

SPECIAL ARTICLE : TELEVISION AND THE PUBLIC

Popular Wireless

HOW THE CATHODE RAY
WORKS
★ ★
NOISE! HOW LOUD IS IT?
Etc., Etc.

EVERY
WEDNESDAY
PRICE 3¢

AND TELEVISION TIMES

No. 665.
Vol. XXVI.
March 2nd,
1935.

First Details of the

EVERYBODY'S KELSEY ADAPTOR



And

**How To
Improve Your
Loudspeaker**



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SUPER - SELECTIVE IRON
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MANAGING EDITOR: N.F. EDWARDS.

TECHNICAL EDITOR: G.V. DOWDING ASSOC. I.E.E.

CHINESE STATIONS
RADIO UPLIFT
SPEED OF WAVES
NEW NAMES

RADIO NOTES & NEWS

THE CHIEF'S VOICE
A POWER POINT
"SEVEN DAYS OFF"
ARTIFICIAL "X's"

South America Direct.

WRITING from Mill Hill, N.W., F. J. S. sends me a highly interesting letter about long-distance reception on medium waves. He uses a 7-valve super, and this brief extract from his letter will show the range he achieves:

"I was more successful with the Spanish-speaking South American stations, which, however, were far from being at their best. Most faded deeply and for considerable periods; those logged were Porto Rico WK A Q and seven different Buenos Aires programmes (LR 3, LR 4, LR 5, LR 6, LR 9, LS 8 and LS 2)."

There was also a handful of odds and ends—chaps like Bahia Blanca, Montevideo and so on—not definitely identified by name.

This was all going on while the Anglo-American Society's all-night test (see page 662, Jan. 19th, "P.W.") was in progress. And after F. J. S. had thus scoured South America he concludes in all seriousness: "In comparison with others it was a very poor night for DX-ing in this district."

Ye gods! A poor night!

Far East Developments.

THE Chinese Ministry of Communications, nobly doing its stuff, reveals, announces and informs all and sundry as follows:

"Four radio stations in the newly created Hsikang Province have been completed and are now in operation. The new station at Hsuechow is also working, and plans are being prepared for a transmitter at Pailingmiao Suiyan."

For the life of me I cannot pretend to be excited about all this, though I can appreciate the justifiable jubilation of the Pailingmiao Suiyans. Nevertheless, I mention to you this Far Eastern tit-bit for two reasons: (a) In the hope that you will be duly impressed by the radio progress of the Celestial Empire; (b) because it was given to me so gracefully and politely that none but a churl could refuse to pass it on!

We Know the Breed.

EIGHTY per cent of Bulgaria's population consists of peasants—hard-working chaps, mostly, with a queer taste in suitings and headgear, I grant you, but none the worse for that.

Annually they plough and sow and reap and mow, and then repeat—year after year, come weal, come woe, come Michaelmas! All they ask is to be left alone. Are they? They are *not*.

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ON OTHER PAGES

Television and the Public	-	827
The Everybody's Kelsey Adaptor	-	828
"P.W.'s" Pioneer Television Research	-	837
"Calling All Cars"	-	838
Noise! How Loud Is It?	-	839

.....

The uplifters are after them! They are to be instructed, elevated, raised; improved and cultivated; and radio is the chosen instrument.

High-minded officials in Sofia have announced their intention "to raise the intellectual level of the village, and, as part of the programme to this end, . . . to stimulate radio diffusion in the provinces."

Poor wireless! "So fair a messenger—such woeful tidings borne."

INSIDE A MOBILE RADIO STATION



Owing to the growth of air-liner traffic in the south and west of England, the Air Ministry recently decided to install a mobile radio station at Portsmouth pending the construction of a permanent station. This photograph gives a glimpse of some of the apparatus inside the special mobile unit, one of the duties of which is to keep in touch with mail planes catapulted off transatlantic liners.

Mailed Fist.

IT was with some concern I noted a certain daily paper's words on Radio Luxembourg. In big black type was the formidable statement:

"Special armed guards have had to be stationed at the Radio Luxembourg broadcasting station, to which many British listeners regularly tune in."

On reflection, however, I decided not to worry about this. It might be an error. And even if it were true the armed guard might be merely a precaution, rendered necessary by an irate public that is too badgered by canvassers and hawkers to take kindly to radio salesmanship.

Watch on Waves.

SOME highly interesting experiments on wave propagation and kindred subjects are scheduled to take place during the night of March 12th-13th.

International transmissions have been arranged, the National Bureau of Standards, Washington, having promised to co-operate by transmitting a frequency of 5,000,000 per second, accurate to within 1 cycle and capable of reception in Europe.

The B.B.C. is going to modulate Droitwich, Scottish Regional and Scottish National simultaneously, with a frequency of 1,000 cycles per second.

Observers, armed with low-voltage cathode-ray oscillographs and more elaborate apparatus, will compare the modulations arriving at their stations by observing the beats; and in this way the incoming waves will be checked to see if they have been misbehaving or loitering between departure and arrival aerials. Qualified experimenters who would like to take a hand in these important tests should write at once to the Chairman, Commission I (Standards), U.R.S.I., National Physical Laboratory, Teddington, Middlesex.

"Give It a Name."

THE above appears to be an enthusiastically received suggestion in France, where they have been naming and renaming their broadcasting stations with great gusto.

"Paris National" is still a little strange to the ears, but the Rennes station has been given so many

(Continued on next page.)

THE "DADDY OF ALL ATMOSPHERICS"!

titles that it is difficult to recognise the old acquaintance under the new nomenclature. Not long ago he blossomed out by styling himself "Radio P.T.T. Ouest"; but now you can tune in vain on 288.5 metres for anybody of that name. Instead, there is "Rennes-Bretagne"—which is really the old firm operating behind a new name plate.

Trade Troubles.

SELLING all-mains sets to Chinamen must be a full-time job if all I hear about it is true. The story goes that an energetic salesman in Shanghai sold a powerful set, with illuminated dial, to a wealthy Chinaman one afternoon. Pleased at this stroke of business, he went home and finally retired to bed and slept happily.



In the middle of the night a loud

knocking awoke him, and he went downstairs to find his customer of the afternoon very perturbed.

"What's wrong?" said the business man. "Sollee to tubble you," replied the customer, "but vellee nice gentleman in set speakee long time, vellee pleasant. Then he say 'Good-night' and go away—but be forget to turn his little light off!"

Oriental politeness demanded that the "vellee nice gentleman" should be traced and informed of his lapse!

The Unlucky Station.

IF you tune carefully to 309.9 metres, dodging the interference from Belfast, Poste Parisien and Breslau, you may, if lucky, hear that most unlucky station, Radio Agen.

A stout fellow is Radio Agen, who, in the fell clutch of circumstances, has neither winced nor cried aloud. Goodness knows he has had cause, for Fate has dealt him a crafty crack or two in the past.

First, floods—so many unnecessary gallons that the station was washed out of existence.

Came the reconstruction, and then fire—so much unnecessary heat that Radio Agen melted right off the map.

Now he's back once more, living right up to his name—Radio Agen!

Bury to the Fore.

BURY Fire Brigade has treated itself to a new loudspeaker installation.

Not, as you might imagine, to listen to the song-and-dance programmes, but to hark to the stern call of duty.

When a fire alarm comes through, the officer on duty first sounds a general call, and then, as the men converge to their posts, his voice in the loud-speakers tells them where the fire is and what's to do about it.

Consequently, as each man settles his helmet on his head, he has beneath that



helmet a more or less clear idea of what sort of fire he is out to extinguish. All this, mark you, within a minute or so of the alarm being given! Bury's pride in its fire fighters would appear to be justified.

Trouble on Tyneside.

GEOGRAPHICALLY speaking, Newcastle is a goodly distance from Tallis Street.

But I have received a letter from "Geordie" that brought the woes and murk of a Tyneside evening right into my room.

It is these wavelength alterations that have upset "Geordie." To prevent people monkeying with his tuning he fixes the adjustment permanently and screws everything down. You can guess what happens. Very next day (or so it seems to "Geordie") the B.B.C alters the Newcastle wavelength again. And so it goes on.

"Why can't we have a permanent wave?" he says. This is exactly what Arieline & Co. keep asking their better halves (me and you). There is no adequate reply.

Mr. H. D. PRICE

It is with the utmost regret that we have to record the tragic death of Mr. H. D. Price by misadventure while on duty in the Baird Television premises at the Crystal Palace.

Mr. Price was for some years a member of the "P.W." Research Department, and was an enthusiastic pioneer in the investigation of short-wave transmission and reception. Though he left our staff in 1931, he took an active part in the "P.W." Crystal Palace ultra-short-wave tests in 1933. (He can be seen in the left of the photograph on page 837, leaning against the tower.)

Shortly after these tests he was offered a position as engineer by the Baird Television Co., and at their laboratories he was enabled to continue research into the subject which was always so close to his heart. His untimely death has cut short a most enthusiastic and promising radio career.

A Great Administrator.

THE moving tribute which was paid by Sir John Reith to the late Rt. Hon. J. H. Whitley—in the broadcast announcement which informed listeners of the death of that leader of official British radio—leaves little to be said about that great though unobtrusive administrator.

In a career that was unusually varied and onerous he made wireless a major interest. And to his unique gifts we listeners owe more than is commonly realised, for he loved to work outside the limelight.

Inquiring once about the early interest Mr. Whitley displayed in wireless, I was told that he enjoyed reading "P.W." And I feel he must indeed have been "one of us," for the announcement of his death brought a sense of loss to many readers who knew not the man, but admired his personality and achievements.

The Heavyweight Championship.

THE question as to which is the world's most powerful wireless broadcasting station has cropped up again—and it is not so easily settled as might be imagined.

There are different ways of reckoning the power—or "pah," as one sometimes hears it pronounced over the air—and comparisons, therefore, are apt to be misleading.

The favourites at the moment of writing are Moscow I (the 1,724-metre chap), who

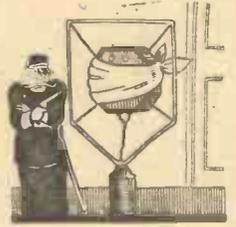
uses 500 kilowatts; and W L W, Cincinnati, U.S.A., who uses 500 kilowatts.

Which kilowatt—U.S.A.'s or U.S.S.R.'s—is the larger kilowatt I know not. They may be exactly equal, but all I know is that each station has 500 of them and claims to be the world's most powerful radio voice.

Madrid's Lapse.

POOOR old Madrid, E A J 7, has been having a spot of bother with the police, and last month the station was sentenced to seven days off the air.

It appears that the police were offended by some details broadcast about a robbery in which one life was lost, and since there is a strict censorship of news in Spain the incident was not regarded lightly. The station authorities hoped at first that the prohibition would apply only to the news broadcasts, but the police were not so obliging and insisted that the close-down should be complete.



The Toy that Grew Up.

SURPRISING as it may seem, there have been several instances of late of letters to newspapers proclaiming proudly that the writers had banned wireless from their homes as being "unnecessary," "disturbing" and so forth.

If ever this ostrich-like attitude were justifiable the day has passed. Weighty Government pronouncements to the public, like that by Sir John Simon on aerial aggression, are made by wireless better than by any other means. And by their directness and intimacy such broadcasts encourage a closer study of the newspapers—create a taste for news, in fact, and so educate us to new interests and a wider outlook.

Wireless can be looked at in many ways—as an entertainer, a teacher or as a means of (not easy) livelihood. But to refuse to look at it at all, to ignore it as of no account—that is just foolshness.

Daddy "X."

NOT long ago I wrote that the Americans were staging a monster atmospheric—the noise of a 10-million-volt "lightning" flash created in one of the G.E.C. laboratories. The fleeting crash it may have administered to listeners in its vicinity was not enough for the engineers.

They decided to record it, and it has since been used as a "call" by station W 2 X A F on 31.48 metres.

In introducing the new call signal the announcer said it was the "Daddy of all Atmospherics"!



TELEVISION *and The Public*

By **THE RT. HON. LORD STRABOLGI**

In this exclusive article our distinguished contributor reviews the present television situation and gives some interesting opinions on the future of "Seeing by Radio."

NINETEEN THIRTY-FIVE will be a notable year in the history of wireless. For early in this year was published the report of the Selsdon Committee on Television.

As one who has been in touch with developments in this great new field during the last six years I propose to examine the situation from the point of view of the public.

An Efficient Committee.

The Selsdon Committee was well chosen and did its work efficiently. It was only appointed in May of last year, and its report was completed on January 14th last. During that time the whole situation was exhaustively examined. Special visits were made by sub-committees of the Committee to the United States and Germany. The report itself is clear and concise, and deals with the whole complicated subject in a large way.

The members of the Committee and the Postmaster-General who appointed it, Sir Kingsley Wood, are all deserving of congratulation. The chairman, Lord Selsdon, is better known to the public as Sir William Mitchell-Thomson. He was an efficient Postmaster-General in his day, and, but for a turn of the political wheel, might have attained to higher office. There was another first-class business man of great experience in Sir John Cadman, and the remainder were technicians or concerned with the B.B.C. and the Post Office.

It is necessary to issue a warning. The early experimenters and inventors in the field of television were hampered by scepticism, official discouragement and much cold-shouldering. In contrast both the German and American Governments and scientific bodies gave active support from the very beginning to inventors and experimenters in their own countries. It is all the more remarkable, therefore, that this country seems well on the way to establishing a lead in this important new science, presently to be developed into a substantial industry.

A Long Way To Go.

Now, we have a habit of going to extremes in this country, and the views of the man in the street have now changed right over to extreme optimism. Many people, without knowing the facts, seem to imagine that a perfected system of television, with the whole organisation for transmitting programmes for entertainment in the home, is in existence already. The truth is that we have still a very long way to go. For technical reasons the development of television, from the point of view of the "lookers in," is unlikely to be anything

like so rapid as the development of sound broadcasting has been.

Those enthusiasts, therefore, who think the time has already come when they should scrap their present wireless sets and buy combined television and sound-broadcasting receivers are quite wrong. Sound broadcasting will be predominant for several years.

We may divide the television public, broadly, into three classes. There are those who regard television as an outlet for speculation. There was a regular boom

LORD STRABOLGI



A recent photograph of the author, who is well known for his fearlessly outspoken opinions, and who as Lt. Commander the Hon. J. M. Kenworthy was a striking personality in the House of Commons for many years.

in television shares for a week or ten days following the publication of the Selsdon report. There will be money made in television, and there will be much employment, in the long run, given to highly skilled artisans and others. A valuable new system of popular entertainment is with us already. But speculation and the dangers of a slump following it are harmful.

The science is, however, still in its infancy. The first station for the London area has to be built, and then it will only serve an area over a 25-mile radius. True, this covers a very large fraction of the total population of these

islands; but the rest of the country will be uncatered for. In passing I would like to put in a plea for the North of England and Scotland. I think the very next step should be to erect television transmitting stations, one in the Manchester area to serve the thickly populated district of that part of England, and a second in the Glasgow area.

Important Developments In Progress.

If the speculative boom continues or revives, this section of the public are likely to burn their fingers, if for no other reason than that very important scientific developments are in progress now; and, valuable as has been the pioneer work of the two companies—Baird and E.M.I.—who are to be given the opportunity of transmitting on their systems on alternate days, they by no means have the monopoly of patents, knowledge and inventive skill.

Thus the Italian Marconi Company is carrying out important researches into the use of the micro-wave. If these are successful the present 25-mile range will be greatly exceeded and another revolution brought about in the development of television.

The second section of the public are the present-day listeners, many of whom will desire, as soon as possible, to have the chance of "looking-in." The first comment to be made is that the sets presently available will be somewhat costly. The estimates range within £50 and £80 a set.

I am glad to see that it is not proposed that there should be any increase in the cost of wireless licences. The immediate finance required can be arranged between the Treasury, which for some years has been taking far too large a slice of the revenue of the B.B.C. in any case, and the B.B.C. itself.

The Question of Advertisements.

I am glad, also, that although the Committee examined carefully into the question of raising additional revenue by advertisements, television will not get into the hands of purely commercial interests, as has happened with broadcasting in the United States of America. There is, of course, a case for the "sponsored programmes"; but if we can get on without them, so much the better.

Now, what are the general public likely to see? The present-day sound-broadcast programmes will be made more interesting when the lecturer, musician or singer can be televised. But what the ordinary man in the street wants, if he can manage it, is to be able to see events actually in progress, such as Royal processions, sporting events

(Continued on page 851.)

FIRST DETAILS OF THE EVERYBODY'S KELSEY ADAPTOR

A particularly simple and compact unit for converting existing receivers for short-wave reception, which can be built for one guinea. Full constructional details will appear next week.

By G. T. KELSEY

IT'S happened. I rather feared that it might right from the start. It appears that everybody wants to build the 1935 version of my battery adaptor, and, to be absolutely candid about it, everybody just can't afford it.

When I say everybody I mean all those kind friends who have written to me—perhaps I should say who have written to me about this question of cost, for I have had almost as many letters from readers who have actually built the new adaptor.

The fact remains that many are precluded from building it simply and solely because of cost, and that concerns me very much. I know how I feel if I read all about the joys of something or other, only to find when I get down to brass tacks that I cannot afford it. It's infinitely worse than knowing nothing about it at all.

Use of Straight Circuits.

But half a loaf is better than no bread. When I was working on the original model of my 1935 battery adaptor I racked my brains for days on end trying to find ways and means of paring the price without sacrificing efficiency. The cost of the unit, as published, was the lowest figure I could get down to. Further economies would have spoiled the ship. And then fifty per cent of my post would have acquainted me with the fact that it was still too dear, and the other fifty per cent would probably have been complaints!

Perhaps I shouldn't have done a superhet. And yet for those who can

BUILT WITH—

- 1 Polar .00015-mfd. variable condenser, short-wave type C.
- 1 Graham Farish .00015-mfd. solid dielectric reaction condenser.
- 1 B.T.S. .0001-mfd. variable condenser, type K.L.1.
- 1 Dubilier .0002-mfd. fixed condenser, type 670.

afford it I am afraid I still think that it is the ideal thing. But it is not the only thing. My faith in the straight type of circuit for short-wave reception may be gauged from the fact that every single one of my previous adaptors, with the exception of the 1935 version, have been of this type.

And that is the one and only way of getting down to a price. There is so much more latitude. With a super it ceases to be a super if you try to take away many of the necessary components. With a straight circuit it is possible to achieve amazing results with incredibly simple apparatus.

You may be wondering why I did a superhet when I think so highly of the

straight type of circuit. It is a matter of relative results. To claim with any degree of certainty world-wide loudspeaker reception, nothing short of a superhet is really adequate. Moreover, in general, it is much more simple to operate. That is why, in the design of my 1935 adaptor, I went the whole hog.

And it can at least be relied upon to give world-wide speaker results if anything will. But perhaps we shouldn't get too superhet crazy. The obstacle of price sticks out a mile, and even a straight circuit will give world-wide speaker reception to a less reliable degree.

Keeping the Price Down.

Well, the fact of the matter is that I have been thinking around this problem for weeks, trying to devise ways and means of producing an "everybody's" superhet short-wave adaptor—an adaptor comparable in performance with that described in the January 19th issue, but costing less than a third of the price. And I am forced to the conclusion, somewhat reluctantly, that it just cannot be done.

Perhaps in some respects that's as well, for I shouldn't be very popular with those who have built the 1935 adaptor if, within a couple of months, I described how the same thing could be made for far less

CARRYING OUT TESTS



Mr. G. T. Kelsey, famous for his short-wave adaptor designs, conducting some experimental tests.

money! But I am not content to let this question of price beat me, especially when, as is apparent from my post, there are so many hovering on the brink of short-wave reception and waiting only for a cheap unit to enable them to take the plunge.

So I have gone from the sublime almost to the ridiculous, so far as price is concerned, and have produced a unit that can be built for twenty-one shillings and no extras!

Does it work? Can a duck swim! But I suppose it really depends upon what is meant by the word "work." Well, here's my conception of it:

This new little unit—this "Everybody's" adaptor—will do everything that can be done short of using a superhet, and that is saying a lot. For instance, you can always be sure of it giving you world-wide reception on headphones, and there will be many occasions, particularly with some of the more powerful American stations, when you will be able to transfer to the speaker.

Advantages of Telephones.

Perhaps you feel a bit doubtful about the 'phones idea. Frankly, there's nothing I like better. Somehow or other it seems to put short-wave reception on an intimate footing. With all the extraneous noises excluded the whole compass of the ears is devoted to hearing only what is coming by radio. You don't hear those unmistakable reminders that you are sitting by your own fireside. You might be in America, or Africa, or Australia. It's all so intimate.

With a speaker it is impossible to get quite the same atmosphere, although it is nice to be able to dispense with 'phones now and again. But don't frown on the 'phones idea. They help enormously to create the one-hundred-per-cent thrill when listening to some station or other on the other side of the world. You take my word for it! I've had over ten years of short-wave experience and my ears are as flat as a pancake. And still I plead the "phones" cause.

Besides, it doesn't rule out the speaker altogether. Such stations as Rome, Zeesen, Moscow, Lisbon, and more often than not the powerful Americans, are always available at speaker strength under average conditions.

After all, what more can reasonably be expected for 21s.? That is what it will cost you, excluding bits of wire and such items, and you will not require a new valve or any extra batteries.

It is suitable for use with any

—THESE COMPONENTS

- 2 W.B. valve holders, 6d. type.
- 1 Bulgin short-wave H.F. choke, type H.F.3.
- 1 Erie 2-megohm grid leak.
- 1 B.T.S. slotted coil former, type K.F.4.
- 1 Cigar box, size 9 in. x 5½ in. x 2½ in. (approx. dimensions).
- Wire, flex, nuts, bolts, etc.

existing battery set which has one or more L.F. stages, and it can be fitted in an instant without making any alterations whatsoever to the existing set wiring. In fact, nothing could possibly be more simple.

Next week I shall be giving you the whole story including constructional details. In the meantime, I should perhaps ask you not to treat this new adaptor with levity because it happens to be built into, or more correctly on to, a cigar box!

I warned you at the outset that I was in for a fight to the death with this demon price, and for a cabinet and panel I might have used a lot of things worse than an ordinary cigar box.

IMPROVE YOUR Loudspeaker by K.D. ROGERS

I HAVE recently been having a good go at one of my loudspeakers which has always evinced a certain amount of top peakiness, together with a bass response that has not been overclean.

Not that the speaker was so bad that it offended the ear very seriously, but I do not like peaks, and I do like my bass to be clear cut; if it is smudgy I would rather do without it.

The speaker in question was one of those with a fabric diaphragm, not a paper one, and it was mounted behind a metal grille. The sketch shows fairly well the type of thing I mean.

The fault with many speakers of to-day is that the diaphragms are not free enough to enable the deep notes to be reproduced properly. Rigidity enables the brilliance to be increased and also the sensitivity, but it does so at the expense of the bass as a rule.

An Unnatural Stridency.

The particular speaker that I tackled was very brilliant indeed—in fact, so much so that the high notes were given an unnatural stridency—and the fact that there were audible peaks above 1,500 cycles further upset the reproduction.

Incidentally, the cabinet in which the speaker was housed had a natural resonance of about 110 cycles, which gave a noticeable boom on many bass notes and a really disconcerting effect on notes that came close to that frequency.

Altogether it was a pretty hard case to tackle.

But the remedy did not prove to be nearly as difficult as I imagined, and though

Does your speaker boom? Are there peaks in the reproduction? Do the bass notes lack cleanness? If your speaker suffers from any of these troubles the suggestions in this article, which have all been tried in practice, may prove extremely valuable.

had been told by a manufacturer of speakers that glycerine, in small quantities, was often used to soften diaphragms of the fabric variety, and so I tried the effect of just a very little on mine.

It is important in such a doping process that the amount be little. It soaks in during a few days, and will remain soft permanently, so that if too much is put on there is no hope that the glycerine will dry out. Too much will make the cone too sloppy.

Just a little "dope" round the edge, near where the cone is fixed to the frame,

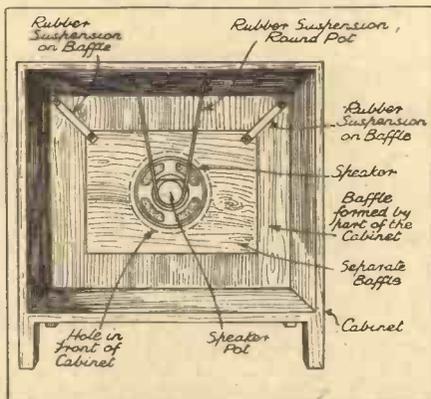
apply, being the addition of a small force round the edge of the cone to make it centre half-way in the gap between centre pole and the magnet pot.

This is applied by means of a thin layer of cotton wool, placed round the edge of the cone, between it and the metal grille of the speaker. This forces the cone down into the gap again, and though it nullifies to a small extent the freedom provided by the doped rim, it does not restore rigidity to the same extent as was present before the cone was treated.

We have now got a well-centred cone, and one that is reasonably free round the edge. So we may expect to get both good high-note response, with clean bass. And we do get that result, with the added advantage of freedom from resonance to a very surprising degree.

But, as I said before, don't overdo the doping. Only a very little glycerine is required. It is better to start with too little than too much. Glycerine can be added, but it cannot be removed.

COMPLETE ISOLATION



By suspending the speaker, mounted on a subsidiary baffle, by means of rubber strips, it becomes entirely "sound isolated" from the cabinet.

and you will have a speaker that is much freer, and which will probably be better from the point of view of peaks.

But the effect of the doping will also have a deleterious effect, in that the sloppiness of the rim fixing of the cone will allow the centring piece to push the cone too far away from the centre, with the result that while there will be plenty of movement inwards, there will be hardly any, if any, outwards.

How to Centre the Cone.

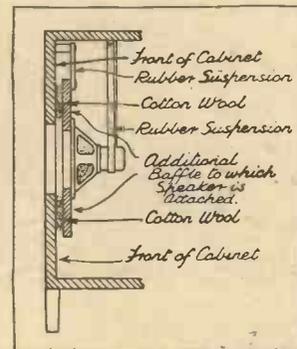
Most of the centre pieces of the speakers tend to thrust the cone outwards slightly, to counteract the force applied at the edge where the cone is kept forced a little inwards. When this latter force is removed by the dope, then the centre piece keeps the cone too far out of the magnetic field and allows it movement in only one direction.

This results in a form of rectification of the bass notes, and very poor reception will result. The remedy is not difficult to

Curing the Resonance.

After doping my speaker I set to work to devise some means of curing the resonance that occurred at 110 cycles. This was proved to be due to the cabinet by trying the speaker on a large flat baffle.

But was the boom due to the sound waves striking the cabinet or to vibration from the frame of the speaker itself being transmitted to the cabinet by the fact of the speaker being screwed to the surface of the wood? (The cabinet was 1-in.-thick oak all the way round, by the way.)



SEEN FROM THE SIDE

This sketch shows in side elevation the details of the speaker mounting illustrated in the diagram above.

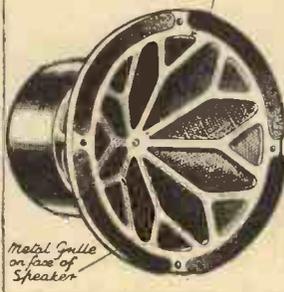
The latter seemed to be the more likely, and subsequent events proved that it was so.

Packing the speaker with felt between the cabinet front and the speaker frame proved unavailing. Something more isolating than that was required.

So I decided to try the effect of suspending the speaker on a dummy baffle, behind the real baffle formed by the cabinet front, and

(Continued on page 848.)

Cone Doped with Glycerine round Edge and Thin Layer of Cotton Wool Packed under Metal Frame.



DOCTORING THE SPEAKER

Bass is improved sometimes by making the cone suspension more free. With linen diaphragms the freeing can be accomplished with a little glycerine.

it may not work so well in every instance, I am telling you about it in case you like to try it. But do not blame me if things go wrong, and in no event try it on a paper-cone loudspeaker.

Many types of speakers have a strengthening ridge in the material of the cone near the supporting rim. My speaker had one, and this was the point I tackled first. I

WITH technical improvements the exchange of programmes across the Atlantic becomes more frequent. As this process develops the B.B.C. encounters increasing embarrassment because of the keen rivalry between the National Broadcasting Company and the Columbia Broadcasting System, the two concerns that cover most of the broadcasting of North America. Each is desperately anxious to make "exclusive tie-ups" with the B.B.C., and this the latter, of course, must avoid.

At present the balance is held fairly evenly. C.B.S. and B.B.C. are doing the exchange of weekly news talks; while N.B.C. and B.B.C. are exchanging characteristic programmes on Saturdays by short-wave relays.

More or Less Broadcasting ?

While a peer has been suggesting in the House of Lords that there should be early morning broadcasting in Britain, a fierce controversy rages within the B.B.C. on the challenge that there is already too much broadcasting, and that the right policy is contraction in time and concentration in effort.

Mr. Val Gielgud is regarded as the apostle of the "concentration" school. Although I do not expect an early extension of programme hours, I feel that there is still less chance of reduction of transmissions. For one thing, there is no certainty that contraction would lead to improvement of quality.

The Government Inquiry.

The Government inquiry into the B.B.C. will cause a lot of fuss and bother. There will be the usual crops of rumours about the B.B.C. being broken up and handed over to commerce. Wire-pullers of all kinds will have a glorious field day. And in the end all that will happen will be that the B.B.C. will receive a new Charter and Licence giving it greater power and more money for a run of another ten years. I would not be surprised, however, to see statutory effect given to the same kind of permanent Advisory Committee as that which is now related to the work of the G.P.O.

Bristol Steps Up.

It is only a few months since Bristol was given an entity in the broadcasting firmament. This was when it was made a lusty outpost of Cardiff, the headquarters of the West Region of the B.B.C. Now, under the vigorous administration of Mr. R. A. Rendall, Bristol has grown to be the equal of Cardiff, both in status and in the division of programmes. It is getting clearer every day that the B.B.C. must contrive somehow to separate Wales from the West Country and establish two equally well endowed Regions.

Radiolympia Again.

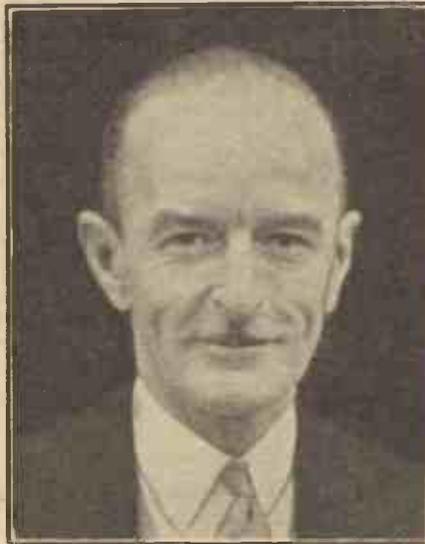
The B.B.C. has accepted the invitation of the R.M.A. to put on a special Radio Theatre performance daily during the National Radio Exhibition at Olympia in August this year. Eric Maschwitz will be in charge, supported by John Sharman and Jack Watt. Henry Hall and his Orchestra

will star. In view of last year's experience it is likely that the R.M.A. will build a substantially larger theatre this time.

A "No. 10" Programme.

Plans are being considered for a feature programme about No. 10, Downing Street. This will turn out to be another of the series of interesting historical reconstructions, at

AT THE CASANI CLUB



CHARLES KUNZ, the well-known conductor of the Casani Club Dance Orchestra.

which the B.B.C. is at its best. The No. 10 feature will be offered during the special Jubilee Programmes in May.

THOSE TRANSATLANTIC RELAYS

NEWS AND VIEWS ABOUT BROADCASTING

Applications for Television Jobs.

The B.B.C. has received just under three thousand applications for jobs in the new television department. Hardly any outside appointments are to be made, and these not for eight or nine months at the earliest. Television will be handled by readjustment of existing B.B.C. staff. In a year or so, however, some new recruitment will be necessary, but more probably for the jobs made vacant by transfers than for the new television jobs.

"Wings Over Europe."

As part of the autumn talks arrangements the B.B.C. is considering a series to be known as "Wings Over Europe." The idea is to send a popular commentator round Europe by aeroplane, letting him broadcast descriptions at short intervals during the tour. I hear the name of Howard Marshall mentioned as the possible commentator.

"Nine Times Five."

Forty-five minutes of music divided into nine five-minute sections will provide the title, "Nine Times Five," of the next concert by the B.B.C. Variety Orchestra, conducted by Kneale Kelley, on Wednesday, March 6th.

The sections will be classified into three divisions, one representative of musical comedy, one of the films and the third tracing the progress of cinema music.

Street Football.

Shrove Tuesday Street Football, a custom probably going back to Roman times in Britain, and once a widespread festival among the populace as an appropriate manner of "blowing off steam" before the restraints of Lent began (which is another version of its origin), is now played to any considerable extent in only three places in England.

Two of these, Ashbourne, an old Derbyshire market town, and Atherstone, in Warwickshire, are in the Midlands; the third is Chester-le-Street, in County Durham. Last year an eye-witness account was broadcast of the game at Atherstone, and this year on Shrove Tuesday (March 5th) a similar broadcast will be given of the game as it is played at Ashbourne, where the street is much hillier than at either Atherstone or Chester-le-Street. It will be given by Mr. John Stone, a free-lance journalist from Birmingham.

Black Country Humour.

No one in the Midlands, least of all the people most intimately concerned, will grumble at the decision to include more Black Country humour in the Regional programmes.

On Monday, March 4th, J. W. Mallard, who lives at Smethwick, and who spent most of his working days at Oldbury, will give his first broadcast. He has written many excellent short stories and "knows his Black Country," as listeners will discover when they hear him.

"Divertissement."

Afternoon and evening broadcasts of the same show will be given of the new "Divertissement" programme which Martyn Webster is producing for Midland listeners on Thursday, March 7th.

Two sketches—"Censored," by Charles Hatton, the author of "White Sails" and "Suicide Party"; and "Winsome Winnie," adapted by V. C. Clinton Baddeley from the story by Stephen Leacock—are to be included; and there will also be items by Janet Joye, Thomas O'Hara and his piano-accompaniment, and David Needham in rural imitations.

"Ghosts at the Priory."

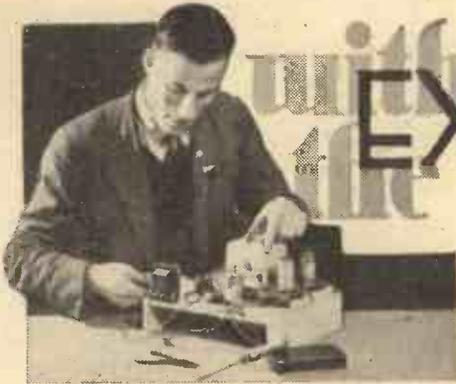
In accordance with the principles of good showmanship the Midland programme officials usually succeed in finding some particularly interesting items for the Saturday evening broadcasts, to which probably more people are able to listen than would happen on any other night of the week. A little feature entitled "Ghosts at the Priory," arranged for Saturday, March 9th, promises to be well up to standard.

Mr. Walter Pitchford, of Lamporn, and a well-known broadcaster, has arranged the programme, which is being produced by Owen Reed. Mr. Pitchford says that one particular anecdote which he has cast into dramatic form will not soon be forgotten by those who hear it.

"Westward Ho!"

Broadcasts of plays in two parts on different evenings is not a new idea to the programme builders in London, but its

(Continued on page 847.)



EXPERIMENTER

"UP GOES THE NEW AERIAL"

CAN you bear heights? I can't. Half-way up the crazily sloping mast of WHK, Cleveland, Ohio, I once had a bad attack of vertigo. Lake Erie literally swam before my eyes. So I let other people put up my aerials. While I superintend operations from terra firma.

Not that my cottage is very high. A thirty-three-rung ladder reaches the pinnacle—but I'm coming to that. Bill and I helped ourselves to a suitable ladder from the local builder.

What did we want the ladder for, anyway? Well, we had a large chunk of iron to fix to the side of the brickwork. We had already made that part of the affair.

Making a Start.

It seemed to me that the old oak tree at the front of the cottage ought to do nicely as the far-end support. The cottage, being only a cottage, was not high enough to take the lead-in end of the aerial with sufficient dignity to satisfy my technically tainted soul.

Hence the chunk of iron, fashioned to be fixed by its lower end to the inverted V at the side of the cottage. At the top, I must tell you, we had already fixed a hefty insulator, so that the aerial might pass through the topmost metal eye on its flight from the old oak tree to the lead-in tube in the "lab." below.

Up the ladder went Bill, armed with rawplugs, hammer, other tools, chunk of iron on a piece of string—and a considerable amount of faith in the strength of the warped ladder.

We had staggered the fixing holes for the chunk of iron, so as to increase the rigidity of the whole affair. But what a time it took to drive in those four plugs! "Good old Sussex bricks!" I thought, but said nothing.

Part of the trouble was that Bill—left-handed at that—had the ladder on the left with the work in hand on the right; but the ghastly business was over at last. I threw up the coil of aerial wire—the best-in-the-world make of 7/22 enamelled copper wire, it was, and a good 100 ft. of it. Bill threaded through enough to form the down-lead into the hut below, and made fast.

The Tree Problem.

Down to earth again, we both went into conference as to how the ladder was going to penetrate into the gnarled boughs of the oak tree. We decided it was a case of climbing most of the way. I decided that

again it was necessary to have someone on the ground to superintend the operations, that someone being me.

Getting the ladder into that tree was extraordinarily difficult. I almost wished I had suggested a pole instead. Bill, from the boughs, suggested that a portable set might be a good idea, too, but I pretended not to hear that.

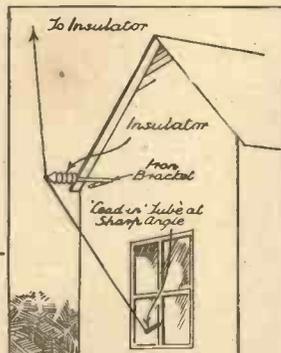
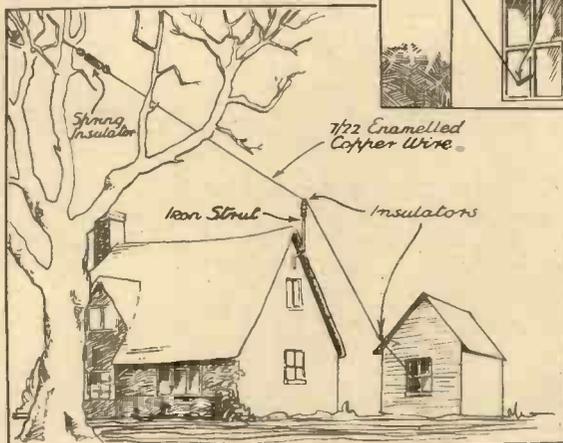
Came the most ticklish part of the whole business—heaving up the free end of the wire into the tree without fouling the branches. This needed science, I said, throwing a strong rope over the wire as Bill slowly dragged it up.

Pulling on the rope from the side, so to speak, I sought to clear the branch that was in the way. It was nearly dark. But we made feverish efforts, and, to the accompaniment of shouts from three village lads, we at last cleared the foul branch and the aerial was up.

I must tell you that, at this tree end, we had fixed to the free wire one of those spring

READY FOR RECEPTION

The two sketches show how The Experimenter's aerial was erected. The spring insulator at the tree end is an important feature, and so is the sloping lead-in tube depicted in the smaller sketch. The whole aerial from tree and right through the lead-in tube is one unbroken length of wire.



insulators, using up the rest of the aerial-wire coil as the support between insulator and tree branch.

Something of the kind is absolutely necessary when you are using a swaying tree branch as an aerial mast. Especially down here in the exposed South—where tearing south-westers sometimes make me pray hard that the roof will not be taken away.

That left us with the lead-in part to finish in the dark. It was a bright moon-

light night, as it happened, very cold but clear. And the second chunk of iron was much easier to fix—the support for the lead-in wire we wanted to come into the tube without fouling the edge of the hut.

At the top of this iron stand-off affair we had fixed another equally massive insulator, with the wire looped through the top eye as before.

I gazed sadly at the lead-in tube Bill had brought along from the radio shop. Quite a good tube, in its way. A foot-long piece of ebonite tubing, with a screwed brass rod running down the centre, and nice wing-nut terminals at each end.

Keeping Out the Rain.

Out came the brass rod, which I threw with the terminals into the junk box. To make a pressure contact to the outside terminal is simply to ask for a poor contact when the atmosphere has done its work.

So we drilled a hole sloping downwards from the inside to the outside of the hut window. Through this we gently hammered the tube into a tight fit, so that it projected at an angle of about 45 degrees.

Through the empty tube we then threaded the loose lead-in—all a part of a continuous wire that had its beginnings at the distant tree branch, of course.

The angle? Oh, just to keep the rain from pouring into the lab, through the tube. Believe me, it can rain down here—in buckets, as they say.

So there it is. A brave-looking affair, forsooth. About 75 ft. overall length. Just right for this district, which is about fifty miles south of Brookmans Park.

Successfully Survived the Storm.

And that aerial is to be the background of a great deal of the things I shall have to say to you in the future, for it will be the basis of heaps of experiments, some of which I hope to tell you about in due course.

It's a good aerial too. I have tried it, and must say that it has so far given every satisfaction, though during a recent weekend I confess I did have qualms about its surviving the umpteen-mile-an-hour gale that swept across our village—and half England, too, judging by the Monday morning papers.

But our handiwork—or rather Bill's—is still there, bravely riding the storms and bringing in scores of stations.

The Experimenter

A RADIO PIONEER LOOKS BACK

Although the thermionic valve was not invented in a night, it was "a sudden very happy thought" that enabled Sir Ambrose Fleming to solve the problem that had been puzzling him, and so make modern broadcasting possible.



SIR AMBROSE FLEMING, F.R.S.

IN a book crammed with absorbingly interesting sidelights on electrical and radio developments during the past eighty years, Sir Ambrose Fleming, F.R.S., tells the true story of his invention of the thermionic valve.*

It all began when Sir Ambrose's attention was attracted to a remarkable thing in certain of the Edison carbon-filament lamps. If these lamps were overrun by too high a voltage some of the carbon evaporated and condensed on the inner side of the glass bulb, blackening it uniformly.

An Important Discovery.

In some of these blackened lamps, though, Sir Ambrose noted a clear non-blackened line of no deposit on the glass in the plane of the filament loop.

Which showed that the carbon atoms must have been shot off in straight lines from some one point on one side of the loop, and that the other side of the loop cast a "shadow," thus causing a clear line on one side of the bulb.

In 1884 Mr. Edison himself noted a further remarkable thing. He found that when a plate was inserted in the bulb containing the carbon filament an electric current flowed through the circuit from plate to one filament leg. This Edison Effect, as it was afterwards called, was duly noted by Sir Ambrose, who worked upon its investigation.

He found, as a result of tests with various kinds of bulbs and arrangements of filaments and plate, that the hot carbon filament was sending off torrents of negative electricity in the form of particles of some kind.

At that time nobody knew that electricity was made up of particles even smaller than the atoms of matter, called electrons. As a matter of fact, Sir Ambrose assumed, erroneously, as he admits, that the particles were atoms of carbon carrying negative charges of electricity.

H.F. Rectification.

But his second discovery was the really important one, as events proved. He found that negative electricity could pass from the hot filament to the cold plate, but not in the opposite direction. He had hit upon one of the major discoveries—many will say the most important—in all wireless, though at that time the then Mr. Marconi was still pioneering.

By 1904 the need for a really sensitive and foolproof detector of wireless waves—to take the place of the magnetic detector and

coherers—was urgent. It was then that Sir Ambrose, thinking over the problem, had "a sudden very happy thought," as he puts it.

"I recalled to my mind," he says, "my experiments on the Edison Effect, and in particular my observation that the space between an incandescent carbon filament and a cold metal plate in a bulb exhausted of its air had a one-way conductivity for electricity.

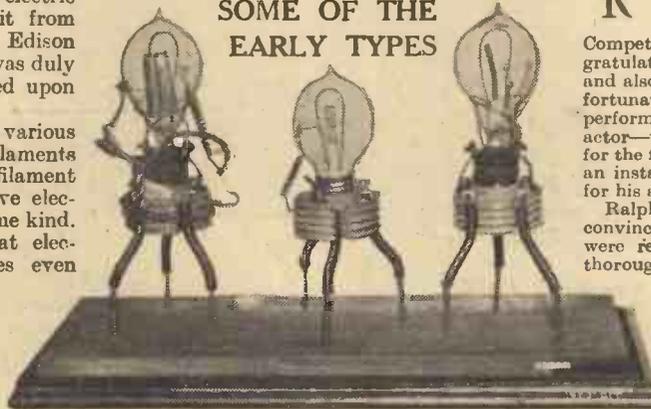
"If this is the case, I said to myself, we have here the exact implement required to rectify high-frequency oscillations."

With the help of an assistant Sir Ambrose then proceeded to detect high-frequency waves for the first time with what we now all use—a valve. Even with an old experimental bulb he was able to work a mirror galvanometer.

At first he referred to the new detector as an oscillation valve, but very soon the small particles emitted from the hot filament were referred to as Thermions (shades of Chillspots!), and accordingly Sir Ambrose modified the name to thermionic valve, which in this country exists to this day.

"I regret," adds Sir Ambrose, "that some authors prefer to denote it by the

SOME OF THE EARLY TYPES



These three curious-looking objects are Fleming two-electrode valves of 1904 vintage.

unmeaning name of diode. There seems to be no advantage—quite the reverse—in coining a scientific gibberish to replace plain English short words for scientific apparatus."

Three years after Fleming had patented his valve an American electrician, Lee de Forest, placed the zigzag wire between filament and plate—the grid that sub-

* "Memories of a Scientific Life," by Sir Ambrose Fleming, F.R.S., published by Marshall Morgan and Scott, Ltd., price 5s.

sequently led to an enormous amount of litigation to determine the priority of the basic valve patent.

Following lawsuits on both sides of the Atlantic, it was finally established the Fleming valve was "a pioneer invention of unusual utility," the judge observing that he did not think the three-electrode valve would ever have come into being but for the previous invention of the 1904 Fleming valve.

As so often happens, the original inventor received very scant reward for his "very happy idea."

Full of Fascinating Facts.

Although I have picked out this particularly interesting item in a very full book, there are equally informative chapters on the pioneer days of electric lighting, the telegraph, the telephone and many other scientific developments we lucky latter-day people take so much for granted.

There is a charming preface by Sir Oliver Lodge, another distinguished pioneer of the electrical arts, in which he shows what remarkably parallel careers the two scientists have experienced.

"And now, having both passed the fourscore milestone, we await a peaceful ending to our troublesome but interesting earth experiences," concludes Sir Oliver, "the one in Devonshire, the other in Wiltshire, in full trust and confidence that our faults will be mercifully regarded and our efforts appreciated."

A note of true humility found, surely, only in the truly great! A. H.

THE "P.W." PRIZE PLAY

A most successful broadcast reviewed by our Radio Critic.

"ROUNDABOUTS" had the additional interest to me of being the £50 prize play in the recent POPULAR WIRELESS Competition. Mr. F. W. Beasley is to be congratulated on his success in the competition, and also on getting his play broadcast. He was fortunate, too, in having such a fine cast to perform it. Mr. J. R. Mageean—that fine Irish actor—was a very happy choice. Broadcasting for the first time from a London studio, he made an instant appeal. I shall look for him again, for his acting is much to my liking.

Ralph Truman as Mr. Bannister was just as convincing, while the brother-and-sister parts were remarkably true to life. Altogether, I thoroughly enjoyed "Roundabouts." With so few characters it was easy to follow.

I must say that I also enjoyed every moment of "Scrapbook for 1921." It really was excellent. Indeed, I can hardly think of any item of broadcast fare that can be regarded as a serious rival to this series.

All the "Scrapbooks" so far have been in a class by themselves, and in my opinion are among the outstanding achievements of British broadcasting. I can't imagine any other country producing this sort of entertainment with the same delicacy and imagination.

Nothing in broadcasting anywhere has ever gone smoother than "Scrapbook for 1921" went. Has there ever been anything more beautifully done than that Caruso episode? It was one of the most moving things I have ever experienced. And the ill-fated R38. This was just as moving. The scene from Writtle was

(Continued on page 846.)

ON THE SHORT WAVES

Conducted by W.L.S.

RANDOM JOTTINGS" is a pretty comprehensive title. It allows me to talk airily about any subject under the Heaviseid Layer, which is precisely what I want to do.

First, let's talk about *people*—so much more interesting than *things*! Someone has raised the question of why short-wave enthusiasts seem to be so completely different from all other radio people. Why *are* they so much more enthusiastic, and why are they so much keener on the social side?

That, of course, involves a lot of things. Don't forget, however, that those who used to make a hobby of broadcast reception are more or less accepting it to-day as a modern commodity served up like the water from the tap. There's no *need* to make a hobby of it now. You can if you want to, but the easier way is just to acquire a really good set (whether you make it yourself or not) and to listen.

Never Completely Satisfied.

Users of commercial broadcast receivers, quite rightly, treat radio purely as an entertainment. Short-wave fans, who are always playing about with their gear, make it a hobby.

I know very, very few short-wave people who have made the set of their dreams and stuck to it. Personally, I've never got so far as being completely satisfied with a set yet; but if I did I'm quite sure I shouldn't stick it up on the bench and stop experimenting for evermore.

Anyone who gets up on his hind legs and tells you that "radio is in its infancy" ought to be taken to see a doctor. But if he is referring solely to short-wave radio, there is just a grain of truth in the remark. Developments spring up every day, and it is quite possible that some fundamental discovery, even at this late stage, will revolutionise short-wave radio as we know it.

Still Experimental.

Thus short waves can be regarded as being still in an experimental stage, and, naturally, there is every encouragement for every Tom, Dick and Harry to carry out his own little experiments.

From this springs the other business—the social side. I know of no more friendly community than a company of people, all engaged in experimenting on the same subject. Hence the way in which the short-wave clubs are flourishing to-day.

Short-wave clubs are in a very healthy state just now, and long may they remain so.

It has taken short waves exactly ten years to develop into a state which carries "publicity value" with it. When I was first writing short-wave articles in 1925 the space allotted to them was regarded as wasted.

MORE RANDOM JOTTINGS

Short waves as a hobby—
The radio clubs—Five-metre
reception—A new superhet

When I started writing for "P.W." in 1927 they were looked upon as "a coming thing," although I received more rude letters than complimentary ones. Nowadays the only rude letters I receive (with a few exceptions) are those from readers who think that short waves ought to have at least twelve pages to themselves every week.

The exceptions are generally from readers who have made up some set or other, don't get results and immediately (by some sort of reflex action) have to write and slang the designer. I honestly believe that it never even occurs to them that the mistake may be their own. It usually is, for a design

happen when some of the slap-dash merchants try to build their own television receivers I can't imagine.

Talking of television (without treading on anyone else's toes), I should like to rub in the fact that several of us said, years and years ago, that ultra-short waves and television were going to be inseparable. I am going to be so daring now as to utter a piece of rank heresy. I say that ordinary broadcasting and ultra-short waves are going to be inseparable *one day*. (The Editor accepts no responsibility for contributors' personal opinions, so that all your wrath must be aimed at *my* head.)

Why am I talking like this? Haven't you seen it yet? Well, the point at the back of my mind is that it's high time for everyone to start acquiring practical experience of the ultra shorts. Amateur 5-metre work is going to be extremely lively this summer. Suppose you all get ready with 5-metre receivers.

Persevere with your Existing Set.

No, I'm not going to "mother" you all with a cut-and-dried design. Just you persevere with your ordinary short-waver until you can make it oscillate with a pair of one-turn coils. If you are anywhere near London you should be able to hear the Baird and E.M.I. transmissions between 6 and 8.5 metres. I expect to find several amateurs using the 5-metre band again before the end of March.

What I am working on, in conjunction with other members of the "P.W." staff, is a new type of superhet which should be equally efficient for all wavelengths from 5 to 50 metres. I should like to think that those readers who build a special superhet for the new television transmissions will have, at the same time, a receiver that is distinctly in the "hot-stuff" class for the reception of ordinary short-wave broadcasting.

A Five-Valver.

The tendency on the amateur bands is to make more use of telephony and less of Morse, and a receiver that is good on short-wave broadcasting, naturally enough, is good for reception of amateur telephony.

Meanwhile, the length of the newcomer on my test bench increases from day to day. At the moment there are five valves, four tuning condensers, three sets of coils. I must get back to it with my pruning knife! Whether I shall be able to cut down the size and still retain the necessary high efficiency is more than I can say at present.

ALL SHORT-WAVE ENTHUSIASTS



This photo was taken at a short-wave demonstration recently given by the West Middlesex and East Bucks branch of the Anglo-American Radio and Television Society.

that won't work has less chance of getting into "P.W." than the camel of getting through the proverbial eye of the needle.

Sometimes they are up against a genuine difficulty, based on a misunderstanding or on a faulty component. In the vast majority of cases, though, the troubles are just caused by rank carelessness, generally on the constructional side. What's going to

ON THE SHORT WAVES (Continued from previous page.)

WHAT READERS ARE SAYING

F. E. B. (Cardigan) puts forward a point of view that is shared by many readers. He says that there are still many regular followers of "P.W." who would be delighted to be the owners of a set like the "B.C.L." Two, but, owing to the lack of regular employment, can't aspire at present to anything better than a short-waver made up of old parts. Will I do something for them?

F. E. B. is a new reader, so I don't suppose he came across my series of "standard-baseboard" layouts, which were intended chiefly for this purpose. They were straightforward short-wave sets that could be made up from more or less anything that one happened to have on hand. I am doing a few more in the near future, and hope F. E. B. will find one of them to suit his purpose.

From a Short-Wave Beginner.

S. T. H. (Guist, Norfolk) has just started short waves, and has received Australia in his first fortnight! The station he logged was apparently VK 2 M E on 31-28 metres.

P. F. P. starts a long letter thus: "I feel like an Old Boy writing to the Head, as I've read all your articles and hooked up all your circuits, but never written to you before." I'll answer his questions briefly, as they probably interest others:

(1) Do amateur transmitters want (and appreciate) reliable reports from receiving stations? Yes, certainly; if they are reliable. The "heard-you-yesterday-please-send-card" type merely annoy them.

(2) What are the best particulars to give? I suggest waveband, signal strength, type of note (or details of modulation in the case of telephony), receiver used and general conditions.

(3) Would you advise me to get the "Radio Amateur Call-Book Magazine"? Well, it is the only publication giving the name and address of every amateur station in the world, and there is therefore no substitute for it.

(4) Is it considered "the thing" to enclose a stamp or International Coupon? It's not always done, but it certainly is appreciated (speaking for myself, that is).

(5) Where can one get a "World Map" giving good detail of all countries? I don't know. Perhaps some reader who already has a good one will give particulars.

Loud Reception of Sydney.

H. G. O. (Bristol) reports logging Sydney (VK 2 M E) as R 9 on several Sundays during the past month. He has been comparing a straight set and a superhet, and says: "Give me the straight circuit every time."

J. F. S. (Rotherfield), with his first short-wave set, has got lost in the wavelength scale! He gets Moscow, Rome, Pittsburg, Zeesen and Daventry, all at the bottom of the condenser with a 16-turn coil, and wants to know if this is the 25-metre band. Certainly it isn't, J. F. S.—you've got the 49-metre band there all right.

With a six-turn coil and four or five turns reaction you should find the 25-metre band at the bottom end. Cure your "dead spot" by using loose inductive aerial coupling.

J. M. G. (County Cork) complains of the difficulty in obtaining short-wave components in Ireland, and wants to know the wiring of "A.W." coils for use in the "B.C.L." Two. Unfortunately, I haven't the least notion what "A.W." coils are! Will he please explain further?

S. M. A. (Southsea), on the other hand, has wired up one of my circuits with a commercial wavechange coil and has blown everything up, including the valves. Sorry, S. M. A., but I didn't recommend the use of that coil, and I don't now. Try some ordinary home-made plug-in types.

A NEAT STATION



This transmitter, which is operated by Mr. H. H. Andrew, of Middleton, Lanes., is used only for the R.N.W.A.R.

More coils! A. D. (Jesmond) wants to know what sizes of two-pin plug-in coils to use in the "B.C.L." Two. All that I can suggest is that he makes up several, of such turn numbers as he thinks fit. Just try each pair until you begin to find out where you are.

J. M. Mc.I. (Glasgow) wants to use the first valve of the "B.C.L." Two, and wonders whether it will be O.K. to connect the phones in the position now occupied by



MORE reductions in prices, as you may have noticed. Regal-Zonophone records are now down to one shilling each! As I said last time, they will be giving them away soon. This price includes all Regal-Zono records, not only dance numbers, except "celebrities" and the twelve-inchers.

The latest list of Regal-Zonophone offers a newly formed gypsy orchestra. It goes under the title of Don Sebastian and his International Gypsy Orchestra, and has made its debut with a medley, *On with the Waltz*. It is a gay, sparkling record, and if you are a lover of gypsy bands you should certainly hear it. (MR1546.)

If there is one form of film that affords universal delight, both for its pictures and for its most applicable music and effects, it is the Walt Disney series of *Silly Symphonies*. We can therefore expect that a very large number of sales will be recorded of the new Columbia record, which gives a most generous potpourri of the music and stories of a number of recent "S.S." films. It opens with Mickey Mouse introducing us to "Funny Little Bunnies," and is followed by "The Penguin is a Very Funny Creature." Other Disney "hits" are recorded in condensed

the L.F. transformer primary. Certainly it will. Second part of your query is answered by "Radio Amateur Call-Book," from R. S. G. B., 53, Victoria Street, S.W.1.

D. D. (Sheffield) wants full particulars of a 5-metre transmitting circuit, and wants to know whether it is difficult to get a 5-metre transmitting licence. Well, D. D., you have to get a full licence for all bands first, and as things are at present I'm not allowed to give you any information until you've got it. Sorry. Look up page 747 of "P. W." for Feb. 9th.

If this should catch the eye of a keen short-wave listener in Birkenhead, will he please get into touch with Mr. George Oxtan, 9, Rosedale Road, Tranmere, Birkenhead? He is a short-wave novice, and would like to have a chat with someone with a little experience.

An Ingenious Graph.

H. G. O. (Bristol) uses one of my "standard-baseboard" layouts with an S.G. detector and pentode output, and loves it. He has plotted an ingenious graph of stations heard, taking their power into account, which makes the short-wave spectrum look rather like a very long pin-cushion. The idea is very similar to that described by Mr. A. S. Clark in POPULAR WIRELESS for December 30th, 1933.

I. G. (Wembley) goes back a long way. To be exact, as far as the "Sydney Two," which, I wager, not very many readers can remember. He is now using the "Pen.-Det.," however, without a pentode (although that sounds Irish). He wants to use an S.G. valve as detector, and isn't sure of connections.

Simple, I. G. Transfer the lead going to the anode terminal, in the circuit diagram, to a clip going to the anode, at the top of the S.G. valve. To the anode terminal, now blank, apply your screen-voltage tapping, by-passed to earth by one or two microfarads. It should work right away.

form, and the whole record is very entertaining. The orchestra is under the direction of George Scott Wood, and succeeds admirably in capturing the real Disney characteristics. If you have seen the films concerned in the record, of course, your enjoyment of the disc is a hundredfold increased, but it is excellent fun even if you have no memories to assist you. (Col. DX666.)

Albert Sandler has been turning out his quota of gramophone records most successfully for a long time. His recordings are always welcome, as are his Park Lane Hotel broadcasts. Now he has thrown in an extra, as it were, in the shape of a twelve-inch selection of *Sandler Serenades*. If you are a follower of this popular violinist and his small orchestra don't miss this record. It holds some real gems and will be excellent light-music entertainment for many years. (Col. DB1493.)

A Popular Crooner

Judging by his postbag, Les Allen must be one of the most popular crooners in the world. He has so far received over 50,000 letters, so they say, and with his radio, film and music-hall appearances he must have an enormous audience.

For those followers of his who want permanent records of their star I give prominence here to his latest Columbia disc (DB1496), *An Old Lullaby*, with which is coupled that long-lived and well-aided *My Kid's a Crooner*. In view of the fact that Les Allen has a young son the words are particularly apt; for if anybody's kid should be a crooner, surely that should be his. We have heard his youngster, anyway, in a previous disc.

By the way, I might mention at this point that Ruth Etting, the famous American radio and film vocalist, who appeared in Eddie Cantor's "Roman

(Continued on page 848.)

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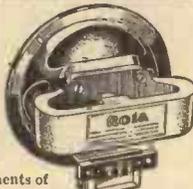


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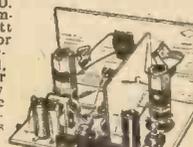
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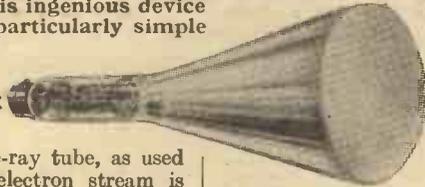
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HOW THE CATHODE-RAY WORKS

The cathode-ray tube is one of radio's latest wonders, and is of invaluable assistance to the research engineer. Here is a short article in which the operation of this ingenious device is explained in a particularly simple and lucid manner.

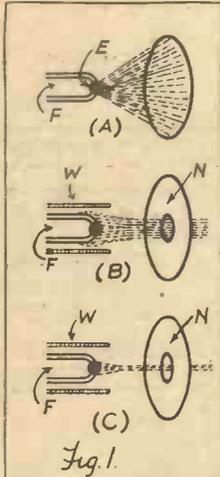
By
J. C. JEVONS.



In the modern cathode-ray tube, as used for television, the electron stream is emitted from a heated cathode and is controlled in its passage through the tube by various electrodes. So far there is a general resemblance to the thermionic valve, though the use made of the electron stream is very different in the two cases.

In a valve we are only concerned with variations in the number of electrons, i.e. the strength of current reaching the plate. We can measure these changes by inserting a milliammeter in the output circuit and observing the deflection of the needle as the current through the valve rises and falls under the influence of the signal voltage applied to the grid.

It is interesting to note that recent research has shown that the electrons do not at any time pass from the filament to the plate of a valve in an absolutely uniform stream. They are, in fact, split up



On the left are sketches depicting the "hot-spot" cathode used in the cathode-ray tube, and the focusing of the electron stream through the hole in the anode by means of the shield or gun. This latter is negatively biased in regard to the filament or cathode.

high speed through a small aperture in its centre into the open part of the tube, as shown in Fig. 1 (C).

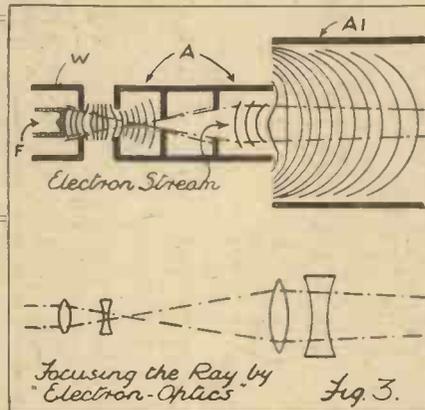
The ray here comes under the influence of two pairs of deflecting plates, P, P1, Fig. 2, to which scanning voltages are applied in order to sweep it, to and fro and up and down, over the surface of the fluorescent screen at the broad end of the tube.

In high-definition television the stream is deflected by one pair of plates so that it sweeps horizontally across the screen 6,000 times a second. This corresponds to the line-scanning frequency. The second pair of plates meanwhile shifts the ray vertically up and down 25 times a second to give the picture repetition frequency.

Two Forms of Modulation.

Simultaneously the "intensity" of the ray is varied by applying the incoming signal voltages to the control cylinder W, which deflects part of the ray away from the centre aperture in the anode. This

INSIDE THE TUBE



circuit." There is no positive charge on the screen and no obvious return path to the cathode.

It was at first thought that the electrons got back partly by leakage over the glass wall of the bulb and partly by ionic conduction through the gas inside the bulb. Actually what appears to happen is that the electrons striking against the fluorescent screen create a "secondary emission" of other electrons, which, when so liberated, flow back towards the highly positive anode—and to some extent towards the deflecting plates—and are distributed as a space current between these electrodes.

The Theory of "Electron Optics."

To prevent this from acting as a "retarding field" on the outgoing stream of electrons the latest type of cathode-ray tube is fitted with an anode extension or guard plate G, Fig. 2, which partly surrounds the deflecting electrodes P, P1 and screens them from the return current.

Another problem is that of focusing or preventing the electron stream from "spreading" after it has passed through the centre aperture in the anode, Fig. 1. Unless the stream can be made to travel through the tube in the form of a concentrated ray or pencil it will not form a clear-cut spot of light on the screen. In other

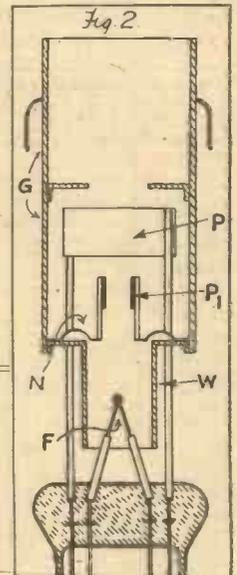


Fig. 2 (right) shows how the deflecting plates, P P1 are arranged in two pairs so that vertical and horizontal scanning of the electron stream can be obtained. The central diagram (Fig. 3) illustrates the system of "electron optics" used in modern cathode-ray tube design.

during their passage through the grid into separate "rays" (corresponding in number to the openings between successive turns of the spiral wire forming the grid).

On reaching the plate these rays fall on its surface in such a way as to form a stationary pattern or image of the grid. Although this is of no practical importance, so far as the normal working of the valve is concerned, it serves to show that the track of the stream through the bulb is somewhat more complicated than is generally imagined.

By contrast, in the cathode-ray tube the stream is deliberately controlled so as to form a definite pattern on the fluorescent screen.

Focusing the Ray.

The usual form of cathode consists of a heated "hairpin" wire F, Fig. 1, having a blob E of highly emissive barium oxide at the end of the loop. From this point the electrons would normally spread out fanwise in all directions, as shown at (A), if they were not controlled by a biased cylinder W, Fig. 1 (B), which repels the electrons from its sides and so concentrates them towards the centre of the cylinder, as shown. The stream is then drawn towards the positively charged anode N, passing at

produces the desired light-and-shade effects on the fluorescent screen. Instead of controlling the intensity of the ray, the same effect can be secured by applying the signal voltage to the deflecting plates so as to vary the instantaneous speed at which the ray travels over different parts of the screen. A low speed of traverse produces a high light, and vice versa.

But whether "intensity" or "velocity" modulation is used it must be borne in mind that the fluorescent screen is not the output electrode of the cathode-ray tube, in the same sense as the plate of a valve is. When the electron stream reaches the plate of a valve it passes as a useful current into the external circuit of the valve.

This is not the case in a cathode-ray tube. The electrons, after striking against the screen and producing the required fluorescent effect, must somehow or other get back to the cathode in order to "complete the

words, the picture as a whole will appear blurred.

The natural tendency is for the ray to spread out fanwise after leaving the anode, because the electrons of which it is composed mutually repel each other. In practice this tendency is counteracted either by gas focusing or by electro-static focusing, according to whether the tube is of the highly exhausted type or not.

Positively Charged Free Ions.

In gas focusing the tube contains a small content of argon or helium gas. As the electrons shoot through the anode they collide with the molecules of free gas and knock off some of the electrons attached to them. This leaves a corresponding number of free ions, which are, of course, positively charged. Each ion, as it is formed, remains practically stationary—that is to say it does not move transversely out of the path of the ray. At the same time it forms a positive charge which attracts the passing electrons radially inwards and so prevents their natural tendency to spread.

One can accordingly visualise the ray, as it travels from the anode towards the screen, continually coming into contact with fresh

(Continued on page 849.)

"P.W.'s Pioneer TELEVISION RESEARCH

by G.V. DOWDING Associate I.E.E.

CONSIDERABLE comment has been occasioned by the fact that POPULAR WIRELESS and its sister journal, "Wireless," were the only journals of any kind to give evidence before the Television Committee. Of course, there were very definite reasons for this.

In the early days of television, while that infant science was struggling against what then appeared to be almost insuperable difficulties, POPULAR WIRELESS played an important dual rôle. On the one hand we did our best to counteract the terrific ballyhoo of the over-enthusiastic televisionaries who were screaming "Television is here," five, six and seven years ago, and who were talking wildly about "the man in the street seeing the Derby this year" when the best that could be done was to produce streaky and barely recognisable images of well-touched-up faces.

Simultaneously, however, we quietly and doggedly maintained our position in the van of television research. And it was because we had first-hand knowledge and experience of the problems involved that we considered it our duty to sound the note of caution. Time has provided ample proof of the correctness of our advice and predictions.

And now that the television position has been stabilised a very brief résumé of our own contributions to television advancement will no doubt prove of interest to our newer readers.

Some ten years or so ago we offered a large money prize to stimulate television research, and, as a result, several scientists, including Professor Fournier d'Albe and many amateurs, turned their attention to this fascinating new science. To what extent modern television owes its present state of development to these early research workers may never be fully realised.

We Design the First Cathode-Ray Viewer.

Television having arrived at a particular stage in its progress, POPULAR WIRELESS commissioned John Scott-Taggart, F.Inst.P., to investigate the situation, and his subsequent informative analysis, published in "P.W.," must for all time stand as a model of reasoned and impartial scientific judgment.

By the beginning of 1933 it became obvious to all that, if television were to advance further from its then very crude state, developments of a revolutionary nature were necessary.

Throughout the early stages of television, right up to the present time, "Popular Wireless" has been in the forefront of research in the new radio science. At the same time, it has been always a fearless and strictly impartial critic of every television development.

Always in the closest contact with the industry, it came to our knowledge that Ediswan were quietly developing a cathode-ray tube, the characteristics of which seemed to indicate that it held great possibilities for television.

We at once got into touch with this enterprising concern and, in friendly co-operation with their engineers, developed the first complete Cathode-ray Television Viewer to be devised in this country.

"POPULAR WIRELESS" LEADS THE WAY



Two photographs which illustrate the pioneer research that has been carried out by "P.W." The top one was taken during our Crystal Palace ultra-short-wave tests, and the other shows Mr. K. D. Rogers, our Chief of Research, carrying out experiments with the first cathode-ray-tube television receiver, a description of which we published nearly two years ago.

The results given by this apparatus, which was fully described in "P.W.," clearly showed that at long last the pace was going to be set for something in the nature of a gallop home to practical television. This is what we said in the May 27th, 1933, issue of POPULAR WIRELESS about our Cathode-Ray Television Viewer:

"Always in the forefront of radio progress, 'P.W.' presents a Cathode-Ray Television Viewer. This practical instrument has been developed by the 'P.W.' Research Department, and is now offered as a constructive contribution to the development of the science of television.

"As we have frequently stated, television has been hampered by numerous limitations in both transmission and reception. But we are confident that the Cathode-Ray Television Viewer, which we are now introducing to our readers, constitutes a sound basis for the complete and final solution of the problems in so far as reception is concerned. At the transmitting end much remains to be done. . . ."

Our Crystal Palace Ultra-Short-Wave Transmissions.

But we were not leaving that "end" entirely to others. Even while some of our technicians were perfecting Britain's first practical Cathode-Ray Televierer, others were busily engaged in organising the world's first large-scale ultra-short-wave experiments. The following announcement had appeared in our May 20th, 1933, issue :

"Commencing at 10 a.m. on Sunday next, POPULAR WIRELESS, in co-operation with a group of enthusiastic short-wave experimenters, is radiating a special series of 5-metre transmissions from the Crystal Palace, London. Every 'P.W.' reader who resides within a reasonable distance is invited to assist us in these important and interesting experiments, for which special permission of the P.M.G. has been obtained."

Cathode-ray television reception and ultra-short-wave transmission from the Crystal Palace in 1933! Two years ago!

Later Baird transmitting apparatus was installed on this vantage point, and the use of the cathode-ray system in television reception was adopted.

All this and other pioneer television and ultra-short work carried out by POPULAR WIRELESS created enormous interest in scientific circles, and we feel that we can justifiably claim that it constituted some of the most significant contributions to television progress.

When all this is remembered it is quite obvious that it was almost inevitable that we should be invited to give evidence before the recent Television Committee, and in at least some measure assist to frame the recommendations for the establishment of a television service in this country.

NO longer need we sympathise with the policeman who tells us that "his lot is not a happy one." On the contrary, it is the criminal who has a thin time of it in these days of science. No sooner has he stolen a car or purloined a telephone box than all the mobile police in the neighbourhood know all about it, thanks to the excellence of modern police radio.

Different countries have tackled this proposition in various ways. The method that has been standardised in the London district seems to work admirably, and will probably be the accepted pattern for police networks all over the country.

A Simple System.

There are several different ways in which police radio could be operated. Ultra-short waves could be used; telephony could be used; two-way work between the cars and the base station could be maintained; but each of these systems has a big disadvantage of some kind or another.

The state of affairs that exists in the London district is simply this: that any policeman, anywhere, has only to ring up Scotland Yard from a police box or a public telephone for his message to be radiated at once on the appropriate wavelength on telegraphy, being picked up instantaneously by all radio-equipped cars. That, in practice, is about as near to a perfect system as it is possible to get in a very large district like the Metropolitan Police area. The wavelength is very convenient, being well below the broadcast band without coming exactly in the category of "short waves." Its carrying powers are excellent, and no great problems are introduced into the design of a suitable receiver.

Let us look, though, at some of the problems that have had to be solved. One of the most difficult arose in the design of the receivers. In the early days of police radio quite a number of solo motor-cycles were equipped with receivers. One of the illustrations on this page shows a combination fitted with its receiver and small aerial on the carrier.

The "Tell-Tale" Light.

It was the very fact of the necessity for using a compact aerial that caused most trouble in the design. Also it was not desirable for the driver to wear headphones all the time, as it would make him oblivious of traffic noises and warnings. A "calling-up" device was a necessity.

Hence a very efficient and compact receiver had to be designed—one that was sensitive enough to pick up Scotland Yard's signals on a mere yard of aerial and bring them up to sufficient strength to operate a relay which would switch on a "tell-tale" light on the handle-bars.

"Fixed-tuned" receivers were used, however, so that the provision of two or more H.F. stages did not involve much

complication. Power supply was derived from a small generator driven from the motor-cycle accumulator.

"Any policeman has only to ring up Scotland Yard for his message to be radiated at once and picked up instantaneously by all radio-equipped cars."

Later, when cars came into more general use, the problem became very much simpler. More space was available for the receiver;

down to the receiver behind the dashboard.

The next problem concerned ignition interference, which had to be combated by using suppressors on the plugs and distributor and by screening all the ignition wiring and earthing the screens.

Up to the present nothing has been said about the transmitter. The second photograph shows the Scotland Yard 500-watt transmitter, as built by Standard Telephones and Cables, Ltd. This has been in successful operation for a very long time, and has proved equal to all demands made upon it.

RINGING UP THE FLYING SQUAD



The 500-watt Standard transmitter in use at Scotland Yard. Both telephony and telegraphy can be used.

Unskilled Operation.

The requirements here were briefly these: it should be possible to switch on with the minimum of delay; an unskilled operator should be able to do so without causing any damage; it must cover the whole area of service with a signal of sufficient strength; and it must not cause undue interference in its own locality.

The first requirement was met by the installation of remote control, and both the first and second by the way in which it was operated. An ordinary hand-type telephone, equipped with four push-buttons, serves as the control for the transmitter. One is installed in the same room and another in a different part of the building.

The various operations of removing the receiver, pressing a button and so on ensured that the transmitter was switched on in the correct

way—filaments first, grid bias next and finally H.T. Elaborate check apparatus ensures that the H.T. cannot be switched on unless both the filament and grid-bias supplies are first operating perfectly.

Another button on the hand telephone switches on the modulator, and anything spoken into the microphone will go straight out "on the air" as telephony. Generally, however, the operation of the station is carried out on telegraphy, an operator being always on duty.

"Man-Made Static" Troubles.

The result of much research and careful study has been, for London, at all events, a police network that functions like clockwork. The writer understands that local "man-made static" is causing a certain amount of trouble in some districts, but that it is being gradually overcome by co-operation. He has noticed police cars standing outside a local transformer station more than once, and drawn the obvious conclusions!

A two-way system, whereby the cars could call up Scotland Yard from any point in their area, would undoubtedly be a marked advance, but it is almost impracticable in view of the amount of power that would be needed to compensate for the small, low aerials on the cars themselves. The existing system of police boxes forms an admirable substitute.

"CALLING ALL CARS"

HOW RADIO IS DEFEATING THE CRIMINAL



The type of receiver adopted for motor-cycle patrols. It is carefully sprung on the carrier, the power supply being carried in the sidcar.

larger batteries on board gave more scope to the designer; a fairly good aerial could be provided; and, since more than one man was generally in the car, no "calling-up" device was necessary, since the passenger could wear 'phones without inconvenience.

Actually the aerial used in saloon cars consists of a kind of wire net in the roof, with a screened lead-in coming

NOISE!!

How Loud is it?

By Joseph Harrison Roberts D.Sc.

IT is not so many years ago that Sound or Acoustics was the Cinderella of Physics—of little importance from the theoretical point of view, and still less from the practical. The study of sound was interesting enough in its way, but there was scarcely any practical problem to which it could usefully be applied.

All that, however, was before the days of the gramophone and the radio, and it was certainly before the dawn of this "age of noise."

There is Noise Everywhere.

Many people think that noise is the cardinal curse of the present day, and that if it goes on at the present rate we shall all be in the madhouse long before another decade has passed, what with trams, buses, motor-cars, lorries, tube trains, pneumatic road-drills, wireless bands, seaside bands, bands in the restaurants, bands in the park—everywhere noise. If an exhibition or any other public gathering is organised the first essential seems to be to regale the public with more noise—even if only from gramophone records amplified *n* times.

Many of these noises are unnecessary, but others are at present unavoidable. The noise of buses, tube trains, machinery and so on appears to be a necessary evil, although attempts are being systematically made to reduce these noises as much as possible.

The ironical thing is that, whilst determined efforts are being made to reduce the noise which is incidental to useful purposes, no attempt is made to cut down the wholly unnecessary noises above referred to. Perhaps this is because the one class is regarded as "noise," whilst the other is music!

Immense Amount of Research.

Now this brings us to an important distinction. What is the difference between noise and music? When does music cease to be music and begin to be a noise? It used to be said that a musical sound was a series of regular waves, whilst a noise was a collection of air vibrations having no relation to one another and all at variance.

During the past few years, more particularly since the war, the study of noise has become increasingly important.

Developments in the gramophone, the telephone, radio and the talking pictures alone are sufficient to bring Acoustics into the front rank of physical investigations. In addition to this, the continual growth of industrial noises of one kind and another has rendered it necessary to seek means for noise suppression.

You would probably be very surprised to know what an immense amount of research

Is Noise the Curse of this Age? With ever-increasing machinery some people say we shall all be driven mad with the noise. What is being done about it all? In this article our Scientific Adviser tells you how scientists are investigating noise, its causes and cure, with a view, as he aptly says, to "making the world a better place to live in, or at any rate saving it from becoming a worse one."

work takes place behind the scenes on these very questions. The noise of machines is carefully measured and compared under different conditions of working and in different locations.

The psychological effect upon different individuals is carefully noted and all manner of tests and inquiries are made—with the broad object of making the world a better place to live in, or at any rate preventing it from becoming a worse one.

TUNNEL ROAR



Measuring the noise in an underground train during tests made in New York with a view to reducing the roar caused by trains rushing through the tunnel.

One of the first essentials to a study of sound or noise is some scale of loudness to which reference can be made. In measuring temperature we have the thermometer scale and in electricity we have perfectly good methods of measurement. But in sound

we have nothing so reliable. We hear two different sounds and pronounce them "about the same," or "one rather louder," or "one about twice as loud as the other."

All this is much too vague and unreliable for scientific work, and it therefore becomes essential to have a proper scale of reference.

In sound measurement it is not nearly so easy to find a scale of reference as it is in most other cases. For one thing, different people differ very widely in their estimates of sounds. For another thing, the comparison of two sounds of the same pitch or the same type—difficult in any case—becomes very much more difficult when the sounds to be compared are of different pitch or different type.

An Interesting Paper.

The formulation of a suitable scale of reference has, therefore, engaged the attention of scientists for many years past, and in a paper read before the Institution of Electrical Engineers a very full account is given of the measurement of noise and of the many problems and difficulties involved in this branch of science. The authors of the paper in question are Messrs. B. G. Churcher, A. J. King and H. Davies. In this paper also is described noise-analysing apparatus for the purpose of assessing the loudness of a complex sound.

In any investigation of noise or sound it is obvious that the actual sensation of hearing of the individual cannot be ignored. Sound may be said to have no objective existence apart from the ear of the listener; in other words, if we had no ears there would be no sound, no matter how much

(Continued on next page.)

TABLE A. COMMON NOISES.

Loudness (2)	Equivalent 800-cycle magnitudes			
	Decibels-above-threshold (3)	Field pressure (4)	Energy flow (5)	
(1)		r.m.s. dynes per cm ²	watts per cm ²	
Two circular saws at 3 ft. Loud motor horn at 100 ft.	160	110	73	13 × 10 ⁻⁶
In suburban steam train, window open	100	100	23	13 × 10 ⁻⁷
Ordinary conversation at 3 ft.	50	84	3.6	3 × 10 ⁻⁸
In quiet saloon motor-car	20	69	0.65	1 × 10 ⁻⁸
Quiet electric motor (2 h.p.) at 3 ft.	10	59	0.19	9 × 10 ⁻¹¹
Ticking of watch at 3 ft.	5	49	0.065	1 × 10 ⁻¹¹
Threshold of hearing	1	30	0.0073	13 × 10 ⁻¹²
	0	0	0.00022	12 × 10 ⁻¹²

NOISE!! HOW LOUD IS IT?

(Continued from previous page.)

"sound vibration" there might be in the atmosphere.

The consideration of the faculties and characteristics of the ear is therefore a primary consideration. The paper under review deals with the Characteristics of the Hearing System; The Determination of the Threshold of Audibility; The Relation between Decibels-above-Threshold for Equal Loudness at Different Frequencies; and The Relation between Sensation and Stimulus.

"Undesired" Sound.

Noise is defined in the paper as "undesired or irksome sound." The definition of it as "undesired" sound is reminiscent of the definition of dirt as "matter in the wrong place"—both rather vague. The winnings of the Irish Sweep, in another fellow's pocket, is "matter in the wrong place," but hardly dirt. And the incessant ringing of a church bell may be an "undesired sound" (it certainly is so to me), but is not "noise" according to ordinary standards.

These two examples show at once the kind of fundamental difficulties you are up against when you start out to investigate noises and sounds from the point of view of their effect upon the individual. The raucous motor horn presents no difficulty, the result being noise on any definition. The hum of a transformer complies with the old definition of noise, but would be regarded as "undesired sound"—and therefore noise—by many people.

Again, many people would unhesitatingly class certain modern orchestral compositions as noise, whilst those whose musical appreciation had been developed in the required direction might perhaps class them as "music."

Peculiarities of the Ear.

One of the first points in an investigation of noise is to determine the maximum and minimum audible intensities of the average ear. Tests of this kind have been made by Wegel, of the Bell Telephone Laboratories in America, and are described in the "Bell System Technical Journal," 1922, Vol. 1. These results of Wegel do not, however, take into account the collecting power of the outer ear and of the bones of the head.

The next point that was noticed was that the estimation of loudness as expressed by "decibels-above-threshold"—the conventional method—did not conform to the simple estimate by the ear. For example, when comparing 800-cycle notes of, say, 90 and 45 decibels-above-threshold, the former seemed much more than "twice as loud" as the latter. These, and many similar observations, show that the so-called Weber-Fechner law is only an approximation

and that the deviation between the decibel and sensation scales is sufficient to be of practical importance.

In attempting, therefore, to formulate a basis for noise measurement which would be acceptable for engineering purposes the authors of this paper have considered first the laws of response of the hearing system of the average individual to sounds of different characteristics, and then the choice of a practical method of noise measurement in accordance with those laws.

The investigation of the laws of hearing falls into three sections, viz. the determination of the threshold of hearing, which provides a datum from which intensity

threshold loudness, it means that there must be no background noise whilst the test is being made. In the tests described in the paper under review, the sounds were generated by a special moving-coil loudspeaker, placed at about the same height from the floor as the observer's head; the room was blanketed on floor and walls so as to minimise reflections. Furthermore, it was essential to produce as pure a note as possible—no easy task. Most notes are collections of harmonics, and special precautions have to be taken to produce a note which is even sensibly pure.

Results of the Tests.

Considerable research had to be undertaken by the authors in order to find an arrangement of valve oscillators and loudspeakers that would generate a sound with only negligible proportion of harmonics.

A large number of tests was then made, with some 50 different observers or "subjects," and the average field threshold pressures determined.

I give in this article a list (Table A) of the magnitude of common noises on various scales.

Compare it with the list of some typical noise levels in various surroundings. These are shown in Table B.

The authors are to be congratulated upon a very exhaustive investigation carried out with great skill, and it is to be hoped that this work, and other work of a like kind, will do something towards mitigating the very serious noise nuisance of the present age.

NO SILENCE IN HIGH HOLBORN!



How many different noise makers can you pick out in this photo? There is no prize for the correct answer, but you will be astonished at the variety in silence-shattering sources.

levels may be reckoned; the determination of the relation between the magnitudes of stimuli of different frequencies which produce equal loudness sensations; and finally, the relation between stimulus and sensation.

It is interesting to note that the ear appears to possess an automatic de-sensitising faculty—like the eye—whereby its sensitivity is reduced as the sound falling upon it increases in loudness. This is a most extraordinary faculty of the ear, and one which, quite apart from any other property, places the ear in a totally different category from any other sound-sensitive device.

As regards its effect on the question of

TABLE B. TYPICAL NOISE LEVELS

		Decibels-above-threshold of equivalent 800-cycle note	Loudness figures
Factory	Erection shop	90-95	67-82
	Steel-tank manufacturing shop	100	100
	Wooden-box shop	95	82
Power station	Machine room, near large turbo sets	100	100
	Boiler house (mainly steam hissing)	90	67
	Fan room (mainly noise from boiler house)	90	67
	Pump house	102	109
Streets	Busy main street of city	about 70	22
	Ditto, with trams passing	85	53
	Office on street, weekdays		
	Ground floor, windows open	70	22
	Ground floor, windows closed	60	11
	5th floor, windows open	60	11
	5th floor, windows closed	50	5.5
	Office on street, Sunday morning		
	Ground floor, windows closed	25	0.6
	5th floor, windows closed	15	0.2
Miscellaneous	Horse cart on cobble stones at 50 ft.	60	11
	Automobile accelerating at 150 ft.	65	15.5
	Street in residential district, day	50	5.5
	Street in residential district, night	30	1
	Train, dining car, 60 m.p.h.	80-90	41-67
	Ditto, in tunnel	95	82
	Locomotive blowing off steam (100 yards)	70	22

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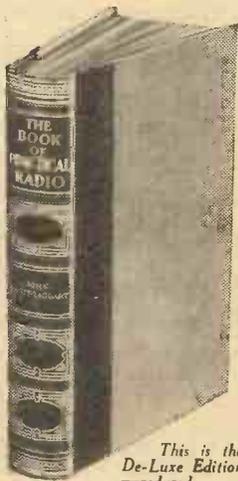
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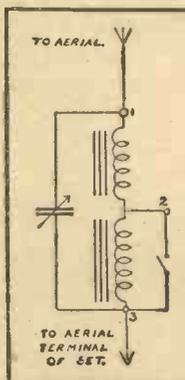
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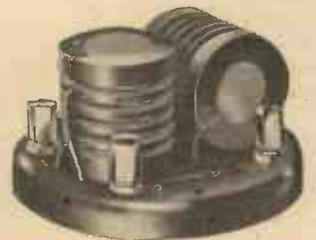
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TELEVISION

A SPECIAL PRACTICAL SERIES FOR ALL READERS

By L. H. THOMAS

This week our contributor explains the relation between mechanical and cathode-ray systems of scanning, with some practical aspects of cathode-ray tube working.

NO one can say, at this stage, how much the future of television may depend upon the cathode-ray tube, which has been so much "in the news" of late that one more or less assumes that we shall all be using one soon.

The official attitude of the various firms associated with television development is this: "We propose to use the cathode-ray tube in our receivers; but if anyone else can obtain good results with some mechanical system of scanning—well, good luck to them!"

Mechanical scanning will almost certainly be possible, but it looks as if the cathode-ray method will, ultimately, turn out to be the most efficient and, later on, the cheapest.

Having left the cathode-ray tube severely alone up to now, I am beginning to introduce it into these notes right away.

Elsewhere in this issue you will find a very informative article explaining the functioning of a C.R. tube, and I recommend you to study this right away. Bear in mind the fact that television is only one of the many applications of the tube, and try to understand the operation of the "beam" of electrons, capable of being deflected either horizontally or vertically.

Instantaneous Action.

You will then realise that this useful piece of apparatus conforms to the present tendency in physics of making electrons do the work for you instead of employing a lot of moving parts. Once we have a convenient method of "harnessing" the electron we can make it do almost anything that we require. Just go back for a while and think of any mechanical scanning system that you like. We have to make a spot of light move up one side of the picture; and just as it disappears at the top edge another spot takes up the tale from the bottom, and travels up the picture along a line parallel to that described by the first. And so on, for 30 lines, in the case of the existing transmissions.

Mechanically, it is fairly easy, because we use more than one light spot. If we were restricted to a single spot it would be almost impossible to do it mechanically. Imagine the apparatus that would be needed to take the spot slowly up the picture, and then, when it had reached the top edge, to swing it back *instantaneously* so that it could start the same operation from the bottom of the next line!

Yet that is exactly what the cathode-ray tube does with the beam of electrons. The spot moves "slowly" across the screen (taking as long as 1/4,500th of a second!), but it has to be back *instantaneously* at the other side, ready to start the next line.

The "Time-Base" System.

This movement, of course, is the very basis of cathode-ray scanning. The light spot on the screen must not have an alternating movement, but must move in one direction at the desired speed, and then jump back very rapidly to its original position. A device known as a "linear time-base" is used for this purpose, and we are all going to become very familiar with the peculiarities of time-base circuits before long.

another line, parallel with the first instead of being actually along the same path.

The huge advantage of the cathode ray is, of course, that there is practically no limit to the speed with which we can make our spot travel. 240 lines, and 25 pictures a second, is a mere crawl compared with what can be done. The Baird Co. have been demonstrating 400-line scanning with a C.R. tube, and one can stand and look at the picture as if it were a photograph. The lines can *just* be distinguished from a distance of a few inches.

But what of the practical side of things, especially from the home constructor's point of view? He has got to learn quite a lot of theory that, naturally, is somewhat strange to him at first. He *must* do this before he can trust himself to make a success of the practical side.

Well, "P.W." will keep him well posted in both departments, and it is going to be *my* particular job in future to keep strictly to practice rather than to theory.

Let us start right away. Here's an essentially practical hint. Whatever you do when you have decided to start on cathode-ray television, cultivate a habit of doing a job properly.

Practical Considerations.

You will be dealing—possibly for the first time—with pretty high voltages, and we don't want to hear of any accidents resulting from the use of 1,000 volts on thin twisted flex! You will have to use the right components if you make a copy of any apparatus that is described. Fixed condensers, for instance, will have to be of the correct type; bare wires will be taboo. Careless handling, with the cur-

rent switched on, will be more than that!

Your time-base circuits are going to strike you as complicated at first, but, after all, so did your first superhet. Once you have a good grasp of the theory, you will find the practical details coming into line very quickly.

Your "scanning machine" will consist essentially of three units: the actual time-base circuit, its power supply and the exciter unit for the tube itself. Possibly the last two will be combined in one. But all the units can be housed in one cabinet.

As soon as suitable circuits have been developed and tested they will be released in POPULAR WIRELESS; but they are undergoing rigid tests for reliability first.

A LARGE-SIZE CATHODE-RAY TUBE



The cathode-ray tube is receiving close attention in all countries. Here we see Manfred von Ardenne, who has done considerable television work in Germany, with one of his latest tubes.

Now imagine that we have the right kind of varying voltage applied across our horizontal pair of deflector plates to make the spot do this. All that we shall see will be a continuous line of light across the fluorescent screen. We shan't *know* that the spot is travelling with the speed of light in one direction and relatively slowly in the other. And it won't do anything for us in the way of scanning.

Almost Infinite Possibilities.

We have to bring another pair of deflector plates into action, at right angles to the others. Across these is arranged the right kind of alternating (or rather *varying*) potential to ensure that after our spot has completed one line it jumps a short distance and on its next journey describes

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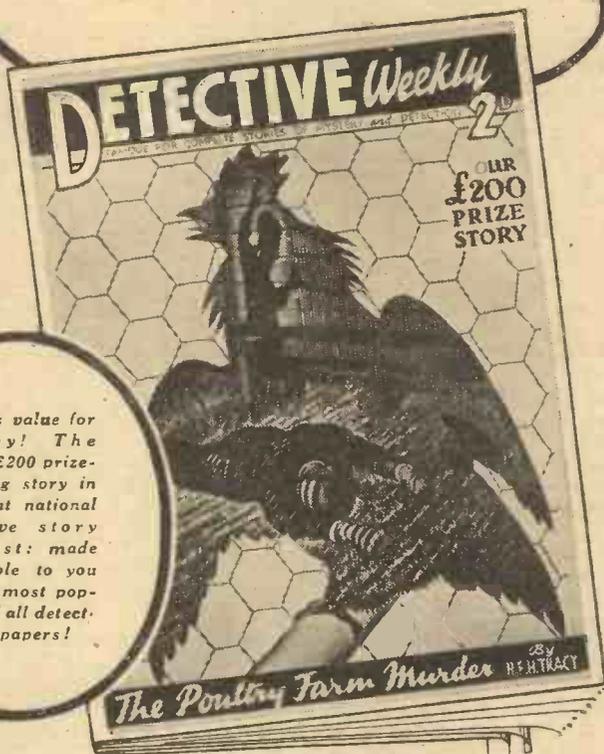
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TELEVISION.—Page 2.

TELEVISION JOTTINGS

GOOD news for the amateur television enthusiast!

Several firms have already made the announcement that they intend to produce complete "scanning kits," consisting of a cathode-ray tube and the necessary double time-base unit.

This, of course, was bound to come. The ultra-short-wave receiver is well within the capabilities of the home constructor, but a good many would not have relished the construction of all the necessary equipment to go with the cathode-ray tube—particularly those not conversant with the technical side and those not used to playing with high voltages.

Is a Super Required?

News also arrives of the development of an interesting circuit for ultra-short-wave reception—not a superhet this time. The circuit in question hails from America and uses two of the new "Acorn" valves specially developed for short-wave work. Whether a similar valve will be obtainable over here is a problematical business at the moment.

I have never been able to see that a superhet would be essential for efficient work on

the very high frequencies. It is convenient and easy to handle; but that is chiefly because of the shortcomings of the first-detector circuit. When we are dealing with a fairly strong signal a straightforward detector (preceded by a "buffer" stage), followed up by a biggish L.F. amplifier, should be capable of giving quite reasonable results.

The general opinion about the present 30-line transmissions seems to be that they will continue until the end of this year, and possibly for some considerable time after that. Provincial listeners who have been making use of them, and who will not be served by the first of the new high-definition transmissions, are quite rightly pressing for the continuation of some kind of service.

Long-Distance Problems.

Speculations about the future lead one up several interesting paths. Bearing in mind the fact that the ultra-short-wave bands are strictly limited in their range (as far as we know at present), one cannot help wondering where long-distance television is going to come in the scheme. Certainly it will be a reality one day—but where are the wavelengths coming from?

The whole of the short-wave spectrum is packed with commercial users of the ether. The four amateur bands occupy so small a space that the question of forcing the amateurs off the air should never even arise.

It seems possible that the wavelengths between 10 and 20 metres, not widely used

at present owing to their unreliability and their "daylight" characteristics, will be bound up with television.

Incidentally, how nicely everything has worked out for television! The ultra-short waves are the only part of the spectrum on which one can obtain the necessary bandwidth for transmission; and they are also the only part where that same bandwidth can be spared! The micro-waves are going to be put to service as a local "link" for the same purpose. What of all the wavelengths shorter than the "micro-waves" at present in use?

Below One Metre.

Lots of research is being carried out with wavelengths of 9 centimetres, and circuits generating oscillations with a wavelength of a few millimetres are quite well known.

In a few years we shall regard Droitwich's wavelength with very much the same feeling that we used to have when we listened to Bordeaux on 23,000 metres! So long that it's almost fantastic! Yes, there are exciting things to come; but nothing seems more certain than this: that television will always be at the bottom end of the scale.

I see that it has been suggested that low-definition television should not by any means be disregarded as having no commercial future. Sixty-line, or even 30-line, pictures are quite suitable for "close-ups," such as one might hope to see in connection with the ordinary land telephone service.

L. H. T.

AN INEXPENSIVE BATTERY.

A DOZEN years ago 120 volts of H.T. in the form of a dry battery would cost about 20s. Twopence per volt! As a matter of fact, we used to figure it out like that, and we looked forward to the time in the then distant future when H.T. might be obtainable at 1d. per volt or some other such idealistic figure.

But now you can buy a better battery at a sum which works out at a little over 1d. per volt! This is no doubt largely due to the fact that H.T. batteries are now made in millions instead of thousands. And there has been continued development and improvement.

Representative of right-up-to-the-minute battery construction and value is the new "Sunbeam" H.T. dry battery made by the Fuller Accumulator Co. (1926), Ltd., Woodland Works, Chadwell Heath, Essex.

The "Sunbeam" is sold in three sizes—

A NEW H.T.



This battery has a useful life of 157 hours on an average three-valver.

60 volt, 100 volt and 120 volt—at 3s. 6d., 5s. 6d. and 6s. 6d. respectively. These are, of course, of standard capacities. But an indication of the quality of the make and type is afforded by an intermittent discharge curve of a specimen 120-volt prepared in the Fuller works.

This shows that the battery has a useful life of 157 hours at a rate of discharge approximating that which might be imposed upon it by an average type of not-too-greedy three-valve set. After that the voltage would have dropped by about 33½ per cent. (There would be a certain

OUR IMPRESSIONS

Details of two radio accessories we have recently been using in our laboratories.

amount of life even after that point was reached.)

This is a very good performance indeed, and it is based upon a practical test. It might be mentioned in passing that "P.W." was the first paper to insist that a test of this kind is the only one which can give a sound estimate of the worth of an H.T. battery, and the "three hours per day for six days a week" at a normal load which forms the basis of the Fuller calculation exactly corresponds with the original suggestion laid down by us.

It is in this way that we have always tested H.T. batteries, and at the moment of writing we are imposing these conditions on the new Fuller "Sunbeam."

But it is already quite obvious that the result will be most favourable. The sections of the battery are discharging with remarkable evenness, and the voltage figures given from day to day conform with those on the "Fuller" curve. In fact, they are if anything, rather better.

From this we are able to say quite definitely that the Fuller "Sunbeam" is a sound and reliable battery, and one which can be purchased by our readers with every confidence. At 6s. 6d. for 120 volts it is very excellent value for money.

A NINE-PIN PLUG.

THE plug-and-socket method of connection is an extremely useful one and saves the amateur experimenter much time. For example, there are all kinds of adaptors and amplifiers which the home constructor collects during the course of his experiences, and it is frequently possible to arrange useful combinations between different pieces of such apparatus.

To do so in the ordinary way would require a multiplicity of terminals. If the gear is built with the idea of rapid interconnection in mind subsequent use of it is very greatly facilitated.

Active home constructors and experimenters, especially those who equip themselves with

valve testing and other such things, should welcome the new Bulgin Nine-Pin Cable Plug.

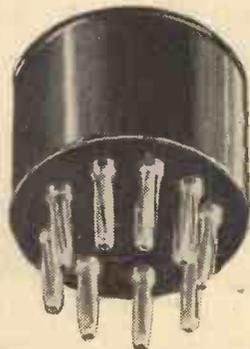
This is designed for use in conjunction with any kind of ordinary nine-pin valve holder. It is of simple and satisfactory construction.

In order to keep it inexpensive (it costs only 2s. 3d.) there are no terminals provided. Instead, the pins are hollow, and connection to them is made by passing the lead ends down through the pins and soldering them at the tips in the same way as the wires are joined up in a valve base.

As a matter of fact, the object of the device would have been practically defeated had there been terminals, for it is essentially a semi-permanent, if not permanent, method of enabling apparatus at any time to be "plugged in"—the complete antithesis of the normal slower terminal system.

Access to the interior of the plug

The Bulgin nine-pin plug fits into a normal nine-pin valve holder and has many uses.



is easily obtained by the removal of three small screws. It can then be seen that ample room is provided for the knotting of the cable to remove strain from the individual lead ends.

It is a useful plug, and although it may be an obvious fact we would like to point out that there is no need to use every one of the pins of the plug. In other words, to refrain from using the plug until a job necessitating a nine-way cable connection crops up. On the contrary such a plug could well be standardised for all cable connections, and thus make both the plug itself and the socket or sockets used with it (nine-pin valve holders) freely adaptable for connection to all suitable pieces of apparatus.

Finally, we must mention that the plug is very well made and is at once both robust and neat.

RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication. A stamped, addressed envelope must be sent with every article.

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

All inquiries concerning advertising rates, etc., to be addressed to the Advertisement Offices, John Carpenter House, John Carpenter Street, 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 specialties described may be the subjects of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS

LOUDSPEAKER ECHOES FOOTSTEPS.

T. H. (Eastbourne).—"Being 64 years old, I do not get about as well as I used to, and so my wireless is a constant companion.

"One thing I do not understand is the loud noise it makes now when I touch the table where it stands. It starts to roar at me, and I have to put it off for a time till it gets into a better temper!

"Sometimes I can hear a sort of echo in the loudspeaker when I walk about the room. Is there anything I can do to bring it back to its old contented state of mind?"

Yes, and it should not be very difficult to put the trouble right. The cause of the noise is that one of the valves is being shaken too much in its holder.

If you can steady the table, or, if necessary, do that and put a thick pad underneath the set, the vibration from walking about the room, etc., will not cause it to "echo."

Apart from any shaking that you may cause by movement near it, there is another possibility to consider—is the loudspeaker too near to the set? If the loudspeaker faces the valves the air waves leaving the loudspeaker will be quite sufficient to shake up the detector valve and create a howl.

This particular fault, also, is remedied easily by providing extra padding, which in this case can take the form of a wrapping of wadding, or something similar, placed over the valve.

An old valve box, packed with wool and stood over the valve where it is fixed in the set, will generally be a complete protection against noises of this kind.

RECEIVING HIGH-DEFINITION TELEVISION.

G. S. (Nr. Royston, Herts).—"Could you tell me whether it will be possible to receive the proposed new high-definition television transmissions with a scanning-disc system? And would it be possible to convert a 30-line disc receiver for 180-line reception, provided that the motor will run at the greater speed necessary?"

"Also, are mirror-screw and mirror-drum methods suitable for high-definition reception?"

Your questions cover the ground that the technicians are now studying in detail, and it will not be possible to give categorical answers until the situation created by the Government's Television Committee is clearer than at present.

Speaking in general terms, your old scanning disc is inadequate to the new high-definition systems proposed, and conversion from 30 lines to 180 lines would present innumerable difficulties in any given instance except under laboratory conditions.

In short, it is not considered likely that satisfactory high-definition results can be obtained on the amateur-owned apparatus originally intended for low-definition systems, with the possible exception of the cathode-ray method. But experiments are now being carried out in all these matters, and "P.W." will give readers advance details of any that promise well for the home constructor.

BEST POSITION FOR A TONE-CORRECTOR CIRCUIT.

M. F. (Combe Martin).—"Since seeing in your paper that tone of reproduction on radio or gramophone could be modified by joining a

variable resistance and fixed condenser in series and placing them across the output choke, I have been using this method with success on my four-valver. (It is a 1932 set, two S.G.'s, det. and L.F.)

"Quite recently I was making a few alterations to the set, and as a matter of curiosity I tried shifting the two components forming the tone corrector (variable resistance and condenser) from their usual position across the choke and joining them instead across the secondary terminals of the L.F. transformer. The results were surprisingly good.

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"As I have not seen this mentioned before I thought I would ask why the results are better—giving more effect for smaller adjustment of resistance—and why my method of connecting across secondary is not recommended instead of the connection across the choke."

The effectiveness of any given tone-control arrangement depends upon the impedance of the component across which it is joined; and thus any given condenser-and-resistance combination used for tone control will be more or less effective according to whether or not it is suitably chosen for the impedance to which it is attached.

Evidently the values of capacity and resistance you are using are more suitable to the L.F. secondary's impedance than to that of the choke. And since tone control can be arranged equally well at either point you are justified in using the present connections.

FILTERING OUT H.F. INTERFERENCE FROM MAINS.

N. C. (Acocks Green).—"I was told it is easy to put in a simple mains filter, consisting of two 1-mfd. condensers, one 0.1-mfd. condenser and the two special 'mains' H.F. chokes.

"I have these on order, but looking over the brief instructions given I think I might misunderstand them, so could you supply a wiring in words, like you did for the H.F. unit?"

The best way is to mount the filter components on a small baseboard, providing this with a strong cover, totally enclosing them. Stand this unit close

(Continued on next page.)

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RADIOTORIAL QUESTIONS & ANSWERS

(Continued from previous page.)

up against the set (or inside, if room permits) and wire as follows:

Each mains choke is joined to one of the .1-mfd. condensers. The two remaining .1-mfd. condenser terminals are connected together and provided with a flex connection which will be joined to the earth of the set—either direct to the earth terminal or to something connected permanently to this.

The arrangement is now connected in circuit as follows: The mains flex from the wall socket, instead of going direct to the set, will go to the unit, one flex lead going to each mains choke at the point which is remote from the .1-mfd. condenser. The other ends of these chokes will now be joined to those points on the set from which the mains leads were taken—viz. fuse holders or transformer primary terminals. We also advise a couple of 1-amp. fuses in series between the mains leads and the chokes.

As stated, there is also the lead from the junction between the condensers, which must go to earth on the set. And even without the .01-mfd. condenser this arrangement forms a unit that is usually satisfactory.

The .01-mfd. condenser may be tried in two positions to determine which is better. (a) Try it across the two choke terminals (in the unit) which are not already joined to condenser terminals; or (b) try it with one side earthed and the other side to any one of the choke terminals that seems improved by the connection of this condenser's lead.

Before attempting any of the foregoing you will, of course, appreciate that mains are dangerous; and no attempt should be made to interfere with mains wiring until the mains plug has been pulled out from its socket.

Also it is imperative that only special mains H.F. chokes, of irreproachable quality, may be employed, and the working voltages of the three condensers must be higher than the voltage of your supply mains.

CHEESEPARING AND THE COMPONENTS LIST.

E. R. (Grantham).—"Having proved to my cost that many set designs are more elaborate than I require, and that I can leave out small condensers, etc., sometimes, and get just as good results as others who put them in, I left out the fixed condensers across the bias resistances. I had trouble with instability and distortion until I found what was wrong; but now I appreciate that condensers across bias resistances really are important, and I should be glad to know why so many different values and types of condensers are used for this."

Of course, the condensers across bias resistances are important—we cannot pretend to sympathise with your troubles after leaving the condensers out, for you were simply "asking for it."

Frankly, we think it is foolish to attempt to save a little here and there by leaving off components which have been recommended. You can take it from us that there is always a good reason for the inclusion of a component that is included in a first-class design; and although you may not involve yourself in immediate difficulty as the result of pruning down components you are saving nothing in the long run, because such alterations to design often result in unsuspected damage, and consequently involve more frequent renewals and higher running costs.

With regard to the types of condenser used for bias resistances and the different values, we would point out that although they may appear to you to be required for the one purpose of connecting across a bias resistance, the functional requirements vary widely.

Much may depend upon whether they are for an H.F. or an L.F. valve, and a great deal will depend upon the rest of the circuit in which the resistances are used. The only safe rule for a set builder to follow is to trust the designer, who has worked out what types and capacities are required for the job in hand.

SWITCH OFF WHEN ALTERING GRID BIAS.

A. H. T. (Wigan).—"He said the valve had been damaged by misuse, and made me describe how I had tried it. When I explained I had tried different G.B. tappings he said that was enough to do the damage, because I had not got the set switched off at the time."

"Is this right? I believe I have seen it stated that the switch should be off when altering G.B., but surely it cannot do a valve in like that? I only altered to the different tappings on a 9-volt battery."

It is quite possible to "do a valve in" by leaving plenty of H.T. on and altering the grid bias.

The modern valves, although made to stand up robustly to unskilled handling, are necessarily delicate pieces of mechanism. And they are "touchy" about grid bias, variation of which, when the valve is alight with H.T. on, will cause very great changes in the valve's internal resistance.

You see, it is not merely a question of changing from, say, 44 volts to 6 volts if you alter the plug while the set is on. For when you take out the plug from 44 the grid bias becomes 0 for a more or less short period. It is the no-bias condition that causes the big rushes of current through a valve with H.T. left on; and if you fumble the change-over from one bias to another there may be a series of such rushes.

They are all avoided if the set is switched off when the plug is changed over from one socket on the bias battery to the other.

So you see it really is important to take great care over this point if you wish to get the maximum life out of your valves. And we all want to do that I am sure.

THE "P.W." PRIZE PLAY

(Continued from page 832.)

very amusing, finishing the "Scrapbook" on quite the right note.

The Madeleine Carroll-Alma Taylor conversations had a bit of an "In Town To-night" flavour, though obviously they had their place in the programme.

Elsie Carlisle has undoubtedly found her proper niche with Ambrose. Here she is making a great name for herself, and in enhancing her own reputation she is enhancing that of Ambrose as well. I tune in to hear Elsie as well as Ambrose and his band. I can't say the same of any other band and vocalist. A typical Elsie Carlisle effort is that number "Thank you very much for that infinite week-end."

"On the Road."

I have already commended to your notice the series "On the Road." Those of my readers who took me at my word must have been delighted with Philip Allingham, the "cheap-jack," who told us of his experiences on the road, and in more detail at Howe Fair.

Mr. Allingham has a rare gift for vivid description and a rich sense of humour. Hence his success at the mike. He also gave us examples of the lingo of his kind—a sort of Yiddish cum Romany, to which he added explanatory notes. Altogether, an instructive and entertaining 15 minutes.

The Saturday evening Sports Talk is unearthing sports and sportsmen of whom we have hitherto known little. Mr. Jim Vincent is a case in point. I thoroughly enjoyed his talk entitled "The Huckling Coot Shoot." Being interested in languages and dialectical questions generally, I find the technical vocabularies of these talks most attractive.

The best individual variety item of the week was the foreign gentleman who imitated musical instruments and whole bands. I can't give you his name. It wasn't in the programme. These omissions frequently happen in music-hall bills. Annoying, isn't it?

The American Relay.

The short-wave relay from America, by the courtesy of the N.B.C.A., had the usual background noise of "angry seas" to contend with. This failed to ruin the concert, however, which wasn't as American as one feared it might be. I should say it was the sort of lunch-time concert we might introduce over here.

We have the like of the Concert Dance Orchestra several times over, but we would have to find a choir that would sing series of West End hits like the Modern Choir over there sang those Friml numbers—once the rage of Broadway.

The Air-Do-Wells have done much to brighten up the winter evenings. Now they are disbanded—I hope, only for a season. The spirit of this little team of artists is largely responsible for the success they have achieved, to say nothing of the bright and tuneful music they always produced.

I believe Ronald Hill has been responsible for a good deal of this, and as I predicted some time ago in these notes, the sort of music he wrote would catch on. The farewell performance of the Air-Do-Wells was well up to standard.

C. B.

THOSE TRANSATLANTIC RELAYS

(Continued from page 830.)

introduction for a performance of an adaptation of the well-known novel, "Westward Ho!" will be now to listeners in the West, who are to hear it in two parts on Saturday and Monday, March 9th and 11th. In this way two full hours can be given to the play, and this is little enough time to keep the main story of an unusually complicated plot, with its large number of characters, both simple and intact.

Fortunately, the story divides itself into two self-contained parts, and Devonshire dialect will be used by some of the important characters. Charles Kingsley, the author of the book, which is both a national classic and an epic of Devonshire, was born at Holne in that county. The play has been adapted by Louise Drury, and will be produced by Cyril Wood.

From Northern Ireland.

Even grown-ups will want to listen to the Northern Ireland Children's Hour on Monday, March 4th, when the surgical ward of the Belfast Hospital for Sick Children will be turned into a studio for the broadcasting of a special programme, in the course of which the "aunts" and "uncles" will entertain the little patients as well as the big audience outside.

But what they will mostly look forward to hearing will be the appeal on behalf of all the children's hospitals in Northern Ireland, which will be made by a child.

Bagdad Anniversary Talk.

Mr. Leslie R. Missen, the Director of Education for Wigan, who has already described some of his experiences during the war as an officer in the 7th North Staffordshire Regiment, is to give another broadcast on Monday, March 11th, which is the eighteenth anniversary of the capture of Bagdad by British forces under General O'Dowd.

A Brilliant Young Pianist.

There is no doubt that Harold Rubens, the young Cardiff pianist who for six years has been a pupil of Madame Levinskaya, is marked out for a brilliant career.

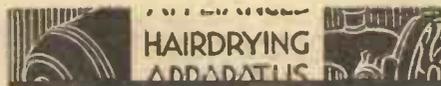
This boy has made many public appearances, and whenever he has played before the microphone listeners have stated they had the impression that he was a man.

An opportunity to hear him occurs on Saturday, March 16th, when he will take part in a concert with the Pump Room Orchestra, at the Pump Room, Bath.

"Wheer Parsley Grows."

Apart from its other theatrical activities, the Yorkshire Comedy Players have broadcast more than a score of dialect plays since their formation about five years ago, and on Friday, March 15th, they are making another appearance before the microphone to present "Wheer Parsley Grows," a title based on the old saying that parsley will only grow where the wife wears the breeches.

This is a new one on me, but incidentally I've never even tried to grow the stuff. The play is by F. A. Carter, a Huddersfield poet and journalist, who has written many works for the Players. O. H. M.



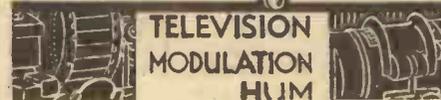
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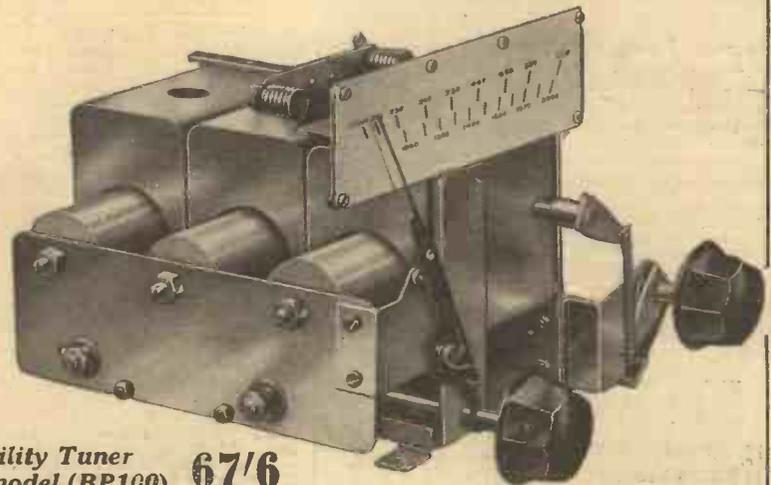
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IMPROVE YOUR LOUDSPEAKER

(Continued from page 829)

thereby isolating the speaker mechanically from the cabinet.

A thick baffle of generous proportions was cut, and on it the speaker was screwed in the usual way. Then the baffle was slung up behind the cabinet front, so that the hole in the dummy baffle came behind the hole in the cabinet.

The Rubber Slings.

Two lengths of fairly thick rubber flooring were used as slings, the holes in the strips being punched with a hollow punch to avoid tearing, the strips being carefully screwed and clamped to the baffle as shown in the sketch. A third strip of rubber was passed round the pot of the speaker to keep it level, and so the whole speaker and baffle assembly was slung up in the cabinet about half to three-quarters of an inch behind the front of the cabinet.

Then the whole of the surface between the dummy baffle and the cabinet face round the hole was filled with loosely packed cotton wool. This prevented sound leakage to a large extent, and I could detect no loss of bass in the scheme, while the packing and rubber supports kept the whole system remarkably rigid.

The result was a complete removal of the cabinet boom, and the speaker is now working perfectly and giving every satisfaction. There are no noticeable peaks, and the bass is clean and full without being resonant at any point.

ROUND THE RECORDS

(Continued from page 834.)

"Scandals," has returned to the Columbia fold after sojourning with Brunswick. She has just made a record of *Stay As Sweet As You Are* and *What About Me?* Ruth Etting's "voice appeal" certainly does get over in her records, and I think that this latest one will be a good seller. She has fine material to work on, especially in the first-mentioned title. (Col. DB1499.)

The number of American talkie stars who are making gramophone records is steadily increasing. It is not surprising, I suppose, when one considers that so many of the light dance and vocal numbers originate in the composing departments of the various film studios. Anyway, Dick Powell, who has just made "Happiness Ahead," has also recorded two of the musical items which are included in that film. They are *Pop Goes Your Heart* and *Happiness Ahead*, and the record is Decca, No. F5404.

And now for some more serious but none the less enjoyable record material. I simply must give particularly high marks to H.M.V. for their superb recording of Mozart's *Concerto in B flat Major*, in which Schnabel takes the piano part. The concerto takes up four records, and they can be had in album form with useful notes on the composition.

As stated by H.M.V., it is hard to realise that Mozart was in ill-health when he wrote this concerto, which is one of his most charming compositions. Composed in January, 1791, it was his last concerto, and he died eleven months later. If you have a good radiogramophone you should certainly try this series of records; it will amaze you with the quality of reproduction. (DB2249-52.)

The second record to which I want to refer in this "serious" section of my notes is that by Elisabeth Schumann. Personality as well as voice are firmly imprinted in the wax of this recording of Schubert's *Are Maria* and Bach's *Bist du bei mir*. It is one of the best she has ever done, and is a record that ought to be included in your library of tuneful classics. (H.M.V. DB2291.)

And here is a third excellent recording for your collection—a first recording of Schubert's *Quartet in G* (No. 15). It is said that the work is so startling in its originality that it was refused for publication during the composer's lifetime. The recording is that of the Kolich Quartet, and covers four discs, which complete an album. K. D. R.

BLUE SPOT FOR EXTENSIONS

Details of the "Star" Cabinet
Model Loudspeaker.

FOR many years POPULAR WIRELESS has enthusiastically sponsored the extension loudspeaker idea. We have consistently maintained that to use one loudspeaker only, particularly if it is built into the set, is unnecessarily to limit the advantages of radio in the home.

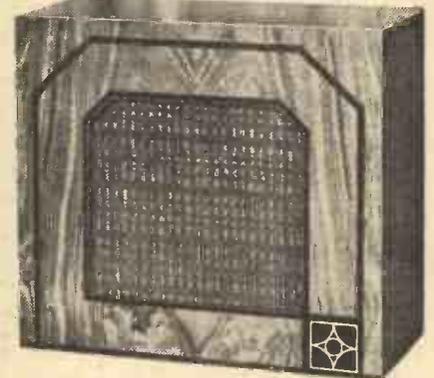
What we have been saying for a long time is at last being said by many others. For example, read the following:

"It is surprising that the use of extension loudspeakers is not more widely practised. Only the other day I was invited to dine at a friend's house. He is the proud possessor of a really good radiogramophone. 'What could be nicer,' said he, 'than to have a background of soft music during our meal?' The pleasure was spoilt, for me, at least, by the fact that the doors of both rooms had to be left open so that the music could be heard. The music was doubtless excellent, but the meal was ruined.

"Now, if this man had taken the trouble—and it is really very little trouble—to run a wire from the extension sockets of his set to connect with an extension loudspeaker in his dining-room, we could all have enjoyed the musical background without being frozen at the same time.

"In my own home I have gone in for extension speakers thoroughly. I have installed them in the dining-room, kitchen, bedrooms, and I have even

HIGH SENSITIVITY



This handsome Blue Spot speaker costs 98s. The cabinet is of walnut.

run a line to a convenient point outside the house for garden listening in the summer-time. The outcome of all this effort is that when the receiver itself is tuned in to the station we want we can have our entertainment in any part of the house. Often, in fact, two and even three speakers have been going at the one time and reception was just as good as it could be.

"Another advantage about this plan of mine, which was brought home to me rather forcibly within the last week or so, is this. One of my family had the misfortune to go down with an attack of flu. When the worst was over she began to be exceedingly bored—as all active people are bored—by having to stay in bed. In the ordinary way the invalid would have been cut off from all wireless entertainment. As it was, I simply fetched one of the extension speakers up to the bedroom and connected it to the socket in the skirting board. Result—many wearisome hours passed with complete pleasure and a positively beneficial reaction on the invalid. I recommend this treatment to doctors with restive convalescents on their visiting list.

"The job of wiring up for extension speakers is too simple to bother describing in detail, but the choice of an extension speaker is rather more involved. I have used Blue Spot speakers throughout because the manufacturers have no small reputation for turning out quality products. The new 'Star' models appealed greatly both to my ear and my pocket, and my wife liked the cabinet work—a point of some importance.

"There is a wide range of extension speakers made by Blue Spot. The 'Star' models I chose are fitted with an on-off switch in the speaker, and for a little extra this may be replaced by a combined volume control and switch, which enables one to control the speaker from a distance. In my opinion, the addition of two or three Blue Spot extension speakers to the radio installation in the average home is the only practical method by means of which one can get full value from one's receiver.

"Without such speakers the alternative between listening to radio programmes in one room only is to do without radio at all, in which case one receives

(Continued on next page.)

BLUE SPOT FOR EXTENSIONS

(Continued from previous page.)

a very meagre return in entertainment for an investment running into a good many pounds.

"Incidentally, I took the trouble to find out from the Blue Spot people that they will be delighted to give any advice and help within their power. If you want further information, I suggest you write to them direct, asking for a catalogue and any specific information desired. The address is: The British Blue Spot Company, Ltd., Blue Spot House, 94, Rosoman Street, London, E.C.1."

That, we think, puts the case as well as it has ever been put.

We can add to that that we have always held the Blue Spot loudspeakers in the highest respect. Blue Spots were giving clear, unfiltered results when the average standard of loudspeaker reception was so low that you wanted analytical ears to distinguish the difference between a violin and a bassoon!

In the Blue Spot "Star" you find all the traditional quality of Blue Spot technique.

High Degree of Sensitivity.

The speaker embodies a magnet constructed of the new aluminium alloy and protected by a chromium-plated casing, which contributes a high degree of sensitivity to the instrument.

The unit has also been made completely dustproof, and its novel suspension system ensures reliability as well as optimum efficiency.

The "Star" Cabinet Model is a very handsome conception, and is built into a walnut cabinet of attractively modern design and pleasing proportions.

It costs 98s., and is worth every penny of that sum, for it is definitely an outstanding production. The results are, in fact, exceptionally good, even for Blue Spot. There is a clear-cut "naturalness" that enables speech and music to be heard with all its original timbre.

It is, in short, a speaker which we would advise our readers to hear, even if for nothing else but to learn to what heights modern loudspeaker design has reached.

HOW THE CATHODE RAY WORKS

(Continued from page 836.)

gas molecules, knocking off the electrons and leaving a chain of positively charged ions strung out like beads in its path. Each of the ions acts as a centre of attraction in the midst of the swift-moving stream and serves to bind the electrons together into a clear-cut pencil.

In the most modern type of cathode-ray tube the inside of the bulb is highly exhausted, so that this method of gas focusing is impracticable. Instead, a system of "electron optics" is used in which the usual anode A, Fig. 3, is supplemented by a second anode A1, carrying a higher positive voltage than the first. The lines of electrostatic force spreading out between the boundaries of the two anodes then concentrate the outgoing stream of electrons in much the same way as a ray of light is focused when passing through a lens.

Electrostatic Focusing.

Owing to the different voltages on the control cylinder W and the first anode A, the electrostatic field between the two takes the curved form of a lens, as shown in the figure. Electrons moving through an electrostatic field must cut the lines of force radially. This effect is used to offset the natural tendency of the stream to spread laterally under the influence of the mutual repulsion between the individual electrons.

As shown in the figure, the ray is first allowed to diverge slightly. On crossing the boundary between the first and second anodes it meets a "reversed" curvature in the lines of force, which brings it to a sharp focus on the fluorescent screen. The optical equivalent of this electrostatic system of focusing is indicated in the lower part of the figure.

JOTTINGS FROM MY NOTEBOOK

Random Technicalities of interest to everybody.

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

OFTEN enough, after completing the building of a set, you will find that the potentiometer volume control works the wrong way round. You may say that there is no particular way round and that, so long as it reduces volume one way and increases it the other, it doesn't matter. In a way this is true, but it saves memory and confusion if you arrange all these little things according to a definite system, and so far as the volume control goes, this system says that the volume should *increase*, not decrease, when the control is turned in a clockwise direction—or, if you prefer it, when turned in the direction of tightening up an ordinary right-handed screw.

Anyway, if you want to make it work the opposite way, whatever it may be, all you have to do is to change over the connections to the terminals of the resistance-element, leaving the connection to the slider unchanged.

Minimising Hum.

Sometimes, in a mains set, a potentiometer of comparatively low resistance is used for the purpose of minimising hum. In such a case it requires careful setting, because the movement of the slider is small. If there is any trouble with it (or with any other type of potentiometer, for that matter) owing to noisy or crackly contacts, it is best to remove the components from the set and then bend the slider arm so as to make better and firmer contact. In some potentiometers adjusting means are provided for the pressure of the contact-on the element.

Visual Tuning.

Visual-tuning indicators are coming rapidly into favour, and several manufacturers are now incorporating them in sets. Usually the idea is that the brightness of the glow in a small bulb, or the position of the glow, indicates when a station is accurately tuned in. This is a good scheme, because it gets away from the practice, which is so common, of tuning in a station any old way, and then just boosting up the volume by reaction, or the volume control, or what not.

Don't Detune.

For proper reproduction it is very important to have the incoming signal properly on tune, and if you want to regulate volume this should be done by some quite independent means—not by detuning. With modern selective receivers it is useless to expect good quality if the set is slightly off-tune. It is not always easy, however, to know by ear when the signal is exactly tuned in, and this is where the visual tuning comes in so useful.

Neon-Tube Indicators.

Most of the visual indicators so far have been based upon the principle of the neon

(Continued on next page.)

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JOTTINGS FROM MY NOTEBOOK

(Continued from previous page.)

tube, but one has recently been introduced, by the Climax people, in which a 2-volt flashlamp bulb is used. This gives a slight glow when there is no reception, increasing as a station is tuned in and reaching maximum brightness at resonance. This is very good and a great boon, and I expect we shall see these indicators in very general use next season.

Batteries for Superhets.

Several readers have asked me, since I made some notes on different types of batteries recently, whether it is better to use the kind that have just two thick plates or those that have several thin plates. The answer is simple. The ones that have just two thick plates are generally much cheaper (they can be had extraordinarily cheaply these days), and they are perfectly suitable where the total current required is not more than perhaps 1/2 amp. As a matter of fact, this limit can be stretched quite a lot for short periods. They hold their charge well, even if not used for a long time. The charging rate is also small.

When the current demands are much higher, however, as in the case of a big battery-operated superhet, the multiple-plate type should be used. This will give a much higher rate of discharge and can correspondingly be charged at a higher current rate.

Don't make the mistake of overloading one of the two-plate cells, either in charge or discharge. Properly treated, these cells give excellent service.

Valve Changes.

Have you noticed how the variety in set design nowadays is more in the valves than in the circuit? In the early days of broadcasting we had just a very few types of valves, but we were continually making variations in the circuit arrangements and in the coils. In fact, I think we paid more attention to coils in those days than to anything else.

Gradually, however, the fashion changed over to improvements in valves, and, once started, this fashion has gone on with ever-increasing acceleration. To-day we have a bewildering array of valve types—some better than others, but all good—marvelously good by comparison with those of only five years ago. The set designer to-day thinks first, not of reaction, output filters, decoupling and the rest—those come presently and are taken for granted for the moment. No, the first thing he thinks of is the choice of valves. From the great choice available he makes his selection—screened-grid and high-frequency pentode, variable-mu, double-diode triode, pentode output and so on—and having settled this part of his scheme, he proceeds to build the circuit around the valves.

A Set in a Valve.

As time goes on, more and more of the receiving set seems to find its way inside the valve. There are multi-valves, several valves (even stages) in one, sometimes with coils complete, and some people say the day will come when we shall have a complete receiver all inside one small exhausted glass bulb!

Well, there's one thing we can never put inside the valve and that's the loudspeaker. Or can we? You never know.

Tags or Terminals?

Why is it that people try to get away from soldering in wiring up a receiving circuit? Soldering is not all that difficult, but many seem to think that it is much better to use all components with screw terminals so as to avoid, as they say, the need for soldering. Personally, I think that soldering is such a very simple operation, but it is not understood by the vast majority of amateur constructors, so that they find it necessary to go to any pains to avoid it; and yet a soldered joint, if properly done, is much more satisfactory than many a terminal joint.

With a good many of the components which I have examined the terminals are far too small, and by the time you have got the wire twisted round and secured under the terminal it is a moral certainty that on the slightest movement the terminal nut will become loose and the wire will fall off. Now this doesn't happen at all with a soldered joint, or even with a soldered terminal tag. Personally, I am all in favour of soldering in the wiring up of a

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set, and I think that, provided always it is properly done, it can be made really satisfactory. Moral: learn to solder.

Condenser Tuning.

I dare say you have noticed that with the condenser tuning, when the condenser is set towards the minimum position, the selectivity of the receiver tends to fall off. And, just to make things difficult, you generally find that most of the stations you want to receive will persist in crowding themselves together in that very region.

At the other end of the scale you get a loss of high-note response. So between the two you see that condenser tuning is not all beer and skittles for the set designer, and he naturally turns to some alternative which will get him out of his troubles.

The solution is to be found in permeability tuning, which gives—or can be made to give—a very uniform behaviour over a whole waveband. Furthermore, it gives a relatively high degree of efficiency.

Amplification Factor.

Many people think there is something mysterious about the "mu" of a valve, which, however, is simply a short name for the "amplification factor." There is nothing strange about it, and, in fact, it is perhaps the most fundamental characteristic of the valve and one which is very

(Continued on next page.)

JOTTINGS FROM MY NOTEBOOK

(Continued from previous page.)

easily determined experimentally. It may be defined as the ratio of a change in the anode voltage to the change in grid voltage necessary to counterbalance the same. For instance, say the anode voltage is 100 volts, the grid volts $1\frac{1}{2}$ volts and the anode current 10 m.a. Suppose the anode voltage is increased to 120 volts (thereby increasing the anode current), and the grid voltage has to be increased to 6 volts in order to keep the anode current down to the original value. Then the change of anode voltage is 20 volts, and the change in grid volts is $4\frac{1}{2}$, and the amplification factor is 20 divided by $4\frac{1}{2}$ —that is, about $4\frac{1}{2}$.

Testing the "Mu."

If you use H.T. and grid-bias batteries (relying upon them being up to their rated voltage) you can easily carry out these tests by the aid of a milliammeter.

I should mention that a test of this kind gives you the amplification factor at, or about, a definite value of H.T. voltage, but the factor will not necessarily be the same at some very different anode voltage.

TELEVISION AND THE PUBLIC

(Continued from page 827)

and so on. It will be many years before direct television reception of large events of this kind will be a practical proposition for the ordinary domestic user. Incidentally, the Americans are claiming to have made a good deal of progress in this direction already. But it is difficult to get at the facts in the U.S.A., where television is concerned to-day.

What can be done now, and very efficiently too, is the photographing of these events by a special cinematograph camera and the extremely rapid developing, fixing and transmission of the moving pictures. It is already possible to carry out this whole process in thirty seconds.

I believe that one of the most successful developments in the immediate future will be the use of this indirect method of television in cinematograph theatres just as news reels are shown now: except that it will be possible to show them practically simultaneously with the events that interest the public. Immediate activity may be expected, therefore, in perfecting a method of throwing a large picture by television on the cinema screen, and from what I have been able to learn we are very near to success here.

There will be an advantage also in linking up the great cinematograph industry with television. At the same time there is a psychological difference between direct and indirect television, and I imagine most people would prefer to "see-in" directly if this can be contrived.

And now I come to a third section of the public, not less important than either of the other two. I refer to the amateur television experimenters. Sound broadcasting was helped immensely by amateur enthusiasts. Every encouragement should be given to amateur experiments in television; and in this connection I must include POPULAR WIRELESS and its very able staff of technical experts in my eulogies.

"P.W.'s" Pioneer Work.

This paper it was which first explained to the man who was making a hobby of television how to use the cathode-ray equipment. POPULAR WIRELESS also hammered away at the advantages of the ultra-short-wave transmission.

It will be a great pity if the B.B.C. decides finally to stop their present television broadcast experiments with 30-line transmission. The two commercial companies will be required to transmit between 180 and 240 lines. No doubt this is necessary for clearer definition; but for experimental purposes the 30-line transmission is more suitable. The special television transmissions for experiments, therefore, should be continued in any case, and independently of what the private companies do on their alternate days.

I must also write a word of praise for the enterprise and long vision shown by POPULAR WIRELESS in offering prizes for television developments and discoveries. A well-merited prize of £200 was won by the late Dr. Fournier d'Albe, one of the early pioneers. This encouragement, and the work resulting from it, have been most valuable, and the whole nation will benefit.

I hope also that the ranks of those with some knowledge of the scientific side of television and the technique of making and adjusting television receivers will be heavily augmented. I should advise anyone who contemplates buying a television receiving set to make as close a study as his time and knowledge will permit of the technique of this science. The people who know much about it are comparatively few. The difficulty will be in getting enough skilled technicians to adjust and keep television receiving sets in order once the public begins buying them in quantities.

Rapid Advance of Television.

Not nearly enough of such experts exist at present, and it will take time to train them. The more the prospective "lookers-in" know about their instruments and how to keep them in order, therefore, the better.

Despite what I have said about unfounded optimism and extravagant hopes and beliefs, the pace of advance in this new science has been extraordinarily fast. It was only in the spring of 1927 that the first television pictures were transmitted in the United States of America by the American Telephone and Telegraph Company over a distance of two hundred miles between New York and Washington. It was in the winter of 1928 that pressure began to be put on the Post Office authorities and the B.B.C. to grant television facilities in this country. I was appointed a member of the first Parliamentary Committee set up to examine into the then stage of television development in March, 1929. The first experimental television broadcast under official auspices was not made in this country until September 30th, 1929; and now here we are in the beginning of 1935 with a definite programme laid down for the next two years and the first special television transmitting station about to be erected!

There is one special use of television that has received little attention, and that is the rapid sending of news. It is possible now to televise a page of a newspaper with the market reports, stock exchange prices, horse-racing and football results, etc., in a far quicker time than is required to tele-

graph the information. For business purposes the possibility of rapidly televising a whole page of figures and facts has obvious advantages.

I am glad to know that the news agencies are alive to this possibility; their assistance should be most valuable in developing this great new industry.

THE H.M.V. MODEL 441.

We should like to draw the attention of readers to the fact that the model 441 H.M.V. receiver, illustrated on page 801 of our last week's issue, is priced at 12½ guineas and not 12 guineas as stated.

—BARGAIN— McMICHAEL RADIO 5-VALVE "LODEX" MODEL BATTERY

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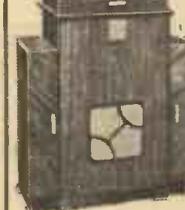
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BATTERY SETS



THE problem of frequency changing has worried most of us, particularly when dealing with the shortwaves. It is admitted that electronic methods of coupling are best, but no single valve is entirely satisfactory. An interesting method of employing Marconi X21, 2-valve heptode, has been evolved, and details will be sent to those who are working in this field.

WRITE TO THE VALVE DEPARTMENT, MARCONIPHONE COMPANY LIMITED, 210 TOTTENHAM COURT ROAD, LONDON, W.1. MENTIONING THIS PAPER.

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THE CHOICE OF THE EXPERTS

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VAUXHALL. Rothermel Piezo-electric pick-ups, 30/-; B.T.H. Senior, 29/-; Minor, 16/6. Sealed cartons.

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VAUXHALL. B.T.H. Trusped A.C., 30/-; B.T.H. Universal model, 110 D.C., 200-250 A.C./D.C., 47/6.

VAUXHALL. Utility dials and drives, complete with escutcheon, state black or brown, 5/-.

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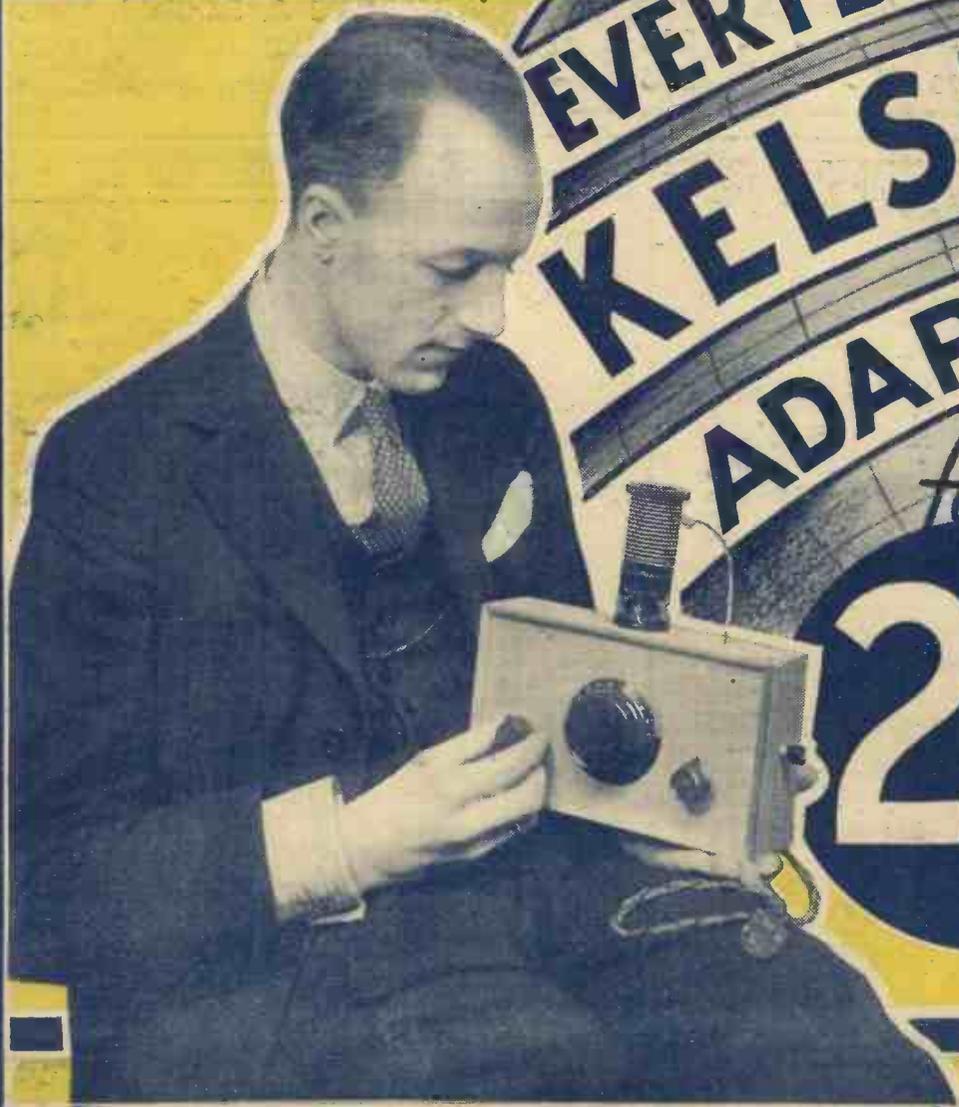
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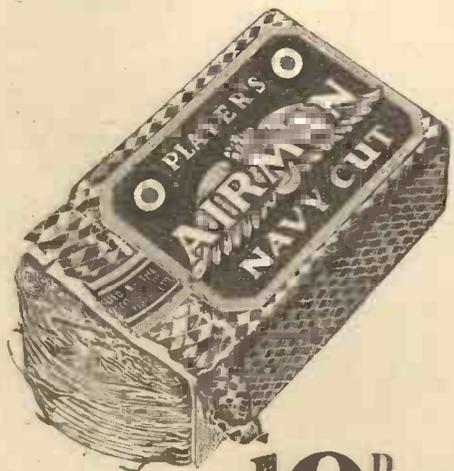
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POPULAR WIRELESS AND TELEVISION TIMES

MANAGING EDITOR: N.F. EDWARDS

TECHNICAL EDITOR: G.V. DOWDING ASSOC. I.E.E.

"ENLARGED" MUSIC
QUICK WORK!
SWEDISH PRODIGY
A NEW "POLE"

RADIO NOTES & NEWS

RADIO LESSONS
A RECORD
IN INDIA
COME CLEAN

On the Other Hand . . .

EMINENT musicians who have slated and rated the B.B.C. for their presumption in thinking that wireless bears any resemblance to *real* music (viz. music produced by the eminent musicians themselves!) will hear with sorrow the result of some recent orchestral experiments. A test was sponsored by the U.S. National Academy of Sciences, during which the full Philadelphia Orchestra played a symphony concert in Philadelphia, the music being sent by wired wireless to a large audience in Washington.

The question was to decide whether it would be possible to *increase* the intensity and *improve* the effect by scientific application of power amplification.

The verdict was that the music, so "enlarged," as it were, "acquires greater eloquence, energy and significance."

"Hotcha" Tunes.

THESE "hotcha" melodies, which the proletariat so obstinately persist in liking, demand "hotcha" methods and enterprise on the part of the music publishers who successfully produce them.

At one time a snappy tune took months to cross the Atlantic, and so we thought it was very "hotcha" when it was considered stone cold in its native U.S.A. But now it's a different story.

One far-seeing music publisher always keeps a get-the-world radio set tuned in methodically to dance-band broadcasts in other lands, and when he hears a regular toe tickler coming over he *records* it. If the play-back makes him want to hear it again he brings his dance-music critics in, and if they nod enthusiastically he sends a wire and buys that tune before the far-off band which played it has disbanded for the night! ("Hotcha"? Youbetcha life!)

Youth Will Be Served.

IN fairness to youth I must recall once again that question of broadcasters who take to the mike long before their mummies have stopped boasting of the discovery of their offsprings' first teeth.

Not long ago I mentioned a young lady of Zagreb, only six years old, and yet a star turn. Then there was a prodigy named Claude, snatched

from his cradle by Radio Normandic—he proved to be a song-and-dance merchant of great merit.

The latest claimant for notice is Frank Willy Andersen, of Stockholm. Aged *two*, Frank Willy is—but he sang, he danced, he clapped the hand and crooned like a veteran when they gave him a few minutes

ON OTHER PAGES

	Page
The Home Constructor and	
Television - - -	855
"P.W.'s" Jubilee Sets - - -	856
On the Short Waves - - -	859
Preventing Interaction - - -	861
How They Look at Television	871

of Sweden's time. I salute this artist with enthusiasm, and hope his nurse is an understanding lady who never forgets the hot-water bottle for a cold *maestro's* feet these chilly nights.

ANOTHER HONOUR FOR MARCONI



The Marchese Marconi has been awarded one of the major Austrian scientific distinctions, viz. the Wilhelm Exner medal. This medal is given annually by the Austrian Association of Commerce and Industry to "persons who, by their scientific work, have given special increase to industrial production," and has never before been awarded to a non-German-speaking scientist. The above photograph shows the Marchese and Marchesa Marconi during a visit to the United States.

Contract Notes.

IN case the heading to this paragraph attracts the eye of the inveterate bridge player I must explain, without delay, that it does not refer to card games.

Auction and contract alike are beyond me, my tastes running no higher than nap, pontoon and an uproarious session of Grandfather's Whiskers at Christmas and like seasons. No! The contract in question is of the legal-document variety, several good ones having recently been received by British radio firms with acclamation.

The latest is of an approximate value of £30,000, and concerns an order for a fine 100-kilowatt station for our old friend Radio Suisse Romande, alias Sottens.

Standard Telephones & Cables is the firm which received the glad tidings, and they are planning to get the new Swiss broadcaster on the air by next autumn on 443.1 metres.

Progress in Sweden.

THE Swedish Radio Broadcasting Service, which has just completed its first decade, celebrated the occasion by a special programme and whoopee night. The Minister of Communications was there, and was able to reflect with complacency that the number of licensed listeners is now more than one-tenth of the total population of Sweden.

In the ten years licence figures have grown from 40,000 to 730,000 odd—a highly respectable figure upon which "P.W." congratulates our good friend on the other side of the Dogger Bank.

Have a Cigar?

FOLLOWING the lead given by Vienna and Budapest, the Polish station at Torun is sporting a "cigar" aerial of the type now popular in America. The peculiarity of this type is that the mast does not support a wire aerial, but itself is made of metal and acts as its own radiator.

Pointed at the top and bottom and broad in the centre (where it is stayed), the aerial gets its name from its cigar-like shape.

Torun uses a power of only 16 kilowatts, so if you hear his tests on 304.4 metres you can bet it is a pretty good "cigar" that he has acquired.

(Continued on next page.)

ARE YOU A "LOOKER" OR A "BEHOLDER" ?

An Eye on Lightning.

PHOTO-ELECTRIC cells are acknowledged to be distinctly nippy in action, but surely their latest application is a unique tribute to speedy work, for they are now expected to beat the lightning.

Engineers at Cincinnati, Ohio, have been worried about station W L W's 831-ft.-high mast, since, if lightning causes it to spark to earth, the effect is to short-circuit the transmitter—no joke when 500 kilowatts are in use.

So somebody suggested placing photo-electric cells near the spark gap, in such a position that if a spark occurred its light would work a relay and switch off the transmitter's H.T. before any real damage could be done.

When the lightning flash has passed, the cells automatically go off duty again, thus enabling the relay to switch on H.T. Cunning work, W L W, as the late Ajax himself would have readily granted.

College Days.

YOU must not believe all you see at the movies about college life in the U.S.A.

On the other hand, collegians and professors get up to capers that would be astonishing even to audiences accustomed to the adventures so vividly portrayed by Walt Disney's art.

For instance, in the N.Y. University School of Commerce recently twenty students sat in a class-room with an ultra-short-wave wireless set. Where was their professor? Not exactly absent, but lecturing them from his home a couple of miles away!

In his easy chair (what they call a rocker), and clad in dressing-gown, the professor distilled his wisdom in slippers comfort, eyeing the class, with only a loudspeaker eyeing them, were free of academic restraint and could think at ease. (Neither Oxford nor Cambridge has adopted this method at the time of writing!)

Wax Works.

THAT wireless is full of snags, nobody of experience will deny. How does this one strike you?

A singer gets an audition from the B.B.C., tries for all he is worth before the microphone, but finally gets a very polite intimation that his voice is not suitable for broadcasting.

Not to be discouraged, however, he tries the gramophone companies, makes some good records and then tunes in his radio one day to find that the B.B.C. is broadcasting one of his recordings, apparently oblivious of the fact that they turned him down in person!

Follows an indignant protest, the B.B.C.'s reply being to the effect that, while one department may reject a certain artist, his singing might be quite admirable for the purposes of another department.

Radio Joe.

TO the many famous Joes of the world—including "Poor Old" himself, Rag-time Cowboy Joe and the inimitable Joe E. Brown—must now be added Radio Joe.



This worthy lives on a trawler, and sprang into fame at Ramsey, Isle of Man, when his floating home sheltered in the bay recently with other vessels.

When the anchors were down and all made snug below and aloft the skippers of the little fishing boats switched on their wireless transmitters to compare notes about the gale and the way of the roving herring.

MORE HISTORIC EPISODES

Peter Creswell's vivid story of General Gordon, in the broadcast of "Gordon of Khartoum," attracted so much attention that it is safe to say that historic episodes must feature largely in future programmes. Listeners in every walk of life have sent in letters congratulating the author and the B.B.C. on the broadcast.

The Sudan Government have asked the author for a copy of the script for their archives, and two film companies have applied for an option on the film rights. In addition, applications were received from two sources for permission to record this historic episode, and various museums have applied for the script for their libraries.

Business settled, a sing-song was decided on—and that was where Joe came in! Every stormbound skipper demanded to hear the invisible Joe—"Where's Joe?" "Put Joe on!" "Come on, Joe!"

There was a pause, a shuffle of sea-boots and then "The Isle of Capri" rang out over the Isle of Man, holding spellbound Joe's stormbound audience and highly delighting the listeners ashore.

Vision of the Future.

DOFFING my hat to young Television, now officially hailed by a Government Committee and upon the point of settling down among us, I should like to ask the promising new art one question. And the question is: "If I look at Television, what am I?"



Do I become an In-looker? Or a Telesee? Or a Visionair?

Some ingenious souls have suggested that the person who looks at Television is an Observer or Spectator; but two well-known editors shuddered and nearly fainted at this, so the suggestion was altered to Beholder!

Do you want to be a Beholder? I thought not! Well, then, be a Sport and suggest something, quick, before we are all mislabelled irrevocably.

India's Radio Chief.

CONGRATULATIONS to Mr. Lionel Fielding, of the B.B.C. Talks organisation, upon his new job. He has been recommended by Sir John Reith to the Indian Government, and will be put in charge of the new State Department of Indian Broadcasting.

There will be no shortage of work for Mr. Fielding, for his task bristles with difficulties—a land like India will not acquire its radio service by people singing "All things bright and beautiful" and sitting in the shade.

Spade-work, midnight oil and honest-to-goodness sweat have been the lot of India's servants ever since the days when young Bob Clive applied them with such outstanding effect. Yet, as a wise old Hooghly pilot once explained to me: "It's all worth while. You come here full of hope, you live here full of fever, but somehow this darned country makes you feel glad you came!"

Come Clean.

SATURDAY afternoons seldom see me absolutely raving and rattle-wielding, though I confess to a great liking for an occasional League game and to a fondness for the Cup-ties. But some of the football fans seem to be no-limit extremists, of the type who want to have their cake, eat it and also share it with their neighbours.

I refer to those enthusiasts who go to see a match, take a portable set with them and tune in to hear the broadcast of another match elsewhere. (Sounds a bit complicated, but you see what I mean?)

This does not seem quite right to me. And it must be very disturbing to neighbouring spectators, to say nothing of the linesman. Let's cut out this portable stuff, boys, and keep the party clean.

Free Radio.

KEEP calm, boys—the above is not for you. Free radio is restricted, in this country, to the blind; and even the claims of the permanently bedridden have not yet melted the hearts of the authorities sufficiently to enable invalids to take out licences without paying 10s. each.

In Germany, however, it is otherwise. So highly does Herr Hitler regard radio as a means of influencing public opinion that he recently granted 180,000 persons the freedom of the air. Some of them were poor and needy, unable to afford a licence, but it was officially stated that poverty was not the only consideration that determined selection for the free list.

If our Government wants to make 180,000 pals for itself here is an opportunity. But I suppose that some of our confirmed B.B.C. programme grouseurs would not be pleased even then.

ARIEL.

The Home Constructor & TELEVISION

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

IN the early years of broadcasting a complete three-valve set would cost twenty-five pounds or more to buy. But a similar kind of outfit could be built from component parts by the home constructor for a matter of about seven or eight pounds.

In fact, considerable money could be saved by "rolling your own." And there was a further very great advantage. Owing to the undeveloped state of the science of broadcast reception there were many improvements and refinements to come; and come they did, almost weekly.

Practically overnight, indeed, the whole technique of reception would change. As an instance, one has only to recall to mind the coming of the screened-grid valve.

The Drawback of Purchased Sets.

This rapid progress meant that a purchased set might become "old fashioned" almost as soon as it was bought. The manufacturers must have had a trying time!

The home constructor was always on top of the times, for he could use many of his component parts for one set after another, and at little cost take advantage of every new development the moment details of it appeared in "P.W."

Those days of spectacular home-construction benefits are over in so far as ordinary broadcasting is concerned, though there are many real advantages remaining.

But on the short waves and in television—particularly television—the situation of a decade ago is re-created.

Television is going to use the ultra-short-wave channels, and these are indeed virgin fields for enterprising explorers. And so is television itself. In fact, everything concerned with seeing-at-a-distance is meat for both the professional and the amateur experimenter.

High Prices at First.

"We are informed that the price to the public of a receiving set capable of producing a picture of about the first-mentioned size (8 in. by 6 in.), with the accompanying sound, would probably at first be considerable . . . ; but it is reasonable to assume that, if and when receivers were made on a large scale under competitive conditions, this price would be substantially reduced."

So run extracts from the Television Committee's report. But receivers for television will not be made on anything like the scale of modern radio receivers for years, and so their prices must remain that much proportionately higher.

There are several reasons why this should be quite inevitable. At first there is only to be the one television station serving

In this brief forecast of the future of television our Technical Editor says that building television receivers is "going to be grand fun—much more thrilling than ordinary reception." He is right, too; there is vast scope for the home constructor in the new field of radio.

London only. This at once arbitrarily limits the market. The whole country is not immediately to be thrown open for the absorption of television trade.

Perhaps a limited form of mass production would, however, be possible, were it not for the fact that technical developments in any quantity may be anticipated under the stimulus provided by the commencement of a television service.

A manufacturing company would be serving its shareholders very badly if it plunged headlong into the manufacturing on a big scale of a particular kind of outfit at this juncture.

The Home Constructor Will Score.

Caution will have to be exercised for some time to come, and it will be during these early years that the home constructor will score tremendously.

However satisfactory television results may seem to us when the service really starts either on a regional or national basis, you can rest assured our descendants won't think much of it.

I can well remember how satisfied we all were with the first broadcasting, and how we tended to consider that there was little else that could be done.

And yet no one to-day would take a ten-year-old outfit as a gift. It would sound absolutely dreadful to our modern ears.

Television, great though the progress in it which has been made, is not yet comparable even with those first broadcasting results. Pretty well anybody anywhere in the country could pick up sound-tones covering a very respectable part of the complete compass covered by the human ear.

A Great Wave of Development.

The eye has a compass infinitely greater, and thousands of research workers, professional and amateur, are going to strive for year after year to embrace a greater and greater proportion of it.

Nineteen-thirty-five will undoubtedly see the beginning of a great wave of development through the courageous attitude adopted by British officialdom. It was one of the themes of the evidence given by "P.W." to the Television Committee that

no real television advance could be made, or at least stabilised, until the material for national experiment and development was provided in the form of public transmissions.

That we now get. The first transmissions, however, will have sufficient entertainment value to make them attractive to ordinary members of the public, but whether or not huge numbers will feel inclined to pay the prices asked for the first complete outfits remains to be seen.

If not, that doesn't mean that the experiment will fail. In the early days of broadcasting relatively few people purchased complete sets. The great majority built their own.

Evidence of Public Interest.

I shall not be at all surprised if history repeats itself in the case of television. A large number of people building their own outfits will serve just the same purpose as a large number buying them ready made, for that would provide just as much evidence of public interest and of solid support for the new service.

And it's going to be grand fun—much more thrilling than ordinary reception. There will be two distinct fields of interest. First of all, reception of sound and vision both together on 7 metres or thereabouts.

The apparatus concerned will be able to take all kinds of different forms. The ideal will be a receiver on which both the sound

(Continued on page 876.)

A NEW VALVE FOR TELEVISION



Examining the electron multiplier tube at the Baird Television laboratories. The new filamentless valve can amplify up to a million times, and thus can take the place of a multi-stage amplifier. Incidentally, the electron multiplier will not burn out.

I believe that a home-assembled equivalent to any factory television outfit will cost far less, but more: it will be easy to dissolve it into its component parts in order to rebuild it in accordance with all the latest developments. It is impossible to forecast what these developments will be, but of their coming there can be no doubt at all.

"P.W.'s" JUBILEE SETS

First details of the great new series of "Popular Wireless" receivers which will provide double-channel reception and open up new worlds for radio enthusiasts to conquer.

THIS year sees one of the most important developments since radio began: broadcasting is going down to the short waves. Probably by the end of October there will be two-hourly transmissions of sound and vision on ultra-short waves every day from a London B.B.C. station. A certain number of listeners will at once purchase or build complete television outfits for the reception of these programmes, but at the most they will form only a small percentage of the listening public, for some will not be able to afford to buy the necessary gear, while others will prefer to wait, believing, perhaps rightly, that the earliest apparatus will be subject to rather rapid modification and improvement during the first months of the new service.

Those Extra Programmes.

But steadily these daily two-hour programmes will be radiated, presumably with all the finish and polish that the B.B.C. devotes to its normal transmissions. Vision and sound! Two hours of broadcasting for one, five or ten per cent of the population of London? A symphony concert from the National transmitter, chamber music from the Regional and perhaps some top-line variety stars in the television two-hour programme for the fortunate few!

The wireless programmes are going to be rather exasperating at times for those not equipped to at least listen to what is going on down among the television frequencies, for it is quite obvious that much of the material is bound to be quite as complete entertainment merely as sound as is the present broadcasting.

But it will be quite beyond the powers of all owners of present types of radio receivers, commercial or home constructed, to share in any way in this new extension of the B.B.C. service. They will be unable to satisfy either their natural sense of curiosity or, more importantly, their desire to share in some way in the benefits arising from this increased expenditure by the B.B.C. of the licence revenue.

Entirely Novel.

Clearly there would be a colossal demand for radio receivers of an inexpensive character able to tune in all wavelengths from the ultra shorts up to the medium and longs were it known that such receivers existed. But such sets won't be found in the set-makers' catalogues. However, as in the past, the home constructor will be in an advantageous position; in fact, he will be in a position to begin the building of the world's first completely

all-wave sets within a week or two—when we publish number one of our Jubilee series.

The POPULAR WIRELESS Jubilee receivers will incorporate several entirely novel features—features which can justifiably be termed revolutionary. Costing little, if anything, more to construct than normal straightforward sets, they will be capable of receiving ultra-short, short, medium and long wavelengths.

The potentialities of such a wide wavelength coverage are enormous. The whole world of broadcasting will be open to the builder of a "P.W." Jubilee set: local-station reception, the continental stations and, on occasions, a few American medium-wavers, short-wave transmissions from all over the world and, last but by no means least, the sound part of those romantic new television programmes. Perhaps some imagine that only Londoners will at first be able to pick up these last. Certainly, twenty-five miles has been spoken of as the service limit for ultra-short-wave television transmissions. But that mainly applies to the vision where ground rays and strong signals are apparently the vital requirements.

A "SYNTHETIC" MUSIC MAKER



Musical instruments based on the principle of the oscillating valve are steadily growing in favour with musicians. The one illustrated here can be played by means of the piano-type keyboard, or by means of the wand which Mr. Maurice Markenol, the inventor, is here seen manipulating.

But five-metre telephony has been heard over distances of hundreds of miles, and who is there to say that the experiments of home constructors with sets based on "P.W." Jubilee designs will not bring new knowledge to bear on the problems of wide dissemination on ultra-short wavelengths?

In any case there will be the world-wide waves of 13 metres upwards carrying

programmes from the ends of the earth for "P.W." Jubilee set builders to enjoy, and in this pleasurable manner give them a fascinating approach to the television spectrum.

An Unique Opportunity.

The great following achieved by "P.W.'s" short-wave expert, W. L. S., and the fact that the Kelsey short-wave adaptor has proved to be the season's second best seller to the "P.W." S.T.600, provides ample proof that many already find the short waves a pleasurable and profitable pursuit. Television is going to provide the stimulus that will render the short waves a *universal* attraction.

And POPULAR WIRELESS, with its Jubilee sets, will ensure that the home constructor is right in the lead.

So far, however, we have dealt with only one feature of these new designs. Besides being true multi-wavers they will incorporate a double-channel feature as original in conception as it will sooner or later be in

"POPULAR WIRELESS" AGAIN LEADS.

Once more "P.W." with an entirely novel departure in reception technique, will give the home constructor valuable advantages over users of standard apparatus.

WATCH "P.W." FOR FURTHER JUBILEE DEVELOPMENTS.

universal demand. With a "P.W." Jubilee set it will be possible to receive two programmes at once. Thus loudspeakers in two different rooms, or a loudspeaker-headphone combination, will be able to give ordinary wave and short-wave or ultra-short-wave entertainment to two different groups of listeners in the one house. Or the home constructor himself will be able to roam round the world in happy search of short-wavers, or take some audio-peeps into television while the family enjoy the normal broadcasting in the usual way.

Ready for Television.

The value of this double-channel feature is even greater than might at first be thought, for it renders the receiver suitable for easy extension into a complete television outfit. There is also the further point incidental to this that it will stimulate television progress. Having brought thousands of constructors and their friends into the wave-realm of television, a large number will be tempted to go the whole hog and give television the encouragement of that much greater support.

So much for the broad principles underlying the POPULAR WIRELESS Jubilee range of sets. There will be

novel methods of layout and certain detail novelties still further to contribute to their entirely unique designs, but we shall have to leave full descriptions of these until later.

In the meantime, we think we have said enough to make it quite clear that the "P.W." Jubilee sets will be something vastly more than ordinary sets bearing a topical name!



With the EXPERIMENTER

HI-FIDELITY, HI! HI!

WITH their penchant for coining cute phrases the Americans have tagged "hi-fidelity" to any sort of set that claims to deliver what we, in our more prosaic English way, would call just good quality.

Actually the Americans are not so utterly "slangy" as some of our purists would like to pretend. Fidelity means, I think, a strict conformity to truth—which most aptly describes what these hi-fidelity sets aim to do.

To the listener who invariably moves the tone control to the position that cuts off any available "top" this hi-fidelity means rather less than nothing. It means, indeed, an unbearable degree of high-note reproduction.

Bass, either real or synthetic, we have had now for some time in our reproduction.

When real the bass has timbre in it; when synthetic it usually resolves itself into a steady "thump" like the beat of the tom-tom in the African jungle.

Curiously enough, listeners who hate top usually like this tom-tom effect—piling agony on agony, in fact. Still, we aren't all throw-backs in that way. Many of us—in fact, all my readers, I'm sure—want the best quality, the highest fidelity they can obtain.

Faithful Reproduction.

I have been playing around with a hi-fidelity set of immense proportions. It has given me great joy. And left me with a nasty feeling that most wireless sets are mere travesties when it comes to faithfully reproduced speech and music.

This set I have had reproduces, so the makers tell me right up to 10,000 cycles. Just think what that means!

Is this large-frequency band of 10,000 cycles so very valuable? Well, all I can say is this: Go and hear a hi-fidelity set somewhere. Hear the magically realistic speech, the individual characteristics of which lie so much in those upper frequencies. Hear the clean-cut music, especially noting the realism of all the instruments rich in higher frequencies.

No, it isn't just sales talk, this hi-fidelity. It is the greatest advance in commercial radio realism since broadcasting began. And yet, looking out upon the bleak horizon of the European ether, I see no chance of applying hi-fidelity standards to reception of anything except the local stations,

Which brings me, in a slightly morbid frame of mind, to the milk in the coconut. To the reason why hi-fidelity must remain a local-station luxury.

It's all because broadcasting stations are separated by only 9 kilocycles. Unless the wanted signal is many hundreds of times as strong as the adjacent signals 9 kilocycles away, a hi-fidelity set, responding up to, say, 10,000 cycles, will reproduce a whistle.

The Heterodyne Whistle.

And that whistle will have the piercingly high frequency of 9,000 cycles—9 kilocycles. It will be the heterodyne frequency, corresponding exactly to the difference in the frequencies of the wanted carrier and the carrier of the adjacent station.

Nothing you may do at the receiving end

Going back a minute, you will see I said that *unless* the wanted signal is hundreds of times as strong as the unwanted you will hear the whistle. But the local station at, say, 10 miles distance often is all that much stronger than any other signal—adjacent or otherwise.

Then the conditions are quite different. Very few amateurs seem to realise how much the *relative* strengths of wanted to unwanted signals affect the production of the whistle.

Yet, unless this point is fully grasped, all hi-fidelity is plain nonsense. For, assuming the production of a 9-kilocycle whistle for every pair of stations separated by 9 kilocycles, every single transmission would be marred on a hi-fidelity set.

Whether you believe the theory or not, you must believe the practical proof. Switch in the high fidelity—flat-tuning

circuits, that is—of a real he-man hi-fidelity set. Tune in the local. It will probably sound wonderful. Turn up the volume control. Still no trace of any whistle or background.

Then tune into a foreigner. Hear the whistles? Hear the background? All due to the fact that the field strength of the foreigner is much less than the field strength of the uniquely powerful local.

Is It Worth While?

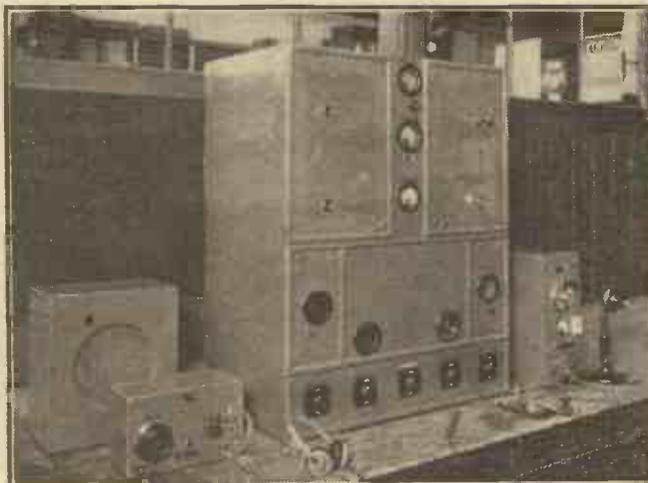
Do I mean to say that all these expensive hi-fidelity sets are really only able to "do their stuff" for one or two stations, then? Yes, that is precisely what I mean, although I doubt if I shall be over-popular in certain quarters for saying so.

Well, do I consider, in view of this limitation, that hi-fidelity is worth while? Yes, I do think so. We must aim at something a little better than seems absolutely practical, I think.

Thinking in terms of ordinary pockets, I would design sets with 9-kilocycle selectivity and very wide-range tone controls to lop off the high notes when the wanted signal's field strength was below the critical "wipe-out" amplitude.

In that way we take advantage of the delights of really good quality when receiving the locals.

CHECKING THE CRIMINAL



A complete transmitter and receiver built by Marconi's Wireless Telegraph Co. for the Stockholm police headquarters. It is to be used for mobile police radio communication.

will cure that whistle—nothing, mark you—unless at the same time the hi-fidelity is to some extent sacrificed.

Your obvious course is to sharpen up the tuning—to increase the selectivity so that the overall tuning or resonance curve cuts off at, say, 8 kilocycles. That is actually being done, more and more, these days.

Or, assuming that the tuning is to be left alone, the low-frequency response can be cut down. Some kind of filter will easily by-pass any trace of a 9-kilocycle whistle; but, of course, at the same time, it may by-pass *all* audible frequencies above the cut-off point.

The Experimenter

THE B.B.C.—A SURVEY, No. 5

OUTSIDE BROADCASTING

Drama, the Empire Service and the Children's Hour are discussed in this article of the short series

BY LOOKER-ON

TALKS, Variety and Music have been already touched upon in this survey of B.B.C. programme activities. There remain for consideration and review the two departments respectively least and most criticised: Outside Broadcasting and Drama. Of the former it is difficult to say much. Admirably organised by a director of enthusiasm and resource, it provides a service that covers what are generally considered the broadcasting "high-spots" of the year.

Outside Broadcast Successes.

To the general public—which as yet is not quite the same thing as the listening public, though the gap between the two narrows every month, broadcasting means the Derby, the Cup Final, the Grand National, Wimbledon, the Boat Race, the Royal Wedding, the King speaking from his own home at Sandringham. And all these things the Director of O.B.'s takes under his wing as a matter of course, and brings to the listener with the aid of skilled commentators of the calibre of Howard Marshall, Captain Wakelam and others.

With so many memories fresh in the mind of the perfect handling of the Wedding, of the ever-fresh emotional effect of the Armistice Day Service at the Cenotaph, of the breathless thrill of the last Derby, Criticism must surely for once veil her face and be dumb. But at the same time it is perhaps worth considering whether such an event, essentially visually spectacular as the Aldershot Tattoo, is really material for broadcasting at all; whether occasionally studios might not be called in to redress the inadequacies inseparable from certain aspects of realities; and whether the commentators themselves might not find something to study in the methods of "rapportage" employed in the United States, and particularly in Germany—not necessarily for imitation!

Shakespeare and Tchekov.

And what of Drama? This much-discussed and over-publicised aspect of broadcasting is the favourite whipping-boy of critics almost certainly too busy ever to listen to it with the concentration which it demands. The truth about the broadcast play is that it is and must remain a strictly minority interest. It cannot compete with Music-Hall or with Henry Hall. Yet it endeavours to maintain a popular interest parallel with that aroused by the activities of its colleagues of Variety.

With theatrical tradition in his blood the Drama Director still looks principally to the theatre for his actors, his dramatic material, his methods. To persist with Shakespeare was probably sound. To do the same with Tchekov is almost certainly absurd. It is true that unescapable economic facts—not the meanness so ludicrously attributed to the Corporation by the ill-

informed—rob the Dramatic Director of the best original work that could be written for the microphone and deprive him of the possibility of maintaining a sufficiently large company of first-class actors trained solely for microphone acting. None the less, the problems of material—in terms of length and quality—and of casting remain for the most part to be solved.

The Best Plays.

But the last word seems to have been said on the subject of the limitation of the radio play when it is admitted that the most satisfactory material so far at its disposal has come from "reality records," as exemplified in "The Egypt's Gold," in "Quarrel Island," in the series of Famous Historical Trials and the series of Historic Occasions. Mr. Guthrie has gone to the stage; Mr. Peach apparently to the films. Miss Delafield and Lord Dunsany have set encouraging examples, but who will follow them? Radio Drama can only justify itself when it can point to its own playwrights.

Last, but not least, the Children's Hour

but the simplest of material on the Empire Service may be a proof of enthusiasm on the part of the branch concerned, but is almost certainly a waste both of time and money. The Empire Service, as the infant of Programme Services, might remember the adage on the subject of not running before it can walk!

A Very High Standard.

The high standard set by the Children's Hour is as remarkable as it is persistent. With the death of the Birthdays a tendency at one time strong towards the coyly futile seems to have been finally abandoned. The present organiser is to be congratulated on his apparent conviction that the best way to appeal to children is to treat them as if they were grown-ups. But will he do two things? Will he bring E. Nesbitt's works to the microphone? And will he do everything possible to induce Mr. Kipling to let the Just-So Stories be read during the Children's Hour as they stand?

RECEIVING SHORT WAVES

"Popular Wireless" Sets in Scotland.

To the Editor, POPULAR WIRELESS.

Dear Sir,—Being a regular reader of your valuable and interesting paper, "P.W.," and especially your short-wave section, I have carefully studied your different layouts and constructional details of all sets published, both for ordinary broadcast receiving and short-wave work. At present I have two of your sets working in the home—the "Airsprite" three-valve, which turned out a real good set, and secondly the "All-Band" short-wave receiver. This set has proved a real top-notch.

I have watched your paper for any reports on this set, but so far I have not seen anything published regarding same from any short-wave enthusiast. I would like to say this set can receive anything on the air from 16 to 200 metres, as claimed by the designer. One day, for instance, I had a splendid one-and-a-half hours' programme from V K 2 M E, Sydney, Australia, and just before picking up Sydney I got the finish of the first broadcast ever to take place between Rome and China. It was from the station I R M.

During the time I was listening to Sydney the German station and Daventry caused some slight interference. Russian, French, German and Italian stations are just like locals.

American Reception.

On the American continent I get L S X Buenos Aires and Radio Splendid. When Daventry is coming in at good strength I pick up the Yanks equally as good, and vice versa. Friday evening, for example, I was listening to W 8 X K, Pittsburgh from 9 p.m. to 10 p.m., when I went off to sleep. Wakened

at 5 a.m., and, just for curiosity, switched on and put on the carphones. A dance band going quite strong. Announcement, W 8 X K, Pittsburgh. I have often left my set tuned to a Yank and switched on the following evening at the same time and he was still there.

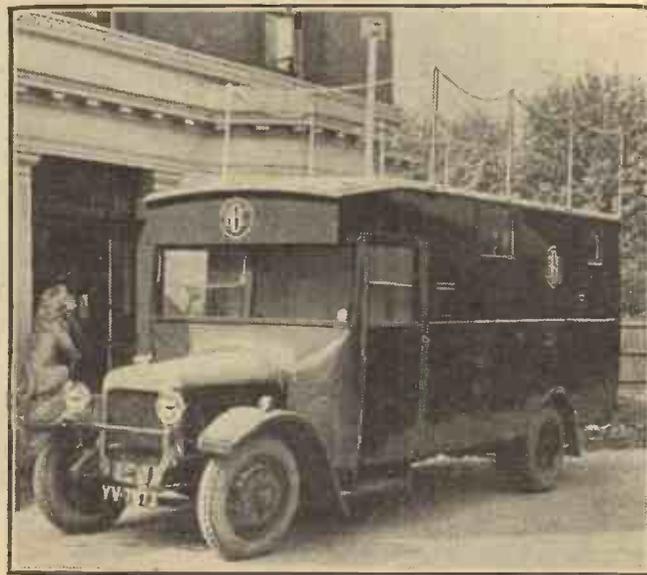
I may add that I can turn this set into a medium-wave set at a moment's notice. I can have my choice between Glasgow, London, Athlone and quite a few Continentals.

Allow me to thank you and the designer for the many hours of enjoyment this set has given my wife and me, as we both listen-in for an hour before going to sleep.

Mingavie, Dumbartonshire.

D. M. GIBSON.

READY TO GO ANYWHERE



One of the well-known "O.B." vans used by the B.B.C. They are familiar sights at the R.A.F. Air Pageant and other outdoor events.

and the Empire Programme Service. Of the latter it is as yet hard to speak. Statistics of an encouraging nature on the subject of the number of probable listeners have been issued from time to time, and specimen letters have appeared in "World Radio." But if conditions of listening throughout the Empire can be judged with any reference to the converse conditions of reception from the Empire on Christmas Day it seems pretty clear that to broadcast anything

ON THE SHORT WAVES

Conducted by W.L.S.

I SUPPOSE I should not be far wrong if I said that fully 90 per cent of my readers are using battery-operated short-wave sets. I am excluding those who use adaptors in conjunction with an A.C. broadcast receiver for the moment.

There are several reasons for the popularity of the battery set for short waves. First, the average short-wave set is small, and its current consumption is very light indeed. Secondly, it is certainly a little more difficult to produce a hum-free short-waver than a hum-free broadcast receiver.

Thirdly, a minute percentage of hum can be tolerated in a broadcast set—it may even pass unnoticed; but with a short-wave set the slightest amount of mains noise upsets things.

A Practical Suggestion.

I have often used all-A.C. short-wavers, but up to the present my "standard" set—the one piece of gear in my den which is always in working order and never pulled to pieces—has been run from batteries. I have just converted that for A.C. operation, and certainly don't regret the change.

The H.T. supply presents more difficulties than the L.T., as far as "hum extraction" is concerned, and this leads me to make a suggestion. Why don't some of you owners of small sets run your L.T. from the mains and retain battery H.T.? You will be released from the tyranny of accumulator charging, and the H.T. consumption of your set is probably so small that an inexpensive battery will last you for many months.

I have often advocated the use of A.C. valves, run from an accumulator, where one wants to "hot up" the set a bit. Now I'm going a step farther and advising the use of A.C. valves run off A.C.

Quite Successful.

My own set was converted in less than an hour, and I have not yet noticed the slightest difference in the handling of the set. The percentage of hum can only be described as "zero." If it were any more than that I would not tolerate it for a moment.

My 4-volt accumulator has been presented to a young relative who has been badly bitten by the short-wave bug, and my trickle charger now feeds the field winding of a moving-coil speaker that has been lying idle for a long time.

Fig. 1 should show you that the conversion of the average set is a perfectly simple

CONVERTING TO A.C.

Some hints on running an ordinary short-wave receiver from alternating current mains.

matter. One merely has to install five-pin valve holders and to remove all the existing connections that go to the filament terminals. The earth returns go to the cathode of the detector, and nothing goes to the filament terminals except the twisted flex from the 4-volt winding of the transformer.

Yet another advantage is the dismissal of the grid-bias battery, since the provision of automatic grid bias for the L.F. stage is such a simple business. I suggest that you make up your twisted leads for the heater circuit from tinned wire and systoflex. It makes a neater job than ordinary twisted flex.

I also recommend that if your set has a raised baseboard you should take the heater wiring underneath, just bringing it up through the board near the appropriate terminals.

So far so good. When you have done this and switched on your set you shouldn't be able to detect the slightest trace of hum—not, at any rate, when the set is adjusted below the oscillation point.

If you do, adjust the centre connection on the "humdinger." If you still can't get it quiet just look at your twisted heater leads and see if they are dangerously near any of the H.F. wiring of the set. Keep them away from the detector grid and anode circuits, anyway.

Now start tuning things in, and note whether you have any hum when the set is just on the oscillation point. I don't suppose there will be; not, anyhow, of the continuous variety.

Inserting H.F. Chokes.

If you have a kind of intermittent "buzz"—something like the "number-engaged" tone on the telephone—you have nothing to worry about. A pair of small H.F. chokes inserted in the mains leads to the transformer primary should cure that.

I use two chokes, each with sixty turns of 24 D.C.C. on $\frac{1}{4}$ -in. ebonite tube. Without them I occasionally get "sparky" noises along the mains, from power leaks and dirty-switch contacts and all the rest of the familiar bugbears. But the chokes cut them all out completely.

If you have not previously been using indirectly-heated valves you will probably notice a great improvement in the reaction control and a distinct increase in all-round efficiency. At present my standard set uses a valve of the "HL" type as detector and a screen-grid type as L.F.! Don't think this is a mad scheme. On the contrary, it's very good.

The H.T. Side.

On the H.T. side there is much to be said, although I will cover it in a later article. Sufficient to say here that if the mains unit is good enough to give completely hum-free reproduction with a broadcast receiver the chances are that it will be all right on the short waves as well. If it isn't the best plan is to introduce

some extra smoothing into the detector H.T. circuit.

The mere piling of extra microfarads across the whole thing isn't likely to help, but a separate choke in the H.T. lead to the detector, suitably by-passed to earth by 4 microfarads or so, generally does the trick completely.

THE SIMPLE WIRING ALTERATIONS

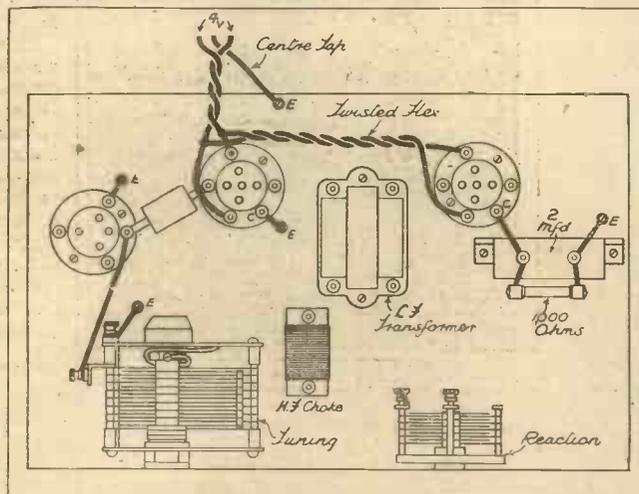


Fig. 1. Changing filaments to run from A.C. instead of batteries involves very few wiring alterations. They are shown in this diagram.

The centre tap of the L.T. wiring should be connected to the baseboard of the set—not necessarily to earth, as you may not need to use an earth with the set. If the winding isn't centre-tapped you will need to connect a 30-ohm "humdinger" across it, the centre connection on that going to the earth terminal or metal baseboard.

ON THE SHORT WAVES—Page 2.

Points from the POST-BAG

R. W. R. (Southport) entered for the B.E.R.U. Receiving Contest, having specially hotted up his receiver for the occasion, and makes a few remarks on the subject. It is interesting to note that he is very keen on a tuned H.F. stage, but finds that an aperiodic stage gives him "a gain of about -2"!

He also inquires whether readers have noticed some of the American amateurs doing Class B telephony! I presume that he has been hearing some system of quiescent-aerial telephony, the carrier-wave disappearing when there is no modulation.

Adaptor Successes.

R. D. E. (Ware), who uses a superhet adaptor with a broadcast receiver, and does all his listening on the speaker, has 400 verifications to show for it. He asks if I know of anyone who has actually had a "veri" from V P D, Suva, Fiji Islands. He also comments on the "come-back" of K 4 S A, the famous Porto Rico amateur station on the 20-metre band—telephony, of course.

Further points from his letter include the following: Has anyone heard a V P 6 station (Barbados) broadcasting on 41 metres? Why is it so hard to get verifications from W 8 stations in Cleveland and Pittsburg? And what does one do when a broadcast station asks for reports, and yet does not acknowledge them, even when a reply coupon has been sent with them?

Several readers seem to have built the "separate-reactor" receiver that I described in the "standard-baseboard" series, and I am glad to say they all seem extremely pleased with it except one, who "chanced" the wrong type of coil and blew the whole thing up. And even *he* seems more sorrowful than angry about it, and doesn't blame me, which is unusual in such cases.

F. R. wants to add an L.F. stage to the arrangement, but doesn't know how. Simply substitute the transformer primary for the present headphone terminals, F. R., and then carry on as usual.

Close-wound Coil Best.

R. W. T. (Glasgow) is in trouble with a two-valve set, particularly with hand-capacity effects and "live" phone leads. Sorry, R. W. T., I haven't any advice that I can add to the various things I've often said about these troubles. Regarding your 2-turn reaction coil that won't react, I suggest that you pull it to bits and arrange the turns so that they are fairly close together. I never could make that type work myself.

Will readers who want the address of V K 2 M E please note that letters addressed to Radio Station V K 2 M E, Sydney, N.S.W., Australia, will certainly find their way there? (Incidentally, I received one recently that was addressed "W. L. S., 'P. W.,' England." I imagine the sorter who handled that was a short-wave enthusiast.)

Once again, too, will readers who want

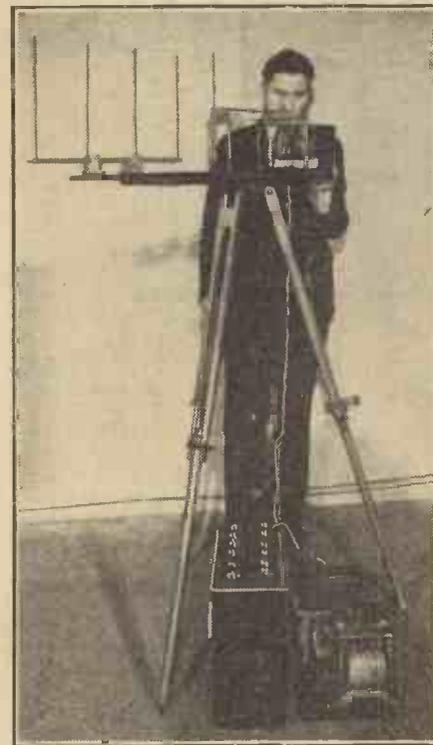
transmitting circuits please note that I cannot possibly give them to anyone who does not hold a transmitting licence? Piracy is increasing these days, and every conscientious short-wave man should try to put it down rather than wink at it. It will bring the amateur fraternity into disrepute if it is allowed to continue, and that would be a bad thing for all of us.

G. L. W. (Richmond, Yorks.) sends particulars of a wavechange scheme which, as he says, is really excellent. Unfortunately, it is already the subject of a patent, held, as a matter of fact, by a prominent transmitting member of the R.S.G.B. The system involves the complete removal, by mechanical means, of one coil and the insertion of another.

This is done by means of a rotating disc with three coils on it. It is pushed in, turned round one notch, pulled out again, and there is the new coil in circuit with all four ends of the old one disconnected.

E. S. (Bath) has pulled off two good pieces of D X, having logged P K 2 D X (Java) and V S 8 A B (Singapore), both working telephony in the 20-metre amateur band. He wants identification of five

A PORTABLE MICRO-WAVE TRANSMITTER



This micro-wave transmitter has a range of ten miles, and has been developed by Baird Television, Ltd., in connection with television. Note the vertical aerial rods.

amateurs, all of which I can give him. Z B 1 E, Malta; F B 8 C, Madagascar; Z N 2 B, an amateur on board a ship, but don't know where he is at the moment; S X 3 A, Athens; P X 1 A A, Republic of Andorra.

W. M. H. (Frampton) is another proud owner of a separate-reactor set, built at a cost of five shillings! And it works! His log shows that, although he says that friends looked at it and told him he'd be lucky if he got the beam station at Dorchester with it.



THE International Short-Wave Club is holding its second annual dinner and dance on Saturday next, March 9th. The venue is Maison Lyons, Shaftesbury Avenue, W.1. No time is stated, so turn up early and have a chat with fellow-enthusiasts if you're *too* early. Apply for tickets in advance to Mr. Arthur Bear, 10, St. Mary's Place, S.E.16.

Short-wave enthusiasts in the neighbourhood of London, N.17, should be interested in the newly formed Pembury Short-Wave Club. The secretary is Mr. L. Woodhouse, of 57, Pembury Road, N.17, and new members between the ages of 16 and 20 are wanted to increase the numbers.

Good "D X" Results.

W. W. (Exeter) sends a few notes on conditions, which have certainly been very good of late. Among the stations he mentions is J V T, Nagasaki, Japan, on 44.44 metres. He has been heard at 13.00 G.M.T. transmitting musical programmes.

V K 3 L R has been heard well at 08.15 and V U B (Bombay) at 17.00.

The Society of Wireless Pioneers is launching a new Chapter in North-East England, with West Hartlepool as the centre of activity. In this case prospective members are asked to communicate with Mr. H. B. Shields, 2, Plant Terrace, Hill Lane, Blackley, Manchester, or with Mr. R. W. Stewart, 8, East View Terrace, Seaton Carew, West Hartlepool.

To be eligible for membership you must be able to prove that you were interested in short-wave work during or prior to 1924.

The B.E.R.U. contests are all over, and we are nearly in the thick of the next event, the A.R.R.L.'s annual D X contest. Dignified by the full name of "Seventh International Relay Competition," this boils down into a furious fight between all non-American amateurs to see who can work the greatest number of "Yanks" in a given time. One just exchanges six-figure code numbers and rushes off for the next. It's a breathless business, with the odds in favour of the man who can last out from March 9th to March 17th without meals or sleep.

A Rumour Scotched.

Certain overseas journals have recently quoted a report which appeared in a London newspaper, the substance of which was a suggestion that a movement was on foot to form a body which was to co-ordinate all the broadcasting activities within the Empire.

The B.B.C. issues a complete denial of this rumour, and states that there is already the fullest co-operation between all Empire broadcasting stations.

The South and Central Americans seem to be dropping off at last. They have had an amazing spell, lasting for more than six months, and we shall probably find them really fading out by the time these notes appear.

Preventing Interaction

SCREENING is an important thing in nearly every modern set. If one were to ask many "experts" how they would screen a component they would promptly reply: "Enclose it in a metal cover, of course. Why do you ask?" The reason for asking is that screening is not by any means the simple and obvious thing that it looks: which probably accounts for the mistakes that are to be seen in some sets.

First of all, it wouldn't be a bad idea to see if we know why screening is used at all. If one were to fix up a very delicate electrical contact, which controlled enough current to pull over a bigger switch, it would be possible to turn on a still bigger current to fire a whole broadside of heavy guns by the weight of a fly on the delicate contact.

Need for Amplification.

It is not claimed that this is a particularly useful stunt, but it does illustrate one aspect of what happens in a sensitive radio receiver. The currents set up in the aerial by a broadcasting station 1,000 miles away are very tiny indeed, and (quite apart from one or two other disqualifications) are far too weak to flood the room with music all on their own.

They have to be applied to a valve that can amplify very weak currents, and the results are passed on to another valve, and so on, until there is enough power to push the loudspeaker about.

Going back to our gunfiring system, it is obvious that we should have to be very careful to prevent the vibration due to the gunfire from getting at the delicate contact, as (if the apparatus were arranged for continued action) when once started it would keep on firing guns, as a result of the vibration from the preceding one, quite independently of the presence or absence of the fly.

Change of Frequency Assists.

In the same way the strong electric currents resulting from the amplification of a receiver must be kept from working round to the beginning and keeping up a continuous noise that bears no relation to the distant programme—in other words, oscillation or instability.

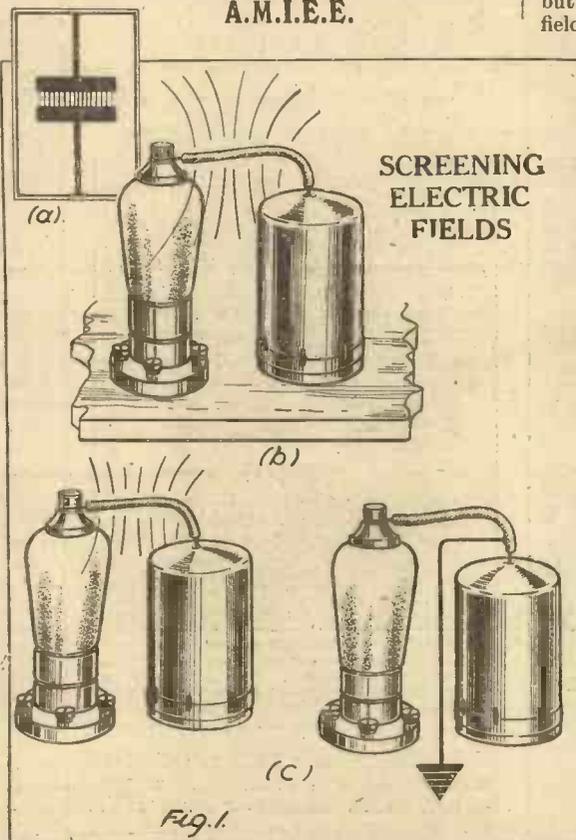
Screening is intended to keep electrical influences from straying into parts of the set where they are likely to produce undesirable effects. The greater the amplification the more danger there is of enough power leaking about to cause trouble.

Fortunately, a change of frequency is like a fresh start so far as this straying difficulty is concerned. The low-frequency currents that work the loudspeaker are very strong indeed compared with the high-frequency currents in the aerial, to which they are due.

Any leakage of them, however, is unable to do mischief at the high-frequency end,

The reason why screening is necessary in modern receivers is clearly dealt with in this article, which also contains many practical suggestions on obtaining really efficient shielding of components.

By M. G. SCROGGIE, B.Sc.,
A.M.I.E.E.



The sketch (a) illustrates that a condenser does not normally need screening, because the electric field is concentrated inside it; (b) shows an ordinary flex lead that badly requires to be screened; and (c) shows a thinner wire in its place with a screen at first unearthed and then properly earthed.

but only at the parts in the low-frequency system. In a superhet the frequency is changed twice, so there are currents of three quite different frequencies, each with its own department in the set, and the amplification in any one of them is thus kept down to a reasonable figure.

This is how such a large amplification can be got out of a superhet without instability trouble or the need for complete screening.

The Two "Fields."

The next thing is to have some idea of what this mysterious influence is that has to be screened. It is not electricity itself, for that is confined to "conductors" like metal wires or the electron-filled space in a valve. It can be kept from leaking away

by insulators, of which the air is the most useful.

No, the thing that spreads out everywhere, air and all, is called a "field." It would take up several issues of POPULAR WIRELESS to explain fields at all fully; but the most important thing to be clear about—and very few people are clear about it—is that there are two entirely different sorts of fields—"electric" and "magnetic."

They always exist together when electricity flows and are closely interlinked; but in some components it is the electric field that counts most and in others the magnetic. The importance of the thing is that different screening tactics have to be adopted, according to which field predominates.

Where Shielding is Needed.

The electric field is due to voltage, and is associated with condensers and capacity. The magnetic is due to current, and is associated with coils and inductance. Of course, a condenser has current in it and a coil has voltage across it; so the two effects are bound to be mixed up. But the above distinction gives a clue to the sort of screening that is wanted.

Take the electric field first. It looks as if a condenser, being the sort of component with most capacity, would need most screening. But the whole plot of a condenser is to get a very strong field right inside it, where it doesn't spread out over the place—Fig. 1 (a).

The things that need screening most are parts which are at the greatest "signal" voltage. Take the anode lead of an H.F. valve. It is at a strong H.F. voltage with respect to earth, and so a strong electric field spreads out from it in all directions. If its invisible tentacles grapple with some part like the grid of a valve, sensitive to small H.F. voltages, there is likely to be trouble—Fig. 1 (b).

Earthing is Essential.

If the anode lead is enclosed in a metal screen, and left at that, the screen is coupled by the capacity to the lead within, just as if there were a condenser connected between them; and thus the so-called screen shares the voltage of the lead and spreads the dangerous field all around—Fig. 1 (c), left.

But now, if the screen is earthed, it cannot be raised to an H.F. voltage, because it is always at earth (i.e. zero) voltage; so there is no field—Fig. 1 (c), right. The screen is a screen. Any resistance or inductances (such as that due to a curly wire connection) prevents the screen from being absolutely earthed and impairs its efficiency.

On the other hand, it is not vital that the screen should be thick or continuous metal. It is nearly as effective if it is metal gauze

(Continued on next page.)

PREVENTING INTERACTION

(Continued from previous page.)

so long as there is a good contact from everywhere to earth.

That is how it is possible to stick a screen right across the middle of an S.G. valve without stopping the electrons from shooting through the fine mesh of which it is composed. But the field is stopped: very nearly all of it.

It seems so easy to screen electric fields that you may think it would be a good thing to do a lot of it, so as to be on the safe side. But the good designer puts it only where it is really needed, because a nasty drawback is that it adds to the capacity of the circuit just where it is most undesirable.

Avoiding Losses.

So beware of having a screen close around a wire or component or for a long distance. Cut down anode leads so that there is no slack. And avoid, as far as possible, "bad" substances between the screen and the screened. They add to the losses.

Examination of a really good commercial design shows that the components are so placed that the "hot" connections needing screening are cut down to almost nothing.

As for the L.F. circuits, electric fields are of much less account at low frequencies, and only absurd things, such as a loudspeaker lead running against the detector grid, are at all likely to cause trouble. The remedy is obvious—shift the wire.

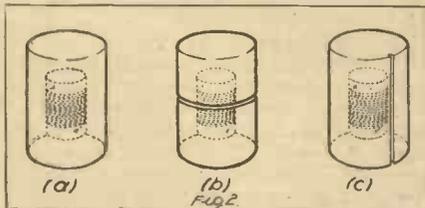
An exception, perhaps, is the heater leads of a D.C. mains set (or even A.C.). The electric field may cause hum by spreading to the detector grid—the danger spot. Either the heater leads or the grid lead may need screening. Added capacity hardly worries the heater leads, but it must be kept off the grid at all costs.

Magnetic Leakage.

What about the magnetic field? It forms rings around any wire carrying current. If there are a lot of wires together all carrying the same current the field adds up and becomes very important. So coils are the most dangerous components.

Earthing cuts no ice at all so far as magnetic screening is concerned, but often

UNDESIRABLE GAPS



A gap in a magnetic screen in line with the coil winding will do little harm; but a similar gap at right angles to the winding may be very detrimental.

magnetic screens (such as coil covers) are earthed so that they will be effective as electric screens, too. The thing that matters in magnetic screening is that there shall be a good low-resistance metal path all around the coil—Fig. 2 (a).

There is no need to worry if there are gaps in the screen in the same direction as

the wire on the coil—Fig. 2 (b); but one must absolutely exclude anything such as a seam in the can that interrupts a really sound path—Fig. 2 (c).

A screen of this sort is not likely to do much screening, but it is likely to spoil the coil, and with it the range and selectivity. If earthed it is quite satisfactory so far as the electric field, emanating from the high-voltage end of the coil, is concerned. And so is a gauze screen, but owing to its many poor contacts it is hopeless as a magnetic screen.

The Iron-Cored Coil.

Magnetic screening is altogether a more awkward problem, because one *must* have coils, and if they are to be good they must be large (with an exception to be mentioned later). A close-up screen kills them—the losses are increased, the inductance is reduced, ganging is difficult and everything is perfectly foul.

Until recently the only way to avoid lots of bulky and massive screens was to use

TRACING "PIRATES"



An official of the Viennese wireless police with special portable apparatus endeavouring to trace an unlicensed transmitter. Such a job is made rather difficult by screening due to metal-frame buildings, steel lift shafts and similar metal structures.

such bad coils that a little more badness due to screening didn't much matter. That is no longer true, thanks to iron-cored H.F. coils. They are small, and in any case have much less than the usual stray field. So the screening problem is practically solved and the performance is better than ever.

Thin Covers Are Useless.

When one comes to the L.F. parts of the set, magnetic screening gets so difficult that it just has to be dodged. You are sometimes told that L.F. transformers are screened by having a metal shroud. Don't you believe it! The thin iron covers, with gaps at the vital places, are just make-believe.

To screen the transformers or chokes effectively you would have to use thick, seamless pots of special alloy that would cost more than the transformers themselves. So the only real way to stop any hum or instability that can be traced to L.F. or power transformers is just to twist them around until they are at such an angle as to be harmless or to move them farther away from the danger zone.

A SIMPLE PROGRAMME REMINDER

Making sure you don't miss your favourite items.

MARKING the daily paper or "Radio Times" in ink or pencil seldom seems a satisfactory method of emphasising the day's good broadcast items. Something more striking is needed which will catch the eye when the time arrives to switch on, and the author has found the device described here most useful.

We are all prone to "register" the position of the hands when we glance at the clock, rather than actually to read the time, and consequently the brain often refuses easily to correlate the information, "Vaudeville at 7.45," with the position of the hands which we associate with a quarter to eight.

It was felt that an auxiliary clock face would be most suitable for recording in advance the time of attractive items, and since every set worthy of the name has a fair range of programmes to choose from a separate indicator was incorporated to give the station name as well.

Setting the Indicator.

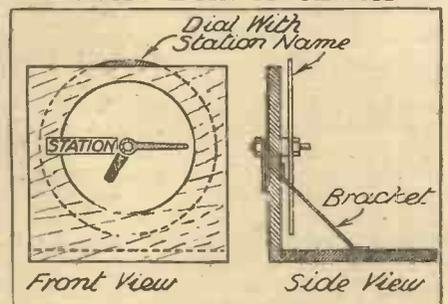
Tit-bits selected in the day's programmes are marked on the paper, but also the time-and-station indicator is set to the first item to be heard. When the time arrives this is tuned in, and at the same time the indicator dials are reset ready for the next selection.

The gadget can be placed either on the radio set or near the clock—the latter position is more suitable.

The construction is clear from the sketches. A clock face is stuck on a three-ply front and two wooden hands are pivoted on a 6 B.A. bolt, with two rubber washers to prevent them slipping. The bolt also acts as a spindle for a cardboard, or paper-faced plywood, circle behind the front panel, having the station names written radially so that they show through a slot in the front.

The station disc protrudes slightly to

LOOKS LIKE A CLOCK



An old clock face and wooden hands play a large part in the construction.

enable it to be "thumbed" round, while the clock face need not be provided with figures, since the position of the hands suffices to call attention to the time.

The design given is very simple and easily carried out in three-ply with the aid of simple fretwork tools.

H. H.

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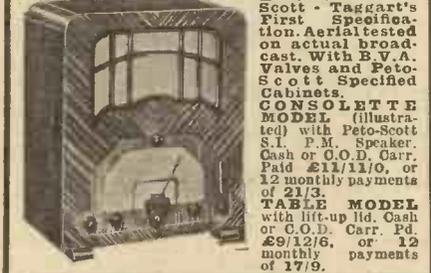
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Comprising complete kit of components, as first specified by Mr. John Scott-Taggart, including Peto-Scott Ready-drilled Walnut-finished Panel, Metaplex baseboard, Ready-drilled plywood platform and Terminal Strip, and copy of "Popular Wireless" with free full-size Blue Print and S.T.'s 100 STATION "SPOT-ON" DIAL and other "P.W." FREE GIFT less valves, cabinet and speaker. and 12 monthly payments of 8/6.

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THE great B.B.C. Jubilee programme will begin at 6.30 on May 6th, and the King will broadcast his message to the Empire at 8 o'clock. Professor Harold Temperley is completing the script of the word picture of the twenty-five years of the reign. This will be interspersed with Imperial-interest items and followed by "signatures" to the homage from all the Dominions and from several of the oldest and principal Crown Colonies. Lawrence Gilliam is the programme builder, and promises to make an even better job of this than he did of the last Christmas Day broadcast to the Empire.

Col. Dawnay's Future.

Col. Dawnay, who until last December was Controller of Programmes at the B.B.C., will command a Brigade of Infantry instead of resuming a staff job at the War Office. This will give him the outdoor life which his health requires.

An Amusing Story.

I heard an amusing story the other day about an argument between a programme official and an administrator at Broadcasting House. The former was pleading for the addition of an oboe player to the main orchestra. The latter suggested as an alternative that the oboe already "on establishment" should be moved nearer to the microphone so that it would convey the effect of two oboes. The argument was discontinued.

Talks and News.

The long-drawn-out controversy about the right place for news in the broadcasting organisation has at last come to an end. News has won its status and is to be an independent department, separate from talks. This probably will entail reorganisation of the other talks departments with some reshuffling of personnel.

B.B.C. and Foreign Organists.

Controversy rages about the attitude of the B.B.C. towards foreign organists. The Organ Music Society wrote to Broadcasting House requesting co-operation in an enterprise to bring to England four well-known foreign organists. The B.B.C. would have nothing to do with the proposal, replying that, if the Organ Music Society decided to bring foreign organists to England, these would have to stand their tests in the ordinary way and with no advantage over British organists, of whom there were sufficient and of excellent quality for broadcasting purposes. The Organ Music Society proposes to go farther in the matter.

Studio Interference Again.

To the other troubles of Broadcasting House has now been added a fresh outbreak of studio interference. During the final rehearsal of a play in studios on the sixth floor the sounds of a piano on the seventh floor rendered Mr. Gielgud's actors almost

inaudible. The trouble is serious, and may lead to a serious revision of rehearsal arrangements.

Scottish Interval Signal.

Scotland is to have its own interval signal in place of the under-modulated Bow Bells that have so long been acceptable as a pleasant noise between programme items.

TWO VERY POPULAR STARS



GERTRUDE LAWRENCE and DOUGLAS FAIRBANKS, Jr., before the recording "mike" at the H.M.V. studios. These two famous stars are at present working hard on the new B.I.P. film, "La Bohème."

Some little time ago Mr. Moray McLaren, the Scottish Programme Director, invited listeners to offer suggestions, and curiously enough a majority of the vast number of requests sent in asked that Bow Bells should give way to the cry of the grouse.

Others wanted the cries of the curlew,

locate the position of the gold mine owing to the difficult jungle country. Realising that his friends were being held as hostages for his return, he abandoned his search and returned to England, only to be executed.

Much of the play has to do with the sea, and it will be particularly interesting as dealing with a period when the British Empire was first being founded. Great care is being taken by the producer in preparing the play, and it will be given eight rehearsals.

Hockey International.

Hockey is a great game, even though it may not enjoy the glamour of Association and Rugby football. On Saturday, March 16th, England meets Wales in an international hockey match at Great Crosby, Liverpool, and on that evening an eye-witness account of the play will be broadcast by Mr. G. N. Osborne, a well-known sports writer.

"Quayside Nights."

Bristol has been selected as the first town to be dealt with in a new series of microphone tours arranged for listeners in the West, under the general title of "Quayside Nights." The date is Wednesday, March 20th. The object of the series is to present personalities and happenings in different types of ports, and small fishing villages—places like Brixham and Padstow—will be included as well as the larger and more important harbours, ports and seaside places.

Variety Relay from Lincoln.

The first relay from the Theatre Royal, Lincoln, will be heard by Midland listeners on Friday, March 22nd, when the programme will consist of variety items. There is also a variety bill relay for Northern listeners on Thursday, March 21st, from the Pavilion Theatre, Liverpool. Among the artists who will be heard on that occasion are Billy Matchett (comedian), Herschel and Heuldre (pianists), Varney and Butt (cross-talk comedians) and the Three Virginians (harmonists at the piano).

In the same week (on Monday, March 18th) a Cornish concert will be relayed from the Foster Hall, Bodmin, for listeners in the West. Among the artists will be Vivian Worth, daughter of a former Mayor of Truro, who, with her partner, Grace Ivell, were early radio duettists. With Miss Worth will be Rosemary Herford (piano-forte), who has just completed three years at the Royal College of Music, and the Camborne Centenary Male Quartet, which first broadcast from the Plymouth studio in 1927.

Light Entertainment in Welsh.

When it comes to giving light entertainments in the Welsh language the programme officials in the West are decidedly up against it, since this particular type of amusement, so abundant on the English side, has hardly any place in Welsh social life.

(Continued on page 877.)

THE B.B.C. JUBILEE PROGRAMME
News and Views About Broadcasting

the cuckoo, the seagull, or the sound of sea waves, the wind, the patter of children's feet, the humming of a top, bugle calls, a fiddle-tuning up, a train crossing the Forth Bridge, and some wanted to hear the new bells of St. John's, Perth.

Scottish songs and psalm tunes were the choice of others, but all will most likely be disappointed except those who asked for a slow-march pipe tune played by a pipe band, which I understand has every chance of being adopted as the most unmistakably Scottish interval signal.

"The Last Voyage."

Four studios will be used for the production of "The Last Voyage," which Howard Rose is putting on for Regional and National listeners on Thursday and Friday, March 21st and 22nd respectively.

This play, by Edward and Theodosia Thompson, has been abridged by Howard Rose himself, and is based on the last voyage of Sir Walter Raleigh, who was released from the Tower of London by James I to proceed to Orinoco and rediscover a gold mine which he had reported on his voyage twelve years previously. Raleigh found the Spaniards in possession of the mouth of the Orinoco, and he was unable to

TELEVISION

SCANNING WITH THE CATHODE RAY

A simple explanation and details of an easily tried experiment.

By L. H. THOMAS

LAST week I had quite a lot to say on the use of the cathode-ray tube as a convenient means of scanning. The same issue contained an article explaining the operation of the tube itself, and I am assuming now that readers have kept up to date and are ready to carry on with the next steps—partly theoretical and partly practical.

Remember, from the start, that the essential characteristic of the scanning operation is the movement of the spot in one direction at steady speed, followed by an instantaneous "fly-back" and a fresh start on the next line. This movement is peculiar to television scanning, and can be admirably studied in "slow motion" by rotating a scanning disc very slowly with some sort of light source behind the scanning aperture.

The "Saw-Tooth" Movement.

In that case, as one light spot disappears out of the top of the picture, another immediately takes on at the bottom. In the case of the C.R. tube it is the same spot all the time, but it flies back so quickly from one end of the scanned area to the other that it is, for practical purposes, a fresh spot!

You will have to get completely used to this "saw-tooth" movement and the methods by which it is produced. Fig. 1 shows it in exaggerated form, the thick lines representing the actual scanning lines and the finer ones the invisible fly-back. In the case of a transmission employing 180 scanning lines and 25 pictures per second the time taken by your spot to travel across from A to B is 1/4,500th of a second, and the movement back from B to C is infinitely faster.

THE SPOT'S FLY-BACK

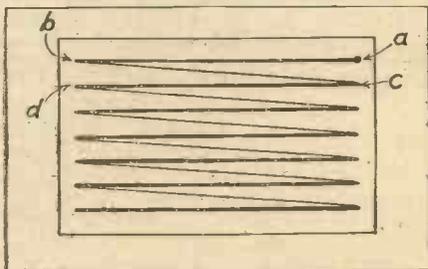


Fig. 1. When the spot has completed the scanning line a-b, it instantly flies back to c to commence the next.

Let us first consider what happens with a single time-base circuit. To make it easier we will simply assume that the light spot is moving from A to B and flying back to A again. How can we produce, across the deflector plates of our tube, a voltage that varies in such a way as to produce this movement? The voltage must increase at a constant rate up to the limit, after which it must instantly fall back to the previous value and start over again.

Obviously, the first thing that suggests

itself is the charge and discharge of a condenser. That gives just the kind of curve you would expect, by charging it at a constant rate up to the point at which a rapid discharge takes place. Then, the *status quo* having been automatically restored, the charging process starts again.

Imagine a constant source of voltage charging a condenser slowly—through a high resistance, for instance. Across your condenser connect an ordinary neon tube. The properties of this neon tube, as you know, are these—until the "striking voltage" (say 160 volts) is reached no current flows. As soon as we get to this voltage a discharge takes place within the tube, and its impedance becomes extremely low.

With such a tube connected across the condenser, as soon as the latter becomes charged to 160 volts, the neon tube will flash over, discharging the condenser down to the figure at which no current can pass through the tube, and (our constant supply of voltage being still there) the charging process goes on.

A Simple Demonstration.

Try a simple experiment if you want to understand this. Connect a D.C. supply of 180 or 200 volts (from dry batteries, if you like) across an ordinary 2-mfd. condenser, with a 2-megohm grid leak introduced into the positive lead.

Across the condenser (not the battery) connect an ordinary beehive neon tube. You should be able to produce a regular "flash-over" of quite low frequency—anything between two flashes per second and one flash every five seconds, according to the voltage you are using and other circumstances.

If you were able to draw a curve showing the voltage variation across the terminals of that condenser you would probably get quite a good "saw tooth," with the essential characteristics of a constant-speed "rise" and an instantaneous "fall."

Using the C.R. Tube.

If you were to apply this same voltage to, say, the "horizontal deflectors" of your cathode-ray tube (see Fig. 2), and to arrange for the slowest discharge you could obtain, you would be able to see your light spot crawl slowly across the screen and then snap back like a shot from a gun. The movement (even under these crude circumstances) would be so rapid that you can easily imagine that your first spot has gone clean off the screen and another one has taken over from the opposite side.

Now, it should not need much in the way of mental gymnastics to understand that

if we apply a similar voltage to the "vertical deflectors," making our spot move downwards at an even slower speed, we should be able to produce the pattern shown in Fig. 1.

The line from A to B will not be horizontal, since the spot is moving downwards all the time. It will slope gently down the "A-B" line, fly back horizontally (because it takes no time to do that) to C; it will then travel along the "C-D" line and repeat the operation.

In other words, as well as doing the horizontal "one-way" motion, it is travelling downwards as well, and what we see is the resultant of the two movements. But what of the fly-back in the vertical plane? Well, as soon as the spot reaches the point at the left-hand edge of the lowest line of all it has gone as far down the picture as it can, and the fly-back occurs—up to the top again.

Repeating the Process.

At precisely the same split second the horizontal fly-back is happening, so that we get, in effect, a lightning jump of our spot from the bottom left-hand corner to the top right-hand corner, from which it starts all over again.

For 180 lines and 25 pictures per second the horizontal sweep must be timed to take 1/4,500th of a second and the vertical 1/25th—thinking all the time, of course, of horizontal scanning, which will be used for the high-definition pictures.

If you use a cathode-ray tube for the present low-definition service with vertical scanning you will have to arrange your

INSIDE THE TUBE

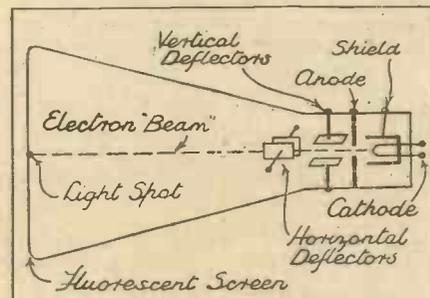


Fig. 2. This diagram shows the main electrodes in a cathode-ray tube. The two sets of deflectors make the spot scan the picture area.

time bases to give a vertical sweep in 1/375th second and a horizontal in 2/25th second—the picture frequency being only 12½.

A little reflection on this time-base business will show you that there's a lot more in it than I have yet dealt with, such as the length of sweep of the spot, for one thing. Next week I will deal with practical time-base circuits, starting off with a survey of the gas-discharge triode, which replaces the neon tube.

TELEVISION.—Page 2.

TELEVISION JOTTINGS

SINCE nothing is more certain than the fact that the 30-line transmissions will be discontinued at some date, people are beginning to ask whether low-definition television will sink completely into the mists of antiquity when that occurs.

What will happen to all our 30-line scanning discs, electric motors, synchronising gear and the rest of the mechanical trappings? I know of one person who will use them right away, and he is the amateur transmitter. Television licences for the 10-metre band are being granted to anyone who can satisfy the authorities that some genuine experimental work will be done, and I can't see high-definition transmissions coming within the limits of the average amateur's pocket.

Very Easily Constructed.

The construction of a 30-line transmitter from standard receiving parts, however, is an extremely simple matter. One can project a powerful spot light through a scanning disc, or one can use a mirror drum. The speed at which pictures are transmitted may be the conventional 12½ per second, or they may be speeded up without altering the apparatus.

Thirty-line television on 10 metres may be made infinitely more satisfactory than the present broadcast service, since there is not the slightest need to impose a 9-ke. limit on the band of frequencies occupied by the transmission.

One of the present conditions of the television transmission licence reads as follows: "Radiating facilities will not be granted until the applicant has produced evidence to

show that the system proposed, or apparatus employed, possesses technical features equal to, or in advance of, existing systems; or that the experiments will be of scientific value."

The last clause, of course, may mean anything. One may find it necessary to transmit television over a short distance in order to investigate the effects of local conditions and to compare the reception of the ground wave with that of a reflected wave.

Obviously, though, if one wanted to carry out some research on photo-electric cells, one would not need to transmit television through the ether for the purpose. That could be done without radiating

FILMING TELEVISION PICTURES



The Baird apparatus for reproducing television pictures on film by means of the cathode-ray tube for showing in cinema theatres.

signals outside the building from which they were transmitted.

But the G.P.O. has never pursued an "obstructionist" policy in matters pertaining to amateur transmission, and anyone who can prove that he has real ideas that he wants to try out should find no difficulty in obtaining a licence.

I am wondering who will be the first amateur to make a really successful long-distance transmission of vision and sound on the new bands. It is stipulated, by the way, that vision must be transmitted on the new band (9.38 to 10 metres) and sound on the old 10-metre amateur band (10 to 10.7 metres).

Looking Ahead!

A reader has written to me with a suggestion that he can already see what will become an important question when the new transmissions start. "How," he asks, "will they use the screen during intervals between programmes?" He foresees the need for phonovision records to be used for this purpose, or for a combination of a film projector and televiewer.

He also suggests that the B.B.C., instead of being inundated with manuscripts, will soon be flooded out with tin boxes containing the efforts of amateur film producers!

A New Line of Thought.

There's not much point in looking quite so far ahead, but the television interval signal will certainly open up quite a new line of thought for the B.B.C. And how about

the television theme song and signature tune?

In a recent issue I referred to the Bennett Optical Unit, produced by the Bennett Television Co., Redhill. I am asked to make it clear that this unit is a registered design at the Patent Office.

L. H. T.

A USEFUL COMPONENT.

WE have recently received from Messrs. British Television Supplies a potentiometer of unusually attractive design. Probably most constructors have at one time or another experienced trouble through faulty potentiometers used for one kind of a task or another.

The trouble almost invariably occurs in the contact between the moving arm and the resistance elements. Contacts do seem still, as always, to be the outstanding trouble in radio.

It is because of that fact that we welcome this new B.T.S. potentiometer. Its design is fundamentally good, and it is a component which cannot fail to give reliable service.

There is a wire winding, and the total resistance is 400 ohms. The winding is well anchored at each end underneath substantial metal plates, and turn-looseness cannot develop.

The moving arm is made of spring material, wide at its base to give a well-distributed pressure. The result is that the movement is smooth and even, and a satisfactory contact is maintained at all points.

The body of the device consists of porcelain and is neat but substantial. There are three terminals nicely spaced for easy wiring.

The 400-ohm B.T.S. potentiometer, as illustrated in the accompanying photograph, is for baseboard mounting, and it retails at the reasonable price of 1s. 8d., but it can also be supplied with a knob and screws for panel mounting at 2s.



This B.T.S. potentiometer is specially designed to overcome the difficulties often met with in these components.

MODERN COMPONENTS

Details of two items which have features of outstanding merit.

SIMPSON'S ELECTRIC TURNTABLE.

THE speed at which a gramophone record is played obviously must vitally affect the tone. There is only the one speed at which the various frequencies impressed upon the wax can be reproduced correctly.

If the turntable rotates too fast all the frequencies will rise in pitch, and should the speed be below that at which the recording was made all the frequencies will be dropped down.

In view of the importance of running records at the one right speed those who possess A.C. mains are to be congratulated because they can throw the onus of speed maintenance on the mains.

And as all A.C. mains supplies, with extremely few exceptions, are these days time controlled in order that A.C. clocks can be used, they are well equipped to carry this responsibility.

What is known as a synchronous A.C. motor drive for the turntable is needed, and this is found in the purest and simplest form in Simpson's Electric Turntable, which is now being marketed by The British Radiogramophone Co., Ltd., of Pilot House, Church Street, Stoke Newington, N.16.

The principle embodied in this is similar to that which is used in some television viewers in order to maintain synchronism. Therefore it is clear that its entire adequacy for the task is beyond question.

There are no brushes or other forms of wiping contacts to cause a possibility of sparking and electrical interference, and the works are so simple that they are almost non-existent as such!

The whole thing is so free from complication that

many will consider that its working verges on the miraculous.

And, of course, it is remarkably compact. It only occupies an under-motor-board depth of an inch, and this is a feature which should be remembered particularly by those who require their outfits to be compact, or, alternatively, want as much room as possible in their radiograms for record compartments and so on.

Another attractive point of a practical nature regarding this most interesting Simpson's Electric Turntable is that owing to the absence of mechanism there is nothing to wear out, so for once the term "will last for a lifetime" is more than justified.

Constructors who have had experience with fitting in some gramophone motors, with their numerous awkward protuberances necessitating a number of holes in the motor board, as well as a huge central aperture, will also note with pleasure that this Simpson Turntable can be fixed in position merely by one hole.

In working the motor runs at an absolutely constant speed (it cannot do otherwise) and silently. It is suitable not only for A.C. mains, but for any voltages between 100 and 150 or 200 and 250 (50 cycles).

Taking very little current, it is perfectly safe in use, and is altogether a most attractive article. It should be mentioned that it retails at 42s.

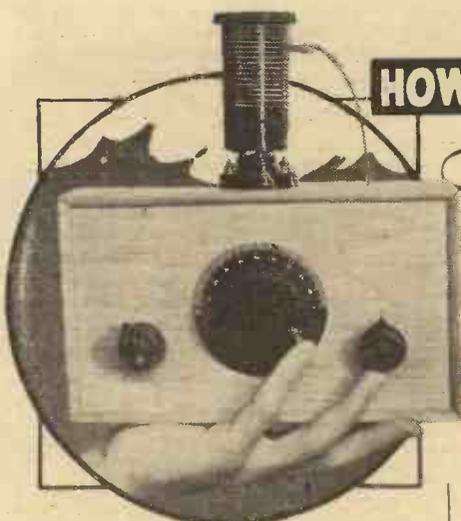


Correct speed is assured with this Simpson Electric Turntable for A.C. mains, which takes up only one inch of space below the motor-board.

HOW TO BUILD

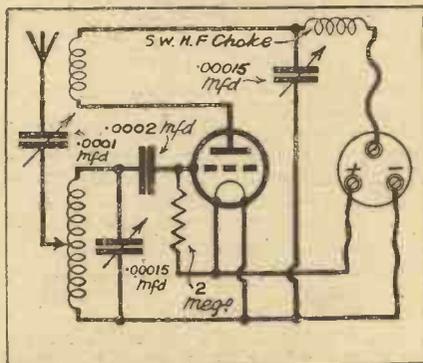
The Everybody's KELSEY ADAPTOR

ECONOMICAL SHORT-WAVE RECEPTION FOR ALL



LAST week I told you something of the reasons which prompted me to design this latest adaptor. As I explained in that article, much as I liked the superhet way of doing it, there was the great snag of comparatively high cost, and that in consequence, and to meet the wishes of all those readers who have taken the trouble to write to me about the question of ex-

A SIMPLE CIRCUIT



The circuit of the inexpensive one-valve adaptor described in this article.

cause, a reversion to the straight-adaptor idea was the only way out.

Well, here is the Everybody's short-wave adaptor—a perfectly straight design with no frills and reduced to the simplest possible terms. What will it do? It might perhaps be easier to tell you what it will not do. But I'm not going to make any fantastic claims.

A Reader's Praise.

I make the comparatively modest claim that it will enable you to receive programmes on your existing battery set on a world-wide basis, but I do not intend to lay down any hard-and-fast ruling as to the way in which the stations will be received.

You see, with a simple design such as this one the general standard of results is dependent to a much greater degree upon atmospheric conditions. Some evenings—I think I can safely say most evenings, judging by my own experiences—you will be able to hear the States on the loud-speaker. At other times you may have to use headphones. But at all times you can be certain of world-wide reception on

phones, and there are always the short-wave "continentals" to be heard on the speaker.

And yet I wonder if I am under-rating this question of results. Only this week I have received a letter from a New Zealand adaptor fan who is getting almost unbelievable results. He is Mr. H. H. Ekins, of Fort Ballance, Wellington, and he writes: "I feel I must write and thank you for producing such a fine circuit as the short-wave adaptor published in 'P.W.' I looked at it several times, but it did not appeal to me, as I was getting very fair results with a short-wave screened-grid 4, but only by squeezing every drop out of it.

Volume Control Needed!

"However, I gave your adaptor a go, and right from the jump it exceeded my most sanguine expectations. I have it coupled to our old friend the 'Magic Four.'

"Of course, out here, London (the Empire station) is our station, and to keep the volume down to reasonable limits I have to use the volume control on the 'Magic Four' nearly closed up. The same with K D K A, F Y A and D J C. With the amateurs on the 80-metre band I have to de-tune, as I can't keep them down enough.

"Fancy having to de-tune on a short-wave set! Well, sir, it is a top-notch, and my advice to anyone contemplating building it is the opposite to Mr. Punch's—'Do.'"

The italics are mine! Mr. Ekins is right.

Just fancy having to de-tune on a short-wave set! And just fancy having to use the volume control

EASY TO BUILD

The whole adaptor, with the exception of the short-wave coil, is fitted into an ordinary cigar box, forming a neat and compact unit that can be fixed to any battery set in a minute.

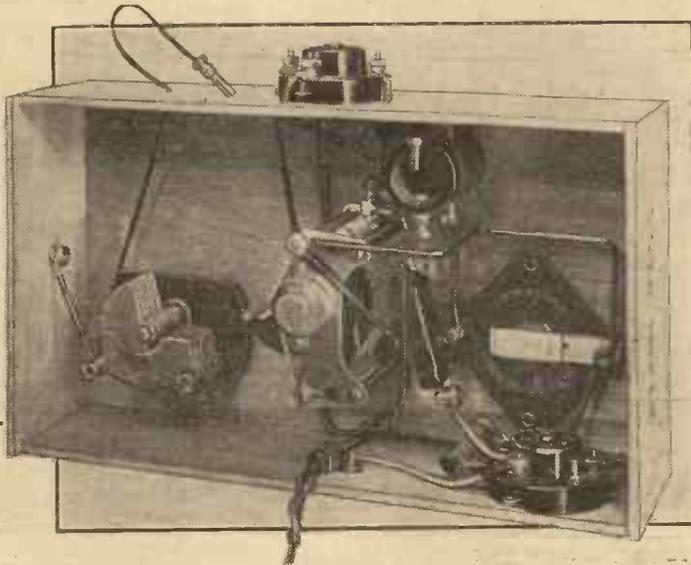
nearly closed up in order to keep down the volume of a station 12,000 miles or so away!

But there you are. His letter is at Tallis House for you to examine if you want to; and although I do think that his results are exceptional, it just shows what can be done, for the adaptor that Mr. Ekins is using was one that I described in "P.W." in 1933, and it employed a straight circuit.

USE THESE PARTS

- 1 Polar .00015-mfd. variable condenser, short-wave type C.
- 1 Graham Farish .00015-mfd. solid dielectric reaction condenser.
- 1 B.T.S. .0001-mfd. variable condenser, type K.L.1.
- 1 Dubilier .0002-mfd. fixed condenser, type 670.
- 2 W.B. valve holders, 6d. type.
- 1 Bulgin short-wave H.F. choke, type H.F.3.
- 1 Erie 2-megohm grid leak.
- 1 B.T.S. slotted coil former, type K.F.4.
- 1 Cigar box, size 9 in. x 5½ in. x 2½ in. (approx. dimensions). Wire, flex, nuts, bolts, etc.

It is only fair to add that it had a pre-detector H.F. stage, but that was only to act as a "buffer" between the aerial and the detector for the purposes of removing "dead" spots. The actual amplification (Continued on next page)



THE EVERYBODY'S KELSEY ADAPTOR

(Continued from previous page.)

due to the H.F. stage on short waves was practically negligible.

And in all other respects that adaptor was not unlike the one that I am now going to describe. So that there are apparently ample grounds for my faith in the straight type of circuit. It may not give such consistently good results as the superhet adaptor, and yet few of us, I think, would have cause to grumble if we could emulate the results of our New Zealand friend.

Costs only a Guinea.

And, after all, there is a vast difference in the relative costs of the two adaptors. This new one—this Everybody's adaptor—is nothing astonishingly new, but it incorporates the circuit scheme which I have found to be most generally successful in my eight years of adaptor designing. And it can be built for a guinea!

I could have turned out something quite startling—again, the cost would have been considerably higher—but where's the advantage? With this particular model I have the satisfaction of knowing that not only does it enable me to obtain good results, but that readers are able to emulate my results. That's the whole point. It isn't what I can do that counts. It is what you yourselves can do in your own homes and under your own local conditions. That's the whole purpose of my job, and there has been ample time during the last eight years for every conceivable "teething trouble" to have shown up with this type of unit.

In the design of this new adaptor, therefore, there are two reasons why I have stuck to the old love. One is because it has enabled me to produce a unit which will enable you to hear the whole world on your

present set for a matter of a guinea, and the other is because it is a design with which 99 per cent of you will succeed.

I suppose by now you are all familiar with the idea of a short-wave adaptor. But there are always the new readers to be considered, so that perhaps just a brief outline would not be out of place.

All of you, I take it, are in possession of ordinary broadcast sets. Well, with those sets, however really super they may be, you can never hope in your searches for

is to use a short-wave adaptor—a simple unit which can be instantly attached to your existing set and which, in the case of the present design, requires no extra valves or batteries.

You take out the detector valve from your set, and in its holder you place the adaptor plug from the unit. You then put the detector valve into the unit, join up the aerial and all is ready for reception on a world-wide basis! No alterations to your existing set, no complicated connections to make. Just the simple operations described above, and that's all there is to it.

And all it need cost you is a guinea! At least, that is all it need cost you if you happen to have the wire by you, and I expect that most of you will. But even the complete kit from Peto-Scott, which includes everything except the cigar box, costs only 22s. 6d., so that the cost of the wire is nothing to worry about.

You will have noticed from the previous paragraph, even if not before, that I have "descended" to the use of a cigar box in the design of this latest adaptor. I say "descended" because I always think that cigar-box efforts are apt to sound stuntish.

Take it from me that there is nothing stuntish about this design. There is a lot of difference between a cabinet and panel costing perhaps 10s. and a cigar box costing a copper or two. And I was determined to keep the cost of this unit down to the guinea mark, even if it meant dispensing with a cabinet altogether.

As it happened, the cigar box was ideal for the purpose, and, disguised as I have disguised it with a bit of beading around the edge, it looks quite respectable.

Box must be Dried.

The cigar box in question was one containing the wares of Jose Morales & Co., and it came from Cuba. But that is neither here nor there, for any cigar box of approximately the same dimensions will do. But you must make absolutely certain that it is quite dry.

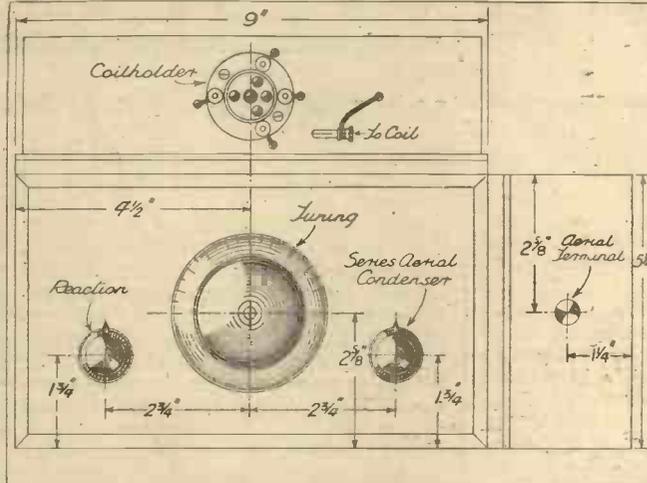
There is not much chance of its being otherwise. That is one of the advantages of using a cigar box. But just to make certain it might be advisable to place it in a warm place for a few hours before you want to use it. By the way, do not use water to soak off the fancy paper and trimmings. If you want to get them off, use fairly coarse glasspaper—that will do the trick.

It doesn't seem to me that there is such a lot that I can say about the actual construction, for the very obvious reason that it is all so simple. But perhaps one or two observations of a general nature will not be amiss.

First about the fixing of those components which are secured to the sides of the box.

—(Continued on page 870.)

THE GUIDE TO CONTROL POSITIONS



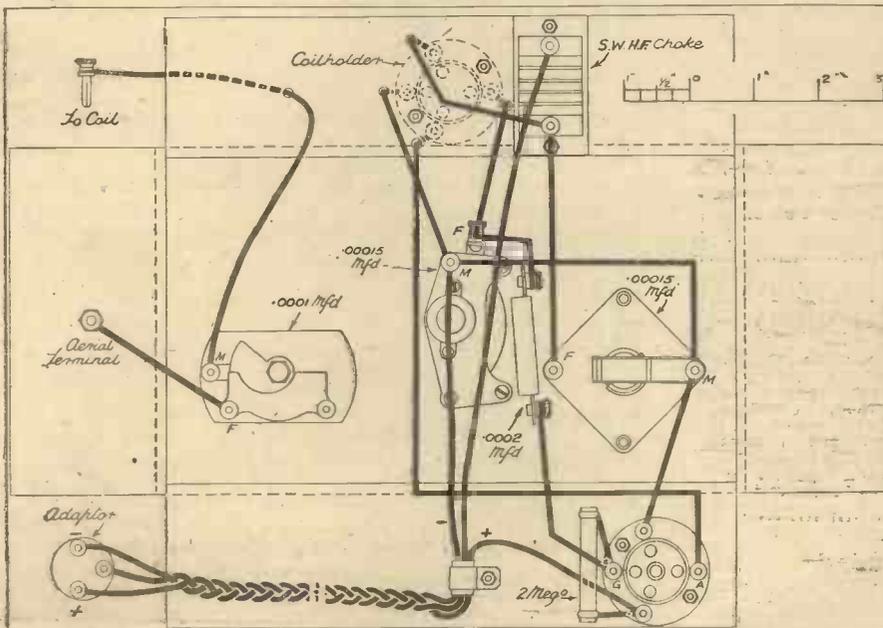
The clip marked "To coil" provides a ready means of varying the number of turns in the aerial circuit.

distant stations to get beyond the barriers of Europe with regularity. That is because the sets will only receive stations on the broadcast and long-wave bands.

Reception on a world-wide basis can only be achieved through the medium of short waves—waves below roughly 60 metres. But it is rarely possible to convert an existing set for reception on all three wavebands.

The only satisfactory way out, therefore,

BUILT IN AN ORDINARY CIGAR BOX



Simplicity is one of the outstanding features of the Everybody's Kelsey Adaptor. There are very few wires to connect, and the whole unit can be completed in an evening.

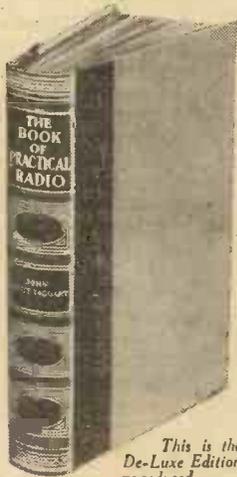
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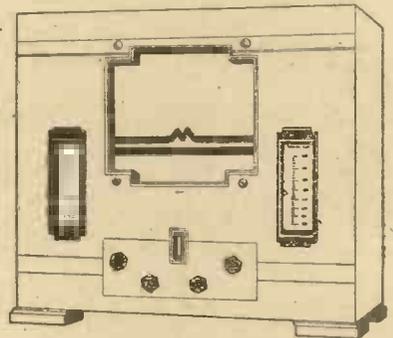
This is the Standard Edition—reduced.

MARCONI END RADIO CHAOS

The crowded state of the ether means that millions of listeners are enduring second-rate reception of all but the most powerful British and foreign programmes.

The end of this chaos is now in sight; no longer need you listen to a harsh discord of intermingled programmes, for the Marconi De Luxe superhet—the finest table model that any enthusiast could possibly wish for—has ended it all. It is called Model 296, a truly DE LUXE 5-valve 7-stage superhet, fitted with full Automatic Volume Control, separate long and medium wave 'wide vision' tuning scales; barometer tuning (a column of light that rises as correct tuning is attained), special Static Suppression, a wide-response speaker diaphragm in a newly designed energised speaker; new Marconi multiple valves; tone control and many other important technical features.

It is housed in a large cabinet of contrasted walnut, beautifully proportioned and finished and carrying that certain air of distinction that brands it as a Marconi product.



This DE LUXE superhet (Model 296) costs 13½ gns. and is available on easy payment terms from a few shillings a week.

Post this coupon to the Marconiphone Company for further details of this remarkable set.

Please send me illustrated descriptive leaflet of Model 296 and address of my nearest Marconi-man.

Name

Address

Pop. W. 9/3/35.



**The Marconiphone Company Limited,
210 Tottenham Court Rd., London, W.1**

THE EVERYBODY'S KELSEY ADAPTOR

(Continued from page 868.)

Ordinary wood screws are out of the question, because the wood is so thin. But if you use nuts and bolts (with countersunk heads) you will find it quite an easy matter. The heads of the bolts should be outside in each case. It looks better, and done this way it does not interfere with the balance of the box when it is standing on its side.

Making the Holes.

The lid of the box, by the way, should be removed entirely. It is the bottom of the box which is used for the panel, and the drilling of this should be the first part of the constructional work. Incidentally, I did not find an ordinary twist drill particularly suitable for making these holes. The holes are rather large and the wood is thin—not a happy combination. But if you do as I did—mark out the hole in pencil, drill a small hole in the centre and then finish the hole with an ordinary fretsaw—you will find it quite a simple job.

There is nothing very complicated about the flex leads which go to the adaptor plug, but there is one important point to watch out for. That is the way in which you connect the filament leads to the adaptor plug.

These must be connected in such a way that the lead from the adaptor marked plus is joined to the L.T. plus in your existing set when the adaptor plug is inserted.

In other words, it may be necessary to reverse the connections as shown in the diagram at the plug end of the lead in order to ensure that filament plus is joined to the plus filament in your set when the adaptor is in use. Get the idea? If you get them wrong it will not be likely to burn anything out, but the adaptor will not be working at its best.

This adaptor plug, by the way, can be obtained from Peto-Scott if your local dealer does not stock it. Alternatively, you can use an old valve base.

Winding the Coil.

When the adaptor is completed—and that should not take you very long—you can proceed to make the coil. For this purpose you will require the B.T.S. former, a small quantity of 20-gauge tinned copper wire and a few yards of No. 30 D.S.C. wire.

Pierce a hole in the former right at the top, secure through it one end of the tinned copper wire (leaving about six inches to spare) and then proceed to wind on 16

turns, spacing them in the grooves provided in the ribs of the former. (Turn one in groove 1, turn two in groove 2 and so on until the sixteen turns are wound.)

The end of this 16-turn winding should be finished off through another hole pierced in the former, and again about six inches of wire should be left over for connecting purposes.

Now pierce another hole in the former—about $\frac{1}{4}$ inch away from the last turn of the previous winding—secure one end of the silk-covered wire (leaving six inches as before) and then wind on

9 turns, taking care to see that the winding is in the same direction as the other one—that is to say, as if it were a continuation of the 16-turn coil.

This 9-turn coil should be close wound, or, if you like, unspaced, and the end should be finished off through a hole as before.

The First Test.

You should now have four loose ends, and these should be passed through to the inside of the former and should be connected to the pins at the base in the following order: Start, or top end, of 16-turn winding to pin marked A; end, or bottom end, of 16-turn winding to pin marked G; start of 9-turn winding (end nearest 16-turn coil) to pin marked F1; and remaining end to pin marked F2.

When completed the coil should be inserted in the valve holder on the top of the cigar box, and the flexible lead from the B.T.S. condenser should be connected by means of a slightly opened-out valve pin to the top turn of the 16-turn coil.

The adaptor is now ready connected up as fol-

low: First remove the detector valve from your existing set and place it in the valve holder inside the adaptor. Next insert the adaptor plug into the valve holder in your set from which you have just removed the detector valve. Remove the aerial from your set and join it to the terminal on the side of the adaptor.

All is now ready, and your main set can be switched on for the first test.

With regard to the controls, the centre one is the main tuning control and is the one which you should use for finding the stations; the right-hand one controls the degree of

aerial coupling and the left-hand one is for controlling reaction.

The first test should be to determine whether the adaptor will oscillate satisfactorily throughout the range of the tuning condenser. Set the main tuning control to zero (plates all out) and slowly increase (clockwise) the reaction condenser until the adaptor commences to oscillate. Repeat this process at every ten degrees or so of the main tuning condenser until 100 degrees is reached.

Avoiding Flat Spots.

If you find a setting of the tuning condenser at which the adaptor will not oscillate, even with the reaction condenser at maximum, alter the setting of the aerial coupling condenser and you will probably find that it cures the trouble.

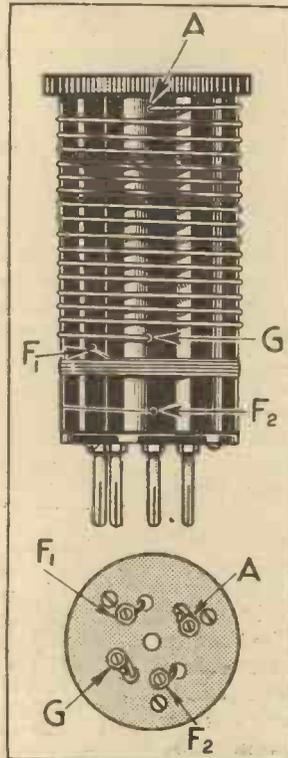
Next week I propose to go fully into the question of operation. In the meantime, I will just tell you that to find stations it is necessary to adjust the reaction condenser until the adaptor is just oscillating, and slowly, *very* slowly, to rotate the main tuning condenser until you hear a carrier-wave, or in less technical language, a whistle. If you then very carefully reduce the setting of the reaction condenser until the adaptor stops oscillating, and at the same time just slightly readjust the main tuning control, you should hear whatever is being transmitted.

An Important Point.

Perhaps I should make it clear that the setting of the reaction condenser to maintain the adaptor just, but *only* just, in the oscillating condition throughout the range of the main tuning condenser will not remain constant. It will thus be found easier at first to use both hands when searching for stations—one on the main tuning control and the other on the reaction knob—so that the two can be worked together, so to speak.

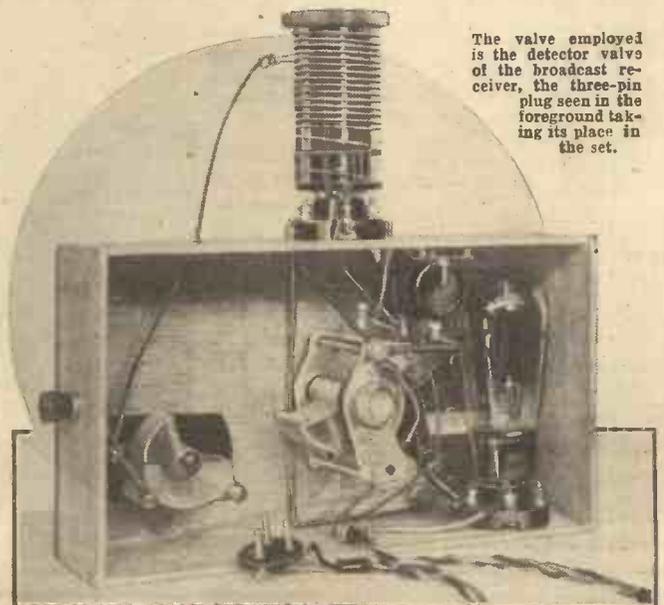
Success is entirely dependent upon the way in which you use these two controls, and although it may sound a little complicated in print, it is really very simple in practice. However, more about it next week.

COIL DETAILS



The connections between coil windings and base are clearly indicated in this diagram.

READY TO PLUG-IN



The valve employed is the detector valve of the broadcast receiver, the three-pin plug seen in the foreground taking its place in the set.

How they look at TELEVISION

AS soon as the long-awaited Seldon report was published we knew that at last a real start was to be made with a public service of television. The birth of a new entertainment industry, affecting millions of potential "lookers" could not fail to draw some lively responses from theatrical and cinema celebrities.

Before I tackled some of the leaders of the established departments of entertainment I thought it most fitting to hear what the "Father" of television had to say. John Logie



Miss Alma Taylor, famous star of the silent screen, is now connected with the Baird Television Group on the development of television production technique.

Baird, in other words.

The man whom the whole world acknowledges as the first to produce recognisable images by wireless received me with customary cordiality. Ever since I saw the very first shadows cross the elementary televisor of Baird's first "baby" I have been in close touch with each succeeding development.

"The report shows quite definitely," said Mr. Baird, "that television has now reached the reality of home entertainment. We of the Baird Company are very satisfied with the findings of the report, which should prove a great impetus to a real television service.

Paving the Way.

"I am very glad to hear that the 30-line transmissions are to continue until the high-definition systems are started. I feel that these low-definition pictures are doing very useful work."

Which is no more than simple fact. But for the so-often-scoffed-at 30-line pictures it is extremely doubtful whether any regular experimental service of television would have been inaugurated by the B.B.C.

When I approached Electric and Musical Industries, whose high-definition television is to alternate with Baird's from the first London television station, they referred me to Mr. Richard Arbib's statement.

The Press Manager of His Master's Voice—one of the E.M.I. group—says: "E.M.I. will be ready to market television receiving sets when the B.B.C. service begins. We believe the price mentioned in the report—£50 to £80—will be more or less correct."

It is pointed out that for a time the new industry of television will be largely experimental and will not in any way affect the

Alan Hunter interviews a number of prominent personalities in the entertainment world regarding their views on television.

development of ordinary sound-broadcasting apparatus.

Sir Oswald Stoll, when asked what effect the coming of television might have on the cinema industry, referred to his remarks made just before Christmas at his corporation's annual meeting.

"Televised programmes," he said, "will call for the rehabilitation of entertainments of the stage.

A Note of Broadmindedness.

"Television is no longer a possibility: it is an accomplished fact. It means that great advances in the entertainment world are imminent, and that they are advances which, so far as we are concerned, will involve preservation of and co-operation with the stage."

That, I think, strikes the right note of broadmindedness. As Sir Oswald also pointed out, "mechanisation and duplication have gone far in entertainment and are going farther. For all that, entertainment depends now as



Teddy Brown, popular xylophonist and an outstanding figure in broadcasting and the dance-band world, is dubious about the physical aspect of the television screen.

ever upon the maintenance, development and continuous supply of living artists."

Which is a thought closely echoed by that well-known schoolmaster comedian, Will Hay, whom I managed to track down on behalf of "P.W."

"I am wondering," he mused, "where they are going to get all the material for this television. Really funny material is hard to come by, you know.

Material Quickly Used Up.

"Take my show, for example. You could easily televise my act. It would be a scream. But in one night you would use up material that has taken a long time to prepare, and then—what?

"It comes to this. The radio audience pays ten shillings a year to the B.B.C.—and all this money going into one pocket mounts up to such a considerable figure that the B.B.C. can more or less dictate its own terms.

"It can decide arbitrarily just how much

it will pay even the most famous of artists. If these artists do not agree to the figure—well, they just aren't broadcast.

"Listeners do not, as a result, refuse to pay their ten shillings next time, because in any case they are getting such a lot for their money.

"In the theatre world it is different. My ability to fill the theatre with my act—as with any other artist with drawing power—forms a sort of box-office compulsion. What I mean is that it is possible to assess the value of an act by the response of the people who come to the theatre to see it—or stop away not to!

"How can you assess that value on the radio? With sound broadcasting one is giving away only half of the act, though, so that hearing the one half may inspire listeners to want to see the other half. If we give the whole show away through television how can we hope to obtain a fair assessment of its value?"

An Expensive Programme!

I suggested that possibly television would evolve its own particular type of entertainment, just as sound broadcasting had done. Will Hay was inclined to agree.

"Of course, for current events, such as boxing matches and boat races, television would be simply marvellous. But I don't think it ought to encroach on established forms of entertainment."

That is one of the problems of television—to find enough material, and, having found it, to recompense the suppliers of that material in terms that will make it a worth-while proposition.

Leslie Henson, the well-known actor manager, and one of our most mirth-provoking funny men, uttered curiously similar sentiments. I asked him straight out what he thought about the "menace" of television to the established entertainment arts.

"It is a serious question," he said with a characteristically comic grimace. "Suppose you broadcast my show, 'Lucky Break,' to your eight or ten million London lookers.

John Logie Baird, to whom we owe a great deal for his pioneering in television and his tenacity through long years of difficult research.



It would cost you a lot of money, my lad. What shall we say—ten thousand pounds? Yes, that's about the figure, I think."

So then I went along to a West End cinema manager, who prefers to remain anonymous,

(Continued on next page.)

HOW THEY LOOK AT TELEVISION

(Continued from previous page.)

"I can't see that television will be a rival to the cinema," he said, "because for one thing the average patron with his bob or one and sixpence could not afford to pay £50 to £80 for the necessary television apparatus.

"Where I do think television has a big future is in giving people pictures of events as they actually happen. In this way it would be doing something that the cinemas cannot do—and there would be a vast attraction in seeing things actually happening."

Television Production Technique.

Having given you the points of view of the entertainment industry, let me tell you what Alma Taylor, the famous British screen star of the silent days, has to say.

"Very few people seem to realise that for six months we have been working on television production technique at the Baird Crystal Palace studios," she said. "In that time I have invented and developed a special kind of make-up that gives amazingly attractive results.

"The picture we can now show lookers is really attractive—so attractive that I myself can sometimes hardly believe it! With my new make-up technique artists will have the comforting thought that when they appear before millions of people in their homes they will be looking their very best."

Alma Taylor is full of enthusiasm for the work that has been done at the Crystal Palace, and especially asked me to say how much she owed to the people she has been working with day and night for the past six months in the Baird organisation.

I thought my symposium would not be complete without the view of a "televised" artist, so I buttonholed Roy Royston, the well-known light comedian, as he came off the "set" at the B.B.C. television studio.

"Under the present conditions the flicker is rather troublesome—it makes one forget one's lines—but if, as you say, this has been overcome in the latest high-definition systems there is absolutely nothing to worry about.

Getting Personality Over.

"You feel ever so much more at home before the television apparatus than in front of just a microphone. Perhaps it is that you realise your whole personality is going over with television, whereas you know when you broadcast by sound alone that listeners are missing a great deal."

Yes, that is a point. Personality is rather hard to squeeze through the sense of hearing alone—as dozens of perfectly good artists have found.

Rather on the same theme was the reaction of Claude Hulbert, not forgetting Enid Trevor, his charming wife. I met these famous radio quarrellers just as they were shooting off to the film studios, and they were both most enthusiastic about television.

"We have great hopes of doing well in television," they said with curiously unusual unanimity—but then they do agree

most remarkably when they are away from the microphone.

"Those with stage and film technique will surely have an advantage when television comes," said Claude; "and that's where we shall come in," added Enid.

"Of course," went on Claude, all thoughtful-like, "we should have to alter our present type of act considerably. There would be much more in the whole thing.

"Not just a series of gags, as we put over in our ordinary broadcasting shows—that would not be enough," he emphasised.

Leslie Henson (right) needs no introduction to theatre and film goers. He regards television in a serious light and sees difficulties ahead in the financial arrangements that will have to be made.



Will Hay (left), astronomer and comedian, considers that a new type of entertainment will have to be developed for the television screen.

Sir Oswald Stoll (right), famous theatre manager, foresees great advances in the entertainment world owing to the advent of radiovision.



Roy Royston (left), a well-known 30-line television broadcaster comedian, is enthusiastic about the advances that have been made.

"Besides," exclaimed Enid, "although I am Claude's wife, I must say he has got a very funny face—and it's just wasted before the microphone. It would add enormously to the value of our act if Claude's face could be seen."

I agreed. As anyone would who has seen Claude Hulbert on the screen. His face certainly is, as his wife remarked, funny.

These two ought to do well in television. They write a great deal of material, not relying on the same old stuff over and over again. If they can keep it up—as I've

no doubt they can—they need have no fear of television's voracious appetite for material.

Yet this question of material cannot be, in general terms, so lightly dismissed. My chat with Philip ("Parade") Ridgeway made me realise its importance again.

"I suppose," he began, "that broadcast television presupposes the use of a lot of outside material?" I thought so, too.

"In that case the B.B.C. has got to decide its policy about payments pretty soon. That seems to me to be the biggest problem. You have to realise that outside acts must demand the prices they know they are worth—and will the B.B.C. agree to that valuation?"

The Assessment of Value.

This was curiously like Will Hay's comments—and showed me even more clearly one of the real difficulties of the coming of television—the just assessment of the value of the televised material. Gerald Cock, who is to take over the onerous post of Television Director, will need all his good tact and judgment in settling this problem—if, indeed, it is capable of settlement.

"Mind you," went on Philip, "I'm looking forward to television—it is much easier and much more worth while to work for sight and sound. It will be a tremendous attraction, this television.

"Why do you suppose my Parade is in its fourth year? Simply because, unlike most other radio acts, it is seen and heard throughout the country.

"I see one great danger unless the B.B.C. can arrive at equitable terms of payment for television acts, though," added Philip, "and that is the use by artists of their second-best material.

"Unless they are paid well they will not want to use up their best stuff, because once it is televised they will not be able to make use of it elsewhere."

Which is an absolutely cast-iron argument, I think. It looks to me as though the real solution will be the creation of television stars, who will be paid enough to enable them to devote their whole time to the new art—instead of living only piecemeal on B.B.C. part-time contracts.

"Seen-and-Hheard Plays."

Another outlet for television technique will undoubtedly be in the production of seen-and-heard plays. I asked C. Whitaker-Wilson, the writer and compiler of historical plays for the microphone, how the addition of sight to sound would help him.

"Enormously!" he exclaimed, with characteristic gusto. "At present I have got into the technique of writing radio drama in such a way that every line has value from the purely aural point of view—or rather hearing.

"After a while you find that this ability to write such lines comes naturally. But the news that television will soon be really here makes my heart leap, because I and other radio dramatists will be able to make use of stage technique once again."

Then, I ran into Teddy Brown, panting from holding up Waterloo Bridge—or so he said.

"No, I'm afraid television's no use to me," he complained sadly. When I asked him why not he replied: "Well, you don't suppose they could get all of me on the screen, do you?"



NORMAN LONG, famed for his "Song, Smile and Piano."

HOW I BEGAN

One of our most popular broadcasters tells "P.W.'s" special correspondent the story of his career in an exclusive article.

No sooner had I made up my mind to become a famous entertainer than the powers that be decided it would be a good time to have a war. So there I found myself in 1914, with a khaki suit in place of the conventional "tails" and experiencing my first experience of foreign travel!

You don't want to hear about my war experiences. What regiment did I serve in? To start with, I was just a member of the infantry, but flying seemed to be more exciting, and I was transferred to the Air Force.

Although I was not, of course, able to do much in the way of concert work, I was able to keep my hand in at regimental concerts, etc., and it was at this time that I first started my songs at the piano.

My First "Broadcast."

Incidentally, I had my first experience of broadcasting during these war years, although even at that time we none of us dreamed of the subsequent marvels of Broadcasting House, and the whole thing was a great joke. I was sitting one day at the piano trying over one or two songs for a regimental concert to be held that evening, and the signallers were busy testing a new line. Apparently the men at the other end of the line could hear my voice above the "one—two—three—four—five" of the tests, and they demanded that the telephone should be moved nearer to the piano so that they could have a free performance from "that blighter Long."

I should think that the result was pretty ghastly, but it caused me a lot of amusement later on when the old British Broadcasting Company invited me to broadcast, and I found the same kind of telephone mouthpiece doing duty as a microphone!

Well, all bad things come to an end eventually, and I was "demobbed" at the end of the war with a few shillings in the bank and the whole world before me. And so back I went into concert-party work, gaining much experience which was invaluable to me when I finally decided to strike out on my own as an "entertainer at the piano."

Great days, those! I wouldn't have missed them for anything—even for all the fun which broadcasting has since brought me.

In November, 1922, I was asked whether I would like to broadcast. The whole thing was very much of an experiment, of course, and there were many artists who had refused to let themselves be drawn into it,

fearing that their reputation would be ruined in the eyes (or should it be ears?) of those who heard them. And so to me came the honour of being the first entertainer to be heard on the air.

I appeared on many occasions in those early days, passing from the informality of Marconi House to the more or less orderly Savoy Hill, and finishing with the luxurious efficiency of Broadcasting House.

A Command Performance.

In 1927, for the first time in the history of the stage, permission was given for broadcasting the Royal Command variety performance from the Victoria Palace, and there I found myself broadcasting to what must have been the largest audience ever to hear one of my songs. The grand ideas we had then seem almost laughable now, when you think of the six million or so licence holders and the relays from Olympia and that sort of thing.

So here I am, in my thirteenth year of microphone work, and still trying to carry on the good work. Early on in my microphone career the fact was impressed upon me that I must have new material for every broadcast. Nowadays I find that the really difficult thing is not to find the new material, but to harden my heart to all the people who send in urgent and pathetic requests for repeat performances of the old favourites!

THE KELSEY ADAPTOR A READER'S RESULTS

To the Editor, POPULAR WIRELESS.
Dear Sir,—Let me first of all congratulate you on bringing out such a spanking thing as the Kelsey adaptor. This is certainly the hottest thing for short waves I've ever struck. I've been keen on wireless since 2 L O first started. For simplicity of construction and handling this adaptor beats everything.

You appear also to have arranged a splendid service through Peto-Scott, who keep up their reputation by sending the kit of the very best, down to the last screw, without any delay. Two hours' easy going suffices to put the kit together. On linking up to a common 3-valve H.F. Pen., Det. and Pentode (battery) I found things very lively, and it did not take long to tune in Rome, Zeesen, Moscow and Daventry.

The best, however, was yet to come, as soon as I learnt how selective the set was, for I have had at loudspeaker strength W 3 X A L, W 8 X K, W 1 X A Z, L K J 1 (Norway), C N R (Radio Maroc), C O C (Havana), Y V 2 R C (Caracas), and the best of all, on two Sundays running, up to 4 p.m., V K 2 M F (Sydney, Australia). This station is received at beautiful strength and can be heard all over the room. I may also mention I've heard quite a lot of other stations, C S L (Lisbon), O X Y (Denmark), F Y A (Paris Colonial) being a few.

Wishing you further success on S.W.,
Yours truly,
O LEWIS.
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RADIOTORIAL

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

All inquiries concerning advertising rates, etc., to be addressed to the Advertisement Offices, John Carpenter House, John Carpenter Street, 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 specialties described may be the subjects of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS

DIFFERENT RESULTS ON SIMILAR AERIALS OF INDOOR TYPE.

W. R. E. (Reigate).—"Can you explain the following, which has been puzzling me for weeks?"

"I use a superhet circuit, run from the mains, and require only a small indoor aerial. The set, containing loudspeaker, is small enough and handy enough to be moved easily from room to room, so instead of bothering with different loudspeakers or switching from one room to another I can easily take the set itself into either of the rooms which are in use in the evening.

"These rooms are of the same size (14 ft. by 12 ft.), and one is at the front of the house and the other at the back. Only the common wall divides them.

"I found that a picture-rail aerial in one room, round two walls, gave perfect reception. So I naturally supposed that a similar aerial, in the adjoining room, of same shape and using same wire, etc., would be equally good.

"Every care has been taken to make the aerials exactly alike, but one obstinately refuses to come up to the results given by the other. Can you suggest any reason why?"

Yes, we can. For we have proved again and again that small alterations in position make noticeable differences to indoor-aerial results.

It is not merely a question of shape, size, distance from sending station, wire used and so forth; indoor aerials are affected by the material in the walls surrounding them, presence of pipes or roofs, proximity to metal and other objects.

Therefore what is a satisfactory arrangement in one room is not necessarily satisfactory in another, even if adjoining. Try altering the aerial's alignment in the unsatisfactory room—it should be possible to find a better position.

RUSHING NOISE AND ITS CURE.

S. R. T. (Port Talbot).—"My cousin, who lives only about a mile away, gets far better and cleaner reception than I can, though our sets are alike in every way.

"As a matter of fact, I got mine because of his, which I liked, and of course I expected the same results. However, there is no comparison.

"For one thing, I get a sort of rushing when tuning in, and on some stations this is almost a hum. Thinking it might be a fault with my set, I took it to his house, but it goes perfectly there.

"At his suggestion we then concentrated on the aerial (neither of us finds that the earth makes any difference), and I have tried all sorts, both indoor and outdoor.

"The upshot of that is that we find that no aerial at my house improves the set, but it will go well at his place with almost any of the many aerials we have fitted it to.

"It cannot be neighbours or locality trouble, because my old battery set was quite free from

this. If you can suggest what it might be I shall be eternally grateful."

It is definitely a bit of a poser, but since the set will give good results elsewhere it should be possible to locate and remove the fault and get similar good reception at your own home.

There is one likely possibility that you appear to have overlooked. And that is that your mains supply is not as clean as your cousin's.

If you are getting high-frequency interference superimposed on the mains supply that would account for the whole difficulty.

Try an H.F. filter (mains chokes and condensers), preferably of a type which has proved O.K. in your neighbourhood.

FADING AT LONG AND MEDIUM DISTANCES.

J. B. N. (York).—"When we lived down in Dorset I used to get the Scottish Regional without much difficulty from fading, and I got into the habit of often 'dropping in' on this programme. (We have friends and a relative

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in Stirlingshire, so many of our interests are Scottish.)

"When it was clear that we should be coming farther North to live I expected to get different wireless results, using the same set, and one of the changes I felt pleased about was that I should hear the Scottish Regional better.

"Now that I am thoroughly settled in, however, I find that while my reception on the whole is quite as good as it was before, the programmes from Scotland are not half as good as they used to be.

"It is not so much strength, which I would not mind much, because I have plenty of power in hand with the variable-mu adjustment. But the fading is much worse, and is far too uneven to make listening worth while, as it means sitting there adjusting all the time.

"I cannot afford automatic volume control, which I suppose would get over the trouble, But even if I can't cure it I should like to

(Continued on next page.)

RADIOTORIAL QUESTIONS & ANSWERS

(Continued from previous page.)

know why fading is so much worse when the distance is far less than it was."

Accounting for fading effects is not at all easy, especially of late, when even the B.B.C. engineers have been surprised by fading phenomena. But we think that the explanation may be that you are now near enough to get noticeable "cancellation" by the ground wave.

It is impossible to say definitely, of course, but it seems reasonable to suppose that whereas you formerly depended on sky-wave reception and found it not too irregular, you are now getting some sky- and some ground-wave results—the mixture that produces notably bad fading.

And since you are outside the Scottish area of service there is nothing that can be done to improve your lot.

TESTING A FIXED CONDENSER.

V. B. (Barkingside, Essex).—"Thanks for your assistance with the fading trouble—it was what you suggested, a dud condenser."

"You may not recall the details you sent for testing this, but having proved their efficiency I should now like to understand how they give the results they do."

"What you told me to do was to use a dry cell and phones in series with a pair of test leads, one of these leads being connected to one of the condenser's terminals throughout the test. Then, you said, proceed as follows:

"Touch the free test lead against the free condenser terminal, and a single click should be heard in the phones. (No click there means the condenser is defective.)"

"Then remove the test lead from the condenser, no click being caused by this disconnection. (Should a click be heard, it indicates a defective condenser.)"

"Again, the free test lead should be touched against the free terminal, and no click should be heard. If the condenser passes these tests it can be assumed to be in order."

"Well, I proved this method to be a good one, and it is a hint for which I shall always be grateful. But I should like to know how it works, for I cannot see rhyme or reason in it."

"In testing a good condenser, why does the second tap on the terminal give no click when the first must give a click if the condenser really is O.K.? I have no difficulty in using the test, and I am quite an expert at it now; but I do not see the reason for the various effects."

We did not describe the cause of the clicks or no clicks because that might have confused you in the first instance, but you will easily see the why and wherefore from the explanation below:

A click in the phones (or loudspeaker) connected to a battery and fixed condenser occurs at the moment of first connection, because at that moment a small current flows into, and charges, the condenser.

If the condenser is a good one no click occurs at the subsequent disconnection, because the condenser is holding its charge and no current is flowing when the disconnection is made.

The next step in the test is to touch the condenser terminal again. No click should be heard, since this time the condenser is already charged, and no current flows through the phones (or loudspeaker) when the battery is joined up.

On the other hand, if the condenser had been a "dud" the test would have shown this up, whether the trouble was a complete short or an open circuit (no capacity).

If there had been a complete short the first connection would have given a click on the current commencing to flow; and the first disconnection would have given a second click in the phones (or loudspeaker) on the current ceasing to flow as the connection was broken.

This behaviour would have shown up a condenser that was shorting.

Alternatively, if the condenser had been "open," with a break inside that reduced its capacity to zero, the test would have been able to indicate this condition, because the first connection of the test lead would not have produced a click. Obviously, if there were no capacity, no current could flow from the battery into the condenser—hence no click.

AN ALL-ELECTRIC ADAPTOR FOR WORLD-WIDE RECEPTION.

S. E. S. (Barry Dock).—"I am told that you have described in your paper a small adaptor

for short waves that can be fixed without trouble to any good modern set working from A.C. mains.

"This is just what I have been looking for for a long while. Please say when the description appeared."

Details for constructing the All-Electric Adaptor to which you refer appeared in "P.W." Nos. 660 and 661, respectively dated Jan. 26th and Feb. 2nd, 1935.

HYDROMETER TESTS OF A BATTERY ON CHARGE.

S. A. (Reading).—"Seeing the letter from 'Janus,' I thought you might be able to settle a point about charging accumulators. Is it right that charging should stop when the hydrometer shows the acid is up to the right strength?"

"It always seems to me that the battery could do with more charge, but I have been told that hydrometer should be used as well

as voltmeter, so it does not get more charge once the acid is up to strength."

The procedure would be O.K. provided the acid were not too strong to begin with. The point to remember is that the correct-strength acid should be employed in the first place, and any loss by evaporation, etc., made up with water (not with more acid). The specific gravity of the acid will drop with discharge, and will return to normal when the battery is properly charged. So the hydrometer test is good only if the acid strength is correct to begin with.

Your best plan would be to test the gravity frequently during a long slow charge, and keep charging until the specific gravity ceases to rise. If it then reads too high you can be sure that the acid is too strong and requires diluting with water until the correct strength is obtained.

(You may have to pour off some acid, to keep the level correct when the water necessary to bring down the excessive specific gravity has been added.)

It would appear from other correspondence on this subject that it is not commonly appreciated that a battery should always be charged until the specific gravity ceases to rise. So if the acid is initially too strong the stopping of the charge at the nominal specific-gravity reading results in the battery being insufficiently charged.

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THE HOME CONSTRUCTOR AND TELEVISION

(Continued from page 855.)

and vision signals could be received simultaneously and without the need of separate tuning controls, and which could be switched over for reception of medium and long and, perhaps, short waves as well.

And these 7-metre sets are going to be real home-constructor propositions.

Then, when the new channels have been tapped triumphantly, there will be the actual vision apparatus itself to play about with.

Exciting Adventures in Store.

And now observe where the home constructor is again going to score. The outfit falls into two well-defined divisions or units, and while the one might not call for rebuilding at any particular juncture in order that advantage could be taken of something new, there might arrive details of refinements and improvements in the other unit, and vice versa.

Yes, there is certainly going to be some exciting adventures in this television business, and I shall feel rather sorry for those who plump down a lot of money for a complete factory-built set. They might feel satisfied with their purchase, even in face of the knowledge that they could have built something to do the same job at less cost. But look at what they'll miss!

HEAVY TEA-TIME BROADCASTS

A plea for better-arranged gramophone programmes is here entered by our Radio Critic.

I WANT to say a word or two about some of those programmes of gramophone records.

There's no denying the fact that gramophone recitals have suffered since Christopher Stone went. In the absence of a great personality as sponsor these days one notices a tendency to play whole concertos involving both sides of two and sometimes three discs.

Now, concertos—or some concertos—aren't to everyone's taste, with the result that a recital of these is often a bore. We had such a one the other Thursday afternoon played to us as tea-time music.

It was a Glazounov concerto, which took about 15 minutes to get through. It was followed by some Ravel music, again as long as it was dreary. Glazounov and Ravel are all right to the Glazounov- and Ravel-minded. But these can't be legion. Nor can Glazounov and Ravel music be considered ideal tea-time music—especially Thursday tea-time music!

Thursday, in many places, is the shop assistant's half-day. It is probably the only day of the week when shop assistants can enjoy tea-time music. Nor must we forget the thousands of clerks who also finish at 1 p.m. on Thursday. Ravel and Glazounov—from the nature of their compositions—can hold the interest of only a specialised type of audience, even including a few shop assistants. Yet shop assistants as a whole have these programmes foisted on them on their one afternoon of the week. Poor shop assistants!

To add to their woes on this particular afternoon the next item on the programme was a church organ recital. I have nothing against church organ recitals, but there are times for everything, and Thursday tea-time, it seems to me, is a singularly inappropriate time for a

church organ, as I see it, through the shop assistant's eyes.

But it's an ill wind that blows nobody good. Joe Loss must have found the circumstances under which he entered the ring very much to his gain. He must have been welcomed with open arms as the deliverer of listeners from a slough of despond. Joe's tonic was just what the doctor ordered.

Jack Payne's return to the mike created a little excitement by his usual high spirits. His audience at St. George's was instantly carried away, and the general effect of a lively atmosphere was handed on through the loudspeaker. The value of an audience to a performance was again demonstrated.

And one more note on one more band—the New Orquesta Hispanica. This is a full blooded, tuneful combination that plays very well, too. And it has a grand soloist. I mean the lady.

It is plain that there is room in the programmes for the historical play. Like the "Scrapbook" productions, it is based on fact, or, at any rate, on probabilities which are more akin to fact than fancy. If it can combine with it an element of mystery or controversy, then it can be a very substantial thing, and thus knock the trivial and flimsy "specially written" play, to which we are often treated, into a cocked hat.

Mr. Powys Greenwood gave us a very lucid talk on Nazi Germany. He has the sort of voice I like. He used the technical language of all these foreign political and economic talks. But he explained what he meant by such terms as "group idol," "ruthless liquidation," "sub-human creatures," "the racial folk conception," etc. Most speakers don't. They just assume we know them already. He also explained the Nordic myth as applied to Germany, and incidentally showed the comic side of Germany's claim to Nordic association. This was an exceptionally interesting talk.

Another talk the same evening was just as arresting. It was Mr. Raymond Swing speaking from New York on American affairs. His talk offered many contrasts to Mr. Greenwood's. Mr. Swing is a 100-per-cent American, and his manner ditto. New York, he said, is a perpendicular city. Hence the gravity of the lift strike which was threatening the city.

He also spoke of Mr. Senator Hughie Long, of Louisiana, and his participation in the "Share-Out Wealth Movement." Also of 60-year-old Dr. Townsend. Good stuff, all this. It even silenced the raging of the Atlantic, for reception was excellent. C. B.

BROADCASTING IN MY TIME

A Review of Sydney A. Moseley's
New Book.

IT is not unreasonably fanciful, perhaps, to call Mr. Moseley the Pied Piper of Broadcasting. He would probably prefer to call himself the Guide, Philosopher and Friend of the B.B.C. in general and of television in particular.

His new book* contains a great deal of information about broadcasting, but it contains even more about Mr. Sydney Moseley. British broadcasting would seem to have made the greatest of its many mistakes when it failed to enrol Mr. Moseley in any capacity other than that of professional critic, for "behind the scenes" Mr. Moseley has apparently been ubiquitous. Not only, it seems, has he saved television for the British Empire—no small claim—but he would appear, while gently chastising

(Continued on next page.)

BROADCASTING IN MY TIME

(Continued from previous page.)

the B.B.C. with one hand, to have protected it from almost all the slings and arrows of outrageous fortune with the other! If a new running commentator was required it was Mr. Moseley who discovered that fine broadcaster Mr. George Allison; if the Productions Department and the Variety profession came to grips, almost to blows, it was Mr. Moseley who poured the necessary oil on the troubled waters; if Lady Snowden wished to encourage opera in this country it was Mr. Moseley who provided her with encouragement and sympathy. No doubt it is all true, but the reader begins to wonder whether, after all, broadcasting and not Mr. Sydney Moseley should not be the real subject of this book.

It is an eminently readable book in so far as it is written in a bright and snappy manner, with a tantalising number of hints and innuendoes that very much more might be said were it not for the discretion of its author.

Comments on B.B.C. Staff.

While Mr. Moseley is obviously doing his best to be fair to the Director-General it would rather seem that his comments on certain other members of the staff at Broadcasting House should either be more fully substantiated or withdrawn. As for the chapter so magnificently headed "Moral Tone!" it should be promptly expunged. It is surprising to find Mr. Moseley, who is widely known as a likeable and agreeable companion, allying himself thus publicly with the drearier apostles of Grundyism. Were it not for its generally patronising attitude the book would be a useful contribution to the series in which it appears.

There can be no doubt that Mr. Moseley has been, and remains, an enthusiast, and he reveals an attractive disposition to crusade on behalf of the Lost Cause and the Under Dog, though the charger on which he elects to enter the lists is too frequently a hobby horse. Both broadcasting and the B.B.C. have grown too important as factors of modern social life to be treated on the plane which Mr. Moseley has adopted. It may be that he feels that, the listening public being so wide, the book that he wished to write must be capable of appealing to the lowest common denominator of that body. He appears to under-estimate the intelligence of the mass of listeners. Still, if Mr. Moseley has not written history he may have caused the fluttering of a few doves; and I have no doubt that many readers will read his book with enjoyment.

V. G.

* Published by Rich & Gowan, price 6s. net.

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THE B.B.C. JUBILEE PROGRAMME

(Continued from page 864.)

Several of these Welsh shows have already been given, notably the Welsh pantomime which was produced in the studio. Another has been arranged for Monday, March 18th, when a variety entertainment will be heard "from the New Theatre, Pant y Pwmp." The programme has been arranged by D. Gwynallt Evans, and Gunstone Jones will act as compère.

From Belfast.

Congratulations to Mr. E. Godfrey Brown, the Music Director for the B.B.C. in Northern Ireland, who on Friday, March 22nd, will complete his twenty-third season as conductor to the Belfast Philharmonic Society.

On that day Mr. Godfrey Brown will conduct the orchestra and chorus in the fourth and last subscription concert of the society's present season in the Ulster Hall. The soloists will be Harold Williams and Emil Telmányi.

"Merry-Go-Round."

As you know, Martyn Webster, the Midland producer, went to Birmingham by way of London and Glasgow.

While in Glasgow he put on many excellent shows, among them being the revue "Merry-Go-Round," which he is to repeat with a Midland cast on Saturday, March 23rd. The book and lyrics are by Sidney Herbert and the music by Ernie Gower, who was pianist with the Scottish "Radioptimists."

"Music of the People."

The eighth of the series of Northern broadcasts, entitled "Music of the People," will come from the Leeds studios on Friday, March 22nd, and will be given by the Sedburgh Harmonica Band, which has the distinction of winning many prizes for its playing of mouth organs.

The band will be led by W. T. Gutteridge, of Little Horton Green, Bradford, whose demonstration of mouth-organ playing at Sedburgh Boys' Club, Bradford, three years ago, produced a promise that he would teach the boys to play, with the result that the band was formed.

The B.B.C. Empire Orchestra.

So far, home listeners have not heard the B.B.C. Empire Orchestra, which since its formation at the beginning of last December has been broadcasting regularly under the conductorship of Eric Fogg, its Music Director, from the Empire station at Daventry.

Most of its work is done in the late night hours and the early morning, but on Friday, March 15th, it is to give a concert which will be radiated simultaneously to Regional listeners and in Transmission 4 of the Empire programmes. In other words, to listeners in East and South Africa and the Mediterranean countries whose local time is within a few hours of Greenwich time. Eric Fogg was associated with Northern broadcasting from 1923 until he joined the Empire department last year. At one time he was station accompanist at Manchester and afterwards assistant to the Music Director there until 1934. O. H. M.

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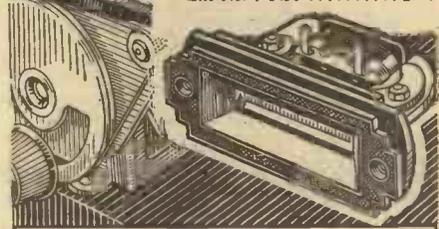


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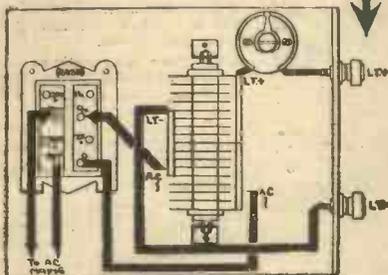
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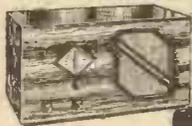
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THAT WASTED POWER

Random Technicalities of Interest to all Readers.

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

IT is not so long ago that we thought it was wonderful to put 3 kilowatts into the aerial of a broadcasting station. Some commercial stations were later considered "giants" if they boasted the enormous figure of 25 kilowatts. Since then transmitters have gone "up and up and up," until to-day we hear of a 150-kilowatt station without the least excitement. But when you come to think of it, it really is a marvellous achievement to be able to pump 150 kilowatts of high-frequency energy into the aerial—something like 200 horse power! It has been brought about by many kinds of improvements in transmitting means, but most of all by improvements in transmitting valves.

The Energy Lost.

One aspect of all this which always strikes me—I don't know whether you've thought of it—is the enormous proportion of the energy actually developed at the transmitting station that goes up in smoke, as it were. I mean that for every kilowatt of energy that is passed up to the aerial, many, many kilowatts have to be wasted. It is like an electric lamp: for a very small amount of energy emitted as light we have to waste perhaps 50 or 100 watts of energy in the form of heat.

Even after we have spent many times the aerial energy in getting to the transmitting stage we again lose by far the largest proportion of that energy in the ether, since most of it never reaches our receiving sets at all. For broadcasting purposes it is obviously essential to send out the energy through the ether in all directions; in fact, the very word "broadcast" describes it perfectly.

This means that a great deal of it runs to earth in all manner of conductors—quite apart from wireless receiving aerials, its intended destination. For commercial purposes, as you know, the "beam" system has enabled great economy to be effected, but this is because the transmitted energy has to pass in a definite known direction, and not simply be allowed to spread out in all directions.

Undistorted Output to Speaker.

The same inefficiency (I use the term in the engineering or "power" sense only) applies in regard to the reproduction at the wireless receiver. The incoming-signal energy merely serves, so to speak, to regulate or control the energy which you yourself supply locally from battery or mains. In the process of amplifying this energy you must needs waste far more energy than you are actually handling. The power used for heating the valve filaments, for instance, is probably many times that which is delivered to the loudspeaker.

Finally, when the set and amplifiers have done their bit, and have delivered, say, 1 or 2 watts of undistorted energy to the loudspeaker, the latter will only convert a very few per cent of this into audible sound.

Interesting, but it doesn't really matter, because the whole of the energy involved,

at the receiving end, anyway, is so small as to be negligible in a mains set.

A Wonderful Tone.

Different people fancy different kinds of radio reproduction: some people prefer a set that favours the bass frequencies (although they may not know that that is the reason), whilst some like a shriller type of reproduction—that is, a set favouring the upper register. This is usually what is meant when you hear somebody say that a particular set has a "wonderful tone."

The primary purpose of a set (or a gramophone record or gramophone) is to reproduce faithfully what took place at the transmitting or recording end. But, curiously enough, people seem to prefer something that gives a special tone, even though it may not be absolutely faithful to the original. You remember the old fable about the competition for the best imitation of the squeak of a pig. The prize went to a man who was at first suspected of having a real pig under his coat, although he was found innocent, and not to the one who, in fact, had. It shows that the judges were going on what they thought the squeak ought to sound like, and not by a comparison with the genuine article.

After all, a radio listener is quite entitled to prefer a tone that pleases him, irrespective of whether it is or is not a perfect copy of the original.

All-Wave Sets.

It's rather curious that so-called all-wave sets never seem to have caught on in this country as they have in America. Whether this is due to national conservatism (I use the phrase in a non-political sense, if you please) or to the feeling that there is any slight technical difficulty in using an all-wave set, it is impossible to say. For my own part, in view of the very great interest which can centre in the short-wave region, I feel that the all-wave set is bound to become much more popular. As a matter of fact, when the "P.W." Jubilee sets are launched the popularity of the true all-wave receiver will be an assured fact.

Sidebands.

In radio transmissions we have to distinguish between the carrier-frequency and the audible frequencies. These audible frequencies are sometimes called "sidebands." I do not want to say too much about sidebands, however, because the whole question of sidebands is a very complicated one and one on which a good deal of diversity of opinion still exists. Some people maintain that the carrier-wave keeps to a single frequency and simply varies in its amplitude, whilst other people say that the effect of this is the same as if the carrier-wave embraced a definite band or group of high frequencies.

High-Frequency Energy.

Anyway, we have to use high-frequency impulses in order to get the waves to travel
 (Continued on next page.)

THAT WASTED POWER

(Continued from previous page.)

through the ether in any efficient way; if we tried to use audio-frequency ether oscillations we should not be able to pass sufficient energy. We resort, therefore, to the high-frequency waves so as to get energy transmitted through the ether, and then we send modulations, or speech currents, as you may call them (speaking roughly), like a rider on the back of the carrier-wave. After the energy has been passed through the detector the carrier-wave, having served its purpose, goes out in the wash, as it were, leaving us with the low-frequency speech impulses which are amplified up by the L.F. part of the circuit and finally turned out through the loudspeaker to be reproduced as speech and music.

Television Definition?

Everybody I meet is asking me whether the television from the B.B.C. is going to be on 180-line definition or 240 lines. You may remember that the P.M.G.'s Committee reported that they would like to see the television transmissions on 240 lines, or even higher definition. Of course, it is impossible to say what degree of definition the B.B.C. will eventually decide upon, but I am inclined to think that perhaps at first they will use 180 lines.

I expect only a few of you will have had the opportunity of seeing television reception, particularly high-definition reception,

television reception at first, I have no doubt that, as time goes on, and when the novelty begins to disappear, this will be replaced by genuine entertainment interest.

Iron-cored Coils.

Some people seem to think that there is very little difference between the cores used in iron-cored H.F. coils and those employed for low-frequency circuits. In actual fact, of course, a core used in a circuit carrying high-frequency currents is vastly different from one such as is employed in L.F. transformers or chokes.

In the iron-cored coil great care has to be taken to keep eddy current losses—and for that matter *all* losses—down to an absolute minimum. One very ingenious and practical method of making iron-cored coils is to mix up bakelite powder and finely divided iron and then to mould the resulting mixture just like ordinary bakelite. I expect you know that bakelite mouldings are made from a powder which is forced under pressure in a heated mould to the required shape and then baked.

When the iron powder is mixed with the bakelite powder the result is that the iron gets equally distributed throughout the moulding, so that you have what is in effect a bakelite-iron moulding which is very convenient for use as a core.

There are now several other methods of making iron-cored coils, each manufacturer claiming that his particular method has special advantages.

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but I can tell you that the 180-line reception is a great advance on the present low-definition type.

Cathode-Ray or Mechanical Reception?

For better or worse, the powers that be seem to have made up their minds that the cathode-ray system of reception is going to be the thing, and I am afraid that the mechanical systems will have to fight against a good deal of opposition for that reason.

Indoor and Outdoor Scenes.

A question many people are asking is what kind of scene will be transmitted—whether it will be an indoor studio scene or outdoor scene, such as the finish of a race. I think you will find that, at first, transmissions will be confined to indoor studio scenes. At present, for instance, it is possible to take in a field about 6 ft. wide and about 10 ft. high, and as many as four performers can be got into the picture at once, but they show up rather small in the reproduction.

However, all this will be greatly improved when things get going, and although the novelty interest will be the main thing in

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Practical Radio **8**

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Saturday, March 9th, 1935.

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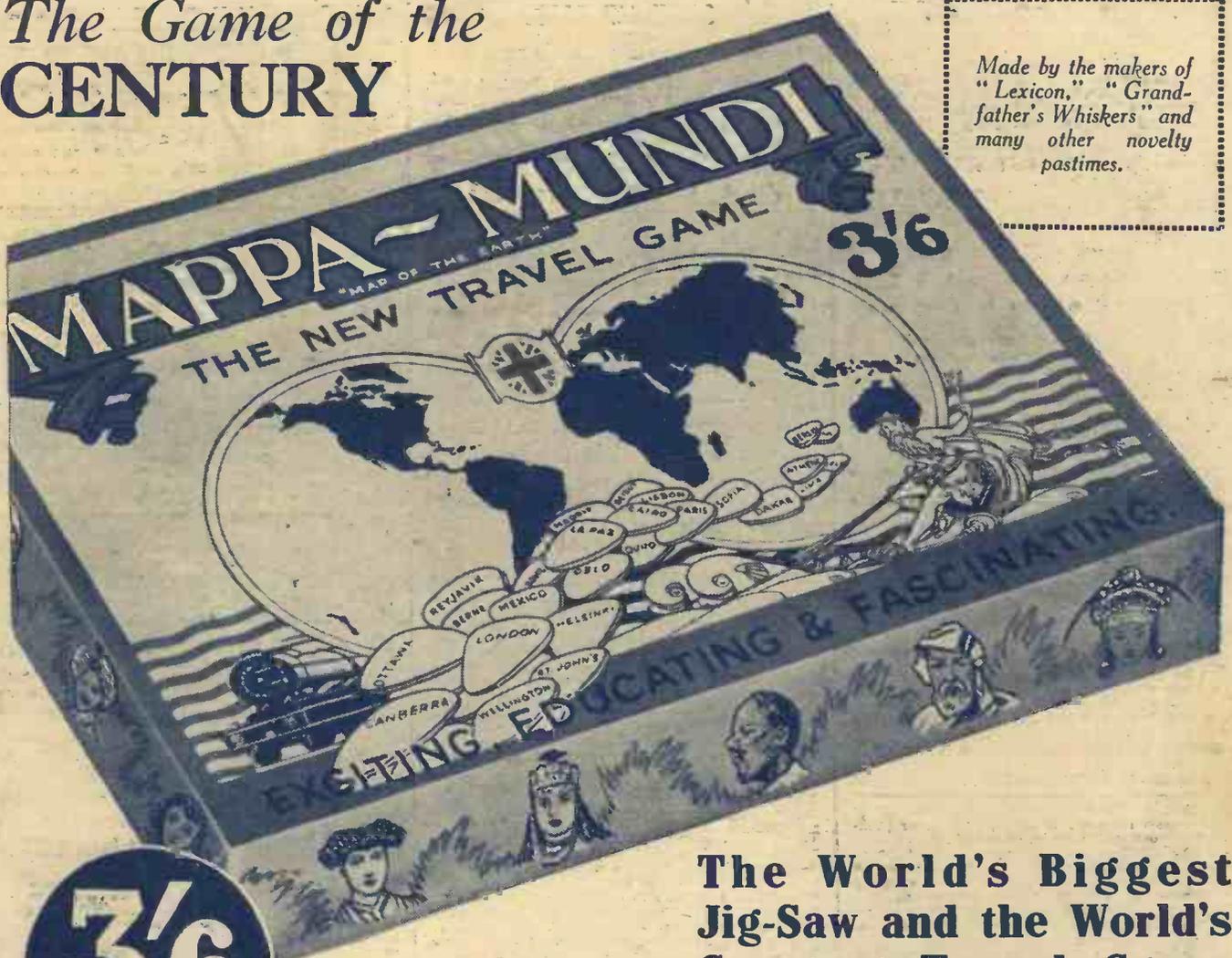
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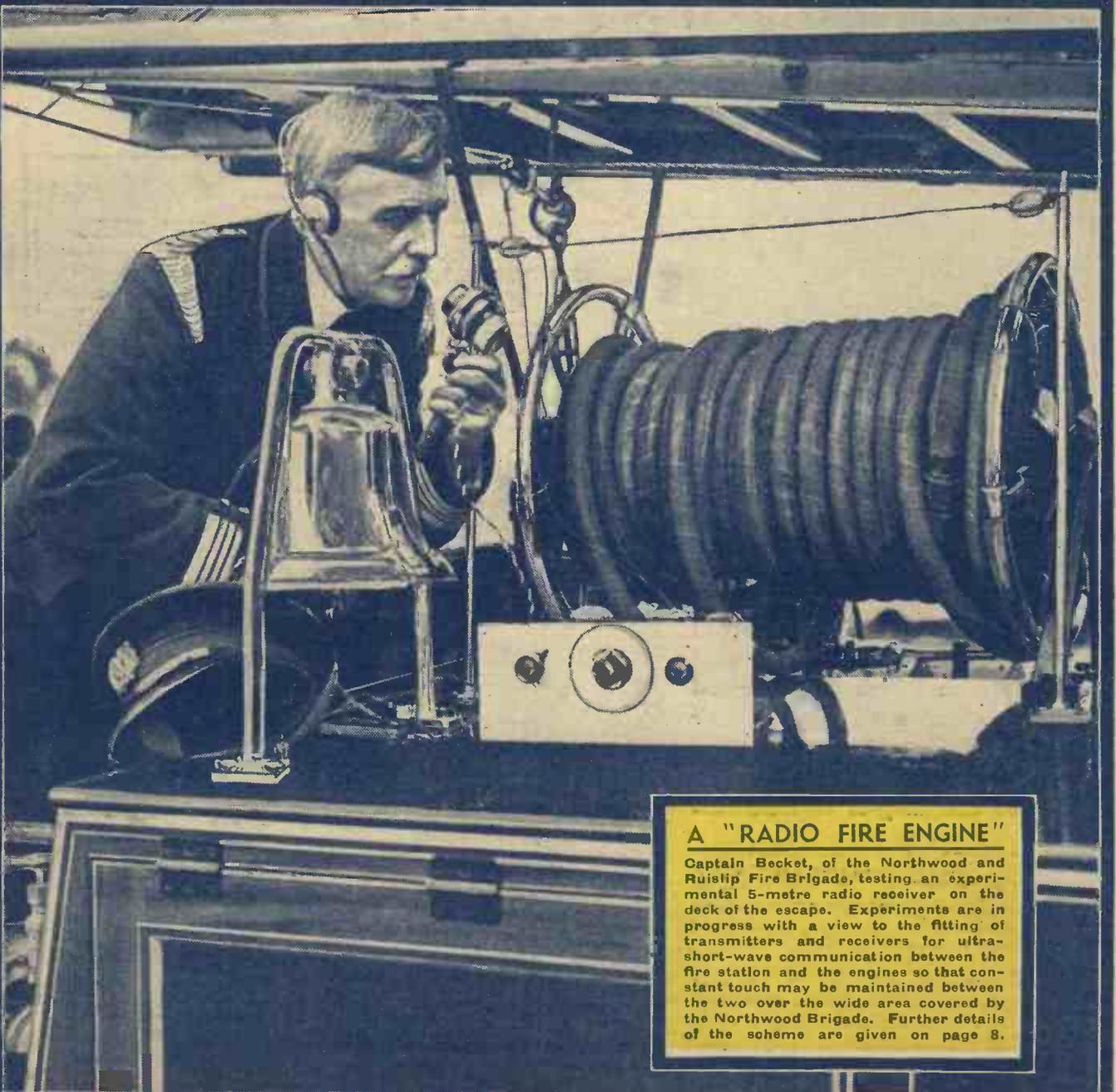
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No. 667
Vol. XXVII.
March 16th, 1935.

AND TELEVISION TIMES



A "RADIO FIRE ENGINE"

Captain Becket, of the Northwood and Ruislip Fire Brigade, testing an experimental 5-metre radio receiver on the deck of the escape. Experiments are in progress with a view to the fitting of transmitters and receivers for ultra-short-wave communication between the fire station and the engines so that constant touch may be maintained between the two over the wide area covered by the Northwood Brigade. Further details of the scheme are given on page 8.



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Impedance - - - - 83,300 ohms
Mut. Cond. } at Va. 100 1.5 ma/V
Amp. Factor } Vg.0 - - - - 125

Price 15s. 6d.

COSSOR 13 V.P.A. (Variable Mu H.F. Pentode)

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Max. Anode Volts - - - - 200
Max. Aux. Grid Volts - - - 100
Mut. Cond. } at Va. 200, Vag. 100, Vg.0 1.8 ma/V
Grid Volts (variable) - - - 0 to -30

Price 17s. 6d.

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Heater Voltage - - - - 40
Max. Anode Volts - - - - 200
Impedance - - - - 1,330 ohms
Mut. Cond. } at Va. 100 - 7.5 ma/V
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Mut. Cond. } at Va. 100, Vag. 100, Vg.0 - 4.0 ma/V
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RADIO NOTES & NEWS

SCRAPBOOK RECORDS
WHY BLAME RADIO?
"TRIPLE" WAVES
"HOW YOU SAY?"

Room Macabre.

THE city of Utrecht can claim to be the birthplace of several inventions now in common demand, but I do not see much of a prospect for the latest. It is a method of obtaining absolutely non-resonant, unechoing, acoustically dead studios.

A special stone is used as a basis, and then the walls are covered with a composition in which wood pulp, seaweed, rubber, paper, cork and human hair are included.

When the walls have been plastered with this cheerless mixture they become acoustically dead, and the most lively music played within the room sounds like the Dirge for the Departed. There may be some scientific interest in such a chamber of horrors, but it is no good for broadcasting. I advise them to keep it locked up, lest somebody who is sensitive to environment goes in and commits suicide. The dull thud would not echo!

Hollywood's Television.

THE indefatigable Mr. Bernard Aylesworth, President of the National Broadcasting Co. of America, has announced that Hollywood is to have a television station.

His organisation will erect the necessary studios within a year, the immediate purpose being to permit stars at work on the film sets to be put on the air with a minimum of trouble and without loss of time.

Judging from what I have seen of some of the new musical films, the looker-in of Hollywood is going to get an eye-ful!

Long Odds.

THE recent disaster to the American airship Macon figures in a coincidence which has not often been equalled in radio.

On the very day of the great U.S. airship's peril the B.B.C. was broadcasting a sound picture of the events of 1921. They included the poignant episode over the Humber, when American observers were on the British airship that met disaster near Hull. And a survivor, who was picked up in the Humber, was recounting

his experiences by wireless when, on another wavelength, the radio news of the Macon's end was coming through to Europe!

Cheerful Talks.

WE often hear grumbles that the B.B.C. talks are not very interesting, but for sheer ghastliness it would be difficult to beat a series of broadcasts given

ON OTHER PAGES

- That Scanning Problem - - 3
- Silver Linings - - - - 6
- The "Radio Fire Engine" - 8
- Henry Hall's Guest Nights - 16
- Metals Without Resistance - 19

in Italy. They are specially intended for elementary school-teachers, the subject being the Effect of Chemical Warfare on the Civil Population.

Lieut.-Col. Gino Pellegrini has the task of giving this grisly series to the microphone. I do not envy him.

Heilsberg's Latest.

GERMANY'S Regional Scheme, which has so successfully introduced the programmes of the Fatherland to British aerials, is now almost completed. In April the last of the projected improve-

ments will have been made, this taking the form of higher power for Heilsberg.

At the time of writing a new anti-fading aerial is being fitted to the East Prussian station, which is working, in consequence, on a 17-kilowatt makeshift transmitter. When the engineers have completed their alterations Heilsberg will blossom out with a 100-kilowatt transmitter, and 291 metres will be a wavelength well worth watching.

Norway's New Ways.

THE Norwegian broadcasting authorities are both wakeful and alert—as might be expected of the Land of the Midnight Sun. Instead of drowsing over past achievements, they have determined to extend their service by means of 10-kilowatt transmitters at Vigra, Trömsø and Stavanger, all to be ready before next Christmas.

Then there is the question of Bergen, who shares 352.9 metres with Sofia and Valencia, as well as with a trio of young Norwegians of low power. Bergen feels that five bedfellows are too many for a 1-kilowatt transmitter, so his power is to be increased to 20 kilowatts. The engineers are now busy on Bergen, and he ought to be feeling the effect of his tonic within the next few weeks.

That All-Night Watch.

MY recent reference to an all-night sitting of the Anglo-American Radio and Television Society seems to have created a lot of interest—especially among the sceptics. These disbelieving gentry watched for a report of that meeting, and because none appeared immediately they jumped to the conclusion that the tests were a wash-out.

Promptly dipping their pens in gall, they wrote me bitter and sarcastic letters about the "impossibility" of getting America to order on medium waves—thereby landing themselves right in the *consommé*. For here are the results of that particular all-night sitting: "WCAU won first place for volume; WABC, WTIC, WJZ, WBT and WBZ (when South America was not interfering!) were good seconds; WAAB, WHN, WCCO,

(Continued on next page.)

WELL KNOWN TO LISTENERS



A recent photograph of Ambrose (right), the well-known conductor of the Embassy Club Dance Orchestra. On the left is Sam Brown, the vocalist.

LOWING KINE WHICH APPRECIATE FOREIGN TALKS

WHAS, WGY, WLW, WEA, WIOD, WNAC, WHO, KYW, WHAM and WTAM came in at moderate-to-good strength."

WBT was heard at good volume before midnight! Dyed-in-the-wool disbelievers will be peevish to know that another all-night watch on the U.S.A. will be arranged in the near future.

Universal Language.

WRITING from Paris Plage with magnificent flourishes that suggest a quill pen, a mercurial temperament and foreign birth, a correspondent named Karpel or Ruilet (or is it Poilet?) wants me to tell him what stations now broadcast "Expenlo."



I had never heard of Expenlo, so I got various experts on the job of tracking him or it, but met with no

success until I handed the letter to our artist. That sagacious worthy went to a cupboard, took out the biggest magnifying glass I have ever seen and, bringing the words up to the size of a railway station's name, he said: "That's not Expenlo—it's Esperanto."

Assuming this to be right, I am still in a quandary, for it would take a book to mention all the stations which now broadcast Esperanto. Vienna, Warsaw, Cracow, Huizen and Sottens are all addicted to it, while Leningrad, Minsk, Tallinn, lots of the French stations and Lisbon all esperant with regularity, I believe. No doubt there are others, but if M. Karpel gets that lot he should be satisfied.

"Scrapbook" Item.

GRAMOPHONE enthusiasts will be interested in a piece of news I had the other day from one of "P.W.'s" well-known contributors, Leslie Baily. He told me that "Columbia" have contracted with him and Charles Brewer for the right to make gramophone records of their various "Scrapbooks," which have been so popular on the air.

The records will be condensed versions of the B.B.C. programmes, the first being already made and comprising the "Scrapbook for 1910." It includes several of the persons who took part in the broadcast last September, and commemorates King Edward and the accession of King George.

Labour Lost.

IF you are in the habit of tuning to Strasbourg on 349.2 metres—and it's not a bad habit, for he is a tuneful soul—you may be glad to know why he could not be received last week.

It was a waste of time searching for him, for the engineers had decided to make a few alterations to the transmitter.

From Monday, March 4th, to the following Saturday no programmes were radiated; but Strasbourg started again last Sunday (March-10th), and you should now be rewarded by improved reception.

Census Problem.

WHILE most of us spend our energies wondering whether the old P.O. bank book will run to a new suit at Easter, and such mundane matters, certain aristocrats of intellect are always thinking high thoughts about Art, Culture and the Future of the Race. Investigating this latter, one distinguished medical gentleman has been very pessimistic—it seems bonnie babies are not arriving half fast enough to please him. Moreover, he darkly gives the reason, affirming that in the corner where the cradle used to be there is now only a wireless set!



B.B.C. VARIETY "DRIVE"

The B.B.C. is to make a variety "drive" during the coming spring season and Jubilee festivities which will place the B.B.C. variety hours among the highest peaks of broadcast entertainment. The ground work has already begun, and John Watt, showman of "Songs from the Films," who has discovered many "stars" for radio, is reviewing artists who can supply suitable material themselves and those who are adaptable to variety work if supplied with the right kind of material. A new territory was tapped when several artists were introduced direct from the sets of film-producing companies. It has now been arranged with various executives in the film studios to report the names of artists who may be suitable for broadcasting.

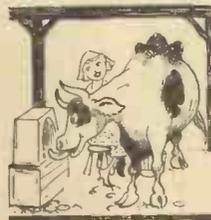
Among artists who have been "discovered" and have now made good in the theatre and films is Gordon Little, who is at present starring in "Stop Press" at the Adelphi. He was leading man in "Songs from the Films" broadcasts. Other "discoveries" have been Fred and Harry, Barbara Wells, Alan Kane, Kitty Shears, The Unknown Singer, Ann Howard, The Four Aces, Harry Brunning, Leslie Elliott (who sold her song, "We've Got to Keep up with the Jones's," to Gracie Fields) and Betty Driver.

Is this fair? Can't young couples, if they prefer, listen peacefully to Dancing Daughters instead of being nightly deafened by bouncing sons?

With all its faults I will say this for the radio set—it does not demand that a man shall rise from his bed at 3 a.m. and warm milk or mix gripe-water. Can you deny that, Baby?

Rural Note.

MILKING cows to music is an old story that generally hails from Yokohama, Oklahoma or other far city whence strange events may come without evoking surprise. Judge, then, of my astonishment to read that down at Haslemere, in Surrey, there is a pedigree herd of Guernsey's that daily yields its lactic store to the strains of radio.



Moreover, the milkmaids—or do they call them lady operators now?—affirm that, in the absence of any music, a nice talk in a foreign language is highly appreciated by the lowing kine

ere they wind slowly o'er the lea. "In a foreign language," you notice. Some of those English talks are quite enough to turn milk sour.

Station Information.

AUGSBURG, the German station on 236.8 metres, was closed on March 1st, having been back-numbered by the high-powered Munich station.

Latvia now uses Europe's lowest wavelength on the medium waveband, the station being Liepaja on 173 metres.

The lowest power in regular use at any European broadcasting station is one-tenth of a kilowatt. Belgium has nine different stations whispering on this power on wavelengths near the 200-metre mark.

Vienna, remembering last year's riots, has now installed an emergency transmitter with a power of 5 kilowatts. It is in the War Office building—top floor.

Phantom Wavelengths.

WHEN I referred to phantom wavelengths a few weeks ago I stirred up much trouble for myself. For phantoms are quite in the fashion, and I had no idea there were now so many spook receiving sets.

One chap—I withhold his name by request—assures me that on certain nights he can tune in a station, say Stuttgart, and then find "shadow programmes" on either side of the main transmission. Not overlapping it, but separate tunable spooks in the background, each repeating the main programme in miniature, rather like spirit faces round a portrait.

I frankly own this beats me. And I will go so far as to say that if my set did that kind of thing I should switch off. Stuttgart is a station I like to listen to after midnight; but I should have no time for Stuttgart, Stuttgart, Stuttgart, Stuttgart & Co.



Quaint Thought.

THE difficulties of correct B.B.C. pronunciation have been much in the limelight since Professor A. Lloyd James wrote his book on "The Broadcast Word." "Lloyd Gems"—as his younger and brighter students call him, to his great amusement—is no believer in a standard pronunciation on the lines of the standard pint or the standard yard. He roundly says there is no such thing.

And now, whirling into the fray, comes Osbert Sitwell, who writes: "No person with an ear ever pronounces the same word twice running in the same way; the sound of one word is modified by the sound of those enclosing it, and thus it is infinitely harmful to a language to attempt to fix the pronunciation of a word."

Does this account for "Oh yeah" and "Sez you"?

ARIEL.

That SCANNING Problem

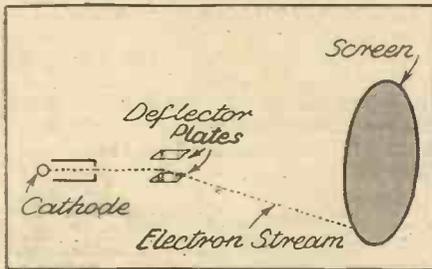
by G. V. DOWDING ASSOCIATE I.E.E.

IT is now a fairly simple matter to break a picture up into thousands of spots and send these spots through the ether in the form of radio waves. But, neglecting for the time being the receiver for picking them up, what method of forming the spots into complete pictures is going to be the most widely used?

There are several methods available, and, broadly speaking, they fall into two well-defined groups—cathode ray and mechanical.

At first sight it might appear that the problem is completely solved by the first, and we need look no farther. But I am not so sure that that is all that need be said about it.

DEFLECTING THE BEAM



By varying the voltages on the deflector plates the electron stream is moved and the position of the spot on the screen altered.

Many experts are quite dogmatic and say that all mechanical systems are quite ruled out for high-definition television reception. On the other hand, there are plenty of supporters of the mechanical systems to argue in their favour.

The fact is, television is littered with pros and cons, and that is what makes it so very interesting. At the very least it leaves the individual experimenter with plenty of scope.

Now about this building up of the picture. First of all, let us see how it can be done with the assistance of a cathode-ray tube.

No mechanically moving parts are needed for this. The main item is the cathode-ray tube itself, which is a kind of big brother to the thermionic valve.

Silent and Efficient.

There is a cathode which emits electrons, and these are made to shoot off in a concentrated stream and pass between deflector plates. After which the thin stream of electrons hits the big end of the tube, which is covered with a special chemical screen and so causes a spot of light to appear.

There are two sets of deflector plates, and when a voltage is impressed on one the electron stream, and therefore the point of light, is moved over in the one direction.

MECHANICAL OR CATHODE RAY?

Which method of scanning will prove more popular for high-definition television? As explained in this article, despite the dogmatic claims of some people mechanical systems have every right to full consideration.

The other deflector plates cause the light spot to move at right angles to this.

In this manner a complete rectangle can be covered by this sweeping spot of light if the correct fluctuating voltages are impressed upon the deflector plates. This can quite easily be done with the aid of "time bases," about which a great deal will be heard in the near future.

In favour of the cathode-ray system it can be said that it is easy to adjust the apparatus to any definition of transmission within limits. The new television service is going to transmit twenty-five pictures per second, each picture comprising 240 lines.

But should a change be made to, say, 400 lines it would be relatively easy to adjust the cathode-ray apparatus accordingly.

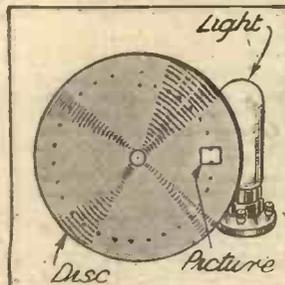
The picture obtained by this method will be quite bright, but not particularly large.

And, as I have already said, there will be no moving mechanical parts, and therefore there will be no noise.

High Voltages.

On the other hand, the cathode-ray tube itself will, for a fairly long time, be a rather expensive item, having a definitely limited life. Also it demands voltages running up to 2,000, and so it is definitely a main job. Batteries could be used, but a four-figure battery voltage is something which many would rather not face.

THE POPULAR DISC



It is quite on the cards that disc scanning may provide a solution to mechanical working for high definition.

The gear, as a whole, is bound to cost a good bit—definitely more than some will be able to afford.

If mechanical systems can be devised

which will handle the high-definition transmissions satisfactorily, then these will offer attractive possibilities. Particularly to those who are not equipped with the mains, for they will probably not require much more than hundreds of volts where the cathode ray demands thousands.

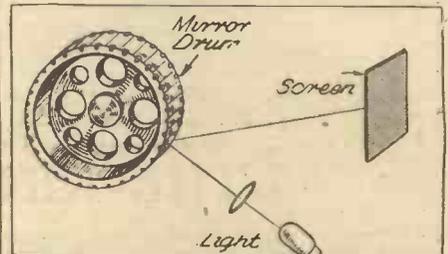
Also they will doubtless be much less expensive. The parts for a 30-line outfit cost only three or four pounds, and it is something in the same category that we require for the "high def." to make this a "riot."

Mechanical Difficulties.

And I can assure you that it would be, because the results really do possess entertainment value—there is not the slightest doubt about that. What quality of entertainment remains to be seen. That is up to the B.B.C.

There are at present two well-established mechanical scanning methods, and these are illustrated in two of the accompanying sketches.

MIRROR-DRUM SYSTEM



This popular method of 30-line scanning would appear difficult of adaptation for 240-line picture reception.

The oldest established is the disc, and many of our readers will know how simple and good that is for the 30-line stuff. But it will need 240 holes for the 240-line transmissions, and so the simplest form is at once ruled out.

You see, each hole has to be separated from its neighbours by the height of the picture. If this were three inches the disc would have to be something over twenty feet in diameter!

An alternative is to have tiny holes, spaced fairly closely, and magnify the picture afterwards. This is a quite possible solution, and I know that work is being done on these lines.

The case of the mirror drum is more complex. The correct optical setting of 240 mirrors would seem to present a very sticky problem.

It is reported from America that an entirely new form of mechanical scanner has been invented which offers great promise for high-definition work.

It comprises a tiny mirror fastened to

(Continued on page 25.)

THE special programme celebrating the King's Jubilee, which will begin about 6.30 on Monday, May 6th, leading up to the King's message to the Empire at 8 o'clock, will be the most important test of representing actuality by recording that has so far been undertaken.

The main part of the programme, lasting about one hour and ten minutes, will endeavour to give a word picture of the twenty-five years of the King's reign. This is being done by Lawrence Gilliam, the brilliant young B.B.C. producer who handled the last Christmas Day broadcast, in collaboration with Dr. Harold Temperley, Professor of Modern History at Cambridge. It will be interspersed with recorded items depicting important episodes in the history of the Empire and characteristic tributes of homage and loyalty to the Sovereign.

All this recording will have been done ahead in the places overseas where the events and incidents occurred, and there will be no pretence of the expressions being made at the time of the transmission. The result probably will be a much better and more skilled programme in the "actual" sense than has yet been broadcast. All of which reminds me of the cogency of the argument I heard from Mr. David Sarnoff, head of R.C.A., in New York, last summer. This was that broadcasting will never come into its own until it recognises that perfection in its medium cannot be secured directly. So, if the great Jubilee programme on May 6th is the success it should be, the future development of broadcasting may be considerably affected.

Those Alternative Programmes.

A friend at the "Big House" tells me that efforts are again being made to cut down the number of alternative programmes. The idea, apparently, is that there are an increasing number of programmes so good that alternatives are no longer necessary; in other words, that the whole listening public should be forced to listen to just one programme. All that I say this year, just before the year the B.B.C. Charter expires, is "Steady on B.B.C."

B.B.C. Overtime.

Most of the personnel of the B.B.C. have no recourse to the demands of those who insist on overtime; but there are signs that the anti-Trade Union attitude of the Corporation is wearing a little thin in certain directions. First of all, the engineers are required to work much longer hours than engineers that belong to Unions, and with no better pay. Then the musicians are required, through an ingenious renaming of orchestras, to work more time than they should according to ordinary precautionary health standards. I foresee a strong protest shortly.

That Cinema Organ.

Lots of listeners as well as lots of programme builders have been anxious for the B.B.C. to install a cinema organ before the Jubilee celebrations. But there is not a chance. There is just no room for the organ. The decision is that there will be an organ of this kind in the extended

building in Portland Place, which work will be begun early next week.

Dialect Announcing.

I hear that Major Gladstone Murray is advocating the introduction of dialect



REGINALD KING, whose light orchestra is a popular feature in the broadcast programmes.

announcing into the B.B.C. ritual. He is very keen on it, but is faced with the dead weight of an established system. There is Professor Lloyd James firmly entrenched. Sir John Reith is not so adamant, but

THE KING'S JUBILEE BROADCAST

NEWS AND VIEWS ABOUT THE B.B.C.

probably requires convincing. Anyway, I shall watch the struggle with interest.

The F.A. Cup Final.

Yes, my hearties. It is all O.K. for Wembley Stadium on Saturday, April 27th.

Listen To These Next Week:

REGIONAL AND NATIONAL: Thursday and Friday, March 21st and 22nd. "The Last Voyage," a play by Edward and Theodosia Thompson, produced by Howard Rose.

MIDLAND: Thursday, March 21st. The City of Birmingham Orchestra's Symphony Concert, relayed from the Birmingham Town Hall.

Friday, March 22nd. Variety relay from the Theatre Royal, Lincoln.

WESTERN: Wednesday, March 20th. "Quayside Nights"—a visit to Bristol's docks, arranged by Ewart S. Brookes.

NORTHERN: Monday, March 18th. Concert by The Hirsch Quartet from the Memorial Hall, Manchester.

Thursday, March 21st. Variety from the Pavilion Theatre Liverpool.

George Allison and Derek McCulloch, who have been responsible for the commentaries on the Cup Final for the last six years, will be in their accustomed places. The Stadium will be packed out, of course, but the world can hear how the game is progressing from start to finish.

The Boat Race.

This year's University Boat Race, which is to take place on Saturday, April 6th, will be of particular interest, as for the first time in history the Cambridge boat will be fitted with swivel rowlocks, while Oxford are being coached by two famous Cambridge Blues who are not in sympathy with this Cambridge innovation.

As usual, a running commentary will be broadcast on the race, and it will be given this year by John Snagge, a member of the B.B.C.'s "outside" broadcast department, with a descriptive background by Gerald Cock, the recently appointed Director of Television.

Later the same afternoon a commentary will be broadcast by George Allison on the Scotland v. England International Soccer match from Hampden Park, Glasgow.

Relay From Blackpool.

Particular interest attaches to Reginald Dixon's broadcast in the main Regional programme on Thursday, March 28th, inasmuch as it will be the first opportunity afforded listeners to hear the new organ which has been installed at the Tower Ballroom, Blackpool. The new instrument is approximately twice the size of the organ on which Mr. Dixon has been broadcasting for some years.

"Wheels in the West."

Interesting items will be included in the programme for Western listeners also on Thursday, March 28th, in the course of a relay from Torquay under the title of "Wheels in the West."

The programme has been arranged in connection with the R.A.C. Rally, the objects and conditions of which will first be explained in a short talk by the Western representative of the club. This will be followed by a talk by an old motorist, who will recount his experiences in the early days of motoring, which includes the story of a trip from Blackpool to Exeter that occupied a week.

Other contributors to the programme will be a seventy-two-years-old driver of a "four-in-hand"; a prize-winner in the last Monte Carlo Rally; a lady entrant who is conveying a letter of greeting from the Mayor of Torquay to the Mayor of Eastbourne; and by the Mayor who will send off the first car.

Exploring Devonshire.

Another programme of exploration through Devonshire, by E. W. Sanders, the same author who was responsible for "The Abbot's Way," which was broadcast last October, will be given for Western listeners on Friday, March 29th. It deals with the River Dart and its ever-changing scenery from its source on one of the wildest spots of Dartmoor, past Postbridge, Dartmeet,

(Continued on page 25.)



With the

EXPERIMENTER

TROUBLE IN PARADISE

OUR village is almost idyllic in the even tenor of its ways. Yet we have our worries—especially wireless worries. The three B's—Bob, Bill and Bunny—were making guzzling noises in my pewter the other evening, when Bunny choked and spluttered thus:

"This Experimenter business is all bunk. You know, if you hadn't blithered about parallel feed the other evening my set would still be working. As it is, the quality's simply awful—thanks very much for your improvements!"

Which is the kind of thing I'm inured to. These lads of the village seem to take a delight in baiting me—or trying to, for I seldom rise.

Keeping to the metaphor, it was a pretty kettle of fish. Bunny had a good old-timer of a three-valver. Which, in his opinion, was still the most wonderful set in all the world.

He had overheard me talking about the merits of side-tracking the high-tension current from the primary winding of the transformer by an anode resistance. And had promptly lost faith in that old set, tearing at its vitals in an access of passion to be *à la mode*.

Lack of Bass.

I untwined my feet from the milking stool—pinched years ago from a Devon farmer!—and asked exactly what the trouble was.

"Well, for one thing, the quality's gone: there's no bass," moaned Bunny, wrongly

rhyming the word with mass—but then his mind dwells on that kind of thing, I fear.

"And that ain't all, mister. The set won't oscillate at the top end of the wavebands. Which means I can't get some of the foreigners I want to. Oh, and another thing. The set's not a bit as lively as it used to be."

That seemed quite enough to go on with.

I stopped asking questions, broke up the party and ploughed across the mire to Bunny's mud hut—sorry, I mean farmhouse.

I switched on. Oh, dear! The set was in a bad way all right. "Tinny" doesn't nearly describe the tone. And the set certainly lacked what Bunny graphically referred to as "guts."

Then I delved into the "innards" of the set. Know

what I found? A .0001-microfarad fixed condenser as the coupling between the anode of the detector and the primary of the low-frequency transformer. No wonder the quality was so rotten!

Then I did a spot of measuring. I found the maximum high-tension voltage was 100 volts on load—while the set was working, that is. I also found a 100,000-ohm resistance in the anode of the detector.

Then, not having a specially good voltmeter on hand, I did some fiddling with the anode circuit. I took out the detector valve—a good old-timer, it was—and put in one of those neat little adaptors that split the anode circuit.

To the two terminals I hooked on a small milliammeter—and found the detector's anode circuit was passing .85 milliamperes. "Ah, only 15 volts on the anode of the detector, my lad!"—I exclaimed. Bunny didn't get that at all.

"You've just taken the anode current—how do you know what the voltage is?—why don't you measure it with the voltmeter?" He was getting quite excited.

Ohm's Law Simplified.

I explained that once upon a time there was a Bavarian named George Simon Ohm, the hard-working son of a locksmith, who during his researches as a Maths. master at Cologne discovered a Law of infinite importance to electrical science.

I drew a circle on a bit of paper. Halved it and put an E in the top half. Quartered the bottom half and put an I in the left-hand quarter and an R in the right-hand quarter.

That puts Ohm's Law in the simplest way,

I think. It shows the relationship between voltage, current and resistance. Cover up any one of these factors—assuming it to be unknown, in other words—and the relationship between the remaining two will give it, assuming them to be known.

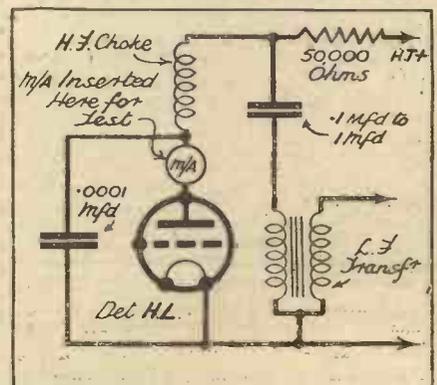
For instance, I knew the resistance was 100,000 ohms and that the current passing through the anode circuit was .85 milliamperes. I badly wanted to know the voltage being dropped across that resistance—the IR drop, as we call it.

Nothing Difficult About It.

So I just mentally covered up the E, and that left me with I to multiply by R, with I as current in amperes and R as resistance in ohms. My little sum was easy: .85 divided by 1,000 and multiplied by 100,000, giving 85 volts as the answer. The division being necessary because, of course, the .85 was milliamperes, or thousandths of an ampere.

Which gave me a voltage drop, you gather, of 85 volts across that anode

TO FIND THE VOLTAGE



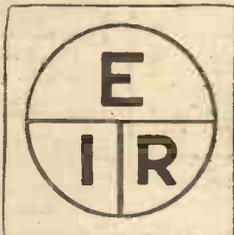
When the maximum H.T. voltage is known it is easy to find the anode voltage by calculation, using Ohm's Law.

resistance. I had already found the total voltage at the battery was 100 volts. Only 15 volts on the anode itself, then, as I had said to Bunny's astonishment.

Not enough, of course. Not nearly enough to give good detection, free from distortion and all that. Besides, on most circuits reaction would be almost impossible with such a low voltage.

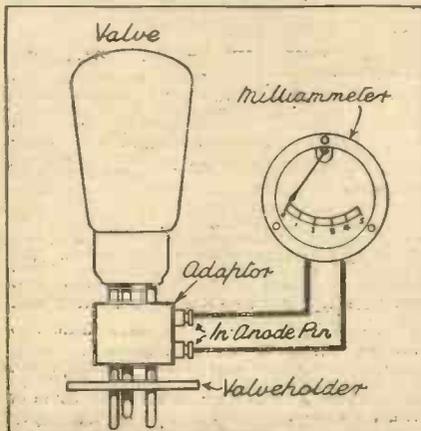
I said we had better put in a new HL valve for the detector—only 5s. 6d. these days. And with its anode impedance of only 18,000 ohms we could obey the normal rules of using an anode-load of three times

(Continued on page 24.)



The simplest way of expressing Ohm's Law.

A SPLIT-ANODE ADAPTOR



A split-anode valve adaptor enables a meter to be inserted without altering the set's wiring.

SILVER LININGS

Do you know what causes that bright deposit on the inside of your valves? How it occurs in the process of removing the last traces of gas and its effect upon the valve's life are lucidly explained

By JEFFREY JACKMAN

starts looking for trouble, which, sooner or later, develops in the form of a collision with the silver lining. Our wandering friend charges at the gettering at such terrific speed that it digs itself well in before its headlong rush is checked and it becomes occluded.

It was, of course, occluded in one of the electrodes before it commenced its adventurous journey, but magnesium is a substance that very quickly combines with most gases, so that an almost inseparable union is formed. This union is very similar to the action that takes place when magnesium ribbon is lighted: it burns, or, in other words, it combines with the air.

Absorption of Liberated Gas.

In this way the silver lining continues to absorb the gas that is liberated from the metal electrodes, and so the valve is kept in tip-top condition throughout its life, which is not brought to a premature end by losing its efficiency due to the deterioration of the vacuum.

THE silver lining which is a familiar feature of most modern valves is not generally hailed as the blessing in disguise that it really is; many think that it is there merely to enhance the appearance. It does, but, quite apart from this, it adds considerably to both efficiency and length of useful life. Gettering, as the silver lining is called, is a notable achievement of the research engineer and not a ruse to hide the interior from prying eyes: the gettering has such a pronounced influence over both efficiency and life that every listener who owns a valve should know all about it.

In order that the action of the getter may be readily understood it is desirable that the evil effect of even a minute trace of gas in a valve be fully realised. One of the most deadly enemies of the valve manufacturer is what engineers call occluded gas in the metal electrodes and their supports. Occluded gas is not nearly so technical as it sounds; it is merely odd molecules of gas held in the surface of anything and capable of being more or less easily dislodged.

Terrific Temperatures Used.

Rigid precautions against occluded gas are one of the first stages in valve manufacture, when the various bits and pieces, such as anodes and grids, are subjected to terrific temperatures to drive out any stray molecules of oxygen, nitrogen or other gas that may be lurking in the surface on the off-chance of getting loose and colliding with the electrons when on their way from filament to anode: in other words, making the valve soft. Extravagant precautions are taken. In at least one factory every worker wears white gloves, which are changed three times every day as an additional safeguard against any unwanted substance getting into the valve bulb.

When the valve is pumped the bulb is heated until it nearly melts, and the anodes and grids are heated until they, also, nearly melt; in fact, everything possible is done, but still traces of gas are left in the metal and also loose in the bulb, as there comes a time when the most efficient vacuum pump in the world can do no more. The remaining molecules are so few in number that they float about without any incentive to travel out of the bulb into the pump. A simple analogy is a water pump, which will never pump up the last few drops.

Firing the Gettering.

When the vacuum pump has done all that it can the getter is "fired," and one of the most fascinating phenomena in modern industry comes into play. The getter in the "raw" state is a piece of magnesium ribbon which, at the appropriate moment, is vaporised by plunging the valve into a magnetic field that is so intense that the getter reaches the necessary temperature in a few seconds.

The magnesium molecules thus freed fly to the sides of the bulb at incredible speed. En route the magnesium molecules "pick up" any odd gas molecules that may be floating about and take them along to the bulb, where they become imprisoned as an unshiftable part of the silver lining, and consequently cannot get between filament (or cathode) and anode, which is the only place where their presence would be harmful. The reader will now appreciate how the getter makes a valve more efficient by making the vacuum as nearly perfect as possible, ensuring that the valve has no adverse effect on quality, range or the selectivity of the receiver.

Keeping the Vacuum Good.

It now remains to explain how the getter prolongs the useful life of the valve, so that there is still another story to tell. The getter continues to look after the vacuum, which would otherwise steadily deteriorate with each minute of use due to the natural

ENSURING SAFETY IN THE AIR



The new direction-finding receiver at Fulham Air Station, Norfolk. The apparatus is used in conjunction with that at Croydon and Lympne, and provides air pilots with a means of readily ascertaining their position.

warming up of the anode, the bombardment of grids, and so on and other causes: molecules of gas are knocked out of the electrodes into the path of the electrons, where they very quickly get into trouble, as the first head-on collision with an electron usually results in the gas molecule having one of its own electrons knocked out of it, which makes it positive.

The positive molecule is now repelled by the anode because it also is positive, and two bodies of the same polarity repel each other.

Thus flung into space, it immediately

HELPING THE UNEMPLOYED

Prof. John Hilton's talks are among the most inspiring of the present B.B.C. programmes, says our radio critic.

BROADCASTING has always been ready to help the cause of the unemployed. Unemployment talks there have been now for several years. There was, for instance, that remarkable series by S. P. B. Mals, the object of which was the provision of more and better physical and mental recreation for the workless. This was a great service done.

But an even more remarkable series, at present under way, is being enthusiastically received. I mean, of course, Professor John Hilton's series entitled "This and That." The success of these talks is due to several reasons. First of all, there is the romantic and inspiring life story of the speaker himself. Then there is John Hilton's unique manner. He talks to the unemployed on questions they themselves have supplied.

One Imagines Him.

As he talks one can't but imagine him sitting among his hearers, breezily but encouragingly discussing their many difficulties. Nothing but success can come of talks of this nature. To listeners generally John Hilton is an inspiration.

It was bad luck on the organisers of the St. David's Day celebrations that the broadcast from Cardiff coincided with a relay from all German stations of the Saar celebrations. Herr Hitler is always a draw whenever he is on the air, and this speech from Saarbrücken of glorification of the New Germany was no exception to the rule.

I understand that Herr Hitler has to be seen to be best enjoyed. His expressive face is remarkable and his eyes are irresistible in their appeal. The speech from Saarbrücken was throughout interrupted by a tumult of cheering, and there were many "Heils." But broadcasting could cope with it all.

A typically German band played a number of national songs and the people joined in the singing with the same enthusiasm that had characterised the whole proceedings. It is such broadcasts as this that always bring home to me the wonders of wireless.

The St. David's Day programme took the form of
(Continued on page 24.)

RECOMMENDED WRINKLES



A REACTION TIP.

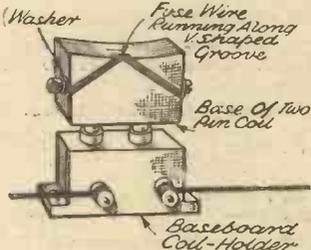
SOMETIMES the bakelite dielectric type of reaction condenser develops an annoying fault—a scraping sound at one spot of its travel. This means that any station situated at this spot will not be properly received. This difficulty can be overcome by increasing the H.T. (or, in the case of a valve which is already receiving the full H.T., by decreasing). This will cause the set to oscillate, either beyond or short of the spot where the scraping sound occurs.

Of course, it will transfer the trouble to some other station, so it is recommended that this procedure be followed only when it is desired to receive the station which was interfered with in the first instance.

A HANDY PLUG-IN FUSE.

THIS handy little plug-in fuse is very simple to make and has the advantage that it can be easily and cheaply renewed at any time that it may "blow".

The two-pin coil plug and holder should be found in most junk boxes—silent witnesses of a bygone day! As can be seen from the diagram, two

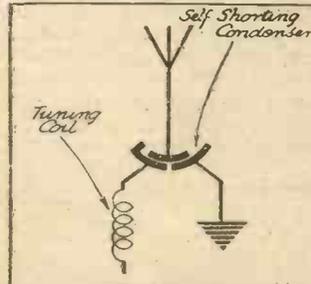


One useful way of employing old two-pin coil mounts.

grooves are cut in the side of the plug to form an inverted V. Suitable fuse wire, which can be bought very cheaply, is run from one side terminal to the other via the V; washers should be put over the terminals to hold the wire tight and give good contact. The coil holder can then be mounted and wired in its necessary position in the mains unit or receiver.

A NEW SELECTIVITY CONTROL.

A SELF-SHORTING differential reaction condenser, as used in the wonderful "P.W." A.T.B. sets, is



By means of the shorting position this series-aerial condenser can be cut out of circuit.

connected as shown in the diagram. When selectivity control is not required the condenser is turned to the shorted position.

LEAKY SWITCHES.

WHEN switches of the plunger type are being overhauled after long usage look out for any signs of a metallic deposit on the ebonite collar that insulates the spindle.

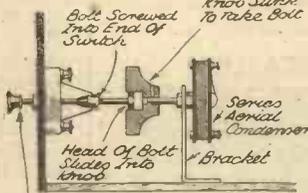
Sometimes this collar takes on a distinctly "brassy" appearance, due to continual friction with the spring contacts at each side.

Although it is not likely such a condition will allow any current flow in the case of an L.T. switch, there may occur a high-frequency loss if the switch is used for wavechanging or similar H.F. separations.

A collar in this state can be cleaned with glasspaper or with a knife-edge lightly scraped across it.

ELIMINATING KNOBS.

ONE of the first things a constructor tries to do, when a set is ready for the drawing room, is to eliminate some of the knobs. The sketch shows how



The wavechange switch also operates the series-aerial condenser.

I ganged a wavechange switch to a series-aerial condenser. The switch was of the push-pull type and the pear-shaped bulb unscrewed slightly to allow for the insertion of a hexagonal-headed bolt. The spindle hole in the condenser knob was then drilled right through and part filed with a small square file to take the hexagonal-headed bolt. The condenser was mounted on the baseboard by a bracket. The selectivity could thus be controlled from the panel. A smaller degree of selectivity is normally required on the long waves; thus this device proved very convenient.

EARTHING LEAD CABLES.

I AM forwarding this to you, as it may be of personal interest to your readers. Many, I have no doubt, suffer from parasitic noises in their receivers, and blame other sources than the possibly correct one.

In my case my three-valve set gave satisfaction, H.T. fed from A.C. mains, excepting that now and then when a switch was operated, even on a separate circuit (top flat), an insistent buzzing took place and spoilt reception.

I was very puzzled for some time, but, by process of elimination, suspected that the cable, in my case lead covered, had not been earthed.

I inspected the loft, and found that our lines had not been earthed, and, on my rectifying this fault have not been troubled by buzzing and parasitic noises since.

I am afraid this does not speak well for the wireman who installed the circuits; but this type of work, or, as it should be expressed, bodging, does take place a good deal, as I have met with it in my business, being an electrician myself.

Of course, obvious and external wiring is not to be suspected usually, as electricity supply inspectors are, as a rule, careful to see that it is earthed.

TINNING AWKWARD ARTICLES.

FOR some time I have used the following wrinkle to "tin" brass, etc., at home:

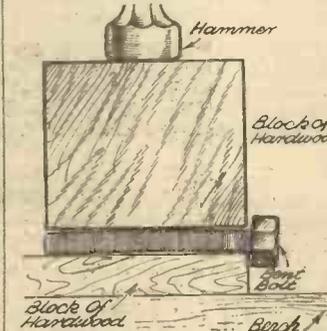
Some tin was bought from a chemist, also some cream of tartar. A little soda is also necessary.

The procedure is as follows: Clean well the article to be tinned with emery cloth. Awkward shapes can be cleaned by boiling in soda water. The metal is then put in some convenient can and covered with tin. About two teaspoonfuls of cream of tartar are added, and the lot covered with cold water. It is now brought to the boil and allowed to simmer for about half an hour. Pour the liquid away and put the tin and article under a tap for a few moments, to wash away all traces of the cream of tartar. Pick out the metal, dry with a cloth, and it is seen to be covered with a thin layer of tin. The remaining tin can be used again and again. Mine has lasted me for about a year.

STRAIGHTENING BENT BOLTS.

WHEN it is necessary to use a bent bolt, don't place it on a flat surface and proceed to hammer it into a good shape; this will ruin the thread.

Place the bolt on a flat piece of hardwood, with its head over the edge



The thread remains undamaged when this method of straightening a bolt is used.

and the "hump" or bend in it uppermost. Hold it in this position and take a piece of close-grained hardwood and stand it end-on to the bolt. Steady it in this position and give its upper end a couple of good blows with the hammer—and you'll find the bolt straightened and the thread in good order.

PLANNING LAYOUTS.

WHEN planning a proposed layout on a baseboard or making a wiring diagram, I find it helpful to make cardboard patterns of all the components used by laying the

components on a piece of card-board and drawing round them with a pencil and cutting out with scissors or a sharp knife.

These patterns can then be placed or moved about in different positions till the best layout is found, the final positions being marked on the baseboard by drawing round the cardboard patterns with a pencil.

Even if it is not desired to make up a set from the sketch, a useful amount of experience is gained in planning out different layouts in this way.

SIMPLIFIED SOLDERING.

HOW often have we heard it said, "Oh, I can't do soldering!" Yet how many people could manage it quite easily if they could only carry out the fundamental principles.

A clean iron and clean work. Still, how many people can keep a clean iron? For no sooner than they put it back over the gas jet, it is black again. And what a time it has to stay there to get hot!

Well, here is a good wrinkle. It is one that I have followed, and with the same piece of appliance, for more than ten years.

Obtain a piece of three- or four-inch half-round iron sheeting, and about



Keep the iron under cover.

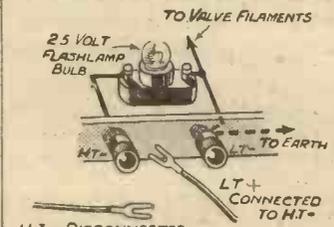
six inches long. Turn this upside down over the gas jet, and you have a first-class soldering stove for the price of two or three pence.

At the same time you will find the soldering iron will keep clean for ages.

A PERMANENT INSPECTION LAMP.

RATHER than go to the trouble of fixing a separate inspection lamp in the set when I have some little jobs to do inside, I have found the following dodge very satisfactory, and one which can be used in the minimum of time.

Use an ordinary 2.5-volt flashlamp



The fuse gives interior illumination to the set.

bulb as a fuse between H.T.— and L.T.— (The bulb, of course, having a horizontal filament.)

The H.T.— spade terminal is disconnected from H.T.— terminal on set, and the L.T.+ spade terminal is transferred to H.T.— terminal on set.

The bulb is then connected directly across the L.T. battery. It is not absolutely necessary to disconnect H.T.—, but it is a desirable precaution.

ONE GUINEA FOR THE BEST WRINKLE!

Readers are invited to send a short description, with sketch, of any original and practical radio idea. Each week £1 ls. will be paid for the best Wrinkle from a reader, and others published will be paid for at our usual rates.

Each hint must be on a separate piece of paper, written on one side of the page. Address your hints to the Technical Editor, "Popular Wireless," Tallis House, Tallis Street, E.C.4, marking the envelope "Recommended Wrinkles."

Will readers please note that the Editor cannot, in any circumstances, guarantee to return rejected Wrinkles, and that payment for published hints is not made until ten days after they appear?

The best contribution in our last selection of Wrinkles, published on February 23rd, was sent by Mr. A. Youngman, 51, Bentry Road, Chadwell Heath.

THE "RADIO FIRE ENGINE"

In order to facilitate communication between the fire station and the engines, the Northwood Fire Brigade is equipping itself with 5-metre transmitter and receiving outfits.

"HULLO, station. 'Gladys' here. We understand we are to proceed to assist the Ruislip auxiliary." That is the sort of thing that listeners on 5 metres in the neighbourhood of Northwood, Middlesex, may shortly hear. For, thanks to Station Officer Snell, the Northwood and Ruislip Fire Brigade is being fitted up with 5-metre two-way transmitting and receiving gear.

Their latest escape, "Gladys," a fine piece of engineering, and designed by S. O. Snell, is being fitted with a battery-operated $2\frac{1}{2}$ -watt transmitter and a receiver, neatly stowed away under the seats of the machine. The fire station at Northwood is also having a 5-metre transmitter and receiver worked from a specially erected aerial slung between the practice tower and a ten-foot mast on top of the station roof.

Keeping in Constant Touch.

Twin feeders will run down from the quarter-wavelength aerial to the $2\frac{1}{2}$ -watt transmitter and the receiver so that the chief of the brigade, on the escape, may be in constant touch by radio with the station.

This will be invaluable, for the area covered by the Northwood brigade is something like 25 square miles, and they take in places as far as 6 miles distant, looking after the neighbouring township of Ruislip. In this town is an auxiliary engine, but the main reliance for fire fighting is placed in the Northwood staff.

Much time in necessary communication between the engines and the station will be saved if the men can speak by radio

instead of having to depend on the ordinary phone service, and it is Officer Snell's ambition to inaugurate and perfect the radio link between mobile and fixed units of the brigade in the near future.

Already a start has been made, and our cover photo this week shows an experimental set in operation on the escape, while the illustration on this page shows S. O. Snell at the transmitter in the station building. The small aerial on the escape will probably give place to a better one arranged on the first section of the escape ladder, and so arranged that it will in no

AT THE STATION



The chief of the brigade (standing) and Station Officer Snell testing the outfit at Northwood.

IT is often asked whether A.C. mains devices can be operated satisfactorily off a supply frequency other than the one for which they are designed.

In some instances this is obviously impracticable. For example, A.C. gramophone motors of the induction and synchronous types will only run at their rated speed at one frequency, and the same applies to certain classes of motor converters used for battery charging, etc.

The Question of Transformers.

On the other hand, most mains receivers will work equally well on a range of 40/50 cycles, which implies that frequency itself has negligible effect on the voltages used. It will be interesting to consider this point and to decide whether, say, a transformer designed for 50 cycles can be used off 25 cycles, or vice versa.

For the question essentially reduces to the performance of the mains transformer at different frequencies. If we can get the same voltage off the secondary the voltages in the rest of the circuit must, of necessity, be the same, i.e. the receiver will still function, with normal currents.

Now, a pretty straightforward answer can be given to this point. Provided the

primary volts are constant the "step-up" or "step-down" ratio of a transformer is a constant *entirely independent of frequency*. It depends only upon the ratio of primary to secondary turns, and, as long as this is

MAINS "FREQUENCY" PROBLEMS

By HANDEL REES

unaltered, frequency will not affect the voltage obtained off the secondary.

But, unfortunately, the matter is not quite so simple. Equal secondary volts do not necessarily mean a satisfactory performance on the primary side. In fact, at a considerably lower frequency than the one specified the primary and core may get seriously overheated, due to a large rise in flux and magnetising current.

It will be observed that the latter quantities *increase* as the frequency is *decreased*. It follows that the use of a *higher* frequency will result in a proportional reduction in flux, although the core losses will be somewhat increased. In fact, transformers

way interfere with the operation of that very necessary piece of apparatus.

The receiver and the transmitter will be stowed away under the deck of the escape, and both will be ready for use at a moment's notice.

Incidentally, Officer Snell, the designer of the gear, is a regular reader of POPULAR WIRELESS, and when I was chatting to him the other day he asked me if I would come along and test the gear out for myself when the official tests were made. I am looking forward to those tests, for they are bound to prove exceedingly interesting.

Promising Results Obtained.

So far very promising results have been obtained, but there still remains much to be done before the final gear is ready and housed in position, and it is all being made by Officer Snell, who is also responsible for much of the modern equipment of this most go-ahead brigade. He is certainly a live wire.

The chief snag is the fact that the electric railway, the "Met.," runs along behind the station and causes a "blank out" of reception whenever a train passes. It is hoped, however, that this trouble will be solved shortly.

A three-stage speech amplifier is used at the station and serves to modulate the transmitting valve, while the range of the apparatus, even on the temporary aerial, has clearly shown the great possibilities of the scheme. Representation to the G.P.O. is to be made with a view to the permanent erection of the radio station.

A Great Enthusiast.

Station Officer Snell is certainly an enthusiast, in radio as in his more direct work for the brigade. He is constantly carrying out research on various fire-fighting gear and is determined to make Northwood one of the most up-to-date brigades in the country.

He welcomes television too, he told me, and pictures the day when television may be harnessed to the aid of the fireman.

K. D. R.

can be operated at considerably higher frequency with advantage. Thus a 25-cycle transformer will generally give an improved performance off a 50-cycle supply.

But when a transformer made for 50 cycles is used on 25 cycles, the flux rises to about twice its normal value. What is more significant, the resulting magnetising current in the primary will rise by more than 100 per cent, since the relation between flux and current is not one of simple proportion: when the core approaches magnetic saturation a small increase in flux requires a current rise out of all proportion.

Effect of Temperature.

Now, the heating in the primary is proportional to the *square* of the current. That is to say, if we double the current, *four times* the quantity of heat will be generated, or nine times for a trebled current, and so on. Evidently, then, temperature rise sets a sharp limit to the lowest frequency that can be used with impunity.

Generally, for a given output, voltage and primary turns the lower the frequency the thicker must be the core in order to keep the flux density within a predetermined limit.

ON THE SHORT WAVES

Conducted by W.L.S.

I HAVE been surprised recently by the number of letters that have reached me from readers who want circuits to play with. Quite a few of them have reached the stage at which they are a little disdainful of "layout" diagrams, and even find them harder to follow than theoretical circuits.

Some want theoretical diagrams of complete receivers, and others would rather like just a sketchy idea of some sort of circuit that they can experiment with. To oblige these latter I want to talk this week about a very useful multi-purpose short-wave oscillator, but first about a push-pull detector.

It is significant that most of the high-powered short-wave transmitters use a push-pull arrangement nowadays. The chief merits of push-pull are simplicity and symmetry. It is impossible, without using two valves, to produce a circuit that is completely symmetrical, but nearly all push-pull circuits come automatically in that category.

A Two-Valve Detector.

Symmetry isn't just a matter of pleasing the eye—it invariably makes for high efficiency and low losses.

But we aren't talking about transmitters at the moment, and perhaps you are wondering what is coming. Well, to start with, there's Fig. 1, on this page, which shows that a detector circuit can be made to look very pretty if one uses two valves. One needs a centre-tapped grid coil, but the reaction coil is split into two sections (equal, of course), one of which is coupled to each end of the grid coil.

Instead of using two separate grid condensers and leaks, it is usual to employ the "Split Colpitts" circuit shown, with one grid leak in what looks like a very unconventional position.

I can already hear people asking: "But is it really worth my while to use two valves instead of one?" Well, in my opinion it is. The circuit shown is much more stable, its reaction control is more effective and it will go down much lower in wavelength than the equivalent circuit re-drawn for a single valve.

One Big Advantage.

It has been used down as low as 2½ metres with success, and I am using it at present for 5- and 7-metre experiments. One great advantage of it—not shown in the diagram—is that it can be used most efficiently with a matched-impedance or doublet aerial.

In such a case both ends of the aerial coil are "live," the centre being earthed.

It is impossible to provide a really logical means of coupling such a coil to an ordinary detector circuit, but it just fits a push-pull circuit like this, in which the grid coil is similarly arranged.

An ordinary Class B output valve may be used instead of the two triodes shown, although a little experimental work with grid bias and different values of grid leaks will probably be necessary.

with a straight piece of wire (centre-tapped, of course!) in place of the anode coil; and with larger coupling condensers I have made it work with a pair of phones (again centre-tapped) as the inductance.

By pushing up the H.T. voltage and using two valves of the L.S.5 class instead of the small Class B valve the layout becomes a transmitter. At the other end of the scale it will oscillate with about 1½ volts of H.T., and makes an excellent signal generator which can be mounted in a tin can at the bottom of the garden and used as a test signal for new receivers!

Probably its most useful sphere of activities is in a superhet. It is, of course, essential for the short-wave oscillator of a modern superhet to be really stable. The ordinary

throttle-controlled detector circuit is all very well in its way for this purpose, but we don't want to be burdened with a variable reaction control on the short-wave side of a superhet, and that circuit will often "squeal" over part of the range if a fixed reaction control is provided.

Oscillates Perfectly Evenly.

Not so with this push-pull arrangement. It will oscillate perfectly evenly from one end of the range to the other, and its frequency is less affected by variations in H.T. and L.T. supply than that of most circuits.

Incidentally, I might mention that a series-gap condenser—both for the push-pull detector and the oscillator circuit—is a refinement that is well worth while. Failing that, an ordinary double condenser may be used and the moving plates connected to the centre of the coil; either method will give a control that is free from hand capacity.

Obviously, you cannot arrange either of these circuits with an ordinary variable condenser mounted on a metal panel, since both sides of it are "live."

One of these days I am going to produce a short-waver employing push-pull throughout! Starting off with a matched-impedance aerial lead-in, we shall pass through push-pull H.F., ditto detector, ditto L.F., probably feeling into push-pull loudspeakers! Then, no doubt, we shall remove half the valves and find that it works even better without them.

Very Fascinating to Use.

I assure you quite seriously, however, that if you are the least bit experimentally minded you will find push-pull detectors very fascinating. Get down to it right away and find out for yourself.

And remember that practically any well-known circuit can be adapted to push-pull,

PUSH-PULL SUGGESTIONS

Outlines of some circuit arrangements which experimentally minded short-wave enthusiasts will delight in trying out.

A really beautiful application of the Class B valve, however, is shown in Fig. 2 on the next page. This is a short-wave oscillator circuit which may be used for all sorts of jobs. I have had one of these going as a heterodyne wavemeter, a monitor, the beat-frequency oscillator for a short-wave superhet and a low-power transmitter.

NICELY SYMMETRICAL

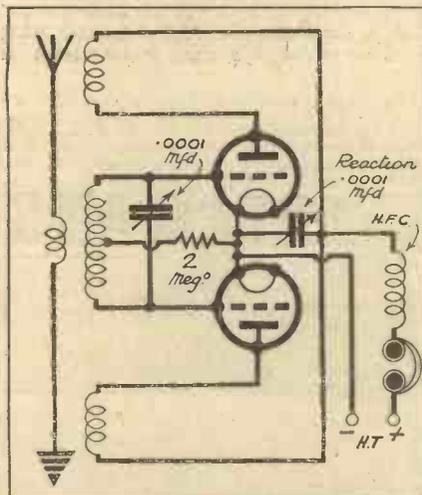


Fig. 1. One of the advantages of push-pull schemes is the attractive layouts to which they lend themselves.

The circuit, as you will see, is simplicity itself, and it will oscillate over a wider range of frequencies than anything else I know. The centre-tapped anode coil is the only variable factor over a range of frequencies from 12 cycles to 60 megacycles—and who shall say that from 12 to 60 million isn't a good range?

I have actually had this circuit oscillating

ON THE SHORT WAVES (Continued from previous page.)

WHAT READERS ARE SAYING

F. V. M. (Coventry) asks too many questions for me to deal comprehensively with his letter, but he brings up the subject of QSL's, which is just about due for review.

He asks: "If I log (a) amateurs and (b) commercial stations and report to them, how can I ensure confirmation, and what shall I enclose, if needed?" Let us take the amateurs first.

If you report an amateur's signals you are pretty sure of a card by return of post if your reception is something out of the ordinary. For instance, if you hear, for the first time, an amateur in (say) Liberia and send him a full and detailed report on signal strength, wavelength, station with whom he was working, conditions at the time, etc., you will probably receive a QSL from him post-haste.

One of Many Reports.

If, on the other hand, you hear a British amateur on telephony and send him a report the chances are that yours will be one of forty-five arriving by the same post. Human nature being what it is, your chance of a reply is rather more slender, unless you enclose a stamped, addressed envelope or, at least, a penny stamp.

Commercials are different. Many of them do not derive the least information from the fact that their signals have been received. If you were to report that on a certain day you could not hear them you would be more likely to receive a reply. Some of the lower-powered broadcast stations in remote corners of the earth do, however, welcome reports on their transmissions, but they welcome an International Reply Coupon at least as much.

G. W. G. (Ipswich), overjoyed at finding that JHB really is a "Jap," discovers that he has heard all continents at last.

If the film and record people had their way we should soon have an entirely new language. Where new words were not available we should substitute old ones with totally new meanings. The medical dictionary, difficult to understand as it already is, would become completely unintelligible, and the present terrors of official horticulture jargon would be as simple as first-grade primer stories in comparison with the new "hotcha" gospel.

All of which is brought about by the mental agony I experienced when I first read the title of Mac Quental's latest record, *I've Got a Pain in My Sawdust*. The vagueness of the anatomical whereabouts of the said pain, as expressed by the bland title, is exquisite in its mental torture.

Where is the Pain?

One is bound to ponder over the words and to wonder where the poor lady is suffering (and I suppose that in that very fact the advertising pundits have got home on you), and the probably hoped-for result of the publicity hounds is that you will forthwith fly out to the nearest dealer and get the record to set your mind at ease on the subject.

Well, I am not going to help you. I have suffered myself owing to the title, and have developed a most annoying discomfort in the region between head and shoulders—in fact, it has given me a decided pain in the neck, and I am in no mood to take on the rôle of martyr so that you should be saved the same agony.

But I will tell you that the record is Decca No. F5452, and the singer is that lady to whom we are indebted for quite a number of the noises on some of the most amusing films—namely, the "Betty Boop Girl." I trust your sawdust will not be adversely affected by this latest chip off the Hollywood block.

Just released is probably the last record made

He is rebuilding two sets—one with an untuned H.F. stage and the other using a screen-grid note-mag., as already described in these columns. He wants to try a short-wave frame aerial for portable work.

C. L. (Birkenhead) continues to send long lists of calls heard. Using my "Pen-Det.," he reports that he has not missed Sydney (VK2ME) on a single Sunday from Nov. 25th, 1934, to date. Furthermore, the strength has never dropped below R4.

He has infected seven of his friends with the Pen-Det. virus, and they all work!

W. D., in a cheery letter from Bangkok (good DX!), confesses that I started him off with short waves in February, 1928, with a set described as something extra

A CLASS B OSCILLATOR

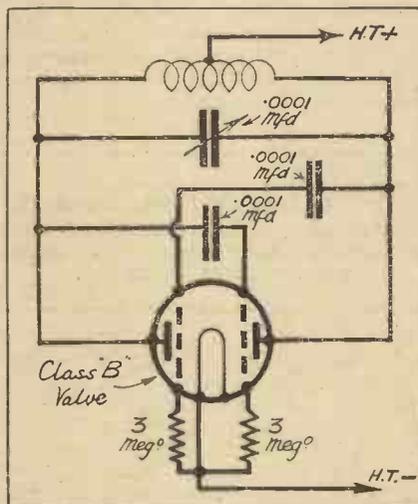


Fig. 2.—A novel use for a Class B valve to which W. L. S. makes reference on the previous page.

good. Since then he has never recovered from the disease. He says, among other things, that he can't imagine anyone using a triode as detector, once they've tried an S.G. for themselves.

Is there a nearer approach to a modern Job than W. D.? Near by, he says, they

have a high-powered commercial transmitter on which they train telegraph operators. The wave is round about 31.5 metres, and W. D. says when this is working—learning, not sending—its wave is quite clear and sharp; but when Sydney, Bombay, G.S.C., Melbourne, G.S.B. and Zeesen are all on, in amongst them it goes grrrrsh, brrrrsh, and absolutely murders reception.

Not All Honey!

Letters to the local authorities have no effect—even the offer of the loan of a buzzer for training purposes hasn't cleared the air. Add to this W. D.'s description of the local trams—so noisy that he thinks they've removed the commutators and are using the armature spiders instead—and the fact that there is no redress, no local broadcast, but the Government takes one's licence fee just the same, and you'll agree that life isn't all honey.

Sorry, W. D. If I'm ever passing I'll drop in and console you.

A six-page letter about the "B.C.L." Two (with digressions) arrives from J. R. (Margate). Let me quote: "Dear W. L. S.,—Although for some years now I have read and inwardly digested your S.W. notes and sets, this is the first time I have dared to send you a line on the subject. I've personally dabbled in short waves for some years, but owing to a perfectly ghastly set-building complex even the best of my creations have lasted but a very short while up to now."

Hand Capacity Eliminated.

J. R. and I would get on rather well, I think. The better my sets go the quicker I pull 'em to bits again. He makes the point that one cannot underestimate the value of short grid-circuit wiring. He has even shortened the leads in the "B.C.L." Two by sticking up a little post in the middle of the set, with the valve holder on one side and the coils on the other. Length of wiring from A.T.I. to A.T.C.—½ inch!

Result—no hand capacity; you can wring the phone cords out and nothing happens. W. L. S.



by that rapidly rising young film actor, Russ Colombo, who was accidentally shot dead some time ago in Hollywood. The recording was carried out the day before the accident, and is published by Decca on F5405. The titles are *Too Beautiful for Words* and *When You're in Love*. Rather a poignant record, this.

Once upon a time the harp was regarded by most as the one and only instrument allowed inside the gates of the Holy City, and it was, moreover, considered to be an essentially serious instrument, used by us straying mortals only for music of the highest order or for the accompaniment of ballads sung by serious-voiced artists. It has fallen from its high estate, I am sorry to say, and not infrequently we have heard the harp used in connection with dance music, and syncopated harp solos are not unknown.

Perhaps you have not heard a harp playing rhythm. If not, hearken to the record just made by Jack Teagarden and his Orchestra on Brunswick 01979. The title is not at all in keeping with the accepted idea of harp music, being blandly *Junk Man*.

Jack Teagarden is, of course, the famous trombonist. In the last year or so he has become famous as a vocalist of no mean order, owing to the energies of one Jack Kapp, who was at the time in charge of the recording for Brunswick in New York. He was listening to some old recordings of Red Nichols and his Five Pennies, and he was intrigued by the vocal work. On inquiry he found that Jack Teagarden, the trombonist of the combination, was responsible, so he sought him out and made him do the vocal records which have been so popular.

Denny Dennis, Roy Fox's vocal find, has again turned out a fine record with the popular band (Decca F5401). It contains *Blue Moon* and *Tiny Little Finger Prints*. Roy Fox seems to be growing steadily in popularity among gramophiles, and Decca are to be congratulated for the early support that they gave to him some years ago when he first thought of forming an English band. That was before he went to the Monseigneur Restaurant, where he made such a success with his comedy numbers of Minnie the Mocher.

A Wonderful Amount of Energy.

Roy Fox suffers from rather delicate health, and it is always a wonder to me how he keeps at it, touring the country as he is at the moment, fulfilling engagements throughout the length and breadth of the land. I believe he is booked right up for many months to come, and his activity is astonishing.

Once more I am glad to welcome our leading comedienne Grace Fields in record form. She has made two excellent recordings for H.M.V. (B286), and you should certainly hear them. The first is *Your Dog's Come Home Again* and the other is *If All the World Were Mine*. I must urge you not to miss these.

K. D. R.

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TELEVISION

HOW THE TIME BASE WORKS

LAST week I discussed the most simple, primitive way of producing a suitable "saw-tooth" voltage for cathode-ray scanning. We employed, you will remember, a simple neon tube across a condenser which was being slowly charged from a constant voltage.

Curiously enough, I received a letter from a reader (written before that article was published) which brings up the very points I had decided to cover this week.

He writes that he has seen a circuit for a double-time base which employs ten valves, for use with a cathode-ray tube, and asks: "Why cannot an ordinary circuit employing a neon tube be used for that purpose?"

Admittedly, double-time-base circuits, when drawn out in full, are about the most complicated things that the average reader has yet been called upon to study. They are most fearsome-looking things until one understands clearly the purpose of every component included in them.

The "Halfway House."

I am, I hope, providing a "halfway house" this week by showing a simplified diagram of one of these schemes in a way that everyone should be able to understand. First, however, we have got to understand the purpose of the modern gas-discharge triode (certain types being known as "Thyratrons"), which replaces the neon tube.

This gas-filled relay (to give it yet another name) operates in a way which has a parallel in the working of an ordinary triode valve. A grid is inserted between the anode and the cathode, and the behaviour of the anode current can be controlled by the grid, but in quite a different way from the control in a hard valve.

Filled with Gas

The discharge taking place in a gas-filled relay is really an arc from a hot cathode to a positively charged anode, this arc taking place, usually, through mercury vapour. This discharge is due to ions, not to electrons, and that is the basic difference between the operation of an ordinary valve and that of a gas-discharge triode.

The effect of the grid in one of these tubes is to give us a control of the anode voltage necessary to cause the discharge. Anyone understanding the operation of a low-frequency amplifier will be able to understand the fact that a high negative charge on our grid will make it necessary for a higher voltage to be applied to the anode before the "flash-over" occurs.

Once the discharge has started the impedance of the tube is very low, and the voltage on the grid does not affect the value

An explanation of the straightforward fundamentals underlying some of the most complicated-looking circuits.

By L. H. THOMAS.

of the anode current—it only controls the striking voltage.

So much, then, for the gas-filled relay. Now what about all those diodes that one often sees in time-base circuits? Well, that is quite easy to understand. The essential property of a diode rectifier with a very dull filament is that the current that it will pass is independent of the voltage applied to it. In other words, if the filament voltage is kept low enough the valve will be completely saturated, and variations in the H.T. voltage will have no effect upon the anode current.

The current passed by the diode flows into the condenser across which our gas tube is connected, and it is, of course, essential that this current should flow at a perfectly constant rate. Hence the diode, or, in more modern circuits, the pentode, which is used for a similar purpose.

of control over this before we can get our pictures the right shape. A cathode-ray tube used on the present 30-line transmissions must have its time base adjusted so that the vertical swing represents seven units of length and the horizontal swing three.

The size of the condenser C1 would also control the frequency at which the discharge occurred, but fixed condensers are generally used.

I must "rub it in" here that the diagram does not represent a complete practical time-base circuit. It is in very much simplified form, but the basic principle is there.

H.F. Pentodes Often Used.

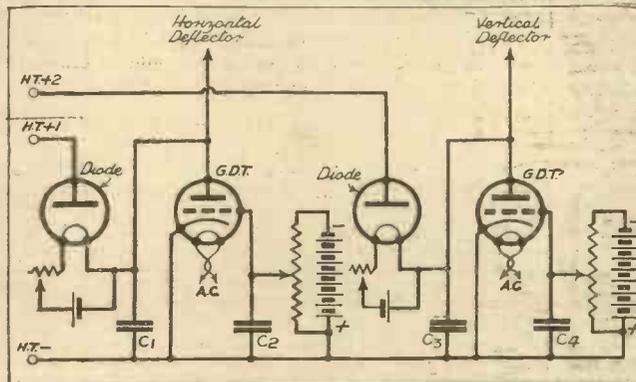
The right-hand half is a duplicate of the left, but one section is connected to the horizontal deflectors and the other to the vertical. The speeds at which the two operate are, of course, widely different. For the existing low-definition transmissions one would have a frequency of 12½, the other of 375.

For 180-line transmissions one will operate at 25 and the other at 4,500.

In practice, diodes are seldom used. Some people are quite successful with the use of H.T. supplied by a good mains unit, final control being effected by variable resistances. Generally, however, a pentode is used in place of the diode, and the variable control is then applied to the screen.

The filament can be heated from the common supply, whereas a diode needs a separate filament supply of its own. A full-working time-base circuit is easy enough to construct from a blue print with full instructions, but it certainly is a little complicated to understand on paper.

A COMPLETE SCANNING CIRCUIT



All the essentials of a double-time base for scanning purposes are included in this circuit. Refinements are omitted to simplify the explanation.

Now study Fig. 1, one half at a time. The left-hand section is connected to the horizontal deflectors—by which we mean the vertical pair of plates, which control the horizontal movement of the beam of electrons in our cathode-ray tube. Refer back to the diagram in last week's issue.

Speed and Length of Swing.

We have two variable controls for this half of the circuit. The filament voltage of the diode valve controls speed of scanning—i.e. number of times per second at which the discharge takes place—and the grid voltage of the gas-discharge tube controls the "length of swing."

Obviously, we have got to have some sort

The Receiver Side.

So far we have said nothing about the various methods by which the incoming signal is applied to the cathode-ray tube; but as we haven't yet touched upon the means of producing the signal, where ultra-short-wave transmissions are concerned, I propose to make a break next week and deal with some points arising on that score.

My fellow-scribe, W. L. S., tells me that he is dealing with superhets for ordinary short-wave reception, but as he will not be covering television I propose to talk about a few of the more important points.

There is a whole lot to deal with, of course, and at the moment, without definite information concerning the exact details of the coming television service, we must be content with fundamentals instead of the intimate details that will come later.

TELEVISION.—Page 2.

TELEVISION

JOTTINGS

Some notes on various aspects of modern reception.

FROM the number of letters I have received since I have more or less "dropped" the subject of 30-line transmissions it is evident that readers are still interested in them.

As a matter of fact, I thought I had covered the various methods of receiving them fairly comprehensively, and proposed to keep further references to them until something outstanding turned up.

Useful Experimental Work.

It is obvious, however, that a very useful amount of experimental work is still being done by the television pioneers, some of whom don't appear to be the least bit thrilled by the imminence of brighter and better vision!

As far as my own experiments are concerned, I must say that I should never dream of going back to a neon tube after the experiences I have had with the various types of white-light lamps.

I had always imagined that the eye-strain one experienced after forty-five minutes of televiewing was due to the slow picture speed and the relatively slow scanning motion. I find, however, that it is entirely absent when one uses one of these brilliant lamps, and conclude, therefore, that it was entirely due to the dull orange glow of the neon tube.

A Really Brilliant Picture.

I never dream of switching off the room lights now when viewing a transmission. A viewing tunnel is a convenience, but I have been producing pictures so bright that they cast a shadow on the wall if one stands in front of the scanning aperture!

A WEARITE POWER TRANSFORMER

Details of a mains component which not only looks safe but IS safe.

NO doubt many constructors approach the construction of a mains set with a certain amount of trepidation. Certainly the mains carry voltages which are high enough to give one a bit of a shock. But we think that it is more probably the idea that things can "burn out," if all is not "just so," which holds some constructors back.

Actually, we have no evidence that any more accidents of any kind happen with mains sets than they do with battery sets. Rather to the contrary, if anything, we imagine. And this is probably explainable by the fact that with a battery set there are external sources of power (batteries external to the set itself) of widely different voltages.

The power arrangements of a mains set are much "tidier." Yet we think the "dangers" of a mains set are more psychological than real, and in saying that we do not wish in any way to detract from the excellent safety-first measures adopted by many makers of mains components or to incite constructors to take needless chances.

No Exposed "Live" Metal.

Nor must we give the impression that we under-rate the points of design of the Wearite Power Transformer, which forms the subject of this review. As a matter of fact, we believe that it is a component like this which can do more for the popularising of

How many readers are using cathode-ray tubes for the 30-line transmissions? (One or two prominent people in the trade have expressed the hope that there are not many, as they are afraid that they will start off with a wrong idea of the possibilities of the C.R. tube for television.)

Surely that argument is rather far fetