all prefer the loud-speaker reproduction to the gramophone, and as we are all keen concert-goers the set is nearly always in action.

"One thing we notice which puzzles us. We used to think that certain instruments or bands reproduced better than others, but we have come to the conclusion that it is largely a matter of the recording.

"The same piece, instrumental, solo, orchestral, or whatever it may be, may sound quite different on another record by another gramophone company. Is there any way of telling which of the new records are particularly suitable for pick-up?

"The gramophone shops are very helpful, with advice, but it does not appear to be based on actual try-out."

It often happens that one record seems perfect for pick-up reproduction while another is not so successful with the same piece, under apparently similar conditions.

You will find in "Modern Wireless," under the heading "Recent Record Releases," a criticism of gramophone records *from a pick-up point of view* that should prove particularly helpful.

The actual adjustment of conditions under which your instrument is working also will affect your reproduction, so you should find that the gramophone section of "Modern Wireless," which is full of hints on the pick-up and allied topics, will do much towards making your reproduction as good as possible.

THE SHUNTING CONDENSER.

T. A. H. (Wales).—"A friend of mine has a three-valve set—Det, 2 L.F.—which is transformer coupled, and he is troubled by a hum or some sort of whistle. He has in the first L.F. stage a Marconiphone Ideal transformer 2·7 to 1, and in the second stage a Formo 5 to 1.

"The other day he touched the secondary of the last stage transformer and the whistle vanished. He then placed a fixed condenser across the secondary terminals and the set started working well at full strength.

"The transformers have been tested and have no break in them at all. He would like to know if this fixed condenser can cause any more trouble in the set, and if so, how to cure it?"

There is no objection to the use of a condenser in this way. As a matter of fact a condenser, being an insulator, will seldom do any direct damage where ever it is connected, providing, of course, that it is of sound construction and able to withstand the voltage impressed across it.

It acts as a complete insulator to current from the H.T. or L.T. battery, or from the mains unit, which are the types of current that will damage the set.

If the reproduction seems absolutely O.K. we should leave the condenser where it is and allow it to solve the problem. But should there be any further trouble, or should you decide that the condenser has affected the quality of the reproduction, you had better let us have a sketch of of the circuit arrangement and particulars of your H.T. supply, in case some better method of overcoming the howl can be applied to it.

TESTING H.T. BATTERY VOLTAGE.

T. B. V. (St. Andrews).—"Which is best for testing the condition of an H.T. battery—a high-resistance voltmeter or a low-resistance?"

A high-resistance voltmeter is better than a low-resistance one, for it does not throw out the working conditions so badly when in use, and thus gives better indication of what happens normally, when the voltmeter is not being employed.

The point is this. When the battery is delivering a certain current to the set you want to know exactly what voltage is being applied from its terminals, so you connect the voltmeter here and measure it.

But do not forget that the meter itself will take some more current whilst it is measuring.

In other words, you cannot tell exactly what happens when the receiver alone is taking current, because as soon as you connect up the voltmeter to try, you are taking current both for the receiver and for the voltmeter. This throws out your conditions, but the higher the resistance of the voltmeter the less current it takes, and the nearer you will get to an accurate test of the voltage.

If you test an H.T. battery voltage when the battery is not connected to the set as shown in the

A test like this does not give the working voltage.

illustration, the voltage may appear much higher than it would be if the battery were supplying set.

And in such a case, if a low-resistance voltmeter were used, the comparatively heavy current taken by it would give you a nearer approximation to the true condition of the battery than a high-resistance type.

Of course, the battery really should not be measured as shown above, but should instead be measured under actual working conditions, after it has been delivering current to the set and while the set's plugs are still in position. The high-resistance voltmeter will then give a pretty accurate idea of what is happening, while the low resistance would not be so accurate because of the extra current it is taking from the set.

As the battery should always be tested under working conditions, it is obvious that a high-resistance meter should be used if possible.

(*Continued on page 58.*)

CAN WE HELP YOU WITH YOUR SET?

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

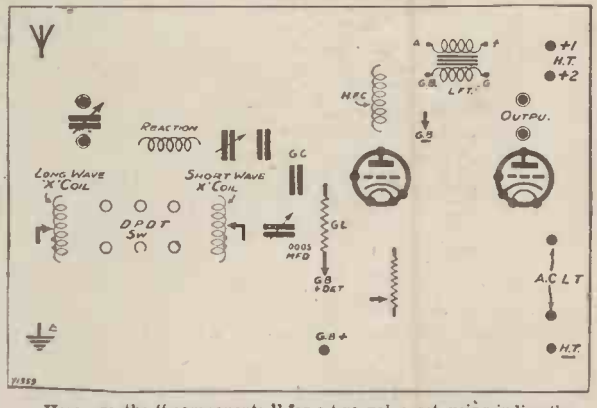
Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers an unrivalled service.

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

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

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

POPULAR "WIRELETS" No. 19

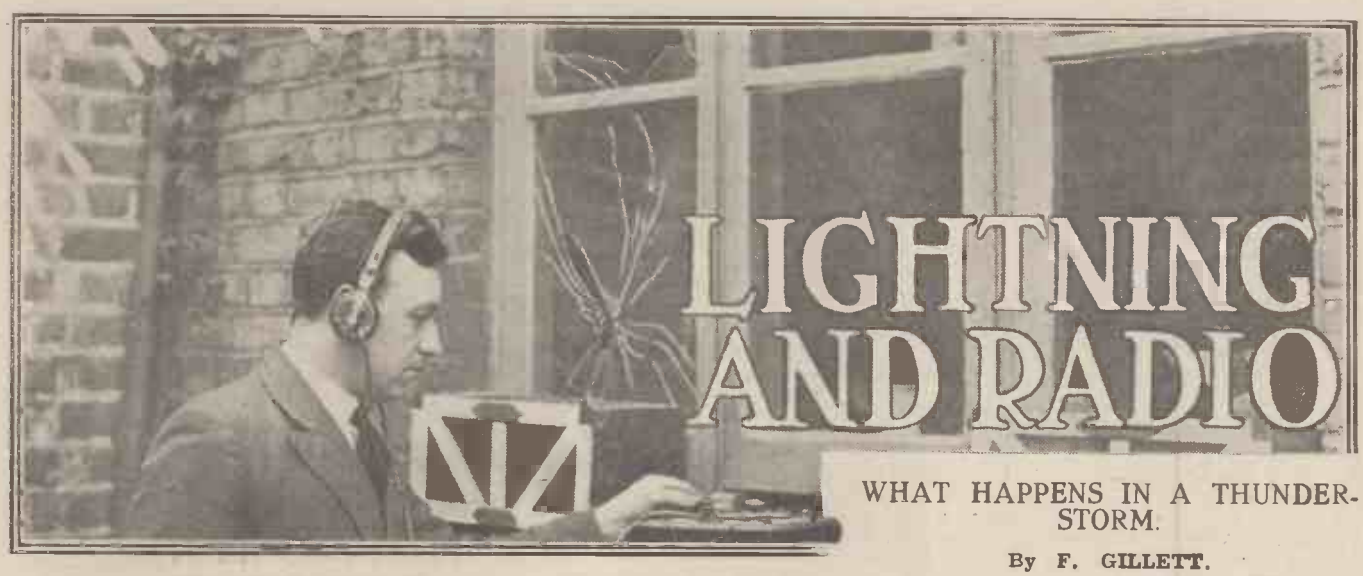


Here are the "components" for a two-valve set using indirectly-heated A.C. valves. The circuit is Detector and transformer-coupled L.F. amplifier using X-coils and a simple wave-change by means of a D.P.D.T. switch.

The reaction coil (about 60 turns) is placed between the others, and the earth L.T. connection is switched to the X tappings for long or short waves.

Can you "wire up" this circuit?

(Look out for the answering diagram next week).



LIGHTNING AND RADIO

WHAT HAPPENS IN A THUNDER-STORM.

By F. GILLETT.

WHEN Nature starts electrical demonstrations on a large scale, she commands the respect of the most case-hardened wireless enthusiast—a respect usually tinged with a certain degree of awe.

The voltage present in a thundercloud just before the discharge is of the order of a thousand million volts. Needless to say, the full voltage never reaches the earth's surface, since before a body can be struck, the electrical discharge must force its way through the very high resistance of the surrounding air.

Thousands of Amps.

As regards the time of duration of the flash, the result of a long series of observations gives an average slightly more than one thousandth part of a second. The mean or average current works out at twenty thousand amperes.

In spite of this rather terrifying figure, the most powerful discharge likely to occur can be safely carried to earth by a copper lightning conductor having a cross-section of only ·08 square inches, or by an iron conductor one-fifth of a square inch in section.

In both cases the size given is much smaller than that generally used in this country, but this estimate may be a source of some satisfaction to broadcast listeners with outside aerials.

THUNDER ABOUT!

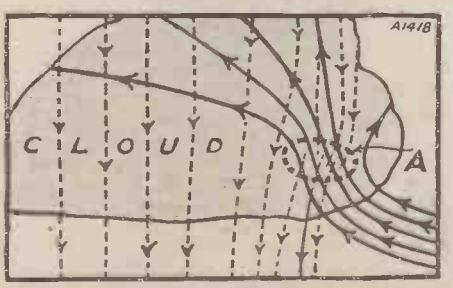


Fig. 1. The typical conditions in a heat-type thunderstorm. The dotted lines represent rain, the others streams of air.

At the same time it is pointed out that any local resistances, such as bad points, or a poor earth, will create very high voltages, and so produce dangerous side discharges.

This is a powerful argument in favour of using a direct aerial-to-earth connection, located outside the house so as to avoid any corners or bends, for those listeners who prefer "safety first."

Dr. Simpson provides an ingenious explanation of lightning based upon the breaking-up of raindrops.

It has long been known that when a drop of pure water splashes against a solid obstacle, the drop acquires a positive charge, whilst the air in the neighbourhood of the impact becomes negatively charged. It appears that the same separation of electrical charges takes place when a drop of rain is for any reason broken in two in the air.

Effect of Air Currents.

The maximum velocity with which a drop of rain can fall through still air is approximately 8 metres per second. Now it is a suggestive fact that violent upward currents of air are usually present in all thunderstorms. If such upward currents exceed a velocity of 8 metres per second, then raindrops cannot easily pass through them to earth.

Fig. 1 illustrates the typical conditions in a thunderstorm of the heat type. The unbroken curved lines represent upward streams of air, whilst the dotted lines show falling rain.

A roughly circular area A encloses the part of the air-stream lines where the upward velocity is greatest. Around about this area the deflection of the falling raindrops will be greatest.

Large drops penetrating this area will be broken and the component parts blown upwards by the air current. The small drops will in turn re-combine into larger ones and start to fall back again. This process is continually repeated.

Every time a drop breaks, the water of which the drop is composed acquires a positive charge. The corresponding negative charge is given to the surrounding air and is blown upwards for a short distance by the ascending air currents. The positively-charged drops are, however, localised because they re-combine before they travel far upwards.

As they increase in size they start to fall again, to be once more broken up, so acquiring a still further charge of positive electricity.

Meanwhile the rest of the cloud, corresponding to the large shaded area, acquires a negative charge. This is indicated in Fig. 2, where an internal area is shown rich in + signs, whilst the main body of the cloud carries distributed — signs.

Contrary to what one might expect, a cloud is one of the best insulators it is possible to have.

The Actual Discharge.

The greatest electrical strain therefore exists inside the cloud, somewhere along the area of separation between the highly positive region and the adjacent negatively-charged parts. The actual lightning discharge accordingly commences here, as shown in Fig. 2.

WHERE IT STARTS

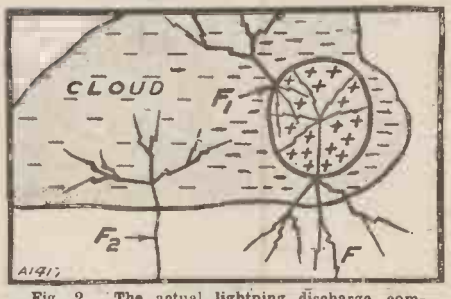


Fig. 2. The actual lightning discharge commences inside the cloud itself.

Directly the initial breakdown takes place, the path of the resulting spark becomes a highly-conducting region. It is as though a piece of wire had been inserted across the highly-charged zones.

The neighbouring charges crowd into and surge along this relief path, so increasing the energy involved, until the initial small discharge grows to enormous dimensions.

In this form it crashes its way through the rest of the cloud, and through the insulation barrier of the air until it finally reaches the earth, as shown at F.

This is the main path of relief. Meanwhile other discharges may take place having upwardly-directed branches, some such as F_1 from the central positively-charged cloud area, and others such as F_2 from the positive charges induced on the earth's surface by the negatively-charged cloud particles directly overhead.

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RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page 54.*)

AUSTRALIAN WAVE-LENGTHS.

M. J. W. (Manchester).—"Do the Australian broadcasting stations work on wave-bands which are similar to those in use in this country? That is to say, would the 200 to 600 metre set be O.K. for use in Australia?

"If you could give me wave-lengths of the Australian stations and call signs I should be very glad, as my nephew wants to take a set out with him, but is not sure if his British set is O.K."

The following is a complete list of the transmitting stations in Australia, according to details supplied by the wireless branch of the P.M.G.'s Dept., Melbourne. The stations are operated by the P.M.G.'s Dept., for the National Broadcasting Service (with the exception of 7 Z L), and the programmes are supplied by the Australian Broadcasting Co., whose headquarters are in Sydney.

Call Sign.	Location.	Wave-length in Metres.
2 B L ..	Sydney, N.S.W.	350
2 F C ..	Sydney, N.S.W.	451
2 N C ..	Newcastle, N.S.W. (Relay)	241
3 A R ..	Melbourne, Vic.	484
3 L O ..	Melbourne, Vic.	375
4 Q G ..	Brisbane, Q.	394·5
4 R K ..	Rockhampton, Q. (Relay)	322
5 C L ..	Adelaide, S.A.	412
6 W F ..	Perth, W. Australia	435
7 Z L ..	Hobart, Tasmania	516

USING CHOKE COUPLING.

H. I. (Monmouth).—"I have tried coupling with both R.C.C. and transformer, but never the choke, and now I am rather keen to incorporate this in the new set before deciding on the final form my five-valver is to take. I am enclosing a sketch of the set as used for R.C., and I propose to use a 30-henry choke (which I am able to borrow if this is O.K. Please describe the wiring of the plate and following grid circuit in words."

The grid circuit of the last valve is the same as at present, namely grid itself to one side of ·01 fixed condenser and to one side of the grid leak, the other side of the grid leak going to appropriate value of grid negative for the power valve. The other side of the ·01 condenser goes to the plate of the preceding valve and to one end of the L.F. choke. The other side of the L.F. choke goes direct to H.T. positive, and you will see that these connections are exactly the same as before, but with the L.F. choke taking the place of the anode resistance.

SHORT-WAVE COIL WINDING.

P. M. (Rowlington, Warwick).—"With the idea of getting well away with short-wave work as soon as the evenings are dark, I am starting the experimental short-wave coils.

"I like making them and am quite prepared to make dozens of different types until I find which suits the receiver best, but I think I have seen it somewhere in 'P.W.' that as a general rule it is nearly always better to put the reaction winding at one certain end of the grid coil. Is this the earth end, or the grid end, and do you think it worth while experimenting with both ends, or is it pretty certain that I should get better results by putting it at one correct end?"

If you are going to use the ordinary circuits you will almost certainly find that the reaction coil gives better results when placed at the earthed end of the grid coil, rather than at the grid end.

If, however, your circuits are unusual ones, you might find them an intermediate position, or even the placing of the reaction coil at the grid end, advantageous, but for all ordinary circumstances and circuits we certainly recommend you to place it at the earth end.

TROUBLE WITH A HOWL.

M. R. P. (Dover).—"It was partly with the idea of overcoming interference and partly with the idea of evolving a perfect holiday set (and also no doubt because I cannot keep my hands away from making different sets) that I built the portable containing S.G., Det., and L.F.

"My idea was partly to have the fun of overcoming the difficulties, partly to be able to cut out jamming, which is very troublesome in this district, and partly to be able to trail the set from one room to the other in the winter according to where the fire was. I was working at it for several weeks before the holiday, and have made several improvements since we got back, but now the single solitary trouble is the fact that as the loud speaker is in the cabinet I get a terrible ringing on certain notes.

"I do not think it is the set which is to blame so much as the fact that the valves and

(*Continued on page 60.*)

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page 58.*)

the speaker are close together. The case itself is fairly heavy and does not seem to vibrate noticeably at all, but I think I ought to have put all the valves in a separate compartment or protected them in some way against this.

"It has been suggested that my best plan now would be to make a sort of cover and fit over each valve to keep it protected from sound waves. Do you think this a good idea, or would you recommend anything in preference to it?"

The idea is quite a good one, and there is no need to make an elaborate business of it at all. Probably if you protect the detector valve you will find the trouble disappear if it is only slight. The protection could take the form of a cardboard cover, such, for instance, as a valve box, and in order to make it as effective as possible we should fill the space between the box and the valve with cotton wool.

BLAMING A NEW MAINS UNIT.

G. N. (Banstead).—"I have been running a 'Titan.' Three ever since this set was published in 'P.W.' and cannot speak too highly about the results. Some months ago a friend offered to buy the set, and as I was rather hard up at the time I parted with it, although loth to do so.

"We fitted it in at his place at Wimbledon and it went magnificently on batteries. Later on he bought a mains unit instead of batteries, and at first it seemed better still. This, however, was not to last, and now he is in trouble with it.

"A terrible hum has developed. Although he has tried extra choking in the detector lead, as hinted somewhere in 'P.W.' and connected all the fixed condensers he has got across various points, he cannot get rid of the hum.

"It certainly never behaved like that with me. And the set is much weaker, and no good at all to him as it is. I should say that, as we both blamed the H.T. unit, we sent it back to the makers, but they have returned it saying it is perfectly O.K., so we are at a loss what to do.

"I notice also that to get the medium-wave stations the 'Titan' Switch seems to operate different now from what it used to do. When I had this set I always had to **pull** the switch (so that all the contacts were connected together) to get the short waves, but now it will not work like this, and what happens is that the switch has to be **pushed** in order to bring in the London Regional and the London National. Why is that?"

Everything points to the fact that you have been wrong in blaming the mains unit for the hum. It is far more probable that a fault in the "Titan" coil unit itself is causing the trouble, and we should carefully remove this from the set and examine it thoroughly.

You may find that one end of the aerial wire is broken, or some other little fault has developed which would account for the strange alteration in tuning. Examine all the moving parts with special care—that is to say the crocodile clip connections, and also the switch contacts.

It is quite possible that one of the leads, although superficially O.K., has become broken almost through, and perhaps one strand of wire is all that is holding together. Pay special attention to the flex lead to the centre of the moving portion of the switch, for as this gets continuous use it is quite possible that the wire has broken.

This would account for the hum and also for the queer tuning, and as the set worked quite well with the mains unit at first, we think there is no doubt that a fault has developed in the coil, and that when this has been put right the set will behave normally again.

WHAT DO *YOU* THINK ABOUT THIS?

A Wellingborough reader of "P.W." was very disappointed to find his loud-speaker unit, which at first was very sensitive, started to "fall off" in strength after only eight months' use. The set itself was O.K., as was proved by a friend who brought his own loud speaker round to try on it. The units were of the same make and type, but the faulty one had been bought later than the other, so it ought not to have "worn out" first.

Whilst talking about it the friend suggested a possible cause for the trouble, and subsequently he was found to be quite right in his suggestion. Could you have guessed

WHAT WAS WRONG?

N.B.—There is no prize for answering this, but from time to time we shall give a radio problem (followed the next week by the answer) in the hope that readers will find them both interesting and instructive. (Look out for the solution to the above next week.)

The cause of the portable set's failure to work, as described last week, was the screening effect of the mirror on the sideboard. The glass, of course, was not detrimental, but the reflective surface behind the glass was quite sufficient to screen the frame aerial.

MORE SCHOOL BROADCASTS.

(*Continued from page 24.*)

Two-way telephone apparatus was introduced for the first time on any railway by the Canadian National Railways in April of this year. It has been perfected after many months of research by the company's radio engineers, and consists virtually of a miniature broadcasting and receiving station on the train itself. The voice of the

(*Continued on page 62.*)

MORE SCHOOL BROADCASTS.

(*Continued from page 60.*)

senger is broadcast a few feet from the railway car to the telegraph lines parallel with the track where the electrical impulses are picked up on the ordinary telephone circuit. Successful telephone communication both to and from the train may be accomplished regardless of the speed at which the train is travelling.

* * *

Six Prime Ministers

British and Dominion listeners may have the opportunity of hearing six Prime Ministers broadcast next month.

The Prime Ministers are: Mr. Ramsay MacDonald, Mr. Scullin (Australia), Mr. Forbes (New Zealand), Mr. Bennett (Canada), General Hertzog (South Africa), Sir Richard Squires (Newfoundland).

Each is principal of his country's delegation to the Imperial Conference, which begins in London on September 30th.

"Plans are not yet complete," said an official of the B.B.C. to a "P.W." representative, "but if the proposals are acceptable, the B.B.C. intends to cover the Conference by broadcasting a series of talks by the chief delegates.

"One talk will be given each week, and it has been considered that the evening will be the best time for these talks, as this will allow a greater number of people to hear them."

We understand that individual talks from the studio are preferred by the B.B.C. to a broadcast of the speeches of the opening day.

Efforts will be made to reach the Dominions, and the new experimental short-wave transmitter will probably be used.

CHOOSING YOUR VALUES.

(*Continued from page 35.*)

To get down to hard brass tacks, it is useful to remember that you get 90 per cent of these amplified voltages across the grid leak, at a frequency of 50 cycles, when the microfarads of the grid condenser multiplied by the megohms of the grid leak produces ·006.

You get that with a ·006 mfd. condenser and a 1-megohm grid leak, or with a ·003 mfd. condenser and a 2-megohm grid leak.

And the "frequency characteristic" will be fine, because if you get 90 per cent efficiency at 50 cycles you will work up to practically 100 per cent on the higher frequencies.

By the way, an output circuit requires different treatment from that of an inter-valve coupling circuit because at the output you want power (volts times amperes) for working loud speakers, and not voltages to operate the grids of valves.

To get the maximum power output from a last valve you must exactly match the output choke (or transformer) and valve resistances.

If the output choke has an impedance either smaller or greater than that of the valve you lose power.

But a higher resistance in the plate circuit will tend to flatten the grid-volts-anode current characteristic of the valve at the lower bend. Taking this into consideration, we find that the greatest *undistorted* power output is achieved when the choke resistance is twice that of the valve resistance.

INDOOR AERIALS.

(*Continued from page 19.*)

You then (see Fig. 3) have some insurance that all your high-frequency is coming in via the aerial terminal.

A possible connection is shown in Fig. 4, where the mains are definitely used as an aerial. There is some Board of Trade regulation that all sets must be earthed, hence the return lead to the conduit. This is a case of a very high-capacity aerial.

You may, finally, use an indoor aerial. In this case, I would like to see an earth, the mains blocked off by high-frequency chokes, but I would not like to lay down any hard and fast rules!

Experiment alone will determine the best way to connect up if you are not on the ground floor and not using a conventional aerial. I hope this article gives some useful hints on the lines to follow in your experiments.

Radio's Red-Letter Week

If you would know the new wonders that have been added to Radio, come straight to **Radiolympia.**

Radio-Gramophones are here that look and sound too marvellous to be true! Valve sets, Crystal Sets, Home Construction Sets, Components. All are here to meet every need and to suit every pocket. And whatever your ambitions you will find that the keynote of modern radio is simplicity. To-day Radio is as much part of the home as Gas or Electric light and just as easy to operate.

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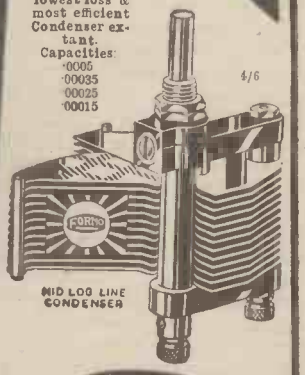

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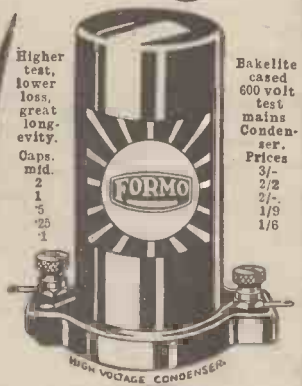

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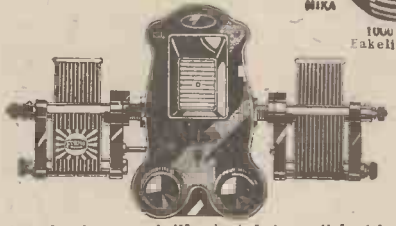

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C.H.S

THE "EXHIBITION" FOUR.

(*Continued from page 38.*)

The coil is a very simple one, just 200 turns of No. 26 D.S.C. wire on a slotted former with tappings at 70, 100 and 150 turns, tappings and ends going to small terminals. By including a suitable amount of the coil in the right place in the aerial lead all possibility of local interference on long waves is completely removed.

The "Contradyne" coil serves another purpose also in the "Exhibition" Four, so don't be tempted to leave it out if you are too far from the local to be afraid of interference troubles. It is quite essential to the proper functioning of this circuit in other ways as well.

Another Problem Solved.

Wave-change switching is another of the problems we have tackled and, we believe, solved for next season. In the course of our work on this particularly difficult matter we have tried out all sorts of schemes and coil units, including commercial ones, and have come to the conclusion that something new is wanted.

All previous arrangements have had some defect or other, either in actual performance, or in flexibility in their adaptation to the various circuits of the home constructor. None was really satisfactory in every possible way, remembering that absolute simplicity of wiring was essential.

Accordingly, we have decided to introduce our own design of dual-range coil unit, and this will be used in all our special set designs for some time to come, so that you may be sure of using it over and over again.

This step we have only taken after long and careful consideration, but we decided at last that it must be done. We simply had to have a dual-range coil unit properly adapted to all the different circuits involved in sets for the home constructor.

Months of work have been devoted to the new coil, and in its final form it represents one of the greatest advances we expect to see this season.

It sets a standard of super-efficiency, combined with simplicity of wiring and switching and adaptability to different circuits, which we are confident has never before been approached.

These are just a few of the attractions of a receiver which is far ahead of its time. Now let us just guide you over the circuit.

Observe that the two coil units are marked U_1 and U_2, S_1 and S_2 being the simple wave-change switches. On medium waves the two secondary windings are placed in parallel, so removing the usual losses.

At the same time the switch cuts out the "Contradyne" coil, which is not required on medium waves, and what is normally the reaction winding also, this latter being used for aerial coupling on long waves.

In the H.F. intervalve circuit is the second coil unit, and here there is another special long-wave coupling scheme, This takes the form of the condenser C_5, which is again cut out by a switch (S_2,) in changing to the medium waves.

This condenser gives what may be described as "Brookmans" coupling on the long waves, because we used it in our famous "Brookmans" Rejector. The method has many important advantages, with which we have not space to deal.

The detector valve is of the usual grid-leak type, with differential reaction, of course, and then comes a quite straightforward L.F. side of the latest modern type.

Altogether, the set is surprisingly simple, in spite of its wonderful powers. Those whose ideas of performance are based on a set of last season will get the surprise of their lives if they think that real performance is impossible with so straightforward a circuit!

What it did on test was a surprise even to ourselves, and we were expecting something pretty good. It cut out the twin waves from Brookmans Park with the greatest ease, and the way it brought the foreigners rolling in was amazing.

Simple to Make and Use.

As a constructional job the set is about as simple as it possibly could be, and you will need nothing beyond the diagrams and photos. (Naturally, we are assuming that anyone who tackles a fairly ambitious receiver like this will have had a little experience of the work.)

Finally, the operating data (brief, because there are no adjustments to speak of, such is the simplicity of the receiver). Valves: One S.G. for V_1, H.F. for V_2, L.F. for V_3, power or super-power for V_4.

Voltages: 120 volts for H.T.+3, about 60 on H.T.+2, 60 to 80 on H.T.+1, 120 or more on H.T.+4. Grid bias according to valve maker's instructions on L.F. and power valves, 1½ volts on S.G. valve.

Open S_1 and S_2 for long waves, and try different portions of "Contradyne" coil for best volume. Close S_1 and S_2 for medium waves. To control volume of local detune *below* on first dial and *above* on second.

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A SELECTIVE CRYSTAL CIRCUIT

(*Continued from page 23.*)

devised by the "P.W." Research Dept. This was the "Inductocrys" circuit as used in the "Brookmans" crystal set.

Readings were taken with aerial tappings of 25, 20, 15, and 10 turns. Fig. 2 shows the results for 20 and 15 turns.

It will be seen that the 20-turn tapping achieves greater strength and selectivity than the circuit corresponding to the lower curve of Fig. 1.

This circuit is particularly successful in conserving the signal strength at the lower wave-length, in which respect it differs from the absorption wave-trap circuit next to be mentioned.

Excellent Results.

It was found that the arrangement of Fig. 3 gave results which were really excellent. The tuning curves show the effect of setting the wave-trap to cut out (a) the 356-metre wave, (b) the 261-metre wave.

With an aerial nearly 50 ft. high at six miles from the transmitter, however, none of the preceding circuits was capable of eliminating completely the 356-metre transmission at 261 metres.

For some reason which is not altogether clear, the absorption wave-trap gave the curious result that the elimination of the 356-metre wave is no better at 261 metres tuning than at 356-metres tuning of the circuit. A slight but irritating murmur of the unwanted transmission can be heard right round the dial.

No doubt some of the uneliminated residue is due to stray voltages in the earth lead and telephone leads, but also more probably to a practical fundamental defect in the tuning circuit.

A Rejector Circuit.

It is clear that however nearly perfect be the coil and condenser employed, in practice there must always be some impedance offered by the tuning circuit to unwanted frequencies. This led to the idea of putting a rejector circuit between the aerial and the crystal. (Fig. 4.)

This circuit proved exceedingly effective, but there was nevertheless still that annoying murmur in the background. This shows naturally that current of the unwanted frequency was still passing in small amount through the crystal.

A further "brain-wave" suggested that this small amount of current could be neutralised by coupling the two coils together in the correct sense. This arrangement proved successful and gives practically an absolute wipe-out of the unwanted station. Daventry (5 G B) is received easily, and the signal bell from Toulouse has been heard with 2 L O in full blast.

FOR THE LISTENER.

(*Continued from page 20.*)

Nietzsche.

The German programmes this week have been letting themselves go in praise of Nietzsche, much as our British programmes do in the case of Bobbie Burns, or some other local god. It was the thirtieth anniversary of Nietzsche's death.

At the outbreak of the War, it was said that Nietzsche had more to do with making the War than anybody else; and the rumour was that every German soldier carried a copy of "Thus spake Zarathustra" in his knapsack. Those were obscure and confused days when the fire of Hate greedily seized upon anything which was thrown to it.

He was a man of great, if somewhat lurid, genius. Time will deal with him, and in a cooler posterity much of his work will, I believe, be found standing.

Picture Postcards.

I had another pleasant evening with Langenberg and a popular concert under the title, "Picture Postcards of a European Trip." It was partly literary and partly musical.

In a popular way, it was very well carried out. Not perhaps quite so pretentious as similar programmes in England.

For Spain, there was a reading from Alfred de Musset, and an Andalusian Dance by de Falla. Switzerland was celebrated by the Overture from "William Tell," and Rome by a selection from César Franck.

I am not quite sure that the programme did justice to London, whose musical picture-postcard was "The Kitten on the Keys"! What view in London that represents is a mystery to me. Perhaps Mr. Maxton making a speech in the House of Commons!

The Waltz.

Langenberg seems to me to be the most alive and interesting station on the continent; but this may only be because for some reason or other I get it easily, and can keep it without much interference. I get quite a lot of fun out of it.

The concert the other evening was on the "Waltz, from the Gaillard to the Boston." It was opened, as usual, with an introductory talk; and, with intervals for sporting and other news, lasted from eight to eleven o'clock.

A perfect orgy of waltzing. We danced them until we could dance no more. It was a hot night after a blazing day. We should have regarded your "heat wave" in London as a cooling breeze!

Stiles Allen.

After eight o'clock at night the English programmes have to fight here for their lives. The greater part of Europe seems to combine against them.

They sometimes break through, as the Guards broke through the Hindenburg Line. But there is nothing of the Entente Cordiale about continental wireless. It is a deadly battle, and every man's hand against his brother!

At eight o'clock each evening this ethereal battle is renewed. But before that zero hour, England has a better chance. And during the week I have been able to enjoy the beautiful singing of Stiles Allen and John Thorne in the Handel Arias.

To my great content, as Pepys would say.

TECHNICAL NOTES.

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

Pick-up Leads.

A POINT which is often overlooked in radio-gram. work is the question of the length of the pick-up leads. If, as is usual a pair of twin wires is used, it is obvious that an electrostatic capacity will be set up between these wires, which will depend upon their length. About four to six feet is generally the most that can be used for pick-up leads without giving rise to capacity troubles, and if a much greater length than this is used, the capacity will cause variations in the output voltage at varying frequencies, with the result that the volume will vary withthe frequency.

Characteristic Curves.

The characteristics of different types of pick-up vary very considerably. Some pick-ups will give a fairly uniform frequency response from, say, 100 cycles to 5,000 cycles, whilst others will give a rising response from 100 to 500 and then perhaps a falling response up to 1,000 or 1,500 with sometimes a subsequent sharp rise.

Although it is often supposed that a straight or fairly straight frequency response curve is desirable, this is not necessarily the case. It *would* be the case if the output from the amplifier followed a similar curve, but inasmuch as the amplifier invariably has its own peculiarities it may actually be desirable to use a pick-up the characteristics of which tend to counterbalance those of the amplifier.

Frequency Response.

Now with regard to the switching over from the radio to the gramophone, you will find that when the pick-up is in use the grid-leak-and-condenser is not in circuit. I speak of a grid-leak-and-condenser because this is the type of rectification which is most commonly employed. When the set is working as a radio receiver, using leaky-grid rectification, there is as a rule a slight loss on the higher frequencies, although often with radio reproduction this is not a very serious matter.

When the set is switched over to the pick-up, leaving the grid-leak-and-condenser out of circuit, this loss of the higher frequencies does not take place and, in fact, it may even seem that the higher notes are amplified unduly.

If the pick-up happens to have a characteristic curve which shows a falling-off towards the higher frequencies, this will tend to counteract the undue amplification of those frequencies by the amplifier.

Pentodes.

Some little time ago, when discussing the pentode valve, I mentioned that this type of valve, curiously enough, has met with much greater popularity in this country than in certain other countries, notably the U.S.A. As a rule it is the other way round, and a new radio component first gains ground in the United States before it becomes really popular over here.

The pentode valve, for some reason, is an

(*Continued on next page.*)

TECHNICAL NOTES.

(*Continued from previous page.*)

exception and even now it is not at all certain that it will be generally adopted by U.S. radio manufacturers for some time to come.

The Pentode in U.S.A.

As a matter of fact, at a recent meeting of manufacturers of valves and radio receivers, arranged by the Radio Manufacturers' Association in New York, a number of well-known experts discussed this very problem and decided, in the words of the report, that "The development of the pentode has not progressed to the point where any definite conclusion can be reached but there may be possibilities which are as yet not definitely known."

It is significant to notice that some of the leading radio manufacturers, including the Philadelphia Storage Battery Company (who make the well-known Philco receiver) and the Stromberg-Carlson Telephone Company, have definitely declared that they will not, for the present, manufacture radio receivers fitted with pentode valves.

Humless Valves.

Talking of valves, a new type of A.C. valve has lately been introduced to the American market which is claimed to be free from the A.C. hum which is a more or less serious drawback to many of the A.C. valves hitherto available.

The hum in a radio set using A.C. valves may in some respects be compared to the needle scratch in a gramophone, that is, it is a kind of objectionable background which it would be very desirable to eliminate altogether. In the majority of cases a good deal of this hum is due to the valves and especially to the detector.

This is not because the detector valve in itself produces any more hum than the other valves, but owing to the fact that the hum so produced is amplified more than that of the other valves.

Neutralising Hum.

One of the difficulties in neutralising hum, by what is sometimes called "opposition," is that the hum produced by the different valves is not the same, owing to variations in actual samples of valves which are supposed to be of the same type.

It is very important, therefore, that the valves should not vary very much from a standard, and in this new so-called "humless valve" the design is such that the valves can be turned out in commercial production to a remarkable degree of uniformity. This, in fact, is one of the secrets underlying the success of the new valve.

Some Difficult Cases.

Talking about A.C. hum reminds me that I have had several letters relating to the question of smoothing devices which I discussed in these notes a few weeks back.

You will sometimes find, more particularly in cases where the supply unit is included in the same cabinet, or is placed close to the receiver, that it is apparently impossible to cure the A.C. hum, even though you are using very large chokes and any amount of fixed condensers.

I have known of cases where practically

(*Continued on next page.*)

TECHNICAL NOTES.

(Continued from previous page.)

unlimited choking and plenty of microfarads have been apparently without the least effect upon the hum, which just went steadily on.

The fact is that in these cases you will generally find there is a direct coupling—I mean a magnetic coupling—between the power transformer and the inter-valve transformer, the effect being very similar to that between the aerial coil and reaction coil, except, of course, that we are dealing with low-frequency oscillations instead of high-frequency.

Transformer Feed-Back.

If transformer coupling is employed in the first L.F. stage the effect is likely to be more marked since any hum produced in the transformer is amplified by the second stage. It depends also upon the design and construction of the power transformer and upon the amount of magnetic leakage which takes place.

If you are troubled in this way it is better, instead of piling on chokes and condensers, to devote a little time to investigating the possible coupling effect between power transformer and inter-valve transformer to see whether you can find a position in which the coupling between these transformers is very small.

Some Useful Hints.

One of the transformers should be shifted about and also orientated in different directions (being connected into the circuit by a short length of twin flex) until the best position (within the limits of the cabinet) is found.

Incidentally, I may mention here a point which has several times been suggested to me by readers, and that is the *screening* of magnetic effects. Where oscillatory currents are used it is possible to get quite a fair amount of screening by means of any metal screen, even though this be of non-magnetic material such as copper.

At first sight it seems rather strange that a non-magnetic material should be able to screen electro-magnetic effects, but this

(Continued on next page.)

TECHNICAL NOTES.

(Continued from previous page.)

property is due to the production of eddy currents in the screen and whereas the screen in itself is devoid of magnetic properties, it becomes temporarily endowed with such properties whilst the eddy currents are flowing in it.

Screening.

If, however, you wished to screen steady or *static* magnetic effects (where the eddy currents do not arise and cannot, therefore, be taken advantage of) you would find it necessary to use quite thick sheets of iron or some similar magnetic material. In fact, the effective screening of static magnetic effects is an extremely difficult matter.

Hum in an A.C. receiver is also sometimes caused by the tuned-anode coil picking up the alternating magnetic field from the power transformer. This, however, can usually be overcome either by keeping the two at a good distance apart or by using a suitable screen.

TECHNICAL TWISTERS

No. 27.

LOUD-SPEAKER ADJUSTMENT.

CAN YOU FILL IN THE BLANKS?

In the cone-type loud speaker the adjusting screw usually alters the . . . . . between the . . . . . and the permanent magnet(s).

If insufficient spacing is allowed the . . . . . will touch the magnet and give rise to an unpleasant . . . . . .

A good method of adjusting is to turn the screw until the instrument starts to . . . . . and then to give the adjusting screw a half-turn in the . . . . . direction.

The fitting of an output filter makes it necessary to . . . . . the loud-speaker.

Last week's missing words (in order) were: Electrodes; Between; Air, Vacuum; Electrons, Filament, Plate (or Anode).

Portables.

A good deal has been said about the unsightly appearance of outdoor aerials, and those amateurs who are enthusiastic about the merits of portable receivers naturally take a certain delight in pointing out the disfigurement which, it is alleged, is about the only noteworthy feature of the outdoor aerial.

Some people are of the opinion that the progress of set-design in the future will tend towards the standardisation of the portable type and the elimination of the outdoor aerial altogether.

I do not think, however, that this is likely to happen, because of the far greater pick-up of an outdoor aerial.

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Cuts out the costly H.T. Battery.
Gives immunity from all danger of live contact because it is All-Insulated.
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POPULAR WIRELESS, September 27th, 1930. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

76 PAGES

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WHAT HAPPENS IN A TUNED CIRCUIT?—By Dr. J. H. T. Roberts, F.Inst.P.

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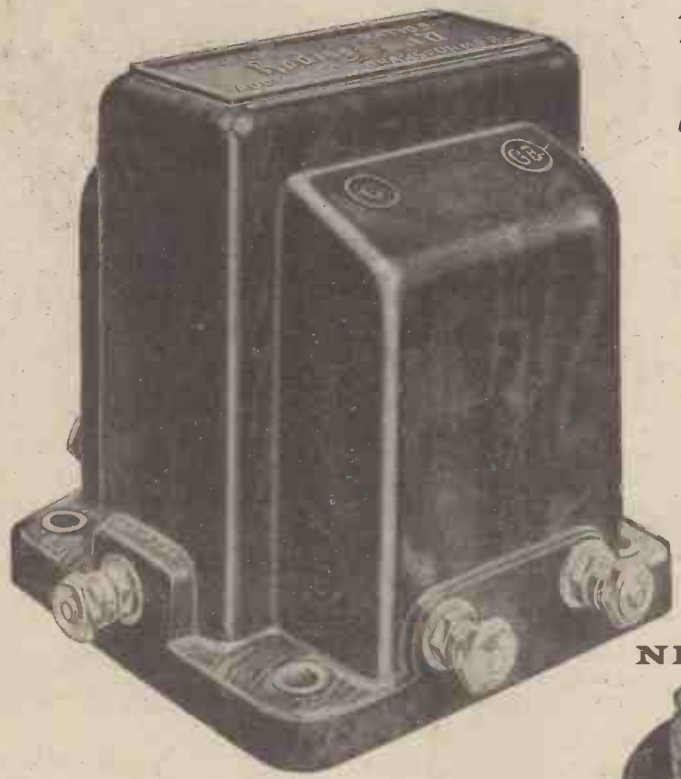

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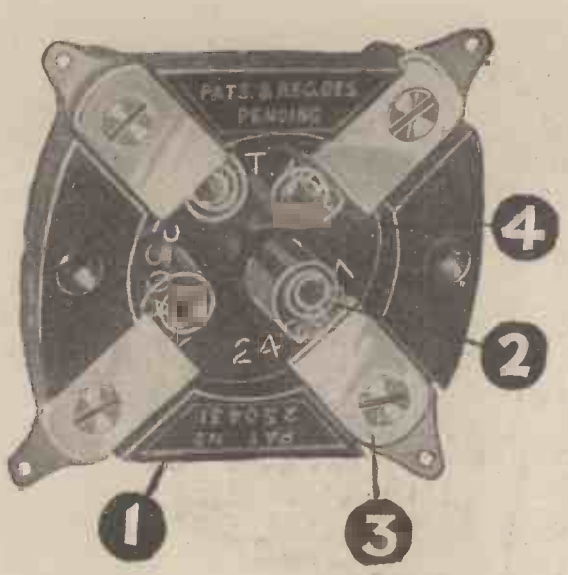

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1/6

1 2 3 4

The Base of the valve is of polished Bakelite, into which the metal sockets are recessed, eliminating damage to the valve by wrong insertion. Distance between fixing holes 1½ inches.

The Spiral, spring-grip sockets are in one piece with the tinned soldering lugs, making excellent connection possible between the valve and its circuit.

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Finally, the four sockets together hold the valve in a sprung suspension which damps out vibration, thereby protecting the valve filament from shock, and eliminating the microphonic "ring" or howl which would otherwise mar reception.

All the different Benjamin valve holders are made on this famous anti-microphonic principle, and a full description of them is given in our new 1931 Catalogue, which we shall be glad to forward on request.

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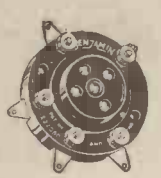
The Clearer Tone anti-Microphonic Holder with terminals and tinned soldering lugs. Cat. No. 8650. Price 2/-.



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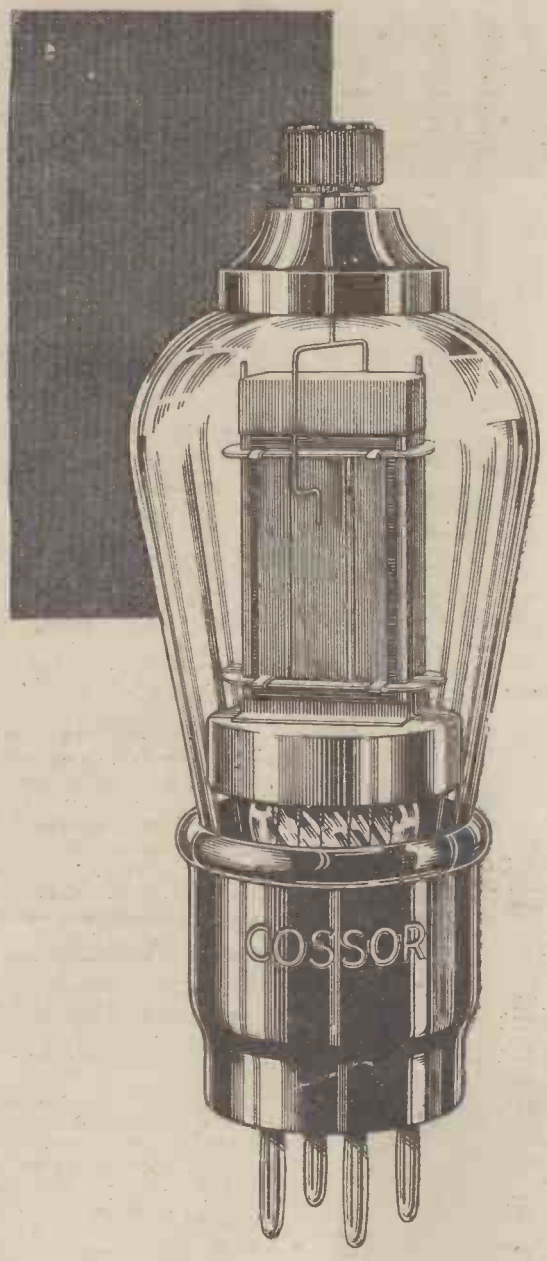

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Cossor 215 S.G. 2 volts, ·15 amp. Impedance 300,000. Amplification Factor 330. Mutual Conductance 1·1 m.a/v. Normal working Anode Volts 120. Positive Voltage on Screen 60-80. Price **20/-**

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YOUR LAST CHANCE
"LAUGH CLOWN, LAUGH"
"DIAGONALISATION"
A SHREWD HIT.

RADIO NOTES & NEWS

OSLO ON LONG WAVES
MORE NEW STATIONS
A HORNET'S NEST
"RADIO PARADISE"

Your Last Chance.

WALK up! Walk up! This is positively your last chance of seeing the National Radio Exhibition, which closes its doors at Olympia on Saturday, 27th inst.

The "P.W." Stand is No. 5, and you can't miss it, for it is just inside the main entrance. There you will find some of the original models of "P.W." sets laid out for inspection, so come in and see them, and tell us all about your radio troubles before the show closes on Saturday.

Where Wireless Scores.

WHAT I like about the Radio Show is that it is really democratic, nice and "middle-brow."

You have the high-brows, you have the low-brows and the host of "in-betweens." If you compare the Radio Show with the Motor Show or any other you will realise that—rough-hew it how we will—we hit upon the world's finest pastime when we chose radio.

Radio as a Hobby.

IF anything could give radio as a hobby the final and finishing attraction it's the way the little ladies are taking it up. They swarm over Olympia as though it were a millinery show!

That's a splendid sign, of course, but I must admit I find them very distracting! (They look so nice when they smile, don't they?)

"Laugh, Clown Laugh."

BEFORE I say another word I must tender thanks to an unknown reader who signs himself "Since No. 1," for the best laugh I have had for many a day. He sent me a cutting, just a little newspaper cutting, but there were some of the biggest laughs in it I have had for months and months!

It is far too subtle a joke to broadcast, but if you see two fellows hardly able to walk for laughing, digging one another in the ribs, and hugging a newspaper cutting, don't look enviously at them, but come and share the joke with "Since No. 1" and me!

"Ariel's" Correspondence.

SUCH a lot of interesting letters have reached me lately that I cannot possibly reply to all of them at length. I must, however, find space to thank J. L. P. of Newcastle-on-Tyne for the lovely limerick of his, and N. P. S., Hounslow, for a perfectly gorgeous short-wave grouse! Which I am passing on to W. L. S., it being right in his line.)

And also A. V. C., of County Dublin, who comes out strongly on my side in the battle about topping up accumulators with tap-water. Nothing like an Irishman on your side in a scrap.)

Wookey Hole.

BUT I confess that what really put me into a hole with my correspondence was Wookey Hole!

Before we had that broadcast from there I admitted that I did not know where Wookey Hole was. And straightway arose thousands of good fellows, grabbed pen and paper, and told me all about that wonderful spot, how to get there, and even what to wear!

It must be a magical spot, for all the letters breathe kindness and a friendliness that leaves me powerless to reply adequately to any of them. Included were two perfectly charming invitations from warm-hearted Somerset folk to visit them if ever I went that way, so I am carefully keeping those letters in the hope that one day I shall be able to wend Wookey-wards.

"Diagonalisation."

THAT is an ugly-looking word, which the B.B.C. now use to cover up giving you last night's programme all over again from a different station!

And if ever you feel really mad about it and would like to write them a hot letter on the subject but lack the energy to do so, be of good cheer. For they have been right gallantly ticked off by M. J., of Hampstead, London, N.W.6, who sent the Editor a copy of his letter to the B.B.C. together with their reply. M. J. smote them hip and thigh, and he got in a specially shrewd crack over their complacency about the increase in licences.

A Shrewd Hit.

WHEN anyone complains of the programmes the B.B.C. invariably point to the licence figures and say that the continual increases show that the public is satisfied. But M. J.—who is in the wireless trade and knows what he is talking about—points out that the tendency is towards buying powerful receivers for

(Continued on next page.)

STARTING ON A "P.W." ARTICLE?

Here is a recent portrait of Sir Oliver Lodge, F.R.S., at work in the open air at his home, near Salisbury. No doubt many of "P.W.'s" articles from our Scientific Adviser have been dictated in this way.

RADIO NOTES AND NEWS

(*Continued from previous page.*)

the express purpose of reaching out for *foreign transmissions* as a welcome relief from the English ones!

He says the would-be purchaser always wants to know the number of foreign stations a set might be expected to pick up. And the official B.B.C. reply does not parry that shrewd stroke!

Corked Programmes.

ACCORDING to the "Irish Independent" the local broadcasting side of the Cork station is to be closed down. For a long time a locally contributed programme of musical and other items has been sent out once a week, while the rest was provided from Dublin, but this costs too much, and in future the Cork station will simply uncork Dublin.

League of Nations Wireless Station.

AGREEMENT has now been reached upon the terms of a contract for the construction near Geneva for the League of Nations of a short-wave transmitting and receiving station. The contract has now been submitted to the Secretary-General of the League. Apart from its telegraphic activities the station is going to send out ordinary broadcasting programmes on high power, so further developments are awaited with keen interest.

Railway Radio.

THIS railway radio has always been full of possibilities, and the other day a Canadian passenger got a great kick out of it. He was travelling on the International Limited, one of the Montreal expresses, and when bowling along at sixty-five miles an hour he picked up the telephone in his compartment and said "Hello" to the Assistant General Manager of the L.N.E.R. here in Great Britain.

Reception was perfect, and this must have been one of the most remarkable transatlantic telephone talks ever accomplished, for the voices were as clear as in an ordinary office to office tête-à-tête.

Oslo on Long Waves.

DO not be surprised if you hear Oslo on 1,071 metres, for although this wavelength has been used by Hilversum it was allotted to Norway originally, and Oslo has designs on it. Although the Oslo transmissions are received well in this country they have been very disappointing in Norway, where the whole broadcast system is being revised and several new stations are cropping up.

If Oslo decides to stick to 1,071 metres the present wave-length of 493 metres will go to Nidaros.

More New Stations.

SO many new stations are coming on the air, or are promised shortly, that it is difficult to keep track of all of them. One of the most interesting is that at the Vatican, which has been installed under the direction of Marquis Marconi.

In addition to the real newcomers there are plenty of the old ones increasing their power (including big jumps from 1 kw. to 15 kw.) a short-waver for Calcutta, and probably a big increase of power for Radio Paris.

Germany, Too!

THE report that the Frankfurt station was to be replaced by a very high-power transmitter was denied, but the Germans are increasing the power of Konigswusterhausen, Zeesen, from 45 to 50 kw. Another interesting newcomer is Raszyn, a station that is situated about twenty miles from Warsaw, and said to be already testing.

Finland's station Viipuri, has increased the power of its 291-metre transmission from just under ½ kw. to 10 kw.

Radio for the River Police.

THE success of the radio equipment of the Flying Squad has caused Scotland Yard to consider the extension of radio to the Thames Police Motor launches. Short waves are proposed, and the predatory river rats are already said to be shivering over this latest proposal.

SHORT WAVES.

Broadcast from Airship.—A high-witness account.—"Daily Mirror."

* * *

A SIMPLER WAY.

The B.B.C. are having a well bored at their new headquarters. They ought to let it listen to a few "talks."—"Bulletin & Scots Pictorial."

* * *

Husband: "Look, my dear, I've brought home a crystal set."
Wife: "Oh! For my dressing-table?"
Husband: "No, it's a radio."
Wife: "Brute!"

"Wireless Weekly."

A BOLT FROM THE BLUE.

A longish arm has old man Law,
Yet motor-bandits mock it;
He's now a radio in his paw,
Or rather in his pocket.

The battery is small and neat,
And to each "cop" they'll hand it!
He'll listen in upon his beat
And catch a motor bandit.

But should his radio chance to roam
And reach some well-known station,
He might imagine he's at home,
To the bandit's great elation.

But the "man in blue" can stand the test
He's quite immune to flattery;
If you should biff him on the vest
'Twould be assault and "battery."

—"News of the World."

* * *

We can't help thinking what a boon radio would have been to King Solomon:
"Good-night, my dears, Good-night!"

A Romance of Business.

FEW people who read a brief announcement to the effect that "Oldhams," the famous accumulator firm, had been affiliated with the U.S.L. Battery Corporation, of Niagara Falls, realised that behind that statement there lies a romance of the radio trade.

The U.S.L. Corporation has huge American interests, and under the new arrangements their research and technical experience will be at the disposal of "Oldhams U.S.L. Products," as the British firm will be called. But the latter remains 100 per cent British—capital and labour—and Mr. John Oldham will still be in control.

The Old Firm.

THERE has always been an Oldham at the head of the firm ever since it was founded in 1865, and that's saying something in these days of big company finance. Accumulators are only one side of the firm's activities, and as a matter of fact about 200,000 Oldham electric miner's lamps are in use daily in this country! I can't help feeling glad that as a result of this deal the old firm isn't going to sacrifice the personal touch, but is still going to be really and truly—"Oldhams."

A Hornet's Nest.

YES—a hornet's nest! That's what I stirred up the other week when I said a few kind words about not receiving signals on an earthed aerial.

Apparently the whole country is thick with people who habitually do it, and get away with it. And some of them actually state that it *improves* their reception. Well, it goes to show how unsafe it is to generalise in radio.

Using Earthed Aerials.

TAKE the case of H. G. (Hatfield Peveril), for instance. He goes away for a fortnight's holiday, earths his aerial before going, comes back and has the wireless going for nearly a week.

Then he reads my reply to J. A. (West Hartlepool), remembers his own aerial, and finds it is *still earthed!* Puts that right, and finds that it makes not the slightest difference.

Moreover, his wife bears him out in this, so all I can do is to record my astonishment, and the fact that when I earth my aerial, bang go nearly all the stations! (The local comes through, but as for continental or long-distance reception, I just say good-bye to all that!)

"Radio Paradise."

SOUNDS good, doesn't it? But that is what W.C.L. found when he left his New Southgate home for a holiday with a "P.W." "Tiny" Two.

"I stayed at a farm on Exmoor, near Porlock Weir. With a 50-ft. aerial, heaved up into a tree, I gathered in the following stations on two pairs of 'phones," he says.

Plenty to Do.

ON second thoughts, I won't give you his list because it looks like a world tour, but I ought to say that no less than fifteen stations were marked with a footnote, saying they would probably have worked a loud speaker with another valve and more H.T.!

Selectivity was "knife-edged," but what surprised W.G.L. was that the farm is some hundreds of feet below sea level in a coombe, and he thought it should be screened from the Continentals. Good old "Tiny" Two!

His Good Earth.

WAY out in the backwoods of America the newspapers have unearthed a radio listener, named Pierce, who has tuned-in 740 different stations from all over the world. He attributed his success to his carefully-thought-out earth.

This consists of 15 pipes embedded in the ground in a circle, 3 ft. in diameter, with a leaky Ford radiator in the centre to keep the ground damp. Pierce admits that he had a lot of trouble in thinking the idea out, and that filling up the old Ford every time you want to listen-in is no joke. But he claims that the results are worth the trouble taken!

ARIEL.

PROGRAMME EXCHANGES

By Capt. P. P. ECKERSLEY M.I.E.E.

I NOTICED the other day that we were to hear a talk by Colonel Lindbergh. He was to speak from America; we were to hear his speech "relayed."

I find my set more often silent than active these days, and I have got into a state when I find much of broadcasting tedious and at times vulgar (in the proper sense). But contrary I know, to the reactions of many of my readers, I find talks the more interesting parts of broadcasting.

I did not, however, expect that Colonel Lindbergh would be, per se, as thrilling as his exploits—people who do adventurous things seldom have ability to explain themselves and are seldom original in their intellectual outlook. (This is no sneer. It is a fact.) But there are exceptions, and I was eager to hear what sort of a job Colonel Lindbergh would make.

Should be Called "Experimental."

I was not altogether surprised when I was told that "owing to atmospheric conditions" we were unable to hear Colonel Lindbergh; what particularly surprised me, however, was the fact that the "Radio Times" printed the item as if it was as certain we should hear him as it was certain we should hear the second general news.

I think these short-wave relays should be, for the time being at any rate, treated as "experimental." As I have so often said, there is still to-day no one hundred per cent guarantee of communication, perhaps eighty per cent of the time, yes, but with the present arrangements, not one hundred per cent.

If these broadcasts are not to be labelled experimental it puts the engineers in an invidious position, people not unnaturally think that the technical arrangements have failed through carelessness or bad management. This is not so.

Absolute Guarantee Impossible.

No engineer on earth can guarantee communication by a single channel of short-wave telephony one hundred per cent of the time of working. That is why I have been careful always to adopt an attitude of caution vis à vis the inter-continental link.

An attitude which has been characterised as conservative, backward, or foolish. At any rate, so long as I remained with the B.B.C. I tried to see to it that all stunts of this kind were very carefully labelled "experimental."

Our Radio Consultant-in-Chief, who was, of course, Chief Engineer of the B.B.C. for many years, has something very outspoken to say in regard to inter-continental relays.

I expect the engineers have been forced into a false position—the example shows them the way out—or it may be that they were not consulted and past reliability was taken as a guarantee of continuance—a compliment to the Heaviside Layer!

It amused me very much to see other reactions. I read a magazine which stated how well and clearly Colonel Lindbergh was heard. How interesting was his speech and so on and so forth. *O tempora! O mores!* What does it mean when things get like this?

Are people interested in anything that they can hack out meaningless stuff like this, or is it the drive of money-making forcing writers into such false positions? But this by the way; the moral of the story is that it is only decent that people should be careful to distinguish between service and stunt.

The point I wish to make à propos is that there are certain groups continuously developing the inter-continental telephone and they are seeking, above all things, reliability.

Likely as not long, longer, short, shorter and ultra-short waves helping, a practically one hundred per cent reliable service will be established some time in the near future.

The Present Difficulties.

The B.B.C. policy should be to co-operate as closely as possible with those developing the inter-continental telephone. Once developed, the B.B.C. could hire the link as occasion arose, just as to-day they hire land-lines.

There would then be possibly no need to label the inter-continental items experimental, because the chances of failure might be as small as those when to-day they hire a line. But to-day, owing to all sorts of muddle, the B.B.C. is not even able to use all the facilities available to the maximum advantage.

The Post Office will not allow such and such a channel, maybe, or one American group cannot be associated with another which might supply a line. The Marconi multi-plex beam service is not to be used because it is "experimental," and so forth.

When and if the inter-continental telephone works, then there is a clear case for printing items in the "Radio Times," whether they originate in an aeroplane over Minneapolis or a toboggan in the San Jak of Novi Bazar.

The B.B.C. need spend neither time nor money to-day in developing the inter-continental telephone; it is being done for them. And when it is done what shall we be allowed to hear? President Hoover tied to caution by the fact of office, or Al Smith

(*Continued on page* 140.)

DON SWITCHES ON

Don Bradman, the young Australian cricket star, enjoys a radio item on his portable during an interval of play.

A GREAT IMPROVEMENT.

The Talks arranged by the B.B.C. for the coming months promise to be really interesting, and below are some details of this new and better series.

By THE EDITOR.

THE new talks programme, now getting into its swing, is probably the best yet prepared by the B.B.C. The first series mentioned in the official booklet is "Science and Religion." On Sundays, from 5.45. to 6.15 p.m., twelve of the most eminent thinkers in the country will discuss and explain their own personal interpretations of the relation of science to religion. The Bishop of Birmingham, the Dean of St. Paul's, Professor Julian Huxley, Sir Arthur Eddington, Dr. J. S. Haldane, and the Dean of Canterbury are among the contributors to the series.

The Morning Talks.

In the morning talks, at 10.45, several new features have been introduced. Talks by Mrs. Oliver Strachey on "Reading for Fun," and those by various speakers on "Strange Peoples and Places," will be welcomed by listeners whose tastes lie in the direction of literature or travel. "The Trials of a Family" is the title of a series being given on Thursday mornings, when children's diets, their physical and mental health, and how to avoid many troubles by care in the early years, will be discussed by experts in the different branches of Child Welfare Work. On Wednesday mornings the series by women M.P.'s is continued, and talks on purely household matters, such as dressmaking, hobbies and handicrafts, are being given as usual.

Gardening and household affairs again occupy alternate Friday evenings at 6 p.m., while a series is being given monthly on Wednesdays by Mr. J. W. Robertson-Scott, on "Going to Live in the Country." Modern poetry will be read weekly at 6 p.m. on Mondays, and on Thursdays Mr. V. C. Clinton Baddeley is reading from Dickens' "David Copperfield."

Re-arranging the Critics

There has been a re-arrangement of the critics' talks at 7 o'clock. A weekly talk on general literature on Mondays will be given alternately by Mr. Desmond MacCarthy and Miss Sackville West. On Thursdays Mr. Duff Cooper and Mr. Michael Sadleir will give in turn a fortnightly talk on New Novels, which will alternate with a fortnightly talk on the Cinema by Mr. Francis Birrell. On Tuesdays Mr. James Agate will give his usual talks on "Plays and the Theatre" once a fortnight, and there will also be a monthly talk by Major Walter Elliot, M.P., on "The Month in Scotland," and another by Mrs. M. A. Hamilton, M.P., on "The Month in the North Country." Mr. Gerald Heard continues his talks on "This Surprising World," and Mr. Ernest Newman those on "Music Criticism."

Six talks on "The Novels of Thomas Hardy," designed for elementary students of literature, will be broadcast at 7.25 p.m. on Mondays. This series by Mr. Basil Willey will be followed by six talks on "World Order or Downfall," in which Professor Arnold J. Toynbee will discuss the future prospects of international relations, with special reference to the split between economics and politics in international relationships. "Standing Room Only," and "A1 or C3—The Future of the Race," are the titles of two series of talks to be broadcast on Tuesday evenings.

In the first, Professor Carr-Saunders will discuss the effect which population has on such problems as unemployment, emigration, and urbanisation; and in the second, Major Leonard Darwin and Mrs. Mary Adams will examine the question of population from the eugenic point of view, discussing the place of the unfit and the reasons for the fall of the birthrate.

BOYS' BRIGADE BROADCAST

When members of an English Boys' Brigade visited Denmark recently it was arranged that they should meet the boys of a similar Danish movement and broadcast a concert together. Here are the two captains making themselves known before the mike.

On Wednesday nights there will be twelve talks called "Industry Looks Ahead." In this series experts will discuss modern industrial problems, concerning themselves chiefly with the human element in industry and with the great changes that are taking place in the management and organisation of industry. Sir Joseph Stamp, Dr. Sargant Florence, Lord Amulree and others will take part in this series.

"The Dark Continent."

On Thursday evenings an experiment is being tried in six international conversations. Representatives of six different foreign countries will discuss national differences and characteristics with representatives of this country. These conversations will be followed by a series of talks by Professor Ernest Barker on "What is Liberty?"

On Fridays experts are going to discuss and describe "The Dark Continent"; and on Saturdays there will be the usual talks on "The Week's Work in the Garden," at 7.20 p.m.

Two series of talks will be broadcast from Daventry, 1554·4 metres only, on Tuesdays at 8 o'clock. Dr. Cyril Burt will follow his popular series on "The Study of the Mind" with six talks on "The Mind of a Child." After Dr. Burt, Sir James Jeans will talk about "The Stars in their Courses."

In the London and Midland Regional programme on Mondays and Wednesdays, half an hour, from 8.0 to 8.30 p.m., will be devoted to language talks. On Mondays, besides giving readings for more advanced students, M. Stéphan will attempt to teach French to beginners. Mr. Otto Siepmann will continue his weekly German language talks on Wednesdays.

On Fridays, at 8.30 p.m., there will be six talks by Mr. J. C. Squire on "The Enjoyment of Words," followed by six talks by Mr. B. H. C. Matthews on "Electricity in our Bodies." In this series an attempt will be made to demonstrate currents in the body by the use of instruments which convert them into sound, so that listeners can hear them.

On Saturdays there will be a series of readings about great British explorers, under the title of "The Spirit of Adventure."

The late evening talks, generally at 9.20, contain a variety of new subjects, while leaving a considerable space for talks of topical and general interest. On Mondays a very important series will be broadcast on "The Future of Medicine." In these seven talks experts will explain the latest developments in various different departments of medicine. The series will be started by Sir George Newman, the Chief Medical Officer of the Ministry of Health and Board of Education, on "Medicine and the State." Among others who follow him are Lord Moynihan, on "Surgery," and Professor Russ, on "Radiology," and the series will be summed up by Sir Humphrey Rolleston.

An Important Symposium.

On Tuesday evenings Sir Walford Davies needs no introduction on his return to his evening series on "Music and the Ordinary Listener."

If suitable arrangements can be made a symposium of vital topical interest and importance, which will include different points of view on "Trade Within the Empire," will be given on Thursdays.

On the whole this new programme of talks is a great improvement on the B.B.C.'s past efforts. Undoubtedly the talks department at Savoy Hill has benefited by the strong criticisms which marked a "campaign" against dull talks in the Press some months ago.

Many of the talks subjects mentioned above have not only considerable interest value, but—more important—entertainment value.

There still remains, of course, the question of the suitability of some of the "talkers" for microphone purposes, and if the method of treatment and attractiveness of actual delivery is as reasonably good as the subjects chosen, then the new talks programmes is assured of success.

MORE ABOUT THE EXHIBITION

The conclusion of a detailed description of the exhibits at Olympia. The Radio Exhibition remains open from 11 a.m. to 10 p.m. on week-days until September 27th. Don't forget to visit "P.W." at Stand No. 5.

GENERAL ELECTRIC CO., LTD.
Stand No. 68.

The most important exhibit here is the "Osram Music Magnet Four." This is certain to create a tremendous amount of interest. Every radio enthusiast will remember the "Osram Music Magnet Three" valve receiver as being one of the most satisfactory kit sets ever produced.

The "Music Magnet Four" bids fair to be even more popular. It is available only in kits of parts for home assembly and of course, these kits include the necessary Osram valves.

It is a very easy set to assemble, quite surprisingly so in fact, and this is mainly due to the three complete and wired units which comprise main portions of the

The display of Wearite components (Wright and Weaire) includes mains chokes, and transformers.

set. The "Music Magnet Four" is a very powerful receiver, and it possesses an unusually high degree of selectivity.

However, the three tuned stages are controlled by a slow-motion condenser, thus giving a one-knob control, and a differential condenser provides an adjustment of reaction.

You will also have an opportunity of seeing the G.E.C. moving-coil loud speaker, a somewhat newcomer, but one which has already jumped into the front rank.

Among the complete receiving sets shown are the Gecophone All-electric three-valve receiver, and a Gecophone All-electric four-valve set for A.C. mains. Both of these are quite new and incorporate many attractive features.

The Chloride Co. are showing a particularly wide range of their Exide accumulators.

Rather more ambitious is the Gecophone All-electric Radio-gramophone for A.C., which employs two screened grid H.F. valves. There is an electrically-driven gramophone turn-table, and a moving-coil speaker.

Reverting to the loud speaker exhibits, we also have at this stand a Gecophone Inductor Dynamic loud speaker, which operates on an entirely new principle and is said to be an immense improvement on the ordinary cone type. Certainly the G.E.C. people have a feast of good things in their display.

GRAHAM AMPLION, LTD.
Stand No. 62.

There is a comprehensive display of Graham Amplion loud speakers, and you will see many of

One of the fine Amplion receivers that can be examined at the Graham-Amplion stand.

those models which have been reviewed in the past few months in "P.W."

The Amplion Console Cabinet set is on show for the first time. This fine receiver has a built-in frame aerial, but as it has two stages of screened grid and a pentode output valve, properly arranged, its range of reception is very extensive.

It is to be marketed in two forms, in the one it can be stood upon a table, while in the other case it will have an independent frame of its own, so that it can be used as a separate piece of furniture.

It is interesting to note that this outfit derives both its H.T. and grid bias from the mains, and that a trickle charger is incorporated which will automatically come into operation when the set is switched off, and which will compensate the L.T. accumulator over and above the current consumed by the set.

And you should not miss the Amplion Two-valve All-mains receiver, a particularly neat little affair. Although sold at a modest price it incorporates every modern refinement, even including a pick-up plug-in, while there are large chokes to supply efficient smoothing.

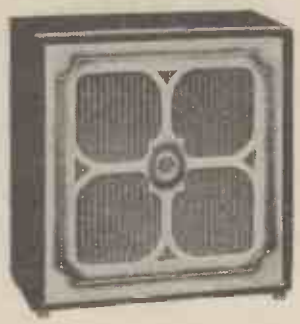
GRAHAM FARRISH, LTD.
Stands Nos. 76 and 108.

These people specialise in resistances, R.C.C. units, and such like components. They have some fine gear in the way of L.F. coupling arrangements and mains devices, and this is a stand which will appeal strongly to the home constructor.

GROSVENOR ELECTRIC BATTERIES, LTD.
Stand No. 263.

Here is to be seen an entirely new battery which is known as the Grosvenor Straight Line High Test Battery. This new battery is said to be "ten times tested," so that complete reliability can be guaranteed.

In addition to this there is a wide range of other Grosvenor batteries for H.T. and grid-bias purposes,



The Camco Triumph loud speaker cabinet, shown by Carrington's.

including a series of specially constructed Grosvenor straight line batteries suitable for fitting to all types of portable sets, the dimensions conforming to those originally fitted in the manufactured sets.

GRIPSO CO., LTD.
Stand No. 202.

Here are terminals, switches, connectors, and other useful items.

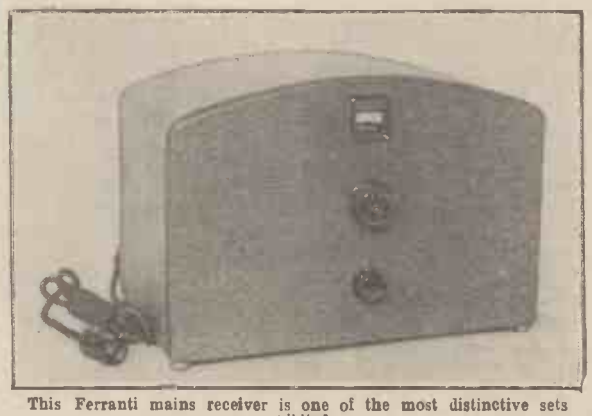
H.S.P. WIRELESS CO.
Stand No. 122.

Attractive portable receivers both of the suit-case and cabinet types.

HARLIE BROS. (EDMONTON) LTD.
Stand No. 141.

A new pick-up, an electric gramophone motor, a moving-coil speaker, and a gramophone adaptor, are features here.

(Continued on next page).



This Ferranti mains receiver is one of the most distinctive sets exhibited.

MORE ABOUT THE EXHIBITION.

(Continued from previous page.)

A. H. HUNT, LTD.
Stand No. 133.

The well-known Croydon concern with attractively designed meters, etc.

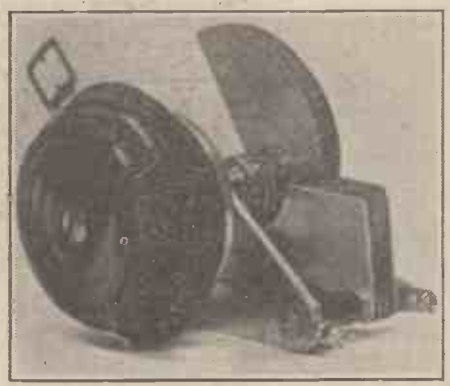
HUSTLER, SIMPSON & WEBB.
Stand No. 247.

A two-valve set, complete with valves, for 50s., sounds a quite impossible proposition, and yet such a thing is to be seen on this stand, for it forms the main exhibit.

At the moment of writing we cannot say much about it, but we do advise "P.W." readers to go along and collect any literature that may be going.

IGRANIC ELECTRIC CO., LTD.
Stand No. 240.

Constructors should not forget to pay a visit to this stand in order to see the new Igranic slow-motion dials that have just been produced for retailing at very attractive prices. These dials are excellent to



A "Utility" variable condenser included in the Wilkins and Wright display.

handle and excellent to look at, but they constitute only one feature of a most comprehensive display in which you will locate such old friends as the Igranic Indigraph, Pre-set condenser, all types of rectifiers, etc. Also, there are some fine sets including the famous Igranic Neutrosonic outfit.

JACKSON BROS.
Stand No. 63.

Here you will see a truly magnificent array of variable condensers and associated equipment, and the "true-tuning" S.L.F. models of the simple type are every bit as interesting as the complete ganged units on show.

A new neutralising condenser and Tiny, a variable fitted with slow-motion and specially designed for portable receivers, are also exhibited.

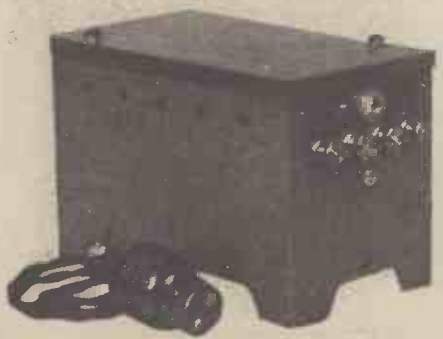
Then there are special short-wave variables and the Chassimount Drum-Thumb dial condensers, which should be inspected by all constructors.

JEWEL PEN CO., LTD.
Stand No. 138.

Red Diamond radio components are, of course, featured here and these include the Crystal Detector, wall plugs for loud speakers, and other such lines which will doubtless be familiar to most "P.W." readers.

JUNIT MANUFACTURING CO., LTD.
Stand No. 65.

On this stand you will see the new Junit mains units. There are three types, viz.: Type 120/T.C.,



A mains unit to be seen at the Burndept stand.

which gives 120 volts at 20 milliamperes H.T. and includes a trickle charger; type 120, a straightforward H.T. unit, and Type 150/4 A.C. which is an A.C. H.T. unit, having a four-volt centre-tapped winding for supplying filament current to A.C. valves.

KOLSTER-BRANDES, LTD.
Stand No. 55.

Some new radio-gramophone outfits, including a magnificent affair embodying a double turn-table and suitable for public demonstations or house parties, etc.

The Climax people are exhibiting their aerial and earth equipment as well as mains apparatus.

LAMPLUGH, LTD.
Stand No. 124.

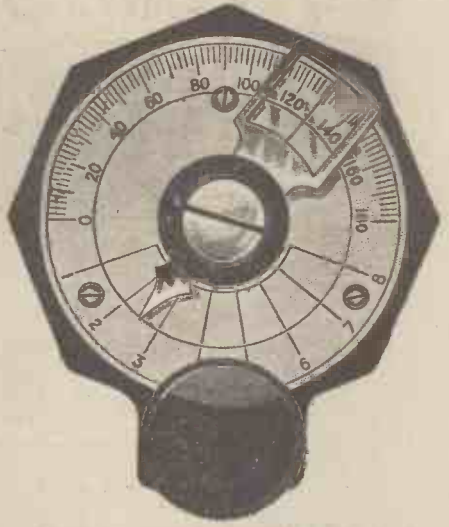
The centre of attraction in this display is the Silver Ghost Inductor dynamic loud speaker, which embodies a new principle in the way of a movement.

There are also some fine sets to be seen on the Lamplugh stand, including an all-mains A.C. receiver, models of which we note with interest are fitted with Inductor-Dynamic speakers. There are also battery-operated receivers, and the Chassirad Popular Three, which is a three-valve receiver, built on an all-enclosed chassis having a special enamel finish.

An entirely new instrument shown is the Lamplugh All-Mains A.C. power unit.

LECTRO-LINX, LTD.
Stand No. 131.

You would think that everything in the way of valve holders had been done a long while ago, but



The famous Ormond slow-motion dial is, of course, displayed at Olympia.

the Lectro-Linx people are able to show a valve holder of a quite new design.

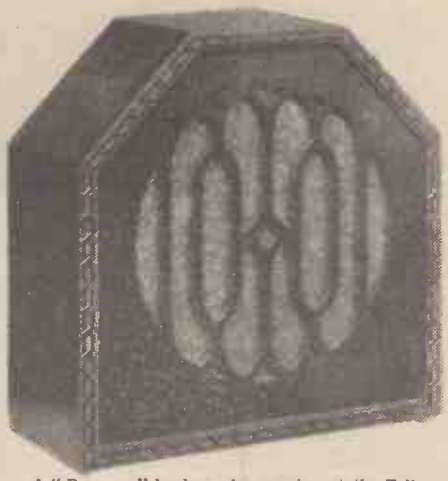
And at this stand you will also be able to see the various wander plugs and other such devices which incorporate an improved principle of resilience which undoubtedly has a number of real advantages.

LEVER (TRIX), LTD.
Stand No. 249.

Power amplifiers, mains units, portable sets and various radio components.

LISSEN, LTD.
Stand No. 40.

Here is a radio exhibition in itself. There is little in the way of radio that Messrs. Lissen are not making these days, from terminals to complete radio-gram



A "Puravox" loud-speaker on view at the Falk, Stadelmann stand.

outfits, and you may be sure that the gear is all, as usual, admirably displayed.

Take particular note of that nice little two-valve radio-gramophone which is now available in oak and walnut finish, and which can be used for either battery operation or for running off A.C. mains (in which case an electric motor is incorporated).

There is also the popular two-valve transportable Lissen with facilities for being operated by either batteries or A.C. mains.

And for the first time at Olympia the Lissen balanced-armature loud speaker is shown in an oak cabinet.

In illustration of their wide activities, Messrs. Lissen are displaying a selection of bakelite mouldings and die castings such as they manufacture for the trade.

W. & T. LOCK, LTD.
Stand No. 132.

A complete range of Kabilok cabinets to meet the needs of home constructors. Radio gramophone cabinets and pedestal cabinets for receivers and loud speakers are on show, including loud-speaker cabinets suitable for all the well-known cone and moving-coil units.

A special feature of the Lock loud-speaker cabinets, by the way, is the provision of substantial baffle-boards behind the grilles.

LOEWE RADIO CO., LTD.
Stand No. 207.

The Loewe people are exhibiting their new four-pole cone loud speaker which they say is the result of laboratory work covering a period of a number of years. It is built into a wooden cabinet with a front panel of genuine Caucasian walnut and completed with a pleated silk centre.

It is certainly a most handsome instrument. At this stand constructors will also have the opportunity of examining the wonderful multi-electrode valve and the Loewe Radio high vacuum resistances and fixed condensers.

LONDON ELECTRIC WIRE CO. & SMITHS, LTD.
Stand No. 41.

An array of components of particular interest to the home constructor. The Lewcos people make extremely efficient coils for all purposes, from ordinary plug-in to dual range six-pin types, and we are

(Continued on next page.)

A Peto-Scott cabinet into which you can slide a home-constructed panel and baseboard receiver.

MORE ABOUT THE EXHIBITION.

(Continued from previous page.)

sure that most "P.W." readers will linger a good while examining them.

They should make particular note of the Lewcos dual-screen-coil-unit, which comprises a dual range aerial coil H.F. transformer, and is designed for S.G. circuits.

The coils are astatically wound and surrounded by a nickel screen, with switch mechanism built in.

The Lewcos L.F. transformers and L.F. chokes and anode resistances are displayed.

MARCONIPHONE CO., LTD.
Stands No. 38 and No. 120.

Complete sets, valves, mains units, batteries and loud speakers are on view. The range of valves

One of the most interesting components on show—a "Parex" screened-grid valve holder (Paroussi).

exhibited is most comprehensive, and includes some very interesting additions recently made. The indirectly and directly heated mains valves and the rectifying valves make a really imposing assembly.

Among the receivers is the Marconiphone model 47, a four-valve receiver for use on any type of mains. There is also a five embodying mains equipment. Among the mains units is the model which is capable of supplying H.T. up to 200 volts at 50 milliamps. Further, it gives you 8 and four volts up to three amps. L.T.

MONTAGUE RADIO INVENTIONS AND DEVELOPMENT CO., LTD.
Stand No. 143.

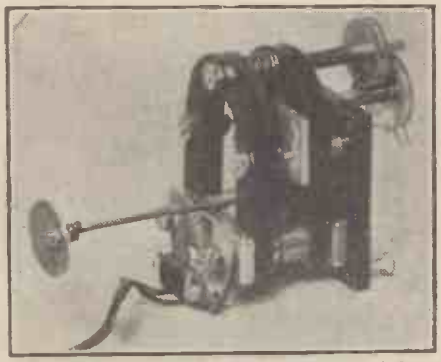
Beethoven portable sets, including one that embodies the Montague constant reaction circuit.

MULLARD WIRELESS SERVICE CO., LTD.
Stand No. 36.

Mullards are, as usual, very strikingly represented. In addition to their main large stand, on which is displayed a complete range of Mullard products, receiving valves for both battery and mains operation, rectifiers, and special valves for transmitting, etc., and accessories, they have a "Radio for the Million" stand in the gallery, from which that enterprising journal will be sold. Also the latest circuits and receivers are displayed upon this stand.

Additionally Mullards have a large demonstration room attractively decorated and illuminated. At the one end of this is a raised dais or miniature

Many fascinating and very useful gadgets, such as the above switch and fuse-holder, are displayed on the Bulgin stand.



The Wates Star loud-speaker unit, both independently and built into speakers and sets, can be inspected at the Standard Battery Co.'s stand.

stage upon which the new Radio for the Million receivers and Mullard loud speakers are being set up for demonstration. We cannot help feeling that there is nothing the Mullard people like better than an exhibition. They certainly do let themselves go to good effect, and they earn our hearty thanks for the brightness they yearly contribute to Olympia.

MURPHY RADIO, LTD.
Stand No. 252.

Here you will be able to examine the Murphy radio portable, a four-valve screened-grid outfit, that seems to bristle with good points. For instance, it has a single tuning control, the circuits being completely ganged and calibrated in wave-lengths.

You can plug a gramophone pick-up jack into this set and the receiver has excellent selectivity: it is said that the twin transmissions can be cut out and foreign stations received at the very gates of Brooknams Park.

NATIONAL ACCUMULATOR CO., LTD.
Stand No. 39.

If you want to see an accumulator that "speaks for itself" do not pass by this display. Certain of the National accumulators incorporate a most ingenious

The Marconiphone Co. are showing the above compact moving-coil loud speaker.

adaptation of the hydrometer principle which enables you to see at a glance exactly in what condition a cell happens to be at any particular moment. Thus you know at once when the time has arrived for recharging according to the position of little indicators.

NEW LONDON ELECTRON WORKS, LTD.
Stand No. 34.

We all use aerials of some kind, and there will be few of us that are not moved to some extent by the claims of Superial, which are so enterprisingly advanced at this particular stand.

OLDHAM & SON, LTD.
Stand No. 64.

Here is shown a new range of Oldham batteries in three sizes. The design of these cells is an entirely new idea in the manufacture of slow discharge accumulators. There are, in addition, no less than sixteen different models of unspillable accumulators in celluloid cases.

Another exhibit is the air-spaced H.T. accumulator which is available in two sizes.

Accumulator plates, terminals, and spare parts complete a most interesting and attractive display.

ORMOND ENGINEERING CO., LTD.
Stand No. 75.

A very fine range of variable condensers, including quite new slow-motion types. There is a new Ormond Corner Cabinet loud speaker, and the Ormond Four oak cabinet set, making their first appearance.

The existing Ormond lines make an impressive display, and the Ormond Console radio gramophones, and the Suitcase Four are well worth close examination if you do not happen to have given them this on some previous occasion.

P.R. PRODUCTS.
Stand No. 224.

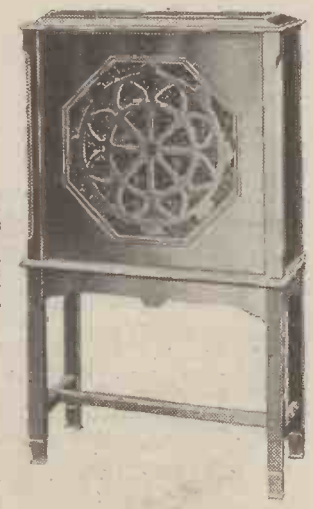
Here can be seen a range of P.R. valves.

PANDONA, LTD.
Stand No. 218.

Portable sets and a five-valve radio-gramophone.

PAROUSSI, LTD.
Stand No. 227.

Various screens and screening boxes suitable for all "P.W." sets, can be seen at this stand, together with



Included in the Celestion display is this Celestrola moving-coil speaker, as well as entirely new instruments.

valve holders and various coils, chokes, and other Parex products.

PERFECTAVOX, LTD.
Stand No. 241.

Inductance types of electric gramophone motors, a new type of pick-up and a moving-coil loud speaker are to be found in the Perfectavox radio-gramophone.

PERTRIX, LTD.
Stand No. 243.

A complete range of the various Pertrix batteries, which include H.T. and G.B. dry batteries, and a fine array of accumulators.

PETO-SCOTT, LTD.
Stand No. 110.

Radio-gramophone outfits and various receivers.

PIONEER MFG. CO., LTD.
Stand No. 226.

Constructors should pay particular attention to the pioneer switches for these incorporate excellent features.

PYE RADIO, LTD.
Stands No. 31 and No. 32.

Here you will see the famous Pye portable set which has sold in great numbers. Pye's also have

(Continued on next page).

A Lotus all-mains transportable set exhibited by Messrs. Garnett, Whiteley.

MORE ABOUT THE EXHIBITION.

(Continued from previous page.)

loud speakers, battery chargers, H.T. batteries, and various radio components on view.

QUEST RADIO MFG. CO.
Stand No. 238.

The activities of this concern will be better known to "P.W." readers under the name of Ready Radio, those enterprising enthusiasts who are always there with complete set kits nicely got up as soon as "P.W." has published details.

And you will generally find that in every kit of parts Messrs. Ready Radio are able to include a number of their own fine components, which are competitive in price with the cheap foreigners, as well as being competitive with the best English gear in point of quality.

Constructors should particularly note the Ready Radio Brookmans condensers and their differential condenser which they added to their range some few months ago.

RADIO INSTRUMENTS, LTD.
Stand No. 61.

The "Madrigal" four-valver makes its bow. And what a set! Two stages of screened grid, a moving-coil loud speaker, all driven from the mains. We have had an opportunity of hearing the "Madrigal" Four, and it certainly is a fine receiver.

A popular component on view at the Brownie stand, where also Dominion Mainsets are to be seen.

It pulls the Continentals in at tremendous strength, while it has the high selectivity necessary before one can really enjoy DX reception.

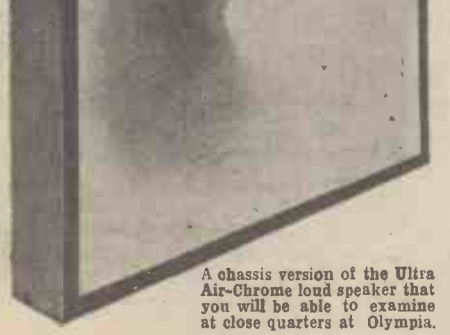
Messrs. R.I. are also showing an improved three-valve all-electric set which incorporates a screened grid and pentode, both of the A.C. variety.

The new R.I. H.T. units are, of course, on view, as well as the famous Hypermu and Hypermite L.F. transformers, and the Hypercore choke.

Some fine mains gear of particular interest to home constructors is displayed.

REDFERN'S RUBBER WORKS, LTD.
Stand No. 204.

Ebonart and Bulwark radio panels and various ebonite formers, sectional rod, lead-in tubes, etc.



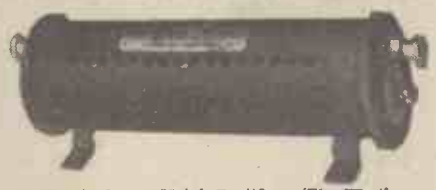
A chassis version of the Ultra Air-Chrome loud speaker that you will be able to examine at close quarters at Olympia.

RED STAR RADIO, LTD.
Stand No. 109.

Two- and three-valve receivers which retail at abnormally low prices are the "star" attractions here. They are sets produced on true mass production lines, although they lose nothing of their individuality of appearance in that.

REGENT RADIO SUPPLY CO.
Stand No. 51.

Make a point of examining the Regentone mains units when at the show, for they include some of the best instruments that are available. The Regentone people were the first in the field with combined units for portable sets, and they still hold a leading position in this line.



A Westinghouse Metal Rectifier (The Westinghouse Brake and Saxby Signalling Co.).

There is only one Regentone receiver, and this is a four-valve A.C. mains-operated set. It is a particularly striking design. It employs two stages of H.F. and there are three tuned circuits, reduced to true single-knob tuning.

And we must not forget to mention the Regentstat, which is one of the few satisfactory variable resistances capable of handling heavy currents.

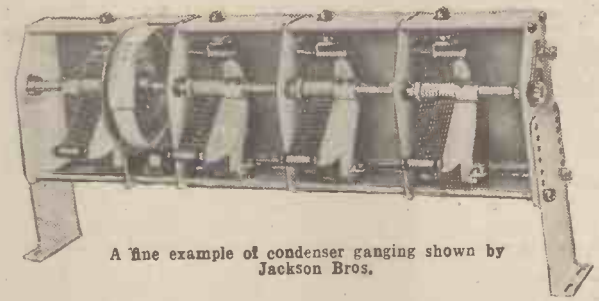
If you have the power mains and you visit Olympia, do not forget to set aside plenty of time for examination of the Regentone gear. It is worth it.

SELECTORS, LTD.
Stand No. 114.

A full range of portable and all-electric receivers.

SIEMENS BROS. & CO. LTD.
Stand No. 70.

Prominently featured here are the "Full O'Power" H.T. batteries, of which recently a complete new range was introduced. The special feature of "Full O'Power" batteries is the employment of seamless drawn zinc cylinders, instead of the usual thin plates bent in the form of cylinders, and as the life of an H.T. battery is more or less limited to the life of its zinc (which is gradually eaten away during the chemical process), the importance of this feature will be realised.



A fine example of condenser ganging shown by Jackson Bros.

SIX-SIXTY RADIO CO., LTD.
Stand No. 58.

If you happen to be contemplating the construction of a loud speaker you will be interested in the Six-Sixty loud-speaker assembly, in which is to be found the special Six-Sixty paper for the diaphragm and a special cone surround. A very inexpensive and easy-to-assemble outfit.

But this is not the only item on view, for there is a full range of Six-Sixty valves, which is now a particularly comprehensive one.

THE STANDARD BATTERY CO.
Stand No. 42.

We should not be surprised if these people alter their name again one of these days, for we notice that they are showing an A.C. mains four-valve set which is known as the "Universal," and does not employ batteries of any kind!

Another new line being shown is a pedestal cabinet loud speaker which matches the Wates A.C. four-valve receiver.

The loud speaker is fitted with a Wates Star loud-speaker unit and a 20-in. double cone chassis.

Other items shown are the Wates Star complete speakers, volt-amp. meters, panel-mounting test-meters, Wates Universal double-cone chassis, and the Wates Star pick-up, which is a quite new accessory.

Last, but not least, there are the standard cartridge type of H.T. batteries, but these will be too well known to "P.W." readers to need any further description here.

TANNOY PRODUCTS.
Stand No. 111.

Some fine mains units. There is a Tannoy mains unit for H.T. that uses a chemical rectifier. Mains enthusiasts should be particularly interested in this exhibit, for we believe it is the only one of its kind at Olympia.

There are also Tannoy units with metal rectifiers, and the portable type is a particularly attractive model. This is sufficiently compact to enable it to be used in a portable set in place of the ordinary H.T. battery.

TELEGRAPH CONDENSER CO., LTD.
Stand No. 145.

T.C.C. are showing samples of all their condenser products. The paper and mica dielectric types for radio transmission and reception purposes are to be seen together with high-frequency and high-tension smoothing models.

There is also a very comprehensive range of special types of condensers for set manufacturers. The wonderful electrolytic condensers can be seen on this stand, and it is interesting to note that the T.C.C. people are now able to supply them in models capable of standing up to a working voltage of as high as 100 volts D.C.

They are showing, too, paper condensers from capacities of ·005 mfd. to 2 mfd. manufactured on a non-inductive principle.

As well as their well-known and reliable resistances, etc. (as above), Graham-Farish are showing their new "postage stamp" mica condensers, and improved Electroficient mains transformers and chokes.

TELSEN ELECTRIC CO., LTD.
Stand No. 69.

The new L.F. transformers are shown for the first time, and visitors are also able to inspect the new Telsen valve holders and H.F. chokes.

There are grid leaks and fixed condensers also which are bound to achieve popularity.

TONEX COMPANY.
Stand No. 239.

The Tonex H.F. chokes are exhibited.

TRELLEBORG EBONITE WORKS, LTD.
Stand No. 228.

Turned and machined radio and electrical component parts and accessories, and Trelleborg genuine ebonite, including panels, drum dials, slotted formers, condenser insulators, switch blocks and pillars, etc.

TURNER & CO.
Stand No. 9.

Here you will see Tunewell coils of all types. There are Tunewell loud-speaker units and a complete loud speaker.

ULTRA ELECTRIC, LTD.
Stand No. 77.

Loud-speaker enthusiasts should make a point of examining the Ultra Air-Chrome loud speakers shown here. These are represented in a fine range of models, from a chassis which you can fit into your own cabinet to large handsome affairs complete with their cabinets. The Ultra Air-Chrome has a double linen diaphragm, and really does give wonderful results.

(*Continued on page* 139).

Loud-speaker enthusiasts should be interested in the above moving-coil speaker cabinet included in the W. & T. Lock range.

Denmark's Most Popular Station Described

"Copenhagen Calling"

By OUR OWN CORRESPONDENT.

"Allo, Allo, Her Koebenharns Radiofonistation!"

HOW many thousands of radio listeners, I wonder, have intercepted this characteristic little message of Copenhagen's broadcasting station in its journey through the ether?

Generally, it is preceded by three strokes of a gong, and if one bears in mind that the announcer at this popular Danish broadcaster pronounces his station "Kerpenhowns," no difficulty will be found in identifying these transmissions.

One of the Old Brigade.

The announcer at Copenhagen is rather a conscientious individual. Not only does he intone the above preliminary statement with considerable frequency, but he also lets us know several times in an evening

CONTROLLING CONCERTS

Some of the engineers at work in the control-room.

the wave-length on which his station transmits, together with sundry other details of an appropriate nature.

Perhaps Copenhagen's announcer cherishes a justifiable pride in his station. He ought to do so, at any rate, for this well-known Danish broadcaster is one of the oldest of the Scandinavian telephony transmitters.

A City Site.

Denmark has possessed radio stations of one kind or another since 1911. In May, 1923, however, an Act was passed in virtue of which the control of all wireless transmitting stations passed into the hands of the Danish Post Office authorities, and it was at this time that the regular broadcasting station at Copenhagen was born.

Two years later, the station was modified and enlarged, and it was about that time, I think, that its transmissions came into general prominence.

You would not have any great difficulty in locating the site of Copenhagen's transmitter. It occupies a very conspicuous position in the centre of the town, its two 65-ft. steel lattice masts being situated on the roof of the Copenhagen Central Telegraph building.

The masts support a four-wire T-type aerial, some 80 ft. long and 15 ft. wide. From this aerial system the station's transmissions are normally flung off on a power of 1 kw. and on a 281-metres wave-length.

Linked with Kalundborg.

It will be seen, therefore, that the Copenhagen station is only one of moderate power, but listeners who have picked up its transmissions on one or more occasions will have no hesitation in agreeing with me on the score of the station's thorough working efficiency.

Technically, the transmitting gear at Copenhagen is built upon universally-accepted lines. It was assembled by local engineers, and it is interesting to note that its circuits now embody the feature of crystal control of wave-length.

The control-room of the station contains not only all the studio controls, but also relay boards and amplifiers used in connection with outside broadcasts.

This apartment is very well appointed, for the authorities at the Copenhagen station make a special feature of their outside broadcasts from local theatres, churches, and public halls. The Copenhagen Town Hall belfry now possesses its own microphone, and the chimes, as well as the striking of the hours, may often be heard from here. Generally, the chimes are "put over" on Sundays at about 5 p.m. G.M.T.

Copenhagen relays mainly to the well-known station at Kalundborg, the latter operating on a power of some 10 kw. and a wave-length of 1,153 metres. The power of this station, however, is subject to change.

Other relay stations of Copenhagen are Hjœrring (1,250 m.), Odense (950 m.), and Sorö (2,400 m.). Hjœrring and Odense do not usually give out their own calls, and, therefore, it is difficult for the English listener to identify them. Indeed, these stations are seldom heard by the English amateur owing to their relatively high transmitting wave-lengths.

A Sound Scheme.

There are a number of interesting features about the studio at the Copenhagen station. It is an apartment 52 ft. long and 20 ft. in width. The only portion of it which is completely draped is that situated at the end where the microphones are placed.

The other portion of the studio walls are hung with draperies which are so arranged that they can be pulled backwards and forwards in order to vary the acoustical effect—a procedure which rather reminds one of the manipulation of the blinds in a photographer's studio for the purpose of controlling the light intensity.

The Copenhagen station would appear to make a special feature of microphones. It has six of these instruments, and they are all different.

Three microphones comprise various Western Electric patterns. A fourth is the well-known Reiss instrument—a German product—particularly good, it is said, for orchestral work. The fifth microphone at the Copenhagen station is of the Siemens pattern, whilst the sixth instrument comprises the latest pattern of the Jonsen-Rahbek microphone, that being of Dutch manufacture.

THE BAND BUSILY BROADCASTING

Have you ever heard this orchestra? It frequently broadcasts from Copenhagen on 281 metres.

LATEST BROADCASTING NEWS.

"THE WORLD AND OURSELVES."

NATIONAL ORCHESTRA OF WALES—SIR JOHN REITH FOR MANCHESTER — PROGRAMME ITEMS—BROADCASTING FESTIVAL WINNERS —LOOK OUT FOR THESE!

AN important series of talks for National listeners is to begin next Thursday, October 2nd, under the title of "The World and Ourselves," when, as already stated in our columns, discussions will take place in the studio between prominent men and representatives of other countries.

These include Mr. Oliver Stanley, Lord Lothian, Mr. Harold Nicolson, Professor Arnold Toynbee and Mr. John Loder representing England, Count Gottfried Bismarck representing Germany, Maurice Hindus representing Russia, and Halide Edib Hanum, a lady who is the wife of Adnan Bey, and the first woman in Turkey to discard the National costume and start an independent career.

National Orchestra of Wales.

The National Orchestra of Wales resumes its series of Sunday evening concerts at the Park Hall, Cardiff, at 8.15 p.m. on October 5th, when Tatiana Makushina (soprano) will be the singer.

The programme will be broadcast between 9.5 and 10 p.m. On the following Tuesday evening the autumn series by the N.O.W. begins at the Patti Pavilion with Olive Gilbert (soprano) as the solo artiste.

A Wagner Concert with May Blyth, Walter Widdop and Keith Falkner as the soloists will also take place at the Assembly Room, City Hall, Cardiff, on Saturday evening, October 11th, this being the first popular concert of the season. Twenty-five minutes of the programme will be broadcast from 9.35 p.m.

Sir John Reith for Manchester.

Sir John Reith, the Director-General of the B.B.C., who has just returned from a Continental holiday, is to perform the opening ceremony of the Manchester Radio Exhibition at the City Hall on Wednesday afternoon, October 8th.

The Manchester Exhibition, like the Radio Exhibition in London, has now become an important event of the year, and it is practically certain that the opening ceremony will be broadcast. It has also been decided to relay several concerts and vaudeville shows from the Exhibition to listeners in the Northern Region.

The first of these will take place between 8.30 and 9 p.m. on the opening day, when a concert is to be given by the Northern Wireless Orchestra, the programme including the Ballet Music from Gounod's "Faust" and songs by Isobel Baillie, the well-known Manchester soprano.

Programme Items.

The final Beethoven Concert of the Promenade Season on Friday, October 3rd, which is to be broadcast as part of the National programme, will include the Choral Finale from Beethoven's Ninth Symphony sung by the National Chorus.

National listeners are to hear a repeat performance of Hermann Kesser's monologue "Nurse Henrietta" on Friday evening, October 24th.

Professor Julian Huxley, Sir J. Arthur Thomson, the Bishop of Birmingham, the Rev. "Dick" Sheppard, Sir Arthur Eddington, Dean Inge and Dr. L. P. Jacks are the speakers in a new series of talks entitled "Science and Religion," to be given in the London studio for National listeners during the autumn.

Broadcasting Festival Winners.

Items by winners at the Leicester Musical Festival are to constitute the Midland Regional programme during part of the evening on Saturday, October 11th, when a concert will be relayed from the de Montfort Hall, Leicester.

All the artistes are amateurs, and the Festival, which is one of the most important in the Midlands, has this year attracted a record entry. Its objects, besides the encouragement of music among the young is also to raise funds for local hospitals and nearly £2,000 has been disbursed to deserving causes.

Look Out for These!

Characterisations of Sidney Carton, Tony Weller and Mr. Micawber will be given by Mr. Wortley Allen in a short recital during an interval of a symphony concert for Midland Regional listeners on Thursday, October 9th.

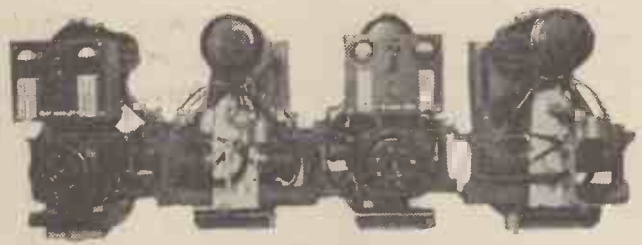
Mr. Leslie Heward, who was recently appointed to succeed Dr. Adrian Boult as the conductor of the Birmingham City Orchestra, will direct his first broadcast concert on Thursday, October 9th, when a programme including the "Magic Flute" Overture and Dvorak's Fourth Symphony will be broadcast to Midland Regional listeners.

A special service arranged in connection with the Church Congress which is being held at Newport, Monmouthshire, between October 4th and 10th, will be relayed from St. Mark's Church, Newport, for West Regional listeners at 6.30 p.m. on Sunday, October 5th. The preacher is the Dean of Llandaff.

A new one-act play entitled "Between the Tides" by Edwin Lewis, whose dramatic work is well-known to Northern listeners, will be included in the programme from the Manchester and Leeds transmitters at 9.40 p.m. on Tuesday, October 7th. The theme of the play deals with the conflicting temperaments of a mother and daughter.

The Blackhill Colliery Prize Band, which is giving a concert at Newcastle as part of the National programme on Monday evening, October 6th, has secured no fewer than 34 first prizes since it entered the field of band contests in 1927. It holds the Durham County Record and has won a first and second prize at the important contest at Belle Vue.

RADIO IN THE DESERT



Here are four interesting light-weight petrol-electric outfits for charging wireless accumulators in the desert. Radio helps the police to keep an eye on the cheery cattle-thief, and these sets are easily carried by a camel. (Leslie Dixon & Co.)

FOR THE LISTENER.

Below our popular contributor—who is staying in Italy—tells how English items are received on the Continent.

By "PHILEMON."

Home From Home.

THIS week there has been quite a glut of English items in the Continental programmes—a sort of "home from home."

There was a performance of "The Mikado" from Stuttgart, a reading of Galsworthy's "Swan Song" from Copenhagen, a "Song Recital" of traditional English songs and modern English songs from Milan, and English Lessons, and English Conversation all over the place.

There seems to be a boom in the Old Country, but "The Mikado" in Stuttgart was not at all the same as "The Mikado" at the Savoy. "Cherry Ripe" sung in Milan by an Italian voice with Italian vowels was as out of place as a harebell in a hot-house.

And Peel's "The Early Morning" was a different song entirely. It was written to an English sun and an English moon. The sun and the moon here are a different sun and moon. No Italian would think of calling the sun his brother; it's more like a bakehouse.

Mozart and Bizet.

We had a glorious performance of Mozart's "Don Giovanni" relayed from Salzburg by Vienna; and, a night or two later, a thrilling "Carmen" from Rome.

The sparkle and fire of it, the fine savour of it, were perfect. Great universal music is, first, great national music.

Beethoven is cosmopolitan because he is a great German. The baritone and the soprano in "Carmen" were superb, so was the chorus, so was the orchestra, so was the "tout ensemble"; and the whole performance went with that easy elegance, that fluent fire, which showed that it was at home.

(*Continued on page* 136)

WHAT HAPPENS IN A TUNED CIRCUIT?

Do you know exactly what happens when you switch the tuning dials of your set round in search of stations? Below you will find the answer to this question authoritatively but interestingly recounted.

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

EVERY radio receiver must have an arrangement by which it can be tuned or adjusted to receive the signals from a particular transmitting station. The tuning of a receiver is its most fundamental and essential control, and it is probably true to say that without the principle of tuning, radio communication, at any rate broadcasting as we have it to-day, would be impossible.

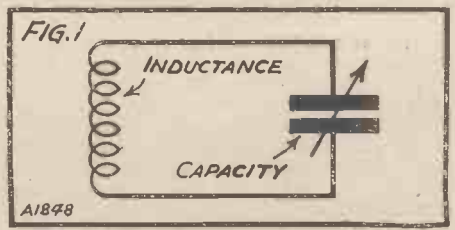
Everyone who uses a wireless set knows that one of the control knobs must be turned this way or that way, until the reproduction is loudest, but not everyone who does this is aware of the changes which he is thereby making in the adjustment of the receiving circuit.

Natural Frequency

In Fig. 1 is a diagrammatic representation of the simplest possible form of oscillatory circuit which consists, as you know, of an inductance coil and some form of capacity. When high-frequency electro-magnetic waves pass in the region of this circuit they cause electricity in the circuit to flow first in one direction when one part of the wave is passing, and then in the opposite direction when the opposite phase of the wave is passing. This will happen whether the set is tuned to the wireless waves or not.

Now if the wireless waves which have caused these oscillatory currents should suddenly cease, oscillatory currents will

THE SIMPLEST CIRCUIT



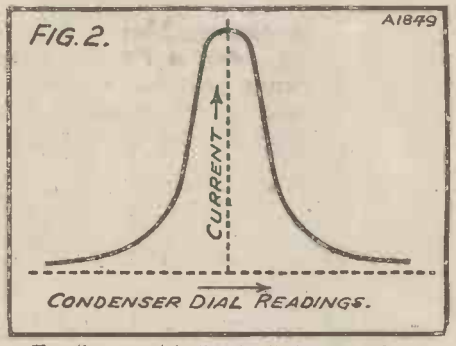
This is a diagrammatic representation of the simplest possible oscillatory circuit.

continue to flow backwards and forwards in the circuit for a short time, but the frequency of the currents when the circuit is left to itself in this way will be what we call the "natural oscillation frequency" of the circuit, and this, of course, will not necessarily be the same as the frequency which was imposed upon the circuit when the radio waves were passing.

In other words, the circuit if set in oscillation and left alone will oscillate in its own natural frequency, whilst it can be *made* to oscillate at any other frequency if wireless waves of that frequency are falling upon it.

It may be compared to the man who will do a certain type of work willingly, whilst he can, under varying degrees of pressure, be made to do various other kinds of work which are not so congenial to him.

WHAT THE DIAL DOES



How the current in the circuit rises and falls as you go in and out of tune by varying the condenser dial position.

Clearly the nearer the work approximates to the kind of work he likes, the better and more willingly he will do it. In the same way, if the wireless waves which are setting the circuit into oscillation have a frequency which is near to the natural frequency of the circuit, the circuit will respond willingly, and the nearer the two frequencies approach the more willingly the circuit responds.

Adjusting the Condenser

In practice we have to deal with matters the other way round, and since we cannot adjust the frequency of the radio waves to the natural frequency of the receiving circuit, we adjust the natural frequency of the receiving circuit to that of the incoming waves which it is desired to receive.

If you tune your receiver to a certain station and then re-tune it to another station having a shorter wave-length (that is, a higher frequency), you will find that to change from the first tuning to the second, the movable vanes of the tuning condenser have been brought more *out of mesh* with the stationary vanes, in other words, the capacity of the tuning condenser has been reduced.

For a given value of the inductance in the receiving circuit the natural frequency of the circuit will be higher the smaller the capacity in the tuning condenser.

Effect on Current

If you could insert a sensitive instrument for measuring high-frequency currents into this circuit you would find that, as the tuning was brought nearer and nearer to that of the incoming waves, the current indicated by the meter would rise in value and it would reach a maximum when the natural frequency of the circuit was equal to that of the incoming waves; further movement of the tuning condenser in the same direction would cause a fall in the reading on the instrument and a curve could be obtained somewhat similar to that shown in Fig. 2.

What I have said so far is no doubt familiar to most of you, but I would like to say something now about the conditions in the circuit which cause it to reach this position of maximum response.

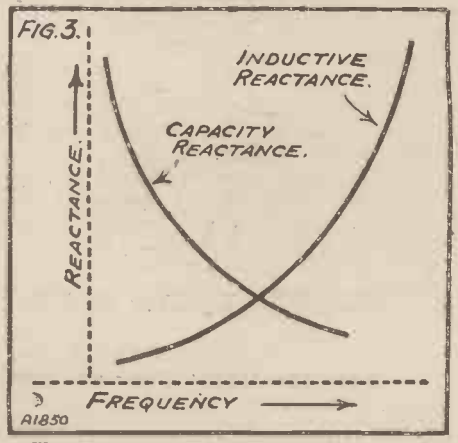
The Frequency Factor

You know that the inductance of the coil tends to impede the oscillatory flow of electricity in the circuit and the condenser has a similar effect. A curious thing is, however, that the impedance offered by the coil (which is sometimes known as the "inductive reactance") *increases* as the frequencies of the oscillations increases, that is, as we deal with shorter and shorter wave-lengths.

The impedance offered by the condenser, however, varies in the opposite direction;

(*Continued on next page.*)

OPPOSITE EFFECTS



Illustrating the opposite effects of inductive and capacity reactances.

WHAT HAPPENS IN A TUNED CIRCUIT?

(*Continued from previous page.*)

the condenser impedance is sometimes known as the "capacity reactance," and it *decreases* as the frequency of the oscillatory current increases. (See Fig. 3.)

Quite apart from the way in which the inductive reactance increases with frequency, it also increases, of course, with size (that is, area and number of turns) of the coil, and generally speaking a large coil will have a greater inductive reactance than a small one. In the same way a large condenser will have a smaller capacity resistance than a smaller condenser.

Variation of Reactance.

When an inductance coil and a condenser are together in the same circuit, we see that the total reactance of the circuit will depend upon the actual values of the capacity reactance and the inductance. If shorter waves now fall upon the circuit (so that it is set into electrical oscillation at a higher frequency) the inductive reactance offered by the coil will be *greater*, while the capacity resistance offered by the condenser will be *less*.

It is easy to see from this that there must be a point at which the sum of the two reactances is a minimum, that is, a point where the total reactance in the circuit is a minimum. This condition, in fact, is the one where the response of the circuit to the electrical oscillations imposed upon it will be the greatest, and when the circuit has been brought to the condition where its total reactance for the particular frequency or wave-length in question is *least*, the circuit is then said to be *tuned* to that particular wave-length.

The Ohmic Resistance.

There is another important factor to bear in mind and that is the actual *resistance* of the circuit, or the "ohmic resistance," as it is called. This resistance may be regarded, for our present purposes at any rate, as being independent of the frequency of the waves or oscillations.

It has the effect, however, of adding to the impedance of the circuit, and for that reason it is desirable to keep the ohmic resistance of the circuit as low as possible. When the circuit is in a condition far removed from resonance—that is, when it is *out of tune* with the incoming waves—the actual ohmic resistance is usually of comparatively little moment, since it is the *reactance* of the circuit at that particular frequency which, so to speak, "takes charge" of the situation.

As we adjust the circuit until the reactance (for that particular frequency) is reduced to a minimum, the ohmic resistance may then become an important consideration; it depends, in fact, upon the relation between the *ohmic resistance* on the one hand, and the *minimum reactance* of the circuit (for the particular frequency) on the other hand.

If the reactance of the circuit, even at its minimum value, is still large compared with the ohmic resistance, then the ohmic resistance can for practical purposes be ignored, and this is the state of affairs which you want to achieve in practice by keeping the actual ohmic resistance as low as possible. Bear in mind that when you tune the circuit to resonance with the incoming waves, the ohmic resistance may make all the difference to the strength of the response, that is, to the loudness of the signals obtained.

So you see that what you do when you "tune" your receiving circuit is this: You adjust the receiving circuit so that its total reactance is at a minimum for the particular frequency of the incoming waves or, expressing it in another way, you make the natural frequency of oscillation of the receiving circuit coincide with the frequency of the incoming waves.

"ALL FARES PLEASE(D)"

One of the six Chicago motor-buses that have been fitted with radio receivers so that passengers can enjoy the broadcast programmes during their journeys.

"DOUBLE-DUTY LOUD SPEAKERS."

The Editor, POPULAR WIRELESS.

Dear Sir,—I should like to tell you of a novel effect I discovered recently. After reading the article "Double-Duty Loud Speakers," on page 543 of "P.W.," dated 26/7/30, I decided to try out the arrangement, using two loud speakers and omitting the resistance. The loud speaker used as a choke was an old (but true) Amplion A R 19, and instead of the 'phones and resistance I used a new Ormond cone unit and chassis. Result: Volume from Amplion went down to a whisper. Volume from Ormond greater than when it was connected *alone* across Plate and L.T.+. Quality better, too.

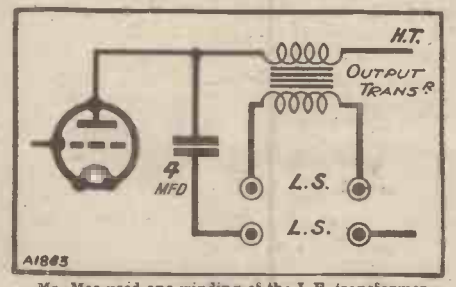
Egged on by this success, I remembered previous half-hearted attempts to provide a choke-condenser output, using old transformer windings in series as a choke. I therefore selected a Lissen 8s. 6d. L.F. transformer which I had on hand, and connected the secondary "I" to H.T.+, secondary "O" to plate and condenser, condenser to L.S., L.S. to earth as usual. Reproduction from the speaker (Ormond) was as good as before. Now comes the (to me) curious part. I had a minor sort of brain-wave and connected another loud speaker across P O and P I, just "to see if it would work." This gave *fair* loud speaker volume, but the volume of the Ormond *did not decrease!* I think the diagram will make it clear.

I tested it several times, but the volume of the Ormond was not decreased by connecting up the other L.S. I have the set, etc., in an upstairs "den" with long leads to the Ormond loud speaker in the dining-room downstairs, and now I am using the loud speaker on the primary as an indicator to show when the set is "on." It is more effective than a signal lamp and takes no current. I might say that I connected up the transformer the other way round—i.e. H.T.+ to P I, plate and condenser to P O, and the other L.S. to the S I and S O, the volume of the first L.S. in the distant room was *reduced* on connecting up "local" L.S. on S I and S O. I suppose the energy developed in the transformer primary would be wasted if not connected to an L.S., but I have never read of this being done before.

Since my apparatus is in a "den," I have plenty of room, and no need to bother about appearances. I have a two-valve amplifier permanently wired-up and supported over the bench by brackets on the wall. This consists of two transformer-coupled stages with output circuit, as described above. Switching is provided for one or two stages. I thus have only to make the Det. or H.F. and Det. part of any experimental circuit, and connect it to this amplifier.

This resembles the scheme outlined by Mr. Dowding in his article, "Any Stage" Adapter, on page 435 of "P.W.," dated 28/6/30.

A TRANSFORMER CHOKE



Mr. Mee used one winding of the L.F. transformer as a choke, and connected a second speaker to the other winding.

I used the detector portion of the "Magic" Three for some time, until recently, along with the amplifier, and found it was very good. Among other stations, I logged Turin for several weeks every Sunday night at 10.40 for the I.B.C. concerts on two valves at good 'phone strength.

Well, I must stop, for this time, with all best wishes for you, "P.W.," "Ariel," and "M.W."

From
L. MEE.

Bolton, Lancs.

HINTS ON UPKEEP.

The correct grid bias for an H.F. amplifying or general purpose valve may be either positive, zero, or negative, according to the circuit.

* * *

If you get an unpleasant "pong" every time you touch your detector valve you can often overcome this by fixing a little plasticine or chewing gum on the top of the valve and embedding a small piece of lead in this to change the natural vibration period of the valve.

* * *

Continuous soft crackling noises, accompanied by very heavy loss in signal strength, are common symptoms of an L.F. transformer with a "burnt-out" winding.

* * *

Among the common causes of distortion are too much reaction, incorrect H.T., L.T. or G.B. voltages, and unsuitable valves.

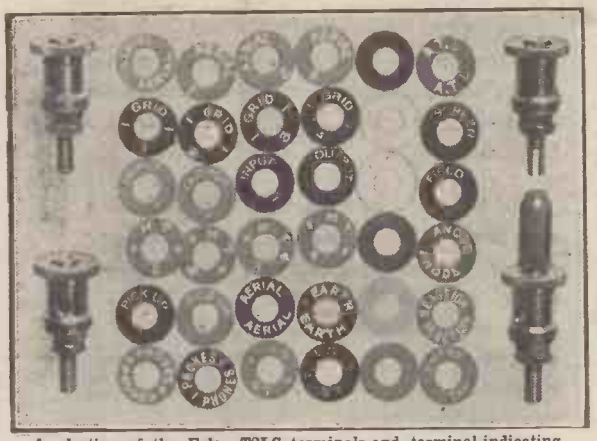
Arks.

FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found—?

CONCERNING THOSE TERMINALS.

CURIOUSLY enough, I had hardly finished writing those words about terminals and wander plugs which appeared in a "When You are Buying" panel a week or two ago, when I received a little packet of samples from those terminal specialists, J. J. Eastick.



A selection of the Eelex T2LC terminals and terminal indicating tabs. The terminal to the right is carrying a 2 DW plug.

Among it—that is, the packet of samples—I find a batch of "Eelex" T2LC terminals which are of the universal type I advocate. Solid, substantial, neatly finished, they have holes for tags plus the usual accommodation for other kinds of lead endings.

Additionally to all this they have central sockets which will take the "Eelex" 2 DW plug a neat little device or any standard wander plug.

These "Eelex" terminals are of the indicating type and have attractive, easily-read markings.

Messrs. Eastick also included samples of their terminal indicators, which are red and black washers carrying engraved lettering. Of these they have available some 40 markings, and they tell me they are constantly adding to this list.

TWO LOUD-SPEAKER UNITS.

After a period of apparent stagnation the loud speaker seems to be forging ahead. You will no doubt have noticed the number of new instruments that I have had to deal with lately, and how many of them undoubtedly constitute definite advances in design.

And quite recently I have been able to test two units, due to Rotor Electric, Ltd., that are of a distinctly promising character.

The one that will appeal to "P.W." readers is the Peter Grassmann Balanced-Armature Unit, a complete assembly embodying chassis and cone that is already for fixing to a baffle or into a cabinet.

Its price is 32s.

I was particularly struck by the way in which it handles bass. In this respect it undoubtedly encroaches on moving-coil preserves. But it hasn't got that crisp upper register that you get with a good moving coil. By the way, don't you think that that is the most valuable contribution offered by the moving-coil to radio realism?

I consider it more important than that bass to which so much eulogy is generally given. Anyway, it surely is at least equally vital. Definition or "attack"—call it what you like—is absolutely essential for realistic results.

However, the Peter Grassmann unit is far from being "soggy," and, after all, it costs only 32s., and in that it does, as I have said, give a real semblance to M.C. effects it must be considered a real success. "P.W." readers should make a point of hearing it—on a baffle of good size.

The Peter Grassmann Moving Coil Unit is for mains or battery construction and it costs £4 17s. 6d. for the D.C. type. It is a fine unit, and its response is superior to all but one (or it may be two) dynamics that I have had sent in for test.

NEW MAZDA VALVE.

During the past two months I have several times referred to the progress of the two-volter, but now we have one with these astonishing characteristics. Amplification factor 6·5; impedance, 1,850 ohms; slope, 3·5. And that with a two-volter taking only ·2 amp. filament current! That makes less than half a watt filament power as against the 4 watts or so of the old bright emitters that had incredibly inferior characteristics.

This latest wonder valve is the P220A Mazda. And fine though is the remainder of the Mazda range I think you have to go to the A.C. valves to get better all-round characteristics.

The P220A is, of course, a super-power valve and with 150 volts H.T. it does give excellent results. It definitely makes the moving coil loud speaker a quite satisfactory proposition for the two-volt man.

Manufacturers and traders are invited to submit radio apparatus of any kind for review purposes. All examinations and tests are carried out in the "P.W." Technical Department, with the strictest of impartiality, under the personal supervision of the Technical Editor.

We should like to point out that we prefer to receive production samples picked from stock, and that we cannot guarantee their safe return undamaged, as it is our practice thoroughly to dissect much of the gear in the course of our investigations!

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

AN EFFICIENT H.T. UNIT.

We have just concluded a series of tests with the Tannoy 12C Mains H.T. Unit that I mentioned a week or two ago.

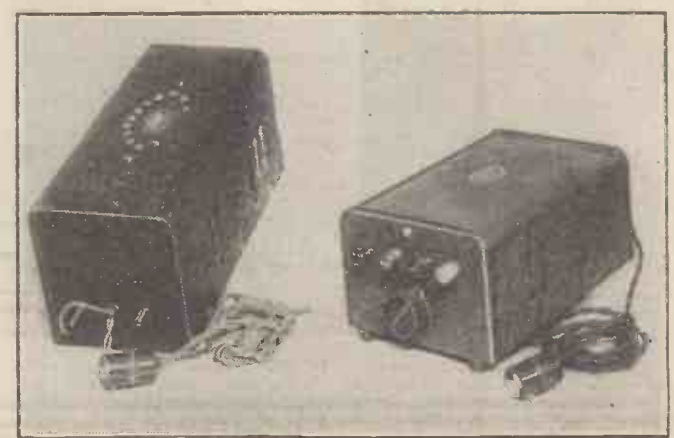
The 12C is unique in that it employs a liquid rectifier. But you mustn't think of this as a messy affair; it is nothing of the sort.

It is built into the neat casing and is perfectly clean, and, in use, is easily kept from "creeping."

The 12C unit altogether is a quite satisfactory device, and its output is perfectly suitable for any ordinary set.

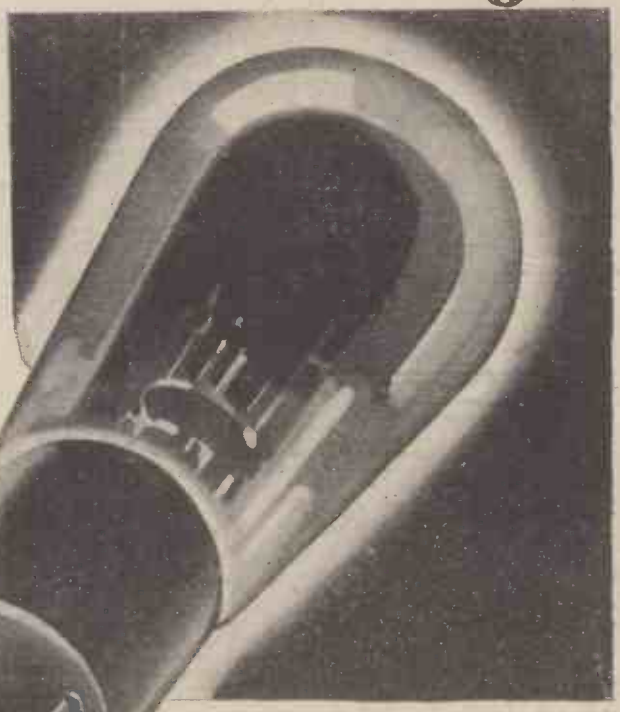
The smoothing really is good for such a small affair, and is far superior to that in many commercial units.

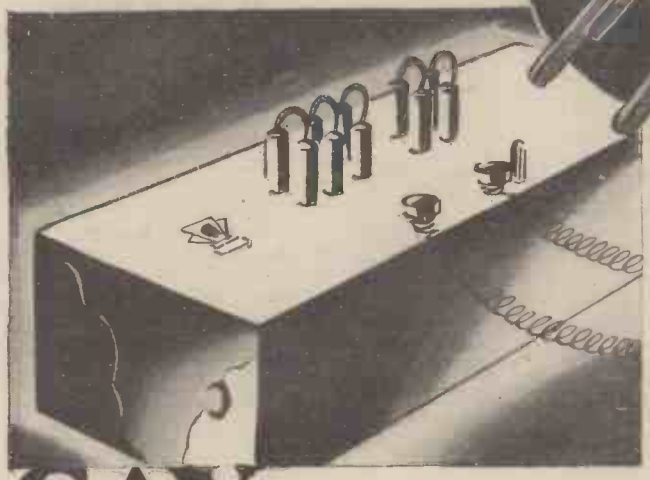
In the operating instructions the use of additional smoothing condensers is advocated, but, to the unit's credit, we found these unnecessary on our mains—which are fairly rough.



Two Tannoy H.T. units: on the right, the P2, and, on the left, the 12C.

They get more – they make more of what they get





Searching out signals from the silence, building up whispers till they fill the room, guarding the tone that brought the singer stardom, the technique that singles out the genius — Six-Sixty valves get more, make more of what they get.

Filament proofed from shock, steady full-bore emission every second of its life, top-pressure, all-out effort. Say Six-Sixty when you're buying valves — and buy yourself better radio.

The Six-Sixty all-mains conversion Unit for any set, any A.C. Mains. No internal wiring alterations, specially selected Six-Sixty valves and 4/5 pin valve holder adaptors. No larger than present batteries. Automatic grid bias.

PRICE.

Valves from	£0 : 8 : 6
A.C. Mains Complete Conversion Equipment from	£8 : 5 : 0
Mains Units H.T., L.T. & G.B. only ...	£6 : 6 : 0

Write for latest Six-Sixty Literature giving particulars of the complete range of Six-Sixty Valves, Mains Conversion Equipment, Valve Adaptors, Valve and Set Tester, Cone Speaker Unit and Cone Speaker Assembly, Cone Speaker Paper, Turntable, Grid Leaks, and Gramophone Pick-up Attachments.

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Six-Sixty Radio Co., Ltd., Six-Sixty House, 17/18, Rathbone Place, Oxford Street, W.1. Telephone: Museum 6116/7.

MAKING CONES

Home-made loud speakers can be so successful, and there are so many possible variations in design that more and more constructors are building their own. Why not try your hand at it? Here's how!

By H. T. SAVAGE.

I WONDER how numerous are the amateurs who find delight in making their own cones for their loud speakers, and who, whilst upsetting domestic arrangements by their monopoly of the kitchen table, revel in the scent of liquid glue, and confidently assert that this, their latest cone, will knock all their previous efforts into a cocked hat!

Now to make a cone approximately to the size desired, and then to cut the circular hole in your baffle-board or cabinet front to fit it, is comparatively easy; but to make a cone of a certain depth and diameter to fit an existing cabinet requires knowledge, and I am going to show you how to do this by a simple and accurate method.

The first thing to do is to draw a section of the proposed cone, full size. In pencil, and on a piece of newspaper, will do nicely.

We will assume that you require a cone 4 inches deep and 13 inches in diameter, not including the flange, as shown in Fig. 1.

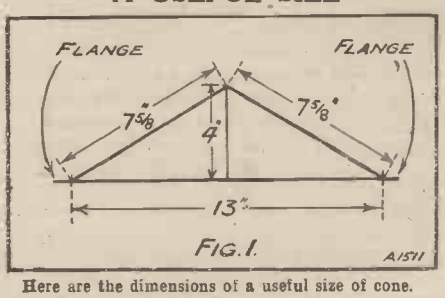
Easy to Cut Out.

If you now measure the two sides of the cone as drawn, you will find that they total to 15¼ inches, so that you will require to describe a circle of 15¼ inches in diameter on your cartridge or other paper.

As you will most probably require to flange it for the purpose of sticking it to a rubber or leather ring, or even direct to the woodwork of the cabinet itself, you will now describe another circle, a half or quarter of an inch larger all round, for this flange, upon your paper.

The problem will now arise as to the width of the segment to be cut out of your circle, as of course, upon this the size and shape of the cone very much depend.

A USEFUL SIZE



Here are the dimensions of a useful size of cone.

The circumference of a circle being about 3⅛ times its diameter, all you have to do is to find the difference between the diameter of the cone as laid flat upon the table (disregarding the flange), and the diameter of the proposed cone. In this case the difference is 2¼ inches. (See Fig. 2.) Multiply 2¼ by 3⅛, and you get, in inches, the size (measured along the rim of the inner circle) of the segment that you will require to cut out—$(\frac{9}{4} \times \frac{22}{7} = \frac{198}{28} = 7$ inches, as nearly as to make no difference).

As you will find it difficult to measure off in inches along a curved line with a straight rule, take a strip of paper of the correct length and bend it edgewise along the curve. The more accurately you work, the better will the cone fit into its place.

Making small radial cuts in the flange will allow it to set better, and if you score the flange line with an instrument not too sharp, it will bend easily.

MEASURING THE PAPER

Marking out the special paper before shaping the cone.

In measuring the segments, you include the overlap of the cone, of course, for sticking purposes. This calculation will work correctly for a cone of any angle or diameter, and its use will save wasting many a sheet of perfectly good paper.

Keeping the "Kick."

I have found that if you mount the cone upon a square sectioned rubber ring (say, ¾ in. square) of the sort of rubber of which some sponges are made (it can be bought in strips) the result will be good for music, but a little boomy for speech. On the other hand, if you mount a cone directly by its flange to the woodwork of the cabinet, it is excellent for speech, but somewhat poor for music. I prefer to favour the music.

It is important to get the unit central, so that the driving rod has no lateral pressure to contend with.

You will lose a lot of the driving force of your unit if it is not mounted on a solid support. I have seen units mounted on thin 3-ply wood. Much of the "kick" is thus expended backwards, instead of where it is wanted, forward on to the cone.

I have yet to find a better cone paper than thick cartridge paper, and after many trials, I let all dope, paint and varnish severely alone.

If the whiteness of the cartridge paper offends the eye, a water stain may be used, which may be sprayed on; but it must be applied to the paper and thoroughly dried before it is made into a cone as, to apply it later, may cause it to buckle.

Make One Like This.

You can, of course, conceal your cone with tinsel and fretwork. It all depends whether or not you place appearance before the greatest acoustic efficiency.

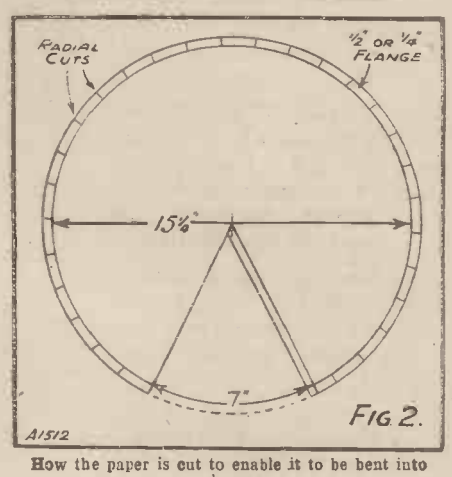
I have found that even spirit varnish causes a cone to lose some of the high notes, and to my ears the high notes are just as important as the low ones.

A cabinet which has given me very pleasing results has an unpainted cartridge paper cone of 14 in. diameter, 4½ in. deep, flanged, and mounted on a rubber ring of ¾-in. square section; the baffle-board is 2 ft. square, of 5-ply, and the sides are of ½-in. white American elm, 9 in. deep. The woodwork was stained with creosote diluted with paraffin, and finally wax-polished.

The whole was mounted on three wooden balls, 2 in. in diameter. I used three balls because three supports will always find a level, where four sometimes will not.

The unit is mounted on a substantial mahogany beam, securely screwed to the sides, and the back is left open.

CUTTING THE FLANGE



How the paper is cut to enable it to be bent into shape.

CAPT. ECKERSLEY'S QUERY CORNER

AM I OSCILLATING?—A MAINS CHANGE-OVER — SATURATION OF L.F. TRANSFORMERS—A DUAL-RANGE FRAME—STOPPING "MOTOR-BOATING."

Under the above title, week by week, Captain P. P. Eckersley, M.I.E.E., late Chief Engineer of the B.B.C., and now our Chief Radio Consultant, comments upon radio queries submitted by "P.W." readers. But don't address your queries to Captain Eckersley—a selection of those received by the Query Department in the ordinary way will be dealt with by him.

Am I Oscillating?

S. W. D. (Boscombe). "How can I tell if my set, a detector and two stages of L.F. is oscillating and causing interference to others? How can I stop the valves howling?"

Oo! Ow! Oh! Oh!!

I think that undoubtedly the best thing for you to do is to write to my erstwhile friends in the B.B.C. Address your envelope to the Chief Engineer, and mark it, "Oscillation" and put the problem as you have put it to me.

Meanwhile do this:

You hear a howl—

Move your tuning dial—

Does the note vary in pitch up or down as you move your dial? If it does, it's you. You are ruining the programme for some few thousands of your neighbours. Don't do it! (Please!)

To stop the oscillation? Well, you have a knob marked volume or reaction? Turn it round till the howl ceases. If nothing stops the oscillation—*switch off* altogether, ask in a knowledgeable friend and he will show you what to do.

But do write to the B.B.C. for their oscillation pamphlet.

* * *

A Mains Change-Over.

J. T. (Ilford).—"The electricity authorities in this district have changed over our D.C. mains to A.C., and I am in a quandary as to what I should do to my set. Several radio friends have advised me to convert the receiver to A.C. valves, while others have suggested that I retain the L.T. accumulator and existing valves, and trickle-charge the former. What do you suggest? I do not mind the cost of new components so long as the results from the set are not 'spoilt.'"

Yes, the scientific thing to do is to go over to the new A.C. valves. But of some things, beware.

(*a*) You will probably have much higher mag. valves so beware instability. Decouple and screen.

(*b*) You *may*, if you are using much L.F. magnification and a low note producing loud speaker, get some hum from your detector. It might be worth rectifying the A.C. component to the detector therefore.

If you want to be perfectly safe from hum in another way, then trickle-charge and "accumulate," but it's clumsy, isn't it?

My advice is, go ahead with A.C. valves and precautions, and be prepared to rectify the low tension to the detector.

* * *

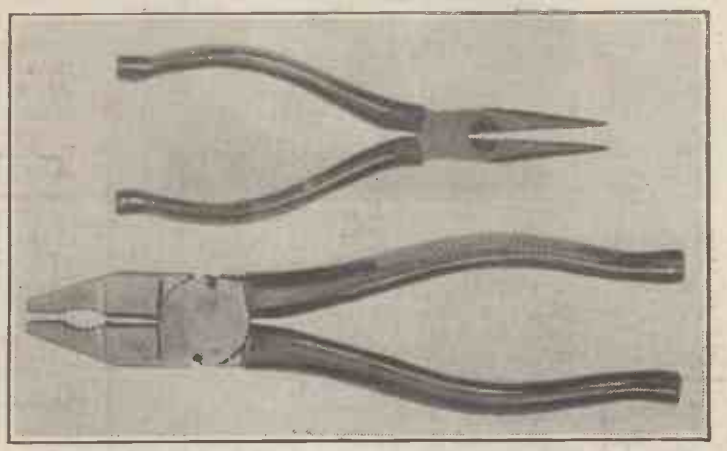
Saturation of L.F. Transformers.

G. P. (Maldon). "Is it a fact that while the new nickel-iron-cored L.F. transformers possess good primary inductances at small anode-current values, they quickly lose their inductances as the current is increased? Am I right in assuming that whereas ordinary Stalloy cored L.F. transformers do not give such good primary inductances on given cores, their efficiency does not fall so rapidly with increase of current. It seems to me that providing nickel-iron-cored L.F. transformers are arranged on the parallel feed system, they are far superior to those of the usual iron-cored type."

I can add nothing new to what you correctly state. The nickel-iron transformers do saturate more quickly, and saturation in transformers is very bad.

Remember, of course, that the parallel-feed system as you call it does not eliminate *all* magnetization current, there is a magnetising current in A.C. transformers. Of course, to eliminate the D.C. component by the parallel-feed circuit is a great advantage.

FOR THE SET-BUILDER



Ever tried insulated pliers? If you have to work with "live" wires sometimes they are very useful, saving the worker from shock and preventing shorts. Different kinds can be obtained, two very useful models being shown above.

A Dual-Range Frame.

L. M. (Belfast). "In arranging the frame aerials for a portable set, should I parallel the high-wave winding across the low-wave one for covering the latter wave-band, or should the high-wave winding be short-circuited? The windings are to be wound on the same former, as rectangular 'solenoids' with a space of approximately 2½ in. between the inside ends.

"If the high-wave frame is left open, when switched to the low wave-band, I understand that a considerable loss of efficiency occurs due to induction effects."

The best method in my opinion is paralleling. Short circuiting is a bit brutal for a frame aerial. Open circuiting gives all sorts of difficulties. Paralleling is in a way short circuiting without being too violent.

* * *

Stopping "Motor-Boating."

A. S. (Wellington). "In order to overcome a tendency to 'motor-boating' in my four-valve set (S.G., det. and two transformer-coupled L.F.) I intend fitting decoupling devices on it. Now I wish to employ one for the first L.F. as well as the detector, and the latter values normally recommended are 25,000 ohms for the resistance, and 2 to 4 mfd. for the by-pass condenser.

"What values should I employ for the first L.F. since I do not wish to cut down the voltage to this valve to any great extent. Would, say, 5,000 ohms be satisfactory?"

The way to look at the problem is to think of any valve as a generator of alternating current.

The current has various paths, but in a valve circuit we fix one part of the circuit to earth. We want to be sure, however, that the end of each valve anode circuit (remote from the anode of course) is truly at earth potential.

To this end we present the current the choice of paths, (1) a resistance; (2) a condenser to earth. We want it to take (2).

Therefore the resistance should have a much higher resistance than the condenser impedance. Now a 4-mfd. condenser has, at 50 cycles, an impedance of getting on for 1,000 ohms!! So that 5,000 ohms is not high enough.

She can't sing if she's gagged

neither can your set pass the full volume and exquisite tone of that glorious voice perfectly unless—

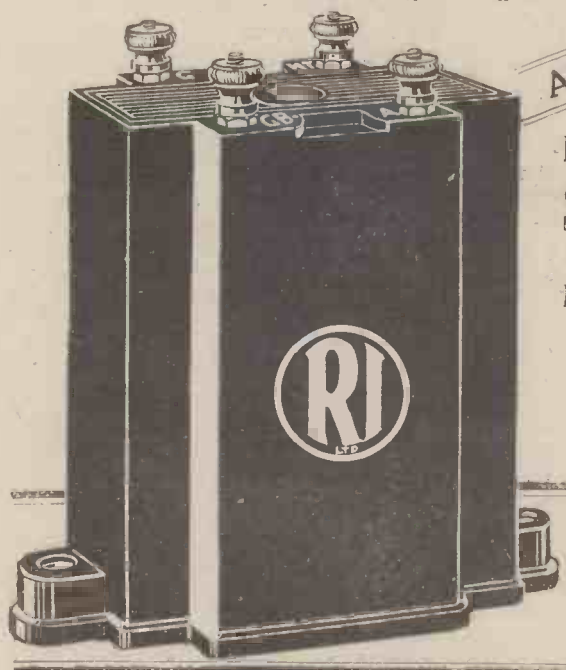
your transformer is capable of giving the maximum amplification plus the uniformity that modern valves demand. Nikalloy, the marvellous metallurgical discovery, applied in a specially designed core makes the "Hypermu" absolutely unique in its performance and suitability for modern circuits. If you want to hear your radio favourites' voices reproduced louder, purer, better than ever before, fit

HYPERMU

the

L.F. INTERVALVE TRANSFORMER with the NIKALLOY CORE

Ask your dealer or write to us for leaflets giving full particulars of the "Hypermu" and the other famous R.I. Nikalloy components. Components that set a new standard of radio efficiency.



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HYPERMITE Presents to everybody an opportunity to test the superiority of R.I. Nikalloy core transformers at a price within the reach of all. Extremely small (2⅜×1⅜×2¼ ins.) for compact set building. Eminently useful when used in conjunction with "Hypermu" in further stages of amplification **12/6**

Hypermu, the world's best transformer — proved alike by amateur and expert

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RADIO INSTRUMENTS LTD., "MADRIGAL" WORKS, PURLEY WAY, CROYDON

RADIO RARITIES

It is really surprising the number of metallic elements which are used in radio, for apart from the common ones such as copper and iron, many rare ones are employed in the ways which are described here.

By F. JACKET.

HAS it ever occurred to you, I wonder, that an up-to-date receiving equipment may very easily contain a surprising number of rare metals which, previous to the advent of radio science, were looked upon, for the most part, merely as laboratory curiosities ?

Platinum, of course, we will except. It is a long time since that metal was regarded as a chemical curiosity; but when you consider metals such as tantalum, molybdenum, tellurium, and a few others, it becomes very strikingly apparent that the development of radio apparatus has within the last few years brought these rare materials out of the obscurity in which they were formerly hidden, and that it has resulted in many new and important applications being given to them.

Modern Valve Filaments.

Take the filaments of your valves, for instance. Although some of the early valves possessed filaments of pure platinum, or of platinum-irridium alloy, nowadays valve filaments are composed of the metal tungsten, a rare element, which, on account of its extremely high melting point, its satisfactory electronic emission at high temperatures, and its ready susceptibility to various forms of treatment and coatings, lends itself better than any other metal to the production of modern valve filaments.

And yet one has not to go back many years to find a period at which tungsten was almost unobtainable outside certain chemical laboratories.

The same may be said of the metal thorium, although, perhaps, to a less degree, because thorium compounds have been used for some considerable time in the production of incandescent gas-mantles.

Pure metallic thorium, of course, is useless for the manufacture of valve filaments because it melts at too low a temperature. Nevertheless, compounds of this metal have acquired an enormous use in the radio industry for the purpose of treating pure tungsten filaments in order to increase their electronic emission, a thoriated tungsten filament having at least 5,000 times the emissivity of a plain tungsten filament.

Metals used for Electrodes.

It is, therefore, owing to the application of thorium and other metallic compounds in the treatment of the pure tungsten filament that the amazingly small operating temperatures and voltages of the modern valves have been made possible.

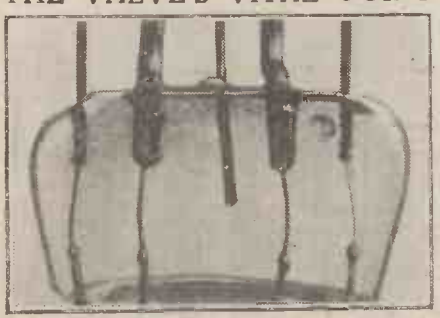
Turning, now, to the valve electrodes themselves, although these, for the most part, in modern receiving valves are made of nickel or of an alloy possessing similar properties, the rare metal, molybdenum, forms the electrodes of many types of high-power transmitting valves.

Molybdenum is a metal which not only possesses a very high melting-point, but it is one which is easily worked, and it is now sufficiently inexpensive for its use to be practicable in the construction of high-power valves. It is used, of course, owing to its being able to withstand the bombardment conditions, and the consequent high temperatures, in valves of the above nature.

At one time, however, molybdenum metal was quite unobtainable in this country. Nowadays you can buy it (in powder form) at the rate of about five shillings an ounce.

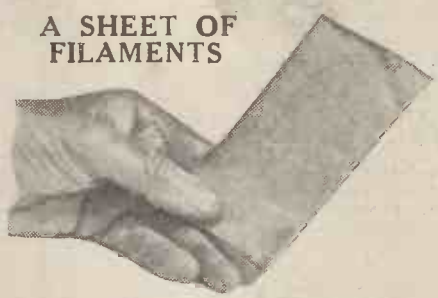
Platinum, of course, still remains one of the rarest, or at any rate, one of the most expensive—of metals, and small quantities of this metal are still used to some extent in the construction of receiving valves. Where ? you may ask.

THE VALVE'S VITAL POINT



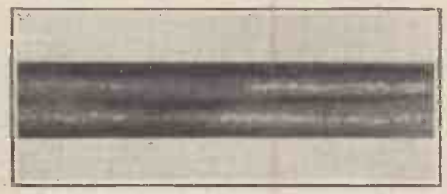
The wires which pass through the pinch of a valve must expand and contract at the same rate as glass. Platinum is largely used in them.

A SHEET OF FILAMENTS



Tungsten, which is extensively used for valve filaments is seldom seen in sheet form. There is enough metal in this piece for many thousands of filaments.

SEEING IS BELIEVING



This massive looking metal rod is an ordinary tungsten valve filament as seen through a microscope.

The area of the valve in which the platinum may be used is practically invisible, comprising as it does the small glass base of the electrode-assembly of the valve. The wires which run through this glass base were formerly almost invariably made of platinum. Some of these "seal wires" are still made of platinum.

The crystal user is, of course, well aware of the number of rare and semi-rare metals and other substances which have been made use of in an endeavour to produce the highest possible degree of rectification. Tellurium, for instance, had scarcely any commercial application before the crystal set became popular.

Elements used in Television.

Radio science has made use of other rare substances in its onward march of progress. Tantalum, is used for the construction of rectifiers for battery-charging purposes. The element, selenium, of course, plays a veteran role in the sphere of radio-vision, and it can no longer be called a scarce commodity But in the production of modern photo-electric cells, metals such as potassium, cœsium, rubidium and thallium are being used in increasing quantities.

ANOTHER RADIO METAL

A strip of tantalum such as is used in an electrolytic rectifier.

GET THOSE DISTANT STATIONS WITH NEARBY STRENGTH

TUNGSRAM Barium Valves have a performance scarcely matched by valves costing considerably more. Whatever programme you choose, music from Motala, a talk from Turin —TUNGSRAM Barium Valves bring it to you with the strength and clarity of a nearby station. And TUNGSRAM Valves have these additional advantages. Their unsurpassed performance gives your radio volume, glorious tone, clear-cut selectivity. Their long life and economy in battery use mean a substantial saving in the cost of your radio.

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V.P. 13

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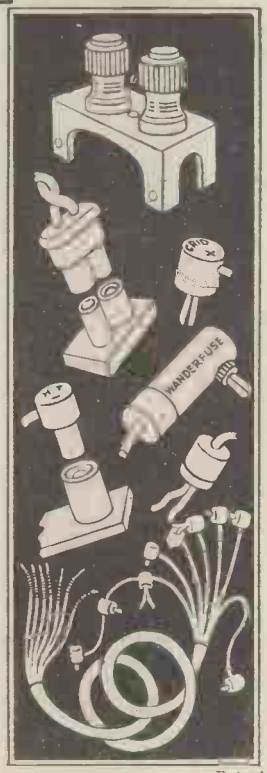
Just push it over the Screen-grid Anode Terminal in place of the usual nut. Then forget it. Strong spring grip—compact—side entry for flex—a special loading device grips the braid as well as the wire.

S.G. Anode Connector 6d. each.

For Screen Grid or Pentode.



Patent

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The new Terminal Mount, Price 8d. The new "Wander-fuse," Price 1/6. Spare fuses (150 m/a), 9d. each.

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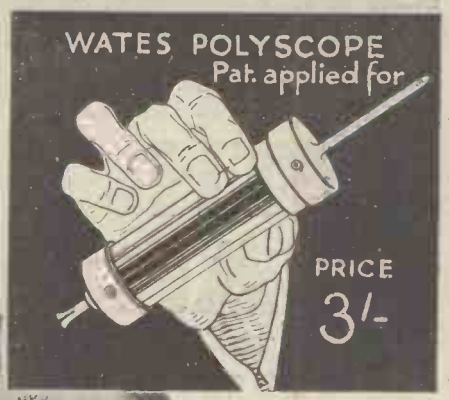
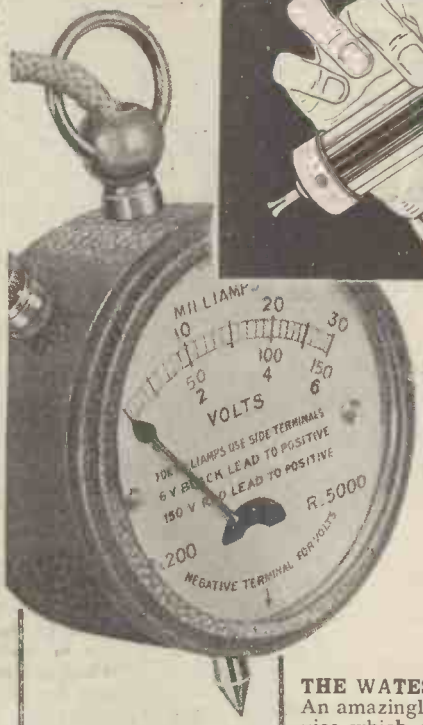
GOOD NEWS
FOR WATES METER USERS





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WHAT YOU CAN FIND OUT WITH THESE 3 INSTRUMENTS.

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L.T. Accumulator Volts, H.T. Battery Volts, Valve consumption in M.A. Resistances between 50 and 2,000 ohms.

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For broken valve filament, insulation of condensers. Short circuits, distortion. If valve is working to correct characteristics. Whether circuit is complete.

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Average depreciation of L.T. and H.T. current, performance of each valve. Milliamps consumed per valve under varying conditions. All information regarding consumption and values of current used.

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A BIRD'S-EYE VIEW of RADIO

By C. E. FIELD, B.Sc.

Don't miss this article. It was written by a Bachelor of Science, but it reads as easily as a fairy tale.

MANY of you no doubt get rather lost in the maze of detail contained in a book or a series of articles dealing with the whole of wireless, while articles on special circuits or explaining particular phenomena soon drag you out of your depth.

So we will forget all about "frequency characteristics," "grid biases" and what not, and try to get a sort of bird's-eye view of wireless reception as a whole, without considering details or technicalities at all.

The First Step.

You all know, of course, that wireless signals are sent out from, say, a broadcasting station, and it is the job of your receiving set to convert these signals into speech or music similar to that being produced in the broadcasting studio.

Furthermore, since there are dozens of stations transmitting at the same time, a receiving set must enable you to select the particular one to which you want to listen.

First of all, then, let us see how this selection is carried out, and in order to do this we must imagine that we know what wireless signals are like. We cannot really visualise them, but for our present purpose we may regard them as being *puffs of electricity*, sent out through space from the transmitting station, much like puffs of smoke from an engine's chimney. Wireless signals, however, are sent out in all directions at once, and the "puffs" follow one another extremely rapidly.

What Is Tuning?

Now these puffs do not constitute the speech or music that you hear, but are sent out whenever the station is working, whether the artists are performing or not, and are simply used to carry the music along with them. As soon as a performance commences, the music is mixed up with the puffs of electricity, and the whole lot travels through space together.

In order that you may be able to select signals from whichever station you choose, each station sends its puffs out at a different rate—that is to say, the puffs follow one another with a different rapidity. For instance, one station might send them out at the rate of a million per second, while those from another station follow one another at, perhaps, 500,000 per second.

Since these puffs all travel through space at the same speed, there will obviously be a great distance between puffs succeeding one another comparatively slowly than between those occurring more rapidly. This distance between successive puffs is what is known as the *wave-length* of the transmission—an expression with which you are quite familiar.

So much for the wireless transmission.

Now let us see what you do in order to receive the wireless signals.

First of all, you put up an *aerial*, which is simply a wire hung up in the air, with one end connected to the ground (usually to a copper plate or water pipe buried in the earth). When wireless waves (which is the proper name for the puffs we have been speaking about) hit your aerial, each wave causes a tiny current of electricity to flow along the aerial and down into the ground.

Consequently, when the waves from a station which is sending out, say, a million waves per second, hit your aerial, little electric currents flow at the rate of a million per second. Similarly, all sorts of other transmitting stations cause currents to flow in your aerial, at a rate depending upon the rate at which each particular station has chosen to send out its waves, or, in other words, upon the *wave-length* of the station.

The first task of your receiving set is therefore to select the currents produced by the particular station to which you intend to listen.

This is done by making all the currents flowing from the aerial to earth pass through a *tuning circuit*, which consists of a coil of wire and a condenser (an arrangement of metal vanes separated by air spaces), the latter being adjustable as a rule by means of a knob and dial on the front of the set, usually labelled "Tuning Condenser;" or simply "Tune."

This circuit possesses the property that at any one adjustment of the tuning condenser, electric currents following one another at a particular rate are blocked, and all other currents are allowed to pass. The tuning circuit is therefore adjusted until only currents from the station that you wish to hear are stopped, all the others flowing straight into the ground.

The Detector's Duty.

Having stopped the particular currents in which you are interested, you can side-track them into the remainder of the receiving set, and then deal with them.

The most important step is to disentangle the rapidly repeated electric currents from the music which is mixed up with them, and this is carried out by means of a *detector*, which may be either a *crystal* or a *valve*.

If the currents received are weak, it is sometimes necessary to make the mixture stronger before it is passed into the detector.

A valve employed to amplify signals before they are sorted out by the detector is known as a *high-frequency* amplifier.

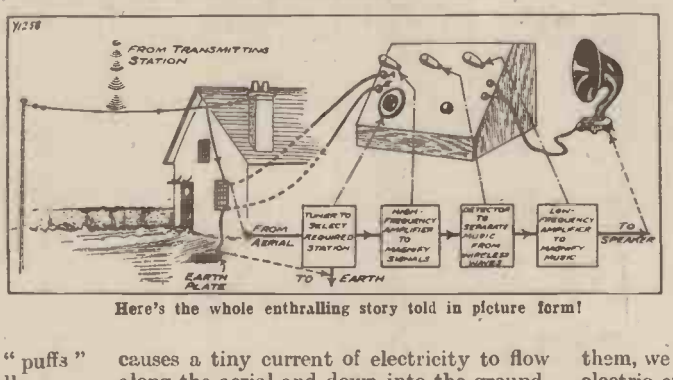
Having amplified the signals, if necessary, and disentangled them, we have, coming out of the detector, electric currents which will work a pair of phones.

L.F. Amplifiers.

If necessary, currents leaving the detector can be made strong enough to work a loud speaker by means of one, two, or sometimes three more valves, these being known as *low-frequency* amplifiers.

That, then, is briefly what happens in your wireless set; wireless waves and music mixed together are received by your aerial, selected by your tuning circuit, according to the station you wish to receive, magnified if necessary by high-frequency amplifying valves, disentangled by the detector, and further magnified by low-frequency amplifying valves before being passed into the loud speaker.

HOW YOUR PROGRAMMES COME TO YOU



Here's the whole enthralling story told in picture form!

THE "CONTRADYNE"

In this article we explain in detail how to make, as a separate unit for your own set, the wonderful new "Contradyne" which enabled such success to be achieved by the "Exhibition" Four described last week. The "Contradyne" has been brought into the world to abate a nuisance which has long troubled listeners all over the country, and though small and inexpensive it does the job completely. Designed and Described by

THE "P.W." RESEARCH DEPARTMENT.

PERMIT us to introduce to you the "Contradyne," a very stout little fellow who has been brought into the world to abate a nuisance which has troubled many of us for years past. A particularly aggravating nuisance it is, too, which has been with us since the quite early days of broadcasting; so long, in fact, that many of us had begun to think that there was no cure for it.

An Old-Established Nuisance.

So far as "P.W." readers are concerned it is now to become a thing of the past, for here is a really effective remedy which works like the proverbial charm. And what is this nuisance we are talking about?

Just that old, old bugbear of the local station breaking through and causing interference on the long waves. It is a trouble to which all the simpler types of sets are liable, especially on large aerials, whenever they are used fairly near to the local station.

It does not happen every time, of course, but the uncertainty only makes it the more annoying, for you never know when you are going to get it. All that one can say is that a set of one of the types possessing only a single tuned circuit is quite likely to suffer from it if used upon a fair-sized aerial located up to perhaps five or six miles from the local station.

That, unfortunately, is not the end of the matter, because experience has shown that there are quite a considerable proportion of freakish cases in which it happens up to much greater distances.

These cases are the most annoying of all, because it may happen with even the best of set designs, and then you may have the extraordinary experience of finding that your selectivity is ample on the lower-wave band, so that you can cut out the local with comparative ease, while on the long waves it comes in again and covers quite a large part of the dial!

Just what happens naturally depends upon a number of circumstances, but when the trouble does occur it is usual to find that the local station comes in quite strongly at the bottom of the dial, and then as the dial reading is increased it gradually dies down and disappears at perhaps 30 or 40 degrees on a 100-degree dial.

In Bad Cases.

This is bad enough, for it means that the Hilversum station will be pretty well smothered, although the middle and upper portions of the dial may be left free for the reception of such stations as Eiffel Tower, 5XX, Radio-Paris, and Huizen.

In exceptionally bad cases matters may be still worse, with the local station covering almost the whole of the long-wave dial so that it becomes difficult to pick out even so strong a station as 5XX. This is not likely to happen with a "P.W." design, since pains have always been taken to minimise as far as possible the risk of this trouble in our sets.

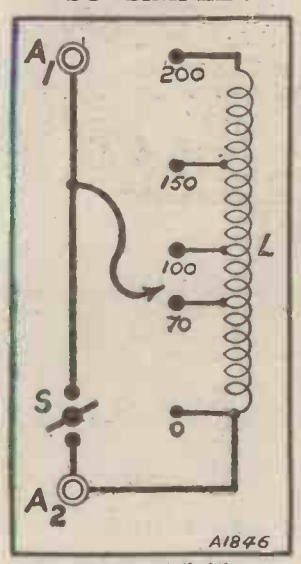
Just why these things happen, and more particularly why they should be so erratic, has been one of the most puzzling points in radio for some years, and it is to be feared that it has not always been taken so seriously as its importance warranted.

It Does Matter!

There has been a tendency to feel that it did not really matter very much, for this reason; the trouble was only likely to occur in quite simple sets with only one tuned circuit and only at such short distances from the local station that great difficulties with interference would be experienced also on the lower-wave band, so that some sort of rejector or wave-trap would normally be used, and this would obviously remove the interference on long waves also.

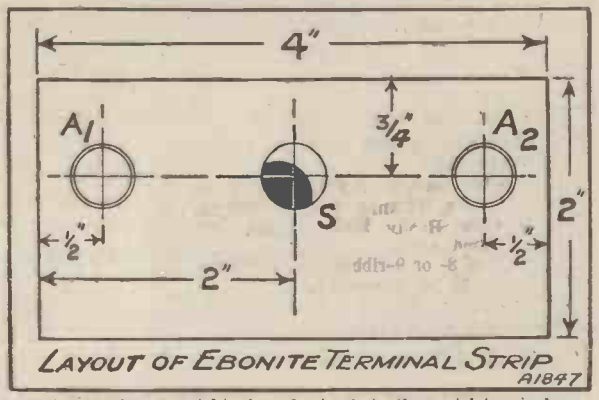
While this argument may be sound enough in very many cases, yet there are quite a number of others in which it breaks

SO SIMPLE!



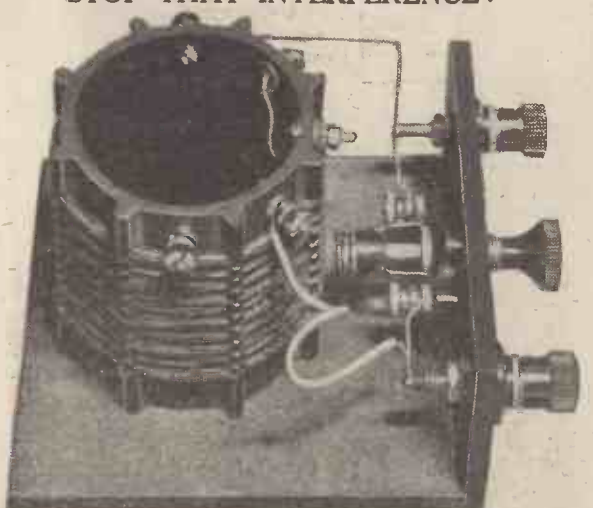
Here is the "circuit" of the marvellous "Contradyne," which is surprisingly effective. Note the positions of the tappings on the coil.

APPLICABLE TO ANY SET



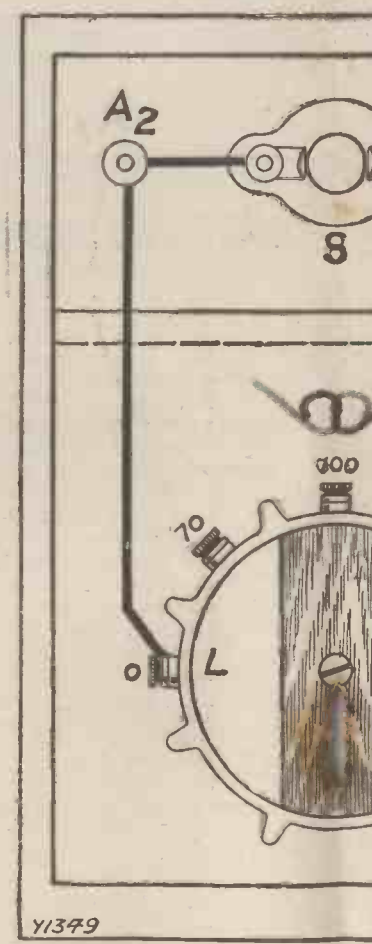
Just connect your aerial to A_1 and wire A_2 to the aerial terminal on your receiver. For work on the lower wave-band close switch S, so cutting the "Contradyne" out of circuit. Pretty easy, isn't it?

STOP THAT INTERFERENCE!



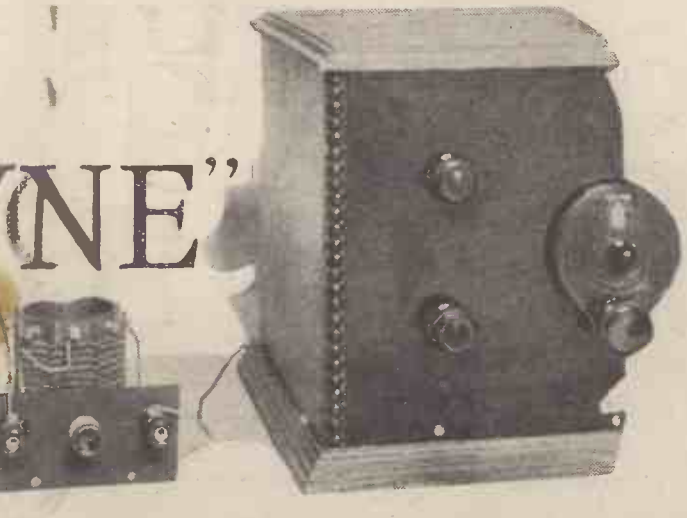
You can do so easily if you build the "Contradyne." No longer need you suffer that "butting-in" of the low-wave local on your long-wave programmes. Just try the flex lead-on the various terminals on the coil, and you will soon find the right adjustment for your conditions.

ONLY A FOUR



How to wire up the "Contradyne." Note ... tion of the ...

PREVENTS INTERFERENCE



...down. For example, there are those exceptional ...examples which we have mentioned of the trouble ...occurring at greater distances, so that it is only ...upon the longer waves that serious interference ...from the local station is experienced.

Again, there is the case of a listener in one of the provincial centres who wants to use his set only for local or semi-local work. He may merely wish to receive the local transmission and 5XX as an alternative, and he is not likely to relish being told that to prevent the local interfering with 5XX he should use a rejector or wave-trap.

Getting Worse.

The trouble has been made far more acute in the London area by the tremendous power of the new Brookmans Park station, and as soon as the amount of the increase had been estimated the "P.W." Research Department set to work on a thorough investigation. It has proved a most exceptionally difficult problem, and it has taken us some considerable time to bring our work to a conclusion.

The first step, obviously, was to try and determine the cause of the phenomenon, and herein lay the real difficulty, for we soon found that there were several causes which might be present singly or in combination in any given case. That probably explains to a large extent why the trouble is so erratic in its appearance and why it varies so much in intensity between one set and another.

We have located what we believe to be the main cause in the methods of aerial coupling which are now almost universally used. In most cases the aerial is left untuned and is inductively coupled or auto-coupled to the tuned secondary circuit. The danger here is that although the aerial may be untuned as far as the long-wave stations are concerned the coupling winding may chance to tune it to some wave-length not very far from that of the low-wave local station, with disastrous results. The size of the long-wave coupling winding is often just about right to do this, and it is very difficult to alter it sufficiently without upsetting the behaviour of the circuit. We have found that it requires a very big alteration indeed to have the desired effect.

This effect, or another rather similar one, seems to be what starts the trouble in almost every case. Once started it may be intensified by other minor causes, but these latter do not appear capable of producing it by themselves. Hence we concluded that if we could stop the trouble in the aerial circuit we should effect a universal cure, and that is just what the "Contradyne" does.

How It Works.

Here is how it works: In the first place, it puts in series with the aerial lead something which offers a high resistance, so to speak, to the passage of the signals of the low-wave station, while allowing those of the long-wave ones to get through quite easily. Secondly, it throws the aerial circuit right out of tune with the low-wave station, and so completes the job.

Actually it does more, for in most cases it even improves the reception of the long-wave station! This is a quite unexpected blessing, and follows from the fact that it brings the normally untuned aerial circuit more nearly into tune with the long-wave station being received (it would not do, of course, to bring it right into tune, because selectivity would suffer too much).

What It Is.

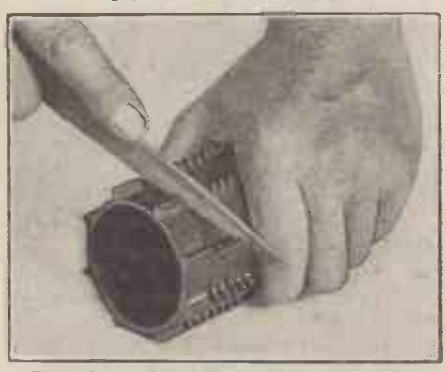
You will probably have begun to guess by now just what the "Contradyne" really is. It is extraordinarily simple, because the idea is just to include in series with the aerial lead a sufficient amount of inductance to achieve the end we have in view. There is nothing so wonderfully novel about the idea of putting coils of various kinds in series with the aerial lead, but apparently no one has yet realised

(*Continued on page* 138.)

ALL YOU WANT.

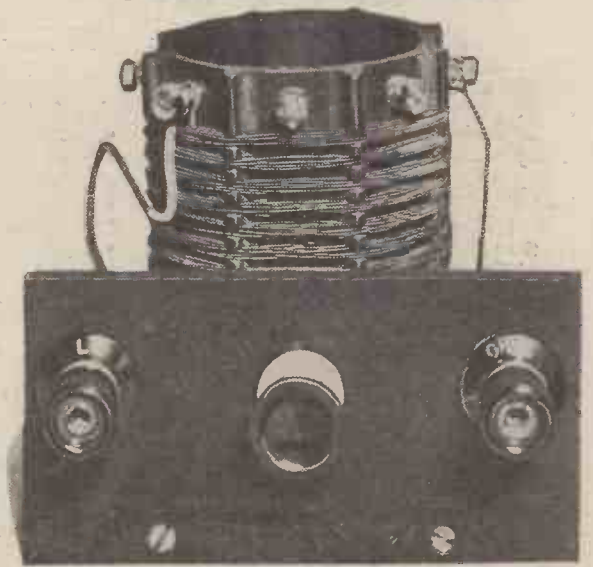
- 1 Wooden baseboard, about 4 in. × 4 in.
- 1 Ebonite strip, 4 in. × 2 in.
- 2 Terminals (Igranic or Eelex, Belling & Lee, etc.).
- 1 On-off switch (Lissen or Lotus, Benjamin, Igranic, Bulgin, Ormond, Wearite, Ready Radio, Junit, Red Diamond, etc.).
- 1 Piece of 8- or 9-ribbed "Becol" tube, 2¼ or 2⅝ in. diameter (over ribs) and about 3 in. long.
- 2 oz. No. 26 D.S.C. wire.
- Piece of flex, a little wire, and some screws, etc.

JUST ONE COIL



There is no doubt about the success of this little unit, the coil-former of which is slotted, as shown above. It is 2½ in. in diameter over the ribs and about 3 in. long. There are 10 file cuts in each rib, making 10 slots for the windings. The slots are about ⅛ in. wide, and there is about 1-16th in. between them. Wind 20 turns of No. 26 D.S.C. in each (200 in all), tapped as in circuit diagram. Take ends and taps to small terminals mounted in former (see photos and wiring diagram).

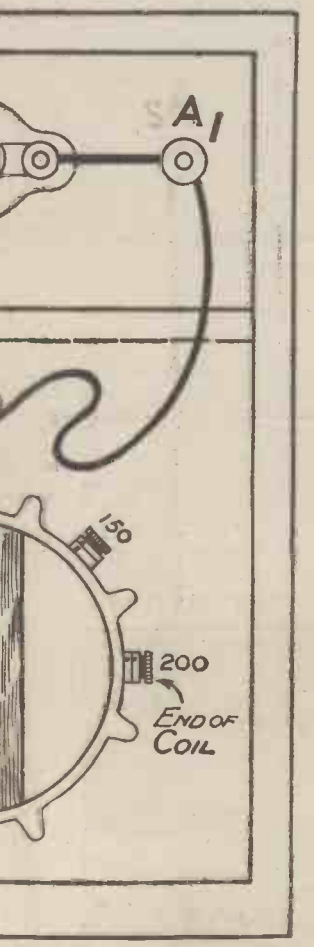
NO "GATE CRASHING" HERE!



As soon as the interference on the long waves begins, snap goes the switch and the interrupter is silenced!

...INCREASES SENSITIVITY!

...R HEADS!



...erent positions of the little terminals ...oil.

Stopping Fading

By J. F. Corrigan
M.Sc. A.I.C.

A practical article that will help you to improve your results.

THE hot summer days, and even the warm weather of early autumn, are right enough for working portables out of doors on the lawn and during week-end trips farther afield, but for downright reliable and constant results, especially on long-distance working, give me the colder periods of the year every time.

I am not referring here to the many atmospheric factors which influence good radio-set working during the warmer weather. Factors such as the well-known fading propensities of short and medium radio waves when they travel over considerable distances in bright daylight.

Weather Effects.

Such things are quite beyond the radio man's influence and, accordingly they just have to be put up with.

Then, of course, in summer weather, particularly towards the end of the warm weather periods, comes the abomination of atmospherics which occasionally rise to an intensity sufficient to mar an evening's programme.

Those influences, also, I do not intend to include in my category of wireless worries. Still, whilst I am on the subject, there is one tip which I may pass on to my readers for what it is worth.

It is this: a good atmospheric-eliminating circuit may frequently be devised by the simple procedure of wrapping a layer of insulating tape over a few inches of the aerial downlead, and then by winding a few turns of insulated wire over this, subsequently connecting both ends of the wire to earth.

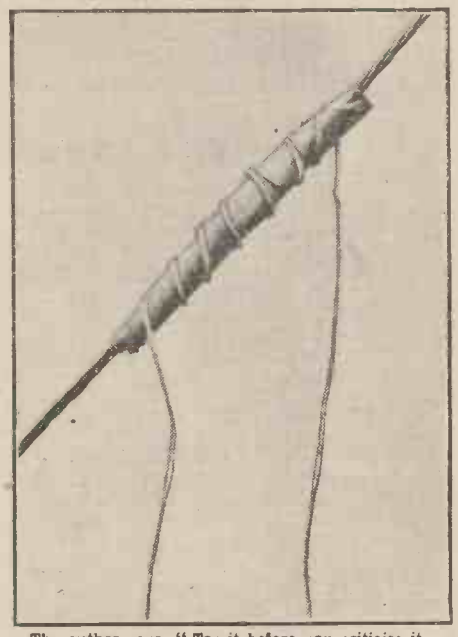
The device may not be coincident with theory. But, before you criticise it, try it. It works! The precise number of turns of earthing wire on the aerial downlead have, of course, to be determined experimentally in individual cases.

It often happens that at the end of the summer, just when the best time of the year for reception is coming along, results from a set fall right off. Some points to watch to avoid such fading are detailed in this article.

Quite apart, however, from external factors which influence wireless reception, there are a number of minor worries which climatic conditions bring.

During a spell of really decent autumn weather you may, for instance, find that your receiver "goes off" most alarmingly in the course of a week or so. An amateur of my acquaintance suddenly woke up to that fact during the height of summer last year.

YOU OUGHT TO TRY THIS STUNT!



The author says, "Try it before you criticise it. It works!"

He traced the trouble to the Leclanché-type H.T. batteries which he was using. The sal-ammoniac electrolyte in them had evaporated almost to vanishing point, and the acid in his accumulator was also low down.

Herein, therefore, lies a moral. If you use wet H.T. batteries or accumulators, keep an eye on the level of the electrolyte in them during the summer and autumn days. Evaporation takes place readily when the set is placed in a close or stuffy room, and, naturally, reception suffers accordingly.

Dry batteries, too, are apt to suffer unduly from the weather. If you have dry batteries in actual use for any purpose, they will, of course, have to stand their chance, but if you have dry batteries of any type in storage you ought to attend to them carefully and to see that their storage shelf is not in the sun or over a warm water pipe.

Look after your aerial downlead during the height of the season, too. Trees and creeping shrubs are often apt to entangle the downlead.

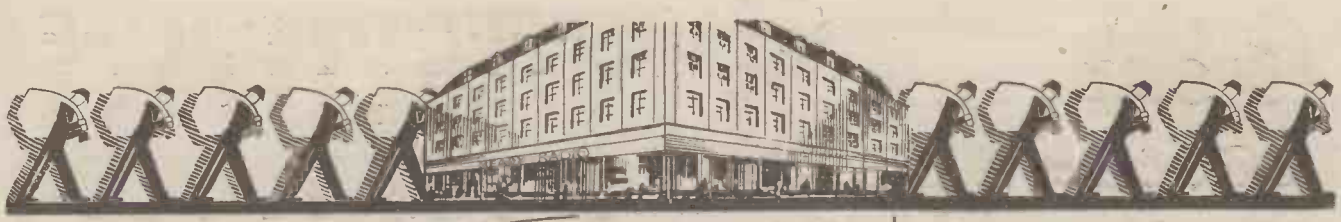
In this connection, also, there is another enemy to wireless reception, and often an entirely unsuspected one. It is the ubiquitous garden spider who frequently takes a pleasure in building her webs between the wall and the aerial downlead.

Here again, is another source of aerial current leakage to be looked for, for despite the fact that the spider's web is of high-grade silk, it becomes wet with the evening dews, and so provides quite a considerable leakage path for the aerial current.

Much has been written upon the necessity of watering earth connections in dry weather. Indeed, some of our mentors have waxed most emphatic about this matter. Personally, however, I do not consider that an outdoor earth connection which has been thoroughly well made should need any artificial watering except, perhaps, in the driest of weathers.

WATCH WHERE YOU PUT YOUR BATTERY

You shorten the life of the H.T.B. if you stow it in a too-warm place.



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TOTAL (including Valves and Cabinet)	£13	1	6

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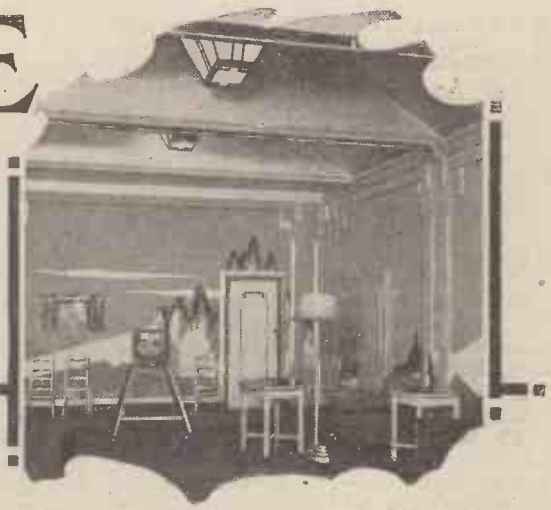
BEHIND THE SCENES AT SAVOY HILL



A special correspondent discloses details of some of the "weird and wonderful" activities of the B.B.C. engineers, to whom credit must be paid for the world's most polished technique in broadcasting.

WHAT a deal is missed by those who have not been fortunate enough to go behind the scenes at Savoy Hill in the company of a B.B.C. engineer! Nearly every programme would be more interesting if only listeners could know of the weird and wonderful devices which enter into the make-up of so many items.

The Grand Slam.

I don't mean the dramatic "effects" room, wherein the rumbles of express trains, the rushing of mighty rivers and of storms, and even the slamming of doors are conjured up by sandpaper and wooden clappers. Such things are taken for granted nowadays, for nobody believes that the radio cuckoo, for instance, *is* a cuckoo.

The really clever things at Savoy Hill and at the B.B.C. provincial stations are the work of the engineering staff—and I say it, although I am distinctly not an ex-B.B.C. engineer. The fact remains that the B.B.C. technical brains have been responsible for many things which Continental and American stations, have copied: the echo-room, for example.

Echo rooms are still used at Savoy Hill, though not at Manchester; there will be two in the new Broadcasting House. The London station echo rooms are down in the basement near the "Chinese" studio. The main one is a bare, plaster-walled room with a sort of skylight opening to street level, and Savoy Hill street noises can enter through this window; it is certainly not sound-proof.

At one end of the room hangs a microphone on rubber strands from the ceiling, at the other end is a moving-coil loud speaker. Behind the microphone is a movable shield, and the position of this alters the "echo period" of the room. At the back of the shield, and therefore out of the loud speaker's line of fire, is the battery bank for the speaker's energising coil current.

Adding Echo.

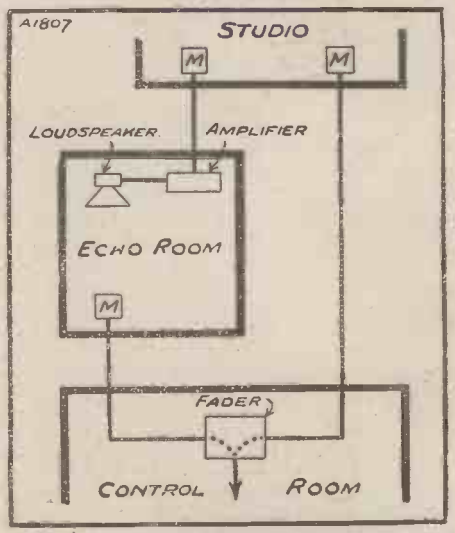
A red light glows outside the door. When this is "off," and one can enter the room, one finds that it is like talking in a bathroom, the echo being so marked.

This room is used for many large orchestral broadcasts from the studio. The amount of echo in the largest Savoy Hill studio, No. 7, can be altered up to a point by moving large sheets of sound-damping felt parallel with the roof: but echo can be *added* when the echo-room is in circuit, and the effect is then somewhat similar to the Grand Hotel at Eastbourne. The Queen's Hall echo can be imitated to a niccty.

How it is Done.

For "echo" work there are always two microphones in the studio. One goes straight to the volume control in the control-room, in the ordinary way. The other is connected via the three-valve amplifier to the echo-room's moving-coil speaker.

ADDING ECHO



By means of a specially arranged microphone and loud speaker any amount of echo can be added to any item.

The microphone at the end of the echo-room picks up the programme *and the echo*. The output from this second microphone then passes to the control-room, and by means of a potentiometer fader device is added to the direct studio line in any proportion.

The Radio Stand-By.

This echo-room idea has been copied by German stations, by stations of the N.N.C. group in the States, and even by one or two talkie-film concerns.

Here's another technical novelty. Did you know that most of the chief B.B.C.

(*Continued on next page.*)

OUT WITH THE "O.B.'s"

The B.B.C. launch, "Magician," which is fitted with a complete transmitting outfit for passing on boat-race and other river commentaries.

BEHIND THE SCENES AT SAVOY HILL.

(*Continued from previous page.*)

stations have a six-valve set, permanently tuned to 5 X X, which can pick up Daventry's programmes for re-broadcasting should the land lines break down ?

These sets are being rebuilt now that the Brookmans Park twins have started, but some of the Northern stations still use these six-valvers on many occasions.

In some cases these Daventry re-broadcast sets are installed in huts about five or six miles from the local transmitter, to avoid interference ; one or two B.B.C. engineers are fortunate enough to have the sets in their own homes, and private 'phone lines are run to the control-room at the station.

The set is quite straightforward, and six valves are used to ensure that the quality by the radio link is almost as good as that on the normal land lines.

For Short Waves.

The first H.F. stage is neutralised with resistance coupling (a 50,000-ohm resistance in the anode lead in place of a tuned coil), the second is a plain resistance-coupled stage, and the third uses a screen-grid valve with an aperiodic H.F. choke.

The grid circuit of the detector is tuned by a condenser and there is thus only this control and the aerial tuning. The detector is an anode-bend job, and it is followed by two resistance-coupled stages of L.F.

An output choke and transformer arrangement couples the set to the 'phone lines, and at the station end, in the control-room, a further "B" type three-valve amplifier is used. The whole set works from accumulators, and can be remote-controlled from the control-room.

Two other B.B.C. receivers are interesting, namely, the short-wave receivers used for outside broadcasts, such as the Boat Race, and the "low-frequency squeaker" which gives the tuning note and the time signal pips.

The B.B.C. has never officially disclosed the wave-length used for the Boat Race, because if local amateurs accidentally oscillated there would be trouble. On one occasion it was 70 metres. Last year the wave-length was changed several times during the race.

The receivers are very amateurish-looking affairs in large screening cases. Three valves are in the actual receiver, and this is coupled to a standard B.B.C. "B" three-valve L.F. amplifier.

The "low-frequency squeaker is a single-valver with large fixed condensers and two L.F. chokes of such values that the oscillating note is at audio frequency, and is the familiar "peep-peep-peep" heard in the time signals and, now infrequently, in the tuning note.

This squeaker is a vital part of the control-room, and is on a bracket near the B.B.C.'s own electric clock. When the minute is approaching, the squeaker is switched into circuit with a relay connected to the Greenwich electric-indicator apparatus.

The squeaker output is taken to a fader, so that the "pips" can be impressed on the programme, as you all know, without the need for switching off while the time-signal is being given.

There is one final wonder of the Technical Department, and that is Tatsfield, the new edition of Keston. At Keston the B.B.C. engineers had relay receivers for picking up other stations' programmes, and also a number of wave-meters.

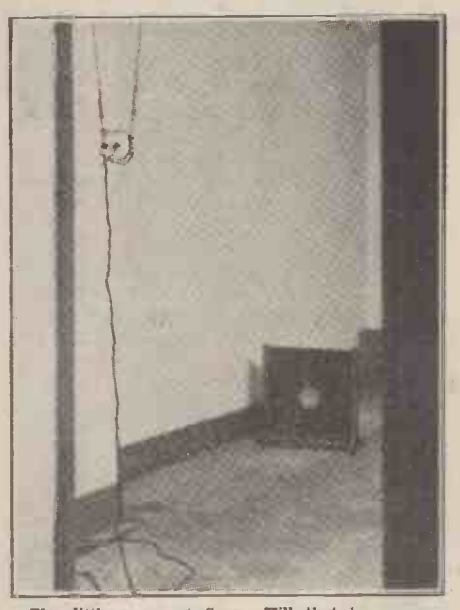
All this has now been moved to a specially built listening post at Tatsfield, a few miles away and on the "borderline" between Surrey and Kent.

The Ether Policeman.

A point about Tatsfield is that the B.B.C. has installed there some standard wave-meters housed in rooms with cavity walls and electric heaters to ensure constant temperature and operating conditions. Tatsfield is England's "ether policeman," and the wave-lengths of most European stations, including all the B.B.C. stations, are checked daily.

Savoy Hill officials have therefore only to put a call through to Tatsfield (on a private line) to find out the cause of any interference with any B.B.C. transmitter. The final frequency standard at Tatsfield has an accuracy of one part in 100,000 !

THE ECHO ROOM



The little room at Savoy Hill that by means of a "mike" and a speaker, can supply just as much echo as the engineers require to give realism to certain transmissions.

WHERE THEY RECEIVE RELAY ITEMS!

Here you see the very specially calibrated wave-meters at Tatsfield, where B.B.C. engineers check the transmissions, and where they pick up the programmes of distant stations for relaying to British listeners.

JUST TO REMIND YOU—

When overhauling a set which has been put away for some time and which is being reconditioned, do not forget the grub screws on the panel controls will probably have worked loose and will need tightening.

* * *

A panel which has been stood aside for some months may show signs of greyness, but this can generally be removed by a light application of mineral oil, and polishing with a soft, clean duster.

* * *

Fifty turns of fine wire wound on a 2-inch cardboard tube makes quite a useful H.F. choke for short-wave work.

* * *

Reaction effects in short-wave work are often improved if a home-made H.F. choke is placed in each of the telephone leads.

For Threshold Howl.

As threshold howl in a short-wave set is a form of feedback, it is always worth paying attention to the output circuit of the set.

* * *

Sometimes a fixed condenser across the telephones, or the installation of a choke output circuit for the telephones, or the use of an L.F. transformer as an output transformer, will remove trouble due to threshold howl.

* * *

As quality is not usually of primary importance on a short-wave set, a small L.F. choke will often serve quite well in conjunction with a large condenser to form a filter circuit.

* * *

To connect the 'phones the wrong way round in a valve receiver is to demagnetise them and thus make them insensitive.

* * *

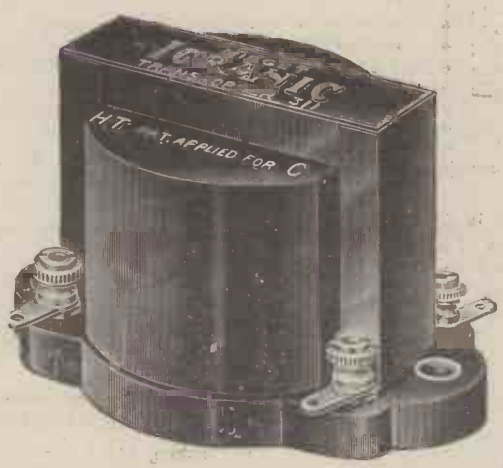
If an L.F. amplifier oscillates at a frequency just above audibility this may give rise to very bad distortion, frequently accompanied by a rushing or noisy background.

* * *

The modern "general purpose" valve is one suitable for certain H.F., detector and L.F. positions, but not for all stages, as were the original "general purpose" valves of several years ago.

Multum in Parvo!

NOW SOMETHING *REALLY* NEW IN TRANSFORMERS



IGRANIC MIDGET 10/6

The trend of modern receiver design calls for smaller components without sacrifice of efficiency. The new Igranic MIDGET L.F. Transformer is a masterpiece in miniature. No refinements—electrical or constructional—have been sacrificed for size.

Study its star points. Remember that its efficient performance has been proved by many exhaustive laboratory and practical tests. It is the Transformer you have been waiting for.

THE STAR POINTS

1. Size $2\frac{7}{8}$" × $1\frac{7}{8}$" × $1\frac{3}{4}$". Weight $6\frac{1}{2}$ ozs.
2. Patented bi-metal core of new nickel alloy, which permits overload without ill effect.
3. Primary inductance of over 60 henries
4. Case of polished Bakelite. Ample material surrounds fixing holes. All terminals clearly marked.

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IGRANIC ELECTRIC Co. Ltd.
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Inspect this "Masterpiece in Miniature" at our ***Stand No. 240,*** *New Empire Hall, Olympia. Write for new catalogue, Dept. R. 160.*

BATTERIES IN PARALLEL

Quality of reproduction and size of H.T. battery are often closely interlinked, for it takes a good, large H.T. battery to stand up to the strain of running a large valve receiver. The problem of supplying adequate anode current is dealt with in this article.

By A. J. Boyington.

THE provision of an ample H.T. supply for a multi-valve receiver still presents a problem to many amateurs. The inclusion of one or more power valves in the set intensifies the difficulty, for the modern power valve, with its generous emission (25 milliamps is quite a reasonable figure), demands an equally generous source of anode current.

By using an appropriate mains unit, of course, the difficulty may be obviated, but quite a large proportion of listeners still have to depend upon dry batteries for their high-tension supply and, as they are usually aware, the output of the average "popular" size dry battery is quite inadequate for anything larger than a two-valve receiver.

Have You Tried It?

If quality of reproduction is to be maintained larger capacity batteries must be employed, their longer life will more than compensate for their higher initial cost.

It sometimes happens, however, that only small-capacity H.T. batteries are on hand, and the writer has heard of cases where these have been employed, joined in parallel, to obtain that higher output which we know to be necessary. Indeed, there is reason to believe that this practice is not as uncommon—among listeners whose electrical knowledge is very limited—as one would assume. And on the face of it, the idea of extracting a double flow of current at the same voltage in this manner is a very plausible one.

In fact, it is to a certain degree a very workable idea, but various limitations and shortcomings in dry batteries themselves combine to make it an extremely unsatisfactory and uneconomical method of overcoming the difficulty. A consideration of these points, therefore, may prove interesting—and should certainly be of moment—to the amateur who has tried, or contemplates trying, to use small-cell batteries in this manner.

The Individual Cells.

In the first place, the construction of the average H.T. dry battery is at fault. It is assembled, in the case of a 60-volt size, from forty individual cells, each of which, theoretically, registers an E.M.F. of 1·55 volts. The word "theoretically" is used here advisedly, be it noted, since the object of the manufacturer is not so much to produce a battery giving exact 1·55 volts gradations as one giving a total of 60 volts. Consequently, in the manufacture it is usual to assemble forty cells which will give the desired total, but which may not necessarily each have identical voltages.

It will at once be evident, therefore, that here is a circumstance which may very easily defeat the successful working of such a scheme as we have in mind. Even assuming that two quite new batteries are used the dissimilarity of their constituent cells presages trouble; it is often found that odd cells deteriorate before the usefulness of the remainder has been appreciably impaired.

Circulating Current.

When two batteries are being used, connected in parallel, then there will obviously be a distinct difference in their individual voltages after a period of discharge. Thus, after a time one of the batteries may only register 54 volts as against the other's 58 volts, although both voltages were identical at the commencement of the test. Now a peculiar phenomenon arises.

The balance of voltage—in this case, four—causes a strong "circulating current" to flow, from the higher to the lower-voltaged battery and back again in a constant cycle. Our 58-volt unit is thus discharging, at a rate considerably in excess of normal, into the 54-volt battery, and the internal resistance of the composite cells becomes a very vital factor.

In the fresh cell this resistance varies, generally, from $\frac{1}{3}$ to $\frac{1}{2}$ an ohm, so that a new 60-volt battery has an average total resistance of about 20 ohms. That means that the circulating current in this instance would be the order of 100 milliamperes—a disastrous rate of discharge for such a battery in any case, and capable of reducing it to impotence in an hour or so.

A Vicious Circle.

Turning now to the weaker battery we find a higher internal resistance consequent upon the lower voltage. Odd cells, indeed, which have deteriorated owing to the partial drying of the sal-ammoniac paste, may have a resistance of anything up to 4 or 5 ohms. Upon such cells the circulating current will have a destructive effect, the increased resistance leading to a further drying-up of the electrolyte.

A vicious circle is set up, in fact. The good cells in the 58-volt battery will, naturally, soon become exhausted under the strain of the abnormal discharge, whilst the faulty ones will fairly crumple up quite early in the proceedings.

It will be seen, therefore, that economical working cannot result from joining two dry batteries in parallel. Using two H.T. batteries with a common negative connection to supply different valves or groups of valves is, of course, quite a different matter. But, as Kipling would say, that is another story!

THE CONTINENT'S LARGEST RADIO EXHIBITION

A general view of the main entrance to the Berlin Radio Exhibition, which is undoubtedly the largest of its kind in the world. It embraces all types of radio, gramophone and talkie productions.

Power for Portables

A little regular attention to batteries and careful adjustment of voltages will make a great difference in the working of your portable receiver.

THERE is a temptation to forget that a portable requires attention and maintenance just like the ordinary receiver.

This applies especially to the batteries which are the weak spot in all portables, particularly the H.T. battery. For this reason a few notes on the power supply may be welcome so that you can make sure your portable is right up to concert pitch whenever you want to use it.

USE OF SMALL H.T. BATTERIES.

First of all let us criticise the H.T. battery, the most important section of the power supply. In the majority of portables and transportables there is not room for anything but small-capacity type batteries, usually a block unit of 108 volts, or two of 60 volts each, weighing some eight pounds.

The obvious convenience of restricting battery weight and space, however, has to be paid for in rather heavy running costs, although a lot can be done to get more value for your money, as you will see presently.

The maximum current drain from an H.T. battery of small capacity cells is usually rated at 6 milliamps. This is ample for small portables, but when you have a five-valve set or an S.G.-detector–Pentode combination, the total anode current may run as high as 15 milliamps.

Your small capacity battery is not going to stand up to such an overload as this for long, and, if you use your portable a good deal, the useful life of the battery will be a short one! Consequently, do not be surprised if H.T. battery renewals are frequent; this is the price you have to pay for the convenience of portability.

A TWO-CASE SCHEME.

For economical running, of course, a high-capacity unit is called for, with a maximum current rating of 15 to 16 milliamps. This means a doubling of space and weight, which is only to be thought of if your outfit is a motorist's transportable.

Alternatively, the batteries can be accommodated in a separate case, with a connecting cable and plug for rapid connection to the receiver. This scheme, which is adopted in one well-known commercial transportable, is well worth consideration, especially as you gain considerably in volume and improved quality.

However, most of us have to be content with standard-capacity batteries, adopting certain dodges for prolonging the useful life as long as possible.

The first thing to do is to cut down the total anode-current consumption to the bare minimum consistent with good quality and amplification by making full use of the G.B. battery. Also, it is quite normal practice to reduce the working screen voltages of S.G. and pentodes below that specified by the makers with a corresponding reduction in anode current. If your portable has one or two H.F. stages, a negative grid bias of 1½ to 3 volts, if not already provided for, will save a milliamp or two.

The L.F. valves are particularly amenable to this treatment, the total anode current being reducable by an amount that counts without spoiling quality or volume by exceeding the values of grid bias specified.

Over-biassing the output valve requires some care, because beyond a certain value the valve begins to rectify, with consequent disastrous effect on reproduction. However, intelligent over-biassing often results in a saving of 4 to 5 milliamps, thus easing the load on the H.T. battery and increasing its useful life.

Another good scheme is to arrange the wiring for a common H.T. positive lead, which ensures an even discharge of all the cells of the battery as against the rapid discharge of a part where more than one tapping is used.

A REALLY POWERFUL "PORTABLE"

Considerable power is required to operate this radio-controlled motor-launch, which recently was demonstrated at Portsmouth.

When we come to consider filament current supply, our choice is practically limited to an unspillable accumulator, the only safe type for a portable. You need not buy a large capacity accumulator, because five ·1 amp. valves can be run for nearly twenty hours from a 2-volt 10 amp.-hour actual capacity cell. For minimum weight an accumulator with a celluloid case is preferable, although one with a thin ebonite case of the above rating weighs only about two pounds.

DRY FILAMENT BATTERIES.

For small portables, using, for example, two valves of similar filament rating, there is a lot to be said for dry battery L.T. supply, since we can wire the filaments in series, with a small series resistance, and use a 4½-volt battery such as the Ever Ready No. 126. Economical running, light weight, and ready replacement at small cost are the advantages. In fact, a spare battery adds little to the total weight if room can be found for it.

Now, as regards the maintenance of the batteries of your portable, it is a good plan to remove both H.T. and accumulator whenever you return from a trip if the receiver is not going to be used for a few days. This will remind you to get the accumulator recharged.

MAINTENANCE HINTS.

Otherwise it may be forgotten, and when you next want to use your portable you may find the accumulator run down and perhaps sulphated. There is also the risk in hot weather of acid fumes damaging the receiver if the batteries are left shut up inside the case.

That is the danger with portables, the batteries are usually hidden away, easily forgotten, and consequently liable to be overrun. Even if you do not forget to recharge your accumulator, it is a good idea, before taking the portable out with you, to read the voltages of both batteries, preferably after the set has been switched on for a few minutes. There is then no chance of your being let down by an expiring H.T. or L.T. battery.

"EKCO" POWER SUPPLY UNITS

SAVE MONEY

"EKCO" Power Supply Units completely do away with batteries and accumulators. All who use these troublesome accessories know how costly they are to renew and to keep charged. "EKCO'S" first cost is practically the last. The same "EKCO" Unit serves on for ever at a negligible cost of upkeep. If you average three hours use of your set a day, "EKCO" in one year will definitely save you pounds. Buy "EKCO" and save money!

SAVE TROUBLE

"EKCO" Units assure smooth CONTINUOUS reception with a constant voltage. No need now to worry as to whether you will hear all the programme. "EKCO" guarantees silent, HUM-FREE reception with INCREASED VOLUME. Buy "EKCO" and save trouble.

H.T. UNIT MODEL 1V.30 A.C. Price £2.19.6

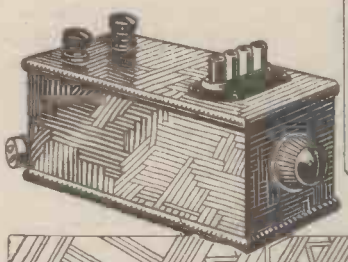
FOUR VOLTAGE TAPPINGS:

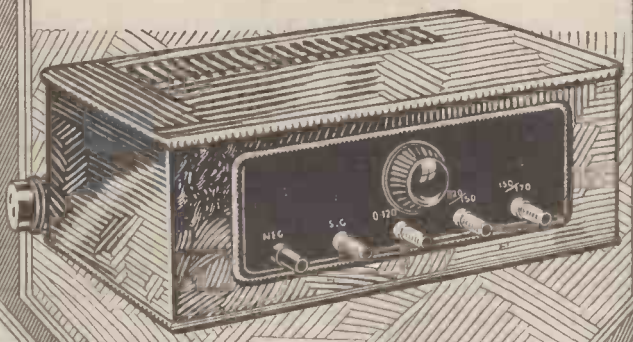
S.G: 60-80 volts for screen of S.G. valves
0-120: Variable between 0 and 120 volts at any current from 1 to 6 m/a approx.
120/150: 120 volts at 5½ m/a. or up to 150 volts at 2½ m/a.
150/170: 150 volts at 25 m/a. or up to 170 volts at 20 m/a.
Total Output of Unit—30 m/a. at 150 volts.
25 m/a. at 170 volts.
Running Cost. 3/6 per 1000 hours. (7 watts)

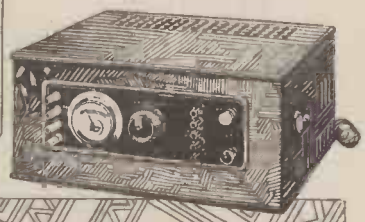
Plug-in  **—that's all!**

SAVE TIME

"EKCO" Units are easily and quickly fitted in three minutes and then forgotten for ever. Compare these with the hours spent on fiddlesome, messy, acid-staining accumulators with their constant shop renewals. Once an "EKCO" Unit is fitted all you have to do is plug the "EKCO" adaptor into any electric light or power socket and then switch on — that's all! Buy "EKCO" and save time.







"EKCO"

ALL-ELECTRIC RADIO

H.T. UNIT MODEL 1.V.20 D.C. Price £2.10.0

THREE VOLTAGE TAPPINGS:

S.G.: 60-80 volts for screen of S.G. valves.
0-120: Variable between 0 and 120 volts at any current from 1 to 6 m/a approx.
120/150: 120 volts at 16 m/a or up to 150 volts at 10 m/a
Running Cost: 2/- per 1,000 hours (4 watts).

ALL-POWER UNIT MODEL C2.A A.C. Price £10.17.6

Provides:

(a) H.T. 3 Tappings of: S.G. for supply to S.G. Valves: 60 and 120 150v. Output 20 m/a.
(b) L.T. 2-6 volts from ·2 amp. min. to ·5 amp. max., so being suitable for any combination of valves of the same filament voltage, provided that the sum total of current consumed by the filaments does not exceed ·5 amp.
(c) G.B. 5 Tappings up to 12 volts. Running Cost 6/- per 1000 hours. 12 watts

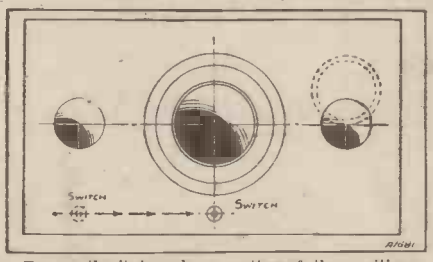
Write for details of the new "Ekco" All-Electric Sets and Easy Payments to E. K. Cole, Ltd. Dept. A. "Ekco" Works, Southend-on-Sea.

YOUR SET LAYOUTS by the Art Editor

JUDGING by the letters I have read in the correspondence columns of "P.W." there must be many who still make up their various sets in rough forms, wiring the components up like so many "konkers" on a string. To these I write—good luck to you!—but it is to the listener and his family that I am really addressing this article.

For necessarily in these days each member of the family needs some consideration. We have, therefore, to think of the layout of the modern receiver. One that will give the greatest efficiency with ease of control, and yet an *objet d'art*, whether for the dining-room or the lounge.

BALANCING THE PANEL.



Frequently it is only a matter of the positions of one or two items on a panel that make or mar its appearance.

Naturally it is not for me to tread on the ground of any of the technical staff regarding efficiency, for this is in their good hands.

The panel layouts must be controlled by the lengths of the wires the other side of the panel; long leads and ill-placed components make for bad squeaks, hopeless distortion and inferior signals.

The "Yanks" Arrive

The old-fashioned flat-top pattern sets had their good points in respect of their shortness of leads. Unfortunately, the various components and valves rising off the panel lent themselves to untidiness, and was undoubtedly good for the valve manufacturers.

Then the American upright panel came into being, with its loaded panel, literally packed with dials, switches, valve windows and terminals, a sight to scare the new amateurs away. Here we had the valves and coils packed away, but the name was a libel on the Americans, who have shown an undoubted ability for symmetrical layout.

By paying attention to quite small details it is possible vastly to improve the appearance of a radio receiver.

From the terminals on the front of the panel many wires curled in an uncompromising mass. How many carpets have been ruined by the broom or duster catching the accumulator wires? And how distracting they were, seeming to grow larger and more intricate in their curls as one sat during the evening listening to the broadcast. I suppose more trouble has been caused by the wire in wireless than anything else in the home!

Matching the Panel

A simple well-balanced layout leads us to ease of control; half a dozen dials do not allow a set to be a family concern, such as it is primarily supposed to be.

Such sets as the "Magic" Three, or This Year's "Titan" Three, are eminently sets for the home, because of their great simplicity of layout both inside and outside. Simplicity of layout unfortunately does not end the problem if the various components are "hung" on the panel like ill-disposed goods in a shop window.

An L.T. switch placed in a corner of the panel because it tends to shorten the wiring is a point not worth considering, if by placing it more central the alignment and general balance is improved, as in Fig. 1. Aerial, earth and loud-speaker terminals look unsightly on the upright panel.

The amateur set builder of to-day has many sources from which to acquire his components, and yet many rarely choose wisely and well.

Take the "mahogany" panel. Can anything look worse in a light oak case? It is essentially suited for a mahogany cabinet, and dials and switch knobs should be in keeping with the panel; black dials or coloured knobs shriek "amateur-built" directly they are observed.

Aluminium panels are certainly only suitable for dark oak, for, strangely enough, the set with this type of panel looks "indecently clothed" in a mahogany cabinet, however well planned its control system may be.

The radio set should be unobtrusive, and not act as a red flag to the rest of the family. To have Jacobean furniture, an over-elaborate Queen Anne cabinet, and a "simply gorgeous" mahogany loud speaker, will show very bad taste.

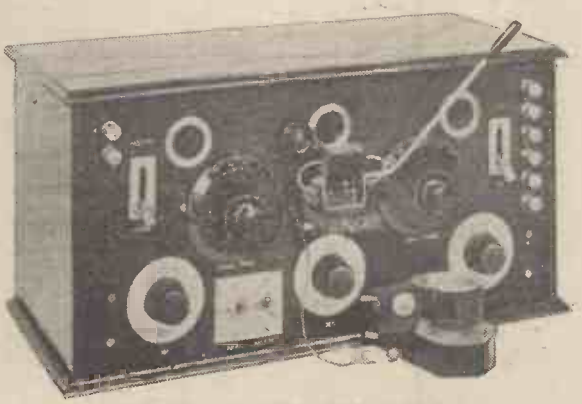
With cabinets in happy relationship to the rest of the home all should be well, and the stand cabinet should be the aim and ambition of every amateur. For then, if he has not a mains set, the ugly wires and oddments of batteries can be packed out of sight and mind.

A New Era

Recently I have noticed that the various mains sets placed on the market are being boxed in walnut. This seems to me to be the *très ideal* of the wireless receiver of the future. Walnut, to my mind, is not objectionable with any kind of furniture, and could be placed in any room with success.

The plainness of these designs, too, seems to point to a new era in radio design.

NOT ARTISTIC!



A photo of a set built in those early days of broadcasting, when panels were invariably untidy masses of switches, terminals and controls.

FROM OUR READERS.

A selection from the many letters received reporting results with "P.W." sets and concerning other items of interest.

THE "MAGIC" FOUR.

The Editor, POPULAR WIRELESS.

Dear Sir,—I feel I must write to thank you for the wonderful sets given from time to time in POPULAR WIRELESS.

I have made up "The Long-Range" Three, "Titan" Three, Popular Wireless "Programme" Four, "Throttle" Three, "Magic" Three and Four, and each one has given good results, but the last one I have made is the "Magic" Four 1930 De Luxe.

You have not named it wrong, *it is "Magic" De Luxe,*

It is placed in a cabinet 3 ft. 6 ins. long. 3 ft. high, with gram on one side, and radio the other.

The set is well worth spending a bit on the cabinet.

The stations pour in one after the other. The Continentals come in at such tremendous volume that I have to use the volume control, I really cannot speak too highly of the set, it is *real Magic.*

Yours sincerely,
J. W. S.

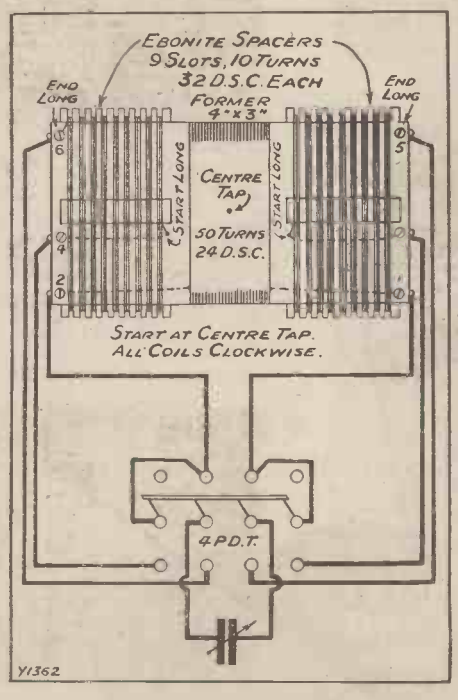
Old Trafford.

THE "C.T." ONE.

The Editor, POPULAR WIRELESS.

Dear Sir,—For the benefit of those who have made up your "C.T." One as described in your issue of May 24th last, I enclose herewith a diagram that may perhaps be of interest. I made this set with the coils described, but with two stages of L.F. (transformers), and have certainly had remarkable results.

The coils, as the diagram shows, are wound in four stages, beginning at the centre. Twenty-five turns of 24 D.S.C. are wound first, beginning at the centre and finishing at the tag shown as No. 1, and another 25 turns of the same size wire are



wound as a continuation and finished at tag No. 2. This completes the short-wave coil.

The long-wave coil is started at tags Nos. 3 and 4. and finished at tags Nos. 5 and 6.

As I had a 4 P.D.T. switch handy, I used this, as it allows the long-wave coil to be cut completely out of circuit when receiving on the short waves.

This circuit, when using this coil, is, in my opinion, one of the best all-round described by you, and I am anxiously awaiting a similar one, but preceded by two stages of S.G. H.F.

Thanking you for the many good sets in the past, not forgetting the "Magic" Three.

Yours truly,
J. COE.

London, N.W.1.

A CURIOUS FAULT.

The Editor, POPULAR WIRELESS.

Dear Sir.—The following experience may be rather puzzling to readers, as it still is to me. I rebuilt an old three-valve set for a friend of mine into a larger case. The set is just a straight Det.-2 L.F. trans.-coupled. Tuning is by a British General unit and ·0005 con.

The only alteration when rebuilt was the addition of a decoupling unit (30,000 res. .2 mfd. con.). When tested out at my home, everything was O.K., there being a marked improvement in every respect, due to better spacing, etc.

When tested at my friend's house, to my surprise a loud, shrill whistle came through with the transmission, and nothing I did would stop it. The set, in its wooden case, stands on a wooden cupboard, the top of which is covered with ordinary American cloth.

Still puzzled and rather fed-up, I put my hand on the cloth and, to my astonishment, the whistle at once stopped, the transmission coming through well. But as soon as I took my hand off the cloth, up came the whistle. Earthing the cloth stopped the trouble (or I thought so), but the loud-speaker leads fell on the cloth, and up came the whistle again as strong as ever!

In desperation, the cloth was ripped right off, and, sure enough, that stopped the trouble. Why the cloth, which seems to be quite a good insulator and not a conductor, should cause the trouble beats me. To prove things, it was put under the set again, and there was the whistle right away, but not for long, you may guess. The set had stood two years on the cloth with no trouble.

What do other readers of POPULAR WIRELESS think about the above?

Wishing you and POPULAR WIRELESS all the best.

I remain, yours truly,
A. S. FERRY.

Southampton.

[We tested a piece of this cloth, which was sent us by Mr. Ferry, and between two points on it separated by 1¼ in. a resistance of 25,000 ohms was measured. Thus the cloth is far from being an insulator, and is obviously sufficiently conductive to provide a marked capacity effect. The "conductance" of the cloth is due to the colouring material used in it.—TECH. ED.]

H.T. SUPPLY UNITS.

The Editor, POPULAR WIRELESS.

Dear Sir,—We are writing to you with regard to what appears to be a very common trouble in connection with sets used in conjunction with H.T. supply units on D.C. supplies, and as the question is of very general interest, we suggest it is a matter that should be commented on noticeably in your columns.

We have experienced a large number of cases where the primary winding of the high-frequency transformer used in the Ferranti "Screened-Grid Three" receiver has been returned to us and found to be completely burned out, the trouble being caused by the use of the set with a D.C. high-tension supply unit without taking proper precautions.

As most engineers are aware, trouble of this kind is unlikely to occur when wireless sets are used with D.C. high-tension supply units on the negative side of three-wire systems; that is, where the positive main is earthed.

One source of this trouble is not having a condenser in the earth lead of the supply unit, a condenser which, for safety's sake, should always be included, the earth connection from the receiver being disconnected entirely, the actual earth being made through the negative terminal of the supply unit, and the isolating condenser, which should be incorporated with it, and which is shown in our D.C. supply unit constructional chart.

The other source of trouble is the aerial, as if the aerial is not efficiently insulated—and very few aerials are insulated adequately to withstand a supply voltage of the order of 230 volts—a short-circuit can occur through the aerial coil of the set, with the result that it is destroyed; and, further, the whole aerial is at a pressure of 200 volts or more above earth, and is a source of considerable danger. This trouble is still further accentuated, even with the best aerial, if the aerial is earthed by means of a switch, as is commonly done.

The remedy is, of course, to connect a small condenser, usually about ·005 mfd., in series with the aerial terminal of the set inside the receiver, so as to prevent the aerial becoming alive.

As we have previously indicated, we have experienced such a lot of trouble due to this particular cause that we feel it is a matter which should be ventilated in the Press.

Yours faithfully,
FERRANTI, LTD.

Hollinwood.

A READER'S "MAGIC" FIVE.

The Editor, POPULAR WIRELESS.

Dear Sir,—I give below a few particulars of an extra stage of S.G. which I have added to my version of the "Magic" Four, and I feel sure that many of your readers who, placed in a similar position to myself with regard to aerials, would be interested in same.

(1) The extra S.G. stage is laid out and wired similar to the "Magic H.F. Unit," described in "P.W." towards the end of last year, except that it is wired into the set, and not used as a separate unit. Switches are fitted to cut out one or both S.G. stages.

(2) One or two extra precautions took the form of 600-ohm resistances and ·01-mfd. condensers in each of the four H.T. supply leads to the S.G. valves, and an L.F. choke in the detector H.T. supply lead to cure a hum which developed from an hitherto "silent" eliminator. I have since discovered, however, that by using unlike makes of S.G. valves it is possible to dispense with all four of these anti-coupling devices.

(3) The consumption of the set on full load is 24 m/a., although if G.B. is dispensed with on the S.G. side, the consumption jumps up to over 30 m/a.

(4) The tuning does not present any difficulties, as the extra variable is quite broad. The potentiometer requires rather more careful setting than with the "Magic" Four, but once set the tuning becomes very easy, the set slides in and out of oscillation beautifully, is perfectly stable, with reasonable care, and is altogether a pleasure to handle.

I have built and operated many sets over the past seven years, but my "Magic" Five (as I feel justified in naming it) is easily the best.

My experience during the past, and particularly with my present "Magic" Five, has convinced me that anyone can build from a "P.W." design with every confidence of success, provided the original layout is adhered to. I am also of the opinion that to "stick to the book" is only fair to the designer, as from examination of your layouts it is obvious that great care and thought is lavished on each and every "P.W." design.

I have pleasure in wishing "P.W." every success during the future.

Yours faithfully,
J. H. GIBSON.

Leeds.

MAGIC COIL-CHANGING.

The Editor, POPULAR WIRELESS.

Dear Sir,—Many thanks for your publication of Mr. Currie's "Magic" circuit—I have now incorporated the wave-change scheme into my own "Magic" Four, and am delighted with the result. Apparently the efficiency of the short-wave coils is not affected in any way—the dear, kind Salford Corporation Tramways compel me to use a very poor indoor aerial, so I should certainly notice any losses if any existed.

I like the suggestion of C. H. N. Smith for a Super-"Magic" with two H.F. stages, but *not* two screened grids. I should like to see a good five with plug-in coils, the first H.F. stage being a 3-electrode neutralised, but please keep the cost down, and no 24-in. panels! 21 ins. is standard for most cabinets.

Can we not have more good four-valvers (S.G.) with *home-made coils?*

Everybody cannot afford the expensive dual coil units some of your recent sets require. I always found a good home-wound coil more efficient, besides they are so instructive to the keen set constructor.

However, I hope I shall not want to make any change for a considerable time, being more than satisfied with my "Wave-Change Magic" Four. All honour to Mr Victor King, yourselves, and last but not least Mr. Currie, for bringing the scheme to our notice.

Yours faithfully,
H. W. MILES.

Salford, Lancs.

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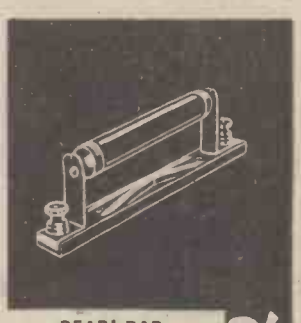

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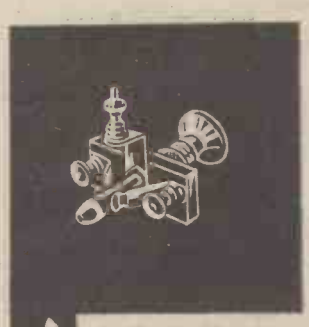

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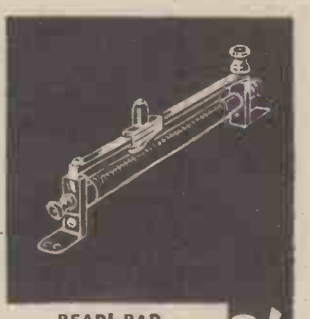

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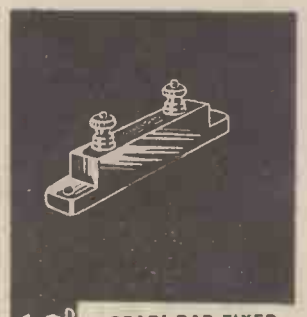

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HOME-MADE RADIO CABINETS

The Prime Minister forms his own cabinet, why shouldn't you ? It is not a difficult job to make a really good-looking " house " for your latest set—and it's cheap, too. Read this practical article.

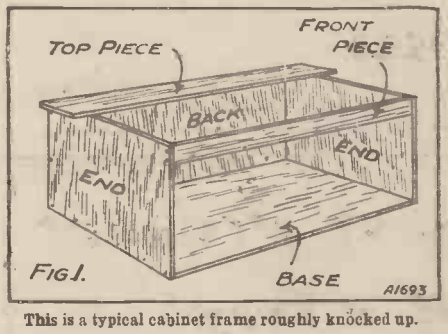
By R. W. HALLOWS.

WHEN a new wireless set is made, a suitable cabinet is often a rather expensive item amongst the parts required. There are therefore many constructors who only wish that they could make their own cabinets just as they construct their own receiving sets.

Unfortunately, unless one is naturally something of a carpenter, it is not possible to turn out home-made cabinets that are quite up to the professional standard ; still, there are several ways in which very presentable cabinets may be constructed with the simplest wood-working tools.

Some readers will find those to be described good enough for permanencies, for they are by no means bad-looking, whilst others, who have spent upon the parts required for the receiving set itself as much as they can conveniently afford for the moment, may care to construct these cabinets as temporary housings for the set, replacing them later on by the work of the professional carpenter or cabinet maker.

A FRAME UP!



This is a typical cabinet frame roughly knocked up.

Only Simple Tools Required.

The only tools required for the simple constructional jobs which form the subject of this article are a good wood saw, a chisel, a plane, a setsquare, a bradawl, and a screwdriver. The amateur cabinet maker will also need a supply of the finest glass-paper.

It should be mentioned, by the way, that those who do not care about squaring up and cutting out for themselves the pieces of wood required can get this done for them very cheaply by the carpenter from whom the wood is purchased.

In such cases the process of building cabinets resolves itself into nothing more formidable than fixing together the pieces with screws, and afterwards rubbing down the lid, front, and sides with glass-paper before applying an oil or French polish finish.

One of the most useful materials for the home constructor of cabinets is ply-wood. What I use a good deal myself for making cabinets for receiving sets, battery boxes, and boxes for wavetraps, condensers, measuring instruments, and so on, is a ply-wood with a total thickness of $\frac{3}{8}$ inch.

Suitable Wood to Use.

This can be obtained with a veneer of various ornamental woods such as oak, walnut, or mahogany at about eightpence or ninepence a square foot. If the surface of the veneer is carefully worked up with glass paper it takes a really beautiful finish.

Fig. 1 shows the framework of a simple cabinet, designed to be made either from plywood or from solid wood. In either case the base consists of a piece of white wood about $\frac{3}{4}$-in. in thickness. The ends, the front piece, and the top piece of the frame are made of ply-wood or of the solid wood selected.

Calculating the Dimensions.

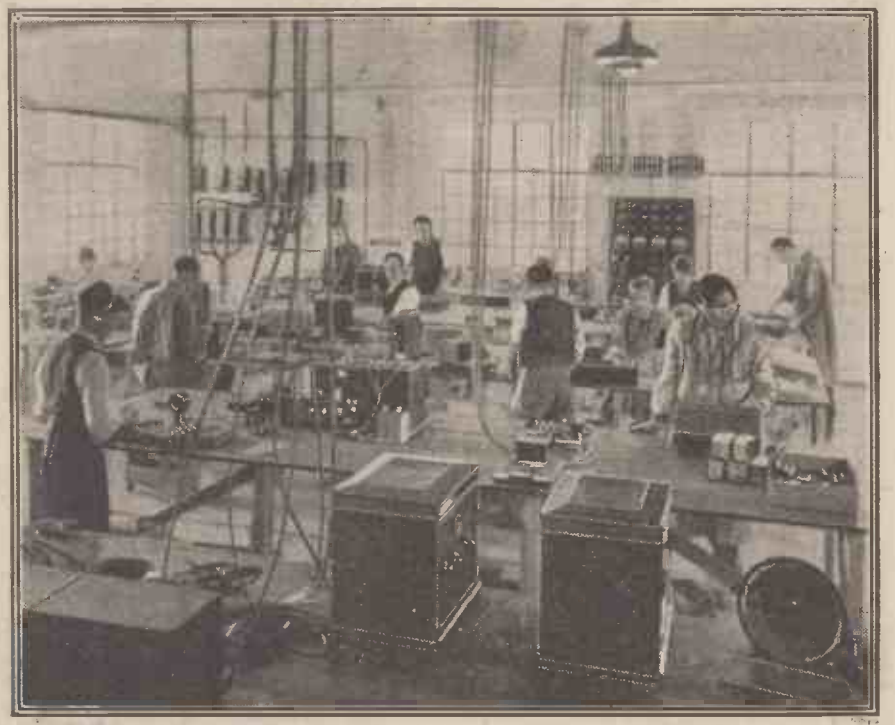
The method of setting about the job of making such a cabinet is this: Before you cut your wood, or order it to be cut for you, make a rough drawing of the cabinet, putting in the dimensions.

The width of the base will be that of the baseboard of the set *plus* the thickness of the panel, and its length will be that of the panel. The front piece is of the same length as the panel, and its depth may conveniently be from 1 to $1\frac{1}{2}$ ins. The top piece is about $1\frac{1}{2}$ in. longer than the panel to allow for overlap; its width should be about 2 in.

The height of each end-piece is found by

(*Continued on next page.*)

CABINETS BY THE CARTLOAD!



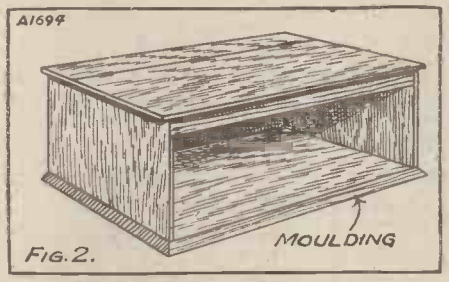
The testing laboratory of Messrs. Radio Instruments Ltd., where completed receivers are put through their paces before being placed in their cabinets and sent off for distribution to the public.

HOME-MADE CABINETS.

(*Continued from previous page.*)

adding together the thickness of the base of the cabinet, the height of the panel and the height of the front piece. Thus, if you are using ¾-in. wood for the base, if the panel is 7 in. in height and if the front piece is 1 in. in depth, the total height of each end will be ¾ in. *plus* 7 in. *plus* 1 in., or 8¾ in. The width of each end-piece is that of the baseboard of the set, *plus* the thickness of the panel, *plus* that of the back. If the baseboard is 10 in. wide, the panel ¼-in. ebonite, and the back ½-in. wood, each end-piece will thus be 10¾ in. in width.

THE COMPLETED CABINET

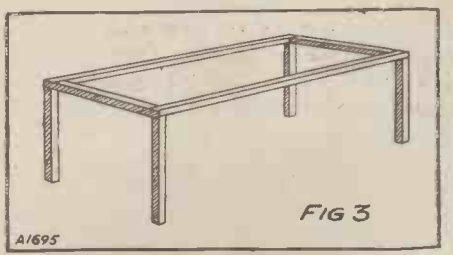


This is how the case looks when ready for staining and polishing.

Cutting Out the Wood.

Begin by cutting out the base, taking very great care to get it exactly square. Then cut out the end-pieces and fix them to the base by means of screws. The fronts of the end-pieces must be exactly flush with the front of the base; their rear edges will protrude beyond the back of the base by an amount equal to the thickness of the backboard. Cut out now the top piece and screw this to the ends, making its rear edge flush with theirs and arranging it so that there is an equal overhang at each end. The front piece follows. When the back-board has been cut out, fit it in flush with the edges of the ends, and top piece.

HOW IT BEGINS



The four supports and their top pieces form the commencement of the cabinet.

The construction of the cabinet has then reached the position shown in Fig. 1. Fix the back-board at first only with a screw or two since it will have to be removed later in order to cut apertures for the terminal strips.

We are now ready for the lid. The length of this is the same as that of the top piece, whilst its width is sufficient to allow an overhang in front of ⅜ in. to ¾ in. Or the front edge of the lid may be flush with the front piece, the overhang being continued with a piece of beading. The latter is the best method if plywood is used since the beading covers up the edges of the layers of wood.

In Fig. 2 the finished cabinet with its lid is seen. The bottom is finished off at the front and sides with a picture-frame moulding, which must, of course, be mitred at the corners. If you do not possess a mitre-board, any carpenter will do the job of cutting out and planing up the beading at very small cost. Beading similar to that suggested for the front edge of the lid may be used to cover the front edges of the end-pieces.

The Polishing Process.

Before the cabinet was put together the veneer surface of the plywood will have been given a preliminary smoothing down with fine glass-paper. This process must now be completed with the finest grade of glass-paper obtainable. The more work you put into rubbing down the veneer with glass-paper the better will the cabinet eventually look. The beadings and mouldings must, of course, be treated in the same way.

Quite a pleasing finish is obtainable if the wood is now simply treated with linseed oil. This should be allowed to soak in until perfectly dry, after which it will possibly be found that the surface is no longer quite smooth, but that the grain of the wood has come up a little. In this case rub down again with glass-paper and oil a second time.

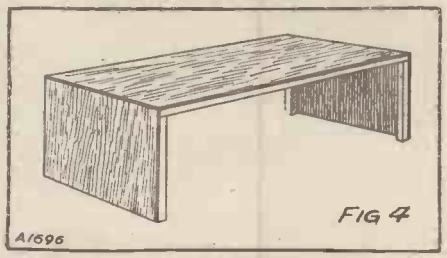
A still better finish can be obtained by means of a French polish that is specially adapted for amateur use, such as that marketed by Hobbies. When one of these simple polishes is to be used it is important that the surface should not be oiled. The polishing is simplicity itself, and the final appearance of the cabinet depends largely upon the amount of elbow grease employed.

Making a Simple Cover.

For those who find the scheme already described rather too ambitious there is a still simpler way of making receiving set coverings. These are not really cabinets since the receiving set does not slide into them. Instead, they are placed over it to serve as a protection from dust and to conceal the "works." As, however, they have when finished, very much the appearance of cabinets we may dignify them by that name in describing them.

These very simple cabinets are made by covering a stripwood frame with very thin three-ply wood. The latter can be obtained very cheaply with a total thickness of 3/16th inch. The cheapest of all, which costs only threepence or fourpence a square foot, has a white-wood outer layer.

PUTTING THE LID ON IT!



The top of the case is placed on at an early stage in the proceedings.

This, however, can be stained and if glass paper is soundly applied it takes quite a pleasant oil finish. At slightly greater expense thin plywood with other veneers can be obtained. The framework is made of pieces of wood about half-inch square in section. Fig. 3 shows just how the frame is put together. Its size must be such that the length between the front uprights is about 1/16ths inch greater than that of the panel and baseboard.

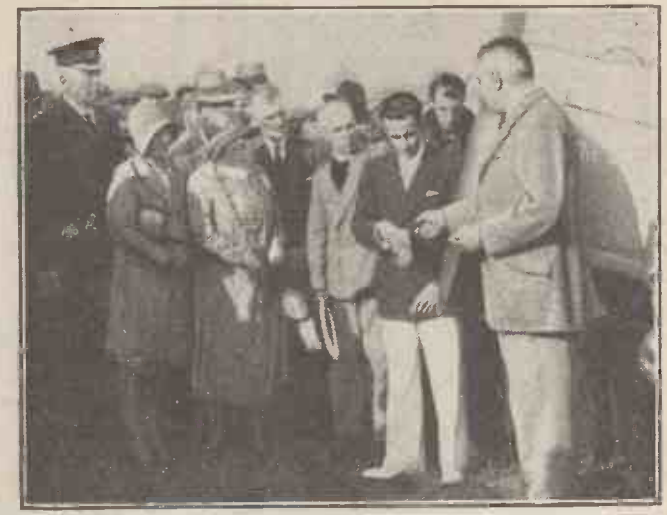
Assembling the Framework.

Each of the uprights is exactly equal in length to the height of the panel. The back-board should be attached directly to the baseboard of the receiving set. The width of the cabinet from front to rear is equal to the width of the baseboard and panel *plus* the thickness of the backboard.

Begin by making the top frame, fixing the pieces together by means of screws and using a dressing of Seccotine as well for the joints. Fix the uprights to this frame also by screws—additional strength will be given if the smallest Meccano brackets are used with countersunk screws. Next, cut out, or have cut out for you, three pieces of ply-wood for the top and the two ends.

Fix these to the frame with very small screws and the job is finished. As previously mentioned the cabinet simply fits over the receiving set and it may be held in place by means of a screw at either end. The interior of the set remains perfectly accessible since the cabinet can be removed merely by taking out these two screws.

A RADIO ADVENTURER



Mr. Stannage, the operator of the famous Southern Cross, which recently flew across the Atlantic, receiving congratulations from members of his home town.

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

QUESTIONS AND ANSWERS.

ANTI-MOTOR-BOATING RESISTANCE.

P. C. O. (Galway).—"In the instructions for building the set a caution is issued about using different parts, as in order to get the best results it says the set must be built exactly as specified.

"However, at the end of it there is a description of how to use an anti-motor-boating device, and the values for this are 3 mfd. for the condenser and 25,000 ohms for the resistance. I have the large condenser all right, but a 30,000 ohms instead of a 25,000 ohms resistance.

"It is wire wound and appears quite suitable but I am wondering whether, in view of the caution which is issued about altering the components, I should be justified in sending this or whether I ought to get a 25,000 ohms as specified. Do you think it would make any difference?"

Probably no difference at all.

The warning about using the correct components is intended to apply to those that are actively working as part of the fundamental circuit, and probably not to such a device as a de-coupling unit, whic his added afterwards as a sort of refinement.

In practice there may be absolutely no noticeable difference at all between 25,000 ohms and 30,000 ohms.

SHORT-WAVE COMPONENTS.

D. P. T. (Cowley, Oxon).—"As I have enough parts I am going to make up a short-wave set on a wooden baseboard, the idea being that it should be very low-priced, but with every attention paid to efficiency as far as possible.

(*Continued on page* 130.)

HOW IS THE SET GOING NOW?

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

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

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

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

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

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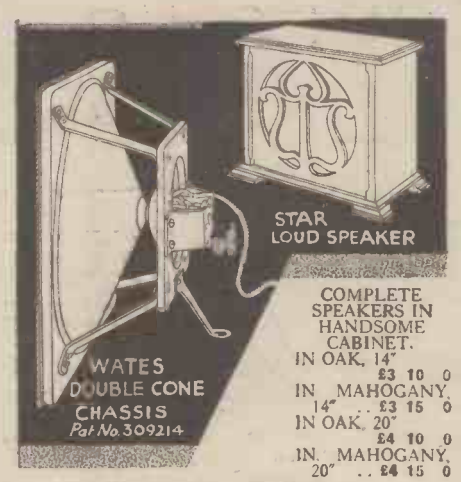

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WARNING.—When buying the WATES Patent Chassis, beware of imitations with the Cones *fixed* to the baffles—insist on seeing the name WATES before purchasing.

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Universal Bracket (only) for fitting various units to speakers		2	0
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RADIOTORIAL QUESTIONS AND ANSWERS.

(*Continued from page* 128.)

"I have two good valve holders left over from a previous set, one of them being of the anti-microphonic type and the other rigid. I am doubtful which is the best one to place in the detector position, and also doubtful about the output.

"I am thinking of using 'phones only and was going to employ a large old L.F. transformer as a sort of output choke, using the primary winding for this. Would this be O.K., as I shall be always using the set on telephones and do not require quality reception?"

With regard to the valve holders we should certainly use the anti-microphonic one in the detector position, and the rigid one as the output valve. The reason for this is that it is generally the detector which gives rise to microphonic troubles, so anything that can be done to shield this valve from such a possibility is worth while.

In your position we should be inclined to use the L.F. transformer primary as an output choke as you suggest. It seems a good idea because with a short-wave set there is often some slight trouble due to threshold howl effects, or to improper reaction, which is liable to spoil the long-distance range of the set, and very often an output filter is a good way of overcoming this.

The poor quality of the filter due to the fact that it will be only a comparatively small output choke will not matter in the circumstances, although, of course, it would be fatal for good broadcast reception. In any case it would be very easy to arrange the output filter externally, so that it can be tried experimentally.

SWITCH FOR THE EARTH-LEAD CONDENSER.

M. J. F. (Goodmayes, Essex).—"For the H.T. I am going to use a mains unit (home made), with a 1-mfd. condenser in the earth lead. As the positive main of my supply is earthed I must have this condenser in series, but when the set is switched off I want the aerial put straight through to earth.

"Can you give me connections for a D.P.D.T. switch which will join aerial and earth together when the set is off, but put the 1-mfd. fixed condenser in the earth lead when the set is on?"

The ordinary D.P.D.T. switch can be used for this purpose when connected up as follows: First of all mark one of the centre contacts on the switch A and the other opposite centre contact 1.

If you place the switch in, say, the "up" position, these two centre arms will make contact with two outer switch points. That outer switch point, which is now joined to No. 1, you should mark 2.

The other outer switch point, which is joined by the switch blade to A, should be marked B. This leaves you with two outer contacts still unmarked, so turn the switch in the "downward" position, when the 2 and the B will be disconnected from 1 and A respectively, and will instead be joined up to the two unmarked switch points.

That one which is now joined to No. 1 switch blade should be marked 3, and that which is joined to A should be marked C.

Having marked all the switch contacts proceed as follows. The aerial lead-in should go to No. 1. The outer point marked 2 should go to the buried earth connection and to one side of the 1-mfd. condenser.

The point marked 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 1-mfd. condenser. The contact which is marked C is taken to the earth terminal of the set. This completes the connections.

If you follow the circuit out you will find that the 1-mfd. condenser is connected in series with the buried earth and the set when the aerial is in use. When the switch is thrown over the aerial is connected direct to earth.

* * *

THE REACTION CONNECTIONS.

R. Y. (Windsor, Berks).—"At first I thought of having a new set altogether, but when I tried the old one out results were so good that I decided I would modernise it instead.

"With a new detector valve long-distance results are already excellent, and I have had stations from practically every country in Europe. The only snag is in handling the reaction, and I think a differential condenser, as used in the 'Magic' sets, would improve this. The present condenser being an ordinary variable as used for tuning.

(*Continued on page* 132.)

TECHNICAL TWISTERS

No. 28.—THE H.T. SUPPLY.

CAN YOU FILL IN THE MISSING LETTERS?

Although a headphone set can be run from flash-lamp-battery H.T., or from a small 60-volt battery, you need a larger battery for . . . . . work.

Small-capacity H.T. batteries can give only . . . . or . . . milli-amps at the most, and even a small . . . . . valve takes more than this.

You can measure your set's H.T. requirements by a . . . . . inserted in the . . . . . H.T. lead.

Or you can calculate it by . . . . . together the . . . . . current of the separate valves. (Obtained from the valve-maker's curves.)

Then choose an H.T. battery that is rated to supply this current (or more), and renewals will be few and far between.

Last week's missing words (in order) were: Distance, Armature; Armature, Rattle; Rattle, Reverse; Readjust.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 130.)

"I cannot, however, see how the connections should be made, as the differential has three terminals instead of the usual two. Would it be an improvement, and if so, what is the wiring?"

You would probably find a distinct improvement, and the alterations are not at all difficult to carry out. If you examine the differential condenser you will see it has two fixed vane terminals and one terminal which is connected to its moving vanes.

Take out your present condenser and mount the differential condenser in its place on the panel. The lead which formerly went from the reaction coil to one side of the reaction condenser now goes from the reaction coil to one side of the differential condenser's fixed plates.

The other lead (which came from the H.F. choke to the reaction condenser) now goes to the moving vanes of the differential condenser. The remaining fixed plate terminal on the differential condenser is joined to the L.T. — terminal, to earth, or to any terminal in the set which is directly wired to L.T. — or to earth, and this completes the alterations.

THE "A.P." TWO.

"JAYKAY" (Liverpool).—"I am thinking of building the 'A.P.' Two, which was described in the August 9th issue of 'P.W.' What coils and valves are recommended, and how much H.T. voltage does this set require?"

The aerial and anode coils are of the X type, but an ordinary coil can be used for reaction.

For the ordinary wave-band a No. 60 aerial, No. 60 anode, and No. 50 reaction are recommended, and for long waves a No. 100 for reaction and No. 250 for the aerial and for anode.

The valves should be one of the screened-grid type, and one of the H.F. or special detector variety for the detector. They may be of either 2-, 4-, or 6-volt filament rating, as any of these will be found to work excellently in this circuit.

You will find that 60 volts, 70, or perhaps a little more, will ensure good results when applied to terminal H.T. + 1, with 120 on H.T. + 2, and 60 or 70 on H.T. + 3.

The H.T. + 3 terminal supplies the detector valve, and accordingly a little adjustment is necessary here to obtain the best reaction effects and the greatest volume on weak signals.

A SHORT-WAVER FOR 10s.

E. M. H. (Leamington).—"Before going away for my holiday in August I noticed in 'P.W.' an account of 'a short-wave receiver for 10s.,' and I put this aside to make up on my return. Unfortunately, I have been hampered until now from getting on with it, and I have lost the copy in which the description was given, as I generally pass on my copies of 'P.W.' to one or other of my friends.

"Can you give me the number in which it appeared, and address from which it can be obtained direct?"

The description of "A Short-Waver For Ten Shillings" appeared in POPULAR WIRELESS No. 426, August 2nd issue, 1930.

Back numbers of "P.W." are obtainable from The Amalgamated Press, Ltd., Back Number Dept., Bear Alley, Farringdon Street, E.C.4, price 4d. per copy, post free.

CENTRE-TAPPED COIL FOR THE "MAGIC" FOUR.

R. F. (Nr. Oxford).—"I must add my bit to the praises of the 'Magic' Four, which has given me a wonderful run for my money. Talking it over with a man I met at a wireless lecture, I was surprised to hear that it is possible to use a centre-tapped instead of an X coil, as I do not remember seeing this referred to in 'P.W.'

"He was not very sure about it, but advised me to write to you, as the set he had seen it on was not his own but a friend's. What is the great idea?"

Probably your acquaintance was referring to the fact that districts which are remote from any heavily interfering stations can get just a little extra volume by using a centre-tapped coil for the one marked L2 on the diagram, instead of the standard X coil, which is used in normal situations. In this way you get slightly tighter coupling in the valve circuit, and so you get a little more amplification, but only at a definite sacrifice of selectivity. Selectivity, however, remains fairly good, and if you are situated where there is no local station likely to spread over your dials, we certainly think the scheme is well worth a trial.

R. M. (Enfield).—"I am using a Brownie Crystal Set, and just recently I tried a loud speaker on it and found that I could hear it faintly at about a yard away from it. Could

(Continued on page 134.)

WHAT DO *YOU* THINK ABOUT THIS?

A recent case of hum from the mains reminds a Congleton reader of his experience, which puzzled him a lot at the time.

He made a Det., 2 L.F. which "worked fine," so instead of trailing a long flex lead to the loud speaker from one room to the next he decided to put in permanent wiring under the floorboards. ("Had to, as my pup *would* nibble the flex!" he explained.)

But as soon as he connected the speaker to the new wiring he got a hum as well. Would you have known

WHAT WAS WRONG?

N.B.—There is no prize for answering this, but from time to time we shall give a radio problem (followed the next week by the answer) in the hope that readers will find them both interesting and instructive. (Look out for the solution to above next week.)

Last week's trouble was a very common one—wrong loud-speaker connections. The Wellingborough reader did not know that his loud speaker had a + and a — terminal to show how it should be joined to the set. He had reversed the leads, and so demagnetised his loud speaker.

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 132.)

you tell me what I could do to make it come through louder ?"

We are glad you asked about this, R. M., because every year about this time a good many people are wondering the same thing.

Let us keep to simple facts and simple phrases. You've got the crystal set, you've tried a loud speaker, and you want to make it louder.

Now, to make that programme louder you must have *more power* pushed into the loud speaker. Where are you going to get *more* power from ?

At present the power for working the set is coming from the broadcasting station at Brookmans Park. It reaches your set via the aerial and earth, which serve as a collector of power.

Obviously, you can't expect the B.B.C. to increase the power they send out from Brookmans Park, can you ? They are doing their best now, and in any case there are all sorts of limits imposed on them, so we must think of some other way.

We have said that your aerial system is a "collector" of power. Suppose you could improve its collecting properties ?

That would give more power to your set. In fact it is the *only* way, without using some form of amplifier.

We don't know what kind of an aerial you've got, but the best form is a single wire, without joints, raised as high as possible above neighbouring houses, trees, etc.

Get it as high as you can, as clear of obstructions as possible, and *keep the wire well spaced away from walls and gutter pipes.*

Use good conductive wire—copper, silicon bronze, or phosphor-bronze are all excellent—and don't forget the earth connection. A short lead (same wire as aerial) to a water-main, or to a large buried earth-plate will give good results, but be sure that all joints, terminals, etc., are tight and clean, so that the aerial currents have no unnecessary resistance to overcome.

Having done all this you will be getting the maximum result possible with a crystal set. Although, if quite near to a broadcasting station, there may be sufficient energy to work a small loud speaker, in most cases the power collected by an aerial-earth system is not sufficient to do this.

In your own case, even if you make the aerial and earth very much better, and so pick up two or three times as much power, we fear there will not be sufficient power to work even a small loud speaker. To do this properly requires quite a lot of power—far more than can usually be picked up on an aerial.

Therefore, it is usual to employ an amplifier for loud-speaker work, the ordinary wireless valve being particularly well suited to the purpose.

A valve set enables a local source of power (such as batteries) to strengthen the input from the aerial, and any desired degree of strength can be obtained by the choice of suitable apparatus.

So you see it all boils down to "gingering" the crystal as far as possible by improving aerial and earth, and if this still gives insufficient power for loud-speaker reception an amplifier will be necessary.

THE H.F. GRID BIAS.

W. T. (Stamford, Lincs.).—"My set is the 'Regional' Four, built from one of the 'P.W.' blue prints, and I must say it is a wonder.

"I have been troubled by one point, however, which, although it makes no difference to signals, has completely nonplussed my friends when I explain it. I noticed it first when testing the grid-bias cell for the H.F. valve to see if it wanted renewing, the negative lead to this cell goes to the ·002 fixed condenser and to No. 2 on the aerial coil unit.

"These two leads were soldered together when I made the set, and had been slipped under the condenser terminal. In some way they have come adrift, and although they looked all right when looking down on the set, I discovered that when I went to test the grid-bias cell that, actually, the condenser was out of circuit altogether !

"To my surprise, I found that when it was put in you could not tell any difference at all in the results. What I cannot understand is that in a set which works so well one of the components can be undone altogether and yet it makes no difference to results.

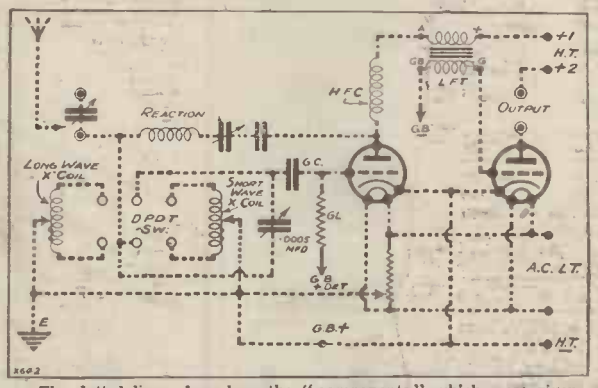
"I knew it was a good set, but I did also think every part was 'pulling its weight,' and I cannot make out how it is that this does not affect the set whether it is joined or whether the connection is broken."

The ·002 fixed condenser which is connected across the H.F. grid bias has been inserted in the circuit to act as a bypass. Actually, it is placed in series in the first tuned circuit of the set, and in that position every care must be taken to introduce no losses into the circuit, as otherwise the whole input to the set would suffer.

Apparently in your own set the extra resistance afforded by the grid-bias battery's connections was

(*Continued on page* 136.)

POPULAR "WIRELETS" No. 19



The dotted lines show how the "components" which were given in the skeleton diagram last week should be connected for a two-valver using A.C. valves.

If the 60-turn reaction coil is placed between the others efficient wave-changing is carried out merely by throwing over the D.P.D.T. switch. (Note that the detector needs a *positive* grid bias, and the L.F. valve ordinary negative grid bias.)

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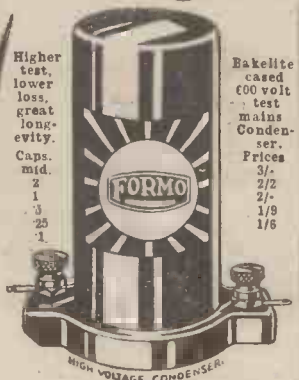

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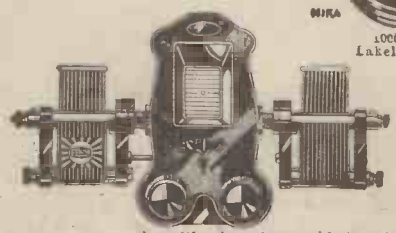

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SEE STAND 72 AT OLYMPIA

C.H.S.

RADIOTORIAL QUESTIONS AND ANSWERS.

(*Continued from page* 134.)

so small as to make no perceptible difference, but this is by no means always the case, and for that reason the condenser is regarded as an essential part of the circuit.

That does not mean to say, however, that it is always making a noticeable difference, and although we have known dozens of instances where such a bypass condenser can be removed altogether without apparently affecting reception at all, it is nevertheless necessary as a general rule to arrange that such a condenser should bypass high-frequency across the grid-bias battery if the full efficiency of the receiver is to be maintained.

* * *

CONNECTING UP THE L.T. BATTERY.

P.M.T. (Andover, Hants.).—"I am rather nervous about changing the L.T. battery, as the last time I did this all the wires got hot. Is this all right?"

No. You must always regard a hot wire as a *danger* signal, for it is one certain way of the set showing its owner that there is something wrong.

If your set has been working all right since the incident of the hot wire, the probability is that for a moment you "shorted" your L.T. battery. This is very bad for the battery, and has an element of danger, inasmuch as if the wire gets too hot it might catch on fire, or set something else alight.

There is absolutely no need for anything of the sort to occur if you connect and disconnect your battery properly. All that you have to do is to remember that the leads to the L.T. battery should always be undone *at the battery end*, and not at the set end of the lead.

The battery standing by itself is quite harmless. But if wires are joined to the terminals and then touch together at the other end (as may easily happen accidentally), heavy current flows which causes the wire to get hot.

If, on the other hand, the far ends of the leads are always properly joined to the set, and it is only at the *battery* end that the leads are undone, there is definitely no danger.

FOR THE LISTENER.

(*Continued from page* 92.)

The Fiddler.

Last night, in the dusk, I was sitting in the window, searching Europe for a little light music to entertain some of our neighbours who were lounging lazily after the day's work among the trees. Came by a tramp, a little oldish man with dust-covered elastic-side boots, clothes that had never been meant for him.

Under his arm he had a green bag, out of which he produced a fiddle, and began to play. It was not of very good vintage, but the local colour was excellent.

By some flash of mother wit, he knew that we were English, and so, after playing an Italian air or two, very wheezily, he suddenly and astoundingly broke in upon us with "Fiddle and I." I admit that it was pretty bad. We paid him off at once.

He was surprised at the coin which dropped into his hand. He seemed to look at it less with his eyes than with his nose, which took on a ruddier tinge at the sight!

"Heaven and Hell."

That is a fairly bright title for a musical programme, isn't it? It came from Stuttgart. It began, of course, with Don Juan's Journey from Gluck's Ballet.

Later there was an item called "Nostalgia," but whether it meant that those in Hell were homesick for Heaven, or vice versa, the music did not make plain. Then Offenbach's Overture, "Orpheus in the Underworld."

Followed by Grimm and Andersen and the programme concluded with some "Jokes" by Georg Queri. I did not quite understand the jokes.

Spitzweg.

You perhaps haven't heard of Spitzweg. Neither had I.

It is a big wild world. He is a painter, or was. And Hamburg the other evening had a programme entitled, "The Painter Spitzweg's Subjects in Word and Music."

I thought it a good idea. Each item in the programme described one of the painter's pictures. "The Cactus Amateur," I'm bound to say bothered me. It was probably a difficult picture—a cactusy picture. It sounded like that.

But Walter Sickert's pictures would make a good programme; so would Goya's.

ABOUT YOUR VALVES.

In addition to reducing the H.T. required by a screened-grid valve a small negative grid bias of 1½ volts or so is often of advantage in improving selectivity.

* * *

Among the incidental advantages of an S.G. stage are the easy volume control effected by incorporating a variable filament resistance or by reducing the voltage on the screening grid.

* * *

Of the "grids" of a pentode valve the innermost one next the filament is the control grid as in the ordinary three-electrode valve, and is joined to the ordinary grid pin on the four-pin base.

EASY TERMS

WE specialize in the supply of all good quality Radio sets and components on easy terms. We will give you efficient and prompt service. A few examples below:

McMICHAEL MAINS THREE. The outstanding all mains set of the season. Remarkable performance both as regards sensitivity and quality of reproduction. A receiver we can thoroughly recommend. Demonstrations daily.
Cash Price £21 0 0
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MARCONI PICK-UP. The best and most sensitive Pick-up available at the present time. Cash Price .. £3 3 0
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120 VOLT EXIDE H.T. Accumulator, 5,000 M.A. capacity, including 2 Polished Oak Carriers. Cash Price.. £4 13 0
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NEW BLUE SPOT 66R UNIT. The finest balanced armature movement on the market. Complete with large Cone and chassis, Cash Price £2 10 0
Or 5/- with order and 10 monthly payments of 5/-.

All makes of Eliminators, Loud Speakers (including moving coil), meters, batteries, etc., supplied on similar terms. Kindly let us have your inquiries and a quotation will be sent by return.

LONDON RADIO SUPPLY COMPANY, 11, Oat Lane, Noble St., London, E.C.2. *Telephone: National 1977.*

The first firm to supply Radio Components on Easy Terms.

"HAVE YOU HEARD" "ELECTROCETS"

All-Electric Radio Gramophone?

Contained in a handsome Polished Mahogany Cabinet. Complete with valves, ready for use on A.C. Mains.

18 gns.

The specification includes: Osram Valves, Blue Spot Speaker, Harlie Pick-up, Collaro Motor, Westinghouse Rectification.

Described as the set that costs less than it should!

May we send you our illustrated brochure, free on request?

THE ELECTROCET RADIO CO., SOLIHULL, BIRMINGHAM

AGENTS WANTED.

£2 Guinea WIRELESS CABINET for £3.

JUST ASSEMBLE IT YOURSELF THE "OSBORN"-WAY THAT'S ALL

No. 219. A Radio or Radio Gramophone Cabinet, 3' 9" high, 2' 2" wide, and 1' 6" deep. The battery and loud speaker compartments are at the bottom and are partitioned off. Size of the baffle behind the fret is 24" x 24". Metallic fabric for the fret front is included. Opening at the top and back. This cabinet will take a panel 2' x 9" or smaller.

READY TO ASSEMBLE: Oak 65/-, Mahogany 70/-, Walnut 80/-.
ASSEMBLED READY TO POLISH: Oak 85/-, Mahogany 90/-, Walnut 100/-
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National Radio Exhibition, Olympia, Sept. 19th-27th.
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CHAS. A. OSBORN (Dept. P.W.), THE REGENT WORKS, ARLINGTON STREET, LONDON, N.1. *Telephone:* Clerkenwell 5095. And at 21, Essex Rd., Islington, N.1. 'Phone: Clerkenwell 5634.
All models carriage paid. Send for 56-page illustrated catalogue. Send 3d. in stamps.

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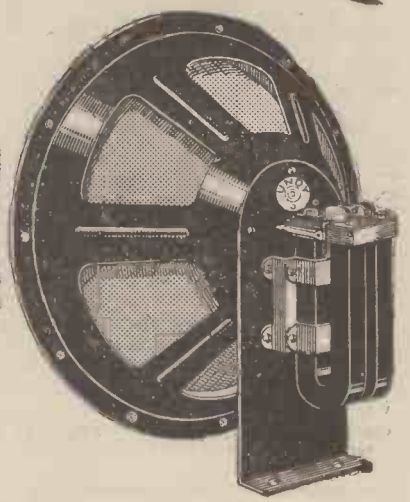
A MOST AMAZING INVENTION IN LOUD SPEAKER UNITS

50/- INCLUDING CHASSIS



Undy 8 pole Dynamic now on top of all modern loud speakers by marvellous new design, the speaker for the smallest set and the great amplifier, known the world over in a few weeks since introduction.

UNDY 4 POLE!

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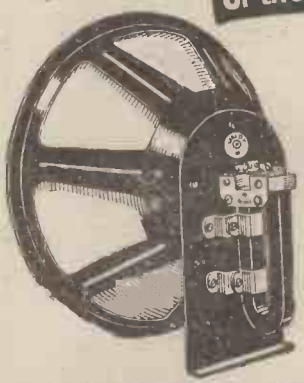

35/- INCLUDING CHASSIS

18/- UNIT ONLY

The Undy 4 pole, the new ingenious design by the inventor of the Undy 8 pole. This loud speaker will give full satisfaction on the ordinary small set or amplifier — its extreme sensitivity, amazing volume and perfect reproduction is unbeaten by any moving coil speaker

"UNDY"

OBTAINABLE FROM YOUR WIRELESS SHOP

Ask for Demonstration!

THE "CONTRADYNE"

(Continued from page 109.)

that here is a perfectly effective cure for the troubles we have been suffering from.

To make a "Contradyne" then, all we want is a coil of the right size, built into a little unit with a pair of terminals, and a switch to short circuit the coil when we desire to receive on the lower wavelengths. To get the best effect the size of the coil requires to be adjusted to suit the particular case, and so in this first model of the device we are showing a home-wound coil with tappings, which you will find is very easy indeed to make.

This coil is convenient, because it enables you to find just the right amount of inductance to suit your requirements, but it is not essential and we intend shortly to describe a simplified version in which a plug-in coil is used, the right effect being obtained by trying different sizes.

Easy to Wind.

The coil is slot-wound on a ribbed former in which the necessary slots have been produced by filing, and one of the photographs shows this quite clearly. The complete instructions for making the coil are given in the caption of this photograph.

To fasten the finished coil down to the little baseboard on which the "Contradyne" is assembled is quite simple: just fit a wooden crosspiece inside one end of the former and pass a screw down through this into the baseboard. The wooden crosspiece should be cut to a length which makes it rather a tight fit in the end of the former, and it can be secured in place by means of a couple of little screws.

All the rest of the constructional work is really too simple to call for any instructions, as you will readily see when you have had a look at the photographs and diagrams. As a matter of fact, both the construction of the unit and its use are so simple that we have managed to tell the whole story in the captions to the various illustrations and you will find that you could make it and use it without reading a word of this article if you chose!

Try it for Yourself.

We have arranged the pictures and diagrams to tell the whole story in this way as a convincing proof of the wonderful simplicity of this device, but there is one thing which we cannot tell you in either pictorial or verbal description, and that is the wonderful efficiency with which it works. That is something which we must leave you to find out for yourself.

Before we leave the subject for this week, however, we must just issue a warning to the effect that there are certain types of receivers with which the "Contradyne" does not function satisfactorily. All those sets described in POPULAR WIRELESS during the last two years have had some form of auto-coupled or inductively-coupled aerial circuit, and with these the "Contradyne" can be depended upon to function. There are certain types of sets, however (not of our design) in which different systems of coupling have been employed, and with these the instrument does not give complete satisfaction.

MORE ABOUT THE EXHIBITION.

(Continued from page 90.)

C. A. VANDERVELL, LTD. Stand No. 7.

An entirely new C.A.V. production is an L.T. accumulator of a particularly robust variety. The C.A.V. non-spillable varieties of the original jelly acid type are shown and are well worth close inspection. On the C.A.V. stand is a machine which demonstrates the unspillable nature and the immovability of the electrolyte in the C.A.V. unspillable batteries. It is a striking demonstration, and one that should have vastly more effect than the most liberally descriptive literature.

VARLEY (OLIVER PELL CONTROL). Stand No. 105.

Here is a very strong display, including some particularly attractive receivers. The Junior all-electric sets are as neat as anything in the whole of Olympia, while the Varley Senior all-electric transportable receivers are magnificent propositions at the prices listed.

The entirely re-designed version of the Varley compound mass suspension gramophone pick-up is exhibited, while there is a comprehensive range of components for mains devices.

As a matter of fact, constructors are well catered for at the Varley stand, although of course the components shown are mostly mains devices and L.F. stage parts. For instance, the new high inductance low-frequency choke and double push-pull input transformers, push-pull pentode output chokes and output transformers are exhibited, and we must not forget to mention the "Nicore" L.F. auto-transformer, a new Varley production which has been designed to give the maximum possible amplification in a single stage.

WATMEL WIRELESS CO., LTD. Stand No. 12.

The new Watmel Universal dual-range tuner is shown. This tuner covers 200 to 600 metres and is controlled by a three-point switch. It is a very compact affair, and the method of aerial coupling enables it to achieve great selectivity without any form of wave-trap.

The Watmel people are also showing their new H.F. chokes, which were reviewed some few weeks ago in "P.W." A further item is the Watmel cone chassis, which is designed primarily to use with a Watmel unit, but a third supporting arm can be affixed to it and a platform fitted, so that any unit can be accommodated. A fine oak cabinet is available for the Watmel unit and Watmel chassis.

WESTINGHOUSE BRAKE AND SAXBY SIGNAL CO., LTD. Stand No. 239.

"The all-metal way" is the slogan around which the exhibits of this stand are grouped. The Westinghouse metal rectifier figures in an enormous number of the mains units shown at Olympia.

It is particularly interesting to note that the range of Westinghouse constructors' units has been extended by the addition of three new units. These are of entirely new design, and have as their main object the provision of metal rectifiers at the lowest possible cost compatible with satisfactory service. These new units are enclosed in a lighter gauge metal casing, and the rectifier itself is of slightly different construction, although equally reliable.

You should make a point of securing a copy of the "All-Metal Way, 1930," which is distributed from the stand, for this book gives instructions for the building of several first-class eliminators and battery chargers.

WHITELEY BONEHAM & CO., LTD. Stand No. 66.

Here are some fine loud speakers, including cabinet cone types, the W.B. cone chassis and stand, and of course, the W.B. four-pole balanced armature cone loud speaker unit, and the new W.B. permanent magnet moving-coil loud speaker.

This instrument is available in chassis form, fitted with a 14-inch baffle, or assembled in a handsome cabinet.

W.B. aluminium copper screens for various uses are exhibited, together with the various well-known W.B. valve holders. There is a W.B. Universal screened grid valve holder and a W.B. four or five pin valve holder for A.C. valves. A particularly interesting item is a W.B. under metal-baseboard-mounting valve holder.

WILKINS & WRIGHT, LTD. Stand No. 60.

A new anti-capacity switch is featured. This new type embodies previous anti-capacity characteristics, but the contacts are greatly improved and are made of solid silver.

There is a drum-dial which makes a full revolution. The "Mite" log condensers, "Mite" thumb control condenser, and the "Mite" log double-balancing condenser are exhibited.

(Continued on next page.)

MORE ABOUT THE EXHIBITION.

(*Continued from previous page*)

WINGROVE & ROGERS, LTD.
Stand No. 118.

The Polar people are showing all their well-known variable condensers, details of many of which have appeared in "P.W." from time to time. An entirely new line is the Polar "Tub" three-gang fully-screened condenser. This is, as its name suggests, entirely enclosed in a screen structure and its sections are very accurately matched.

There is also the Polar short-wave condenser, a specially designed component for the low wavelengths so constructed that the tuning can be spread out over the scale.

WRIGHT & WEAIRE, LTD.
Stand No. 250.

Here is a very fine range of switches, from the simplest single-way types to those capable of carrying out very intricate circuit rearrangements. Special coils are exhibited, and among these you will find the well-known "P.W." types. There are also mains transformers, valve holders, and H.F. chokes, both of ordinary and heavy duty types.

The Wearite L.F. coupling unit is included in the display.

YOUNG ACCUMULATOR CO., (1929).
Stand No. 225.

A rectifier, for charging H.T. batteries, and a range of Young accumulators.

ZEITLING & SONS, LTD.
Stand No. 26.

These people are wholesalers, and are displaying the general products of the trade.

PROGRAMME EXCHANGES.

(*Continued from page* 85.)

talking realities—a name in the papers or the thought of a thinker? I give you only *one* guess.

For the rest the incident is useful in drawing one on to discuss this proposed short-wave broadcasting station again. The incident should bring people to realise that, as apart from the inter-continental wireless link, a service is more "*pour passer le temps*" than to give broadcasting reality.

Advertisement Programmes.

I am entirely in favour of a short-wave station now that 5 S W has given us the information that the lonely are amused by the fact of its existence, but don't let us shout about it as a fundamental of the service. I have suggested and I reiterate that it affords a useful medium to try out "advertisement" programmes, but these must be "live," not just prosy emasculations telling the Colonial how a Government department has published a leaflet showing that a British tractor might be used in Uganda.

Advertisement programmes have got to attract per se. They have got to be alive, and then the lonely will be the more amused, the more inclined to listen and the more inclined to believe the message that is interwoven.

Short waves cannot at present be used for one hundred per cent reliability unless supplemented and reinforced in other ways, so let us use them as they should be used.

I conclude: Wait on the inter-continental telephone for the exchange of real programmes between continents; make the short-wave broadcast programmes real and make the station economic by handing over the service to private enterprise.

TECHNICAL NOTES.

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

Leads That Alter Tuning

WHEN fixing up a receiver with a loud speaker at some distant part of the house, you will sometimes find a little difficulty with regard to the tuning of the set. For instance, in a case recently described to me by a reader, it was found that the long leads to the loud speaker slightly altered the tuning of the set, with the result that the dial setting for the National programme was appreciably changed, although in the case of the Regional the effect was not so noticeable.

The actual change in the tuning of the set is not in itself important, since it is obvious that you have only to re-tune to another position.

Distant Speaker.

But if you are using only one loud speaker, and that is at a considerable distance away, it may be that whilst you are tuning the set you are unable to hear the loud speaker, or at any rate sufficiently well to enable you to make accurate tuning.

This difficulty is very simply overcome by connecting at the same time a small local loud speaker to the output terminals, which will then serve as an indicator for tuning the set sharply. Alternatively, if you wish to keep the additional load on the output terminals as small as possible, you may use a pair of headphones connected across these terminals.

Of course, it will not do, using only one loud speaker, to connect this first in a position adjacent to the set and then, having tuned the receiver, to remove the loud speaker to the remote end of the long leads. When making your tuning tests it is necessary to have the distant loud speaker connected up in the position in which it is intended to operate.

Some Aerial Problems.

I am often asked whether it is possible for two receivers (for example, in neighbouring houses) to be operated from a single aerial without interference with one another, and also whether two aerials can be used satisfactorily when they are close together, or when one of the aerials is in effect a prolongation of the other, with an insulator in the centre.

It is obvious that readers raising these points are desirous of co-operating with a neighbour and making convenient arrangements with regard to the erection of aerials.

As regards working two receivers from one aerial, although this is theoretically possible and, in fact, is actually done in many commercial cases, it is not to be recommended for amateur reception. In the first place, unless the two receivers are of exactly the same type, there is considerable likelihood of complications, owing to the relationship of the aerial to the receiver. For practical purposes it is better not to attempt to operate two different receivers on the one aerial.

(Continued on next page.)

TECHNICAL NOTES.

(Continued from previous page.)

Local Interference.

As regards two aerials in line with one another, this also is an arrangement which is not to be recommended, as, although the aerials are theoretically separate from one another, and can, in fact, be tuned quite separately on different receivers, it is almost certain that there will be interference between them, and if a powerful set is connected to one aerial it is probable that a large amount of absorption may take place from the other one.

In the case of two neighbouring aerials, it is better to keep these as far away from one another as is conveniently possible. It would be better still, of course, to arrange them so that they should not be parallel to one another, but this will not generally be practicable, as the most convenient direction for the one aerial will most probably also be the most convenient direction for the other one.

Gramo-Motors.

I have had several queries from readers with regard to the use of electric gramophone motors, and whether it is worth while going to the extra expense of an electric motor rather than a spring one. Also, I have been asked whether there are any special disadvantages or "snags" in regard to the electric drive.

Personally, I think the electric gramophone motor (assuming you have a suitable electric light supply, of course) is very much to be preferred to the spring drive, as you simply switch on and the motor runs as long as may be required, the nuisance of re-winding being entirely obviated. The extra expense is perhaps a consideration, as an electric gramophone motor costs considerably more than a spring motor.

Electric Drive.

The earlier models of electric gramophone drive were sometimes unsatisfactory, owing to irregular running, and for that reason many people got the impression that the electric drive was necessarily not as satisfactory as the spring drive.

Electric gramophone motors have, however, been considerably improved during the past two or three years and there are several makes now on the market which you will find perfectly satisfactory in every way. They give quite a steady, uniform rotation of the turntable, and the speed can be regulated within the usual limits, by means of the ordinary regulator acting upon the governor.

Shielding.

There is just one point which has to be borne in mind when using an electric pick-up, and that is the possibility of electrical interference between the motor and the pick-up. There should be no sparking in the motor, as this will certainly cause interference, and it is desirable to shield the motor from the pick-up as completely as possible. In most cases you will find that the makers of the motor have had this point in mind and that the electric motor is so constructed as to be practically incapable of causing interference.

(Continued on next page.)

TECHNICAL NOTES.

(Continued from previous page.)

Short-wave Effects.

I mentioned some time ago the discovery of a second electrical layer in the upper atmosphere a sort of second Heaviside layer, although not, strictly speaking, to be called by that name. As you know, a curious feature of short-wave transmitters is the "skip" effect, as a result of which the transmission will almost completely miss a nearby station whilst it will be received strongly at a more distant station.

It is supposed that this skip effect is due to reflections between the earth and the electrical regions in the upper atmosphere, and it varies at different times of the year and even from time to time during the day.

An Important Test.

Although many observations have been made on this skip or reflection effect with short-wave transmission, these observations have been more or less haphazard, many of them, in fact, having been carried out by amateur transmitters and experimenters.

It is now proposed to make a really serious test on this effect by setting up (in America) a number of receivers spaced over a distance of some hundreds of miles, with special arrangements so that it will be possible for the operator in charge of the whole chain to know exactly how the transmission is being received at the same moment on each of the receivers.

This experiment naturally involves a considerable outlay both in money and in labour, but, if successful, it should throw a great deal of light on the manner and peculiarities of short-wave transmission, which after all is an extremely important section of radio communication.

Reception Pointers.

The resistance value of the grid leak depends as you know largely upon the signal-strength which you intend to receive, and as distant stations are naturally, as a rule, on the weak side, it is a well-known rule-of-thumb to use a fairly high value of grid leak for distant reception and low value for strong local reception. Remember, however, that it is not purely a question of distance which decides this point, but rather the question of actual incoming signal strength.

Distance and Quality.

Of course, a high value of grid leak, although increasing the sensitivity of the set—that is, the power of distant reception—is apt to interfere with the quality of the reproduction, and therefore you have to strike a compromise between sensitivity and good quality.

In any case, long-distance reception is almost invariably marred to some extent by causes which are not within your control, such as fading, interference, and so on, so that generally speaking you cannot aim for such high quality in distant reception as you expect in local or comparatively short-distance reception. Therefore, you need not put too fine a point on the question of quality when you are out for distance, and it is a good plan to use a fairly high value of grid leak; even up to, say, 5 megohms.

This is also particularly important for short-wave reception, which, as you know.

(Continued on next page.)

TECHNICAL NOTES

(Continued from previous page.)

depends so much upon the efficient operation of the detector.

The grid condenser is not so amenable to adjustment and I do not think you can do better than to stick to the conventional value of about 0·0003.

The Attractions of Portables.

There are an increasing number of listeners who cannot be bothered with the erection and maintenance of an outdoor aerial and who are intrigued with the easy operation of a self-contained portable receiver, which is about as easy to operate as a gramophone. Moreover, it can, like the gramophone, be carried about from room to room wherever it may be required.

Recent Improvements.

As regards the efficiency and range of reception of a portable receiver (points upon which it was open to a good deal of criticism until comparatively recently) these have now been very greatly improved and extended by the introduction of the screened-grid high-frequency amplifier and with a portable model employing a couple of stages of screened-grid H.F., the need for an outdoor aerial is certainly much less.

Nevertheless, in spite of the many important advantages of the portable type of receiver, there must, in my opinion, always remain a large body of more technically inclined listeners and experimenters who will refuse to discard the outdoor aerial.

It must always be remembered that, within limits, however good the portable may be, it can always be improved by a good outdoor aerial and a good earth. Of course, some portable receivers are provided with aerial and earth sockets, so that they can be used either with or without the external aerial.

Questions of Price.

Another important point to bear in mind about a receiver designed to operate with an external aerial is that, as a rule, its price is only a fraction, at any rate perhaps a half or a third, of that of a good portable.

A final point to bear in mind also (particularly in regard to the alleged unsightliness of an external aerial) is that it is fashionable nowadays to use an outdoor aerial which is only a third or a quarter or even a smaller fraction of the length which used to be considered necessary in the early days of broadcasting. The smaller length of the outdoor aerial (height is still important) renders it very much easier to make it a neat and unobtrusive job.

Safer, Cheaper Better Radio with the-

The Sensation at Olympia

THE R.I. H.T. UNIT FOR A.C. AND D.C.

Cuts out the costly H.T. Battery.
Gives immunity from all danger of live contact because it is All-Insulated.
Gives safe H.T. current from any electric supply at a cost of approximately 3/- per annum.
FITS PORTABLES and suits all sets up to five valves—output 20 milliamps for A.C. and D.C.
Improves reception amazingly.
Sells at a popular price.

A.C. MODEL - £4-15-0
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NEW ALL-INSULATED H·T·UNIT

Nikalloy—the Marvellous New Metallurgical Discovery—has been applied by R.I. Research Workers and Engineers to a new H.T. Unit.

Absolutely Revolutionary in Safety, Efficiency and Economy, this Nikalloy H.T. Unit attains a new achievement for British Radio and R.I. Reputation, equalled only by the performance of the Big 3—the "Hypermu" and "Hypermite" Transformers and the "Hypercore" Choke.

Ask your dealer or write for illustrated descriptive leaflet.

SAFETY & EFFICIENCY

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ALL-INSULATED SAFETY FIRST R.I. H·T·UNIT

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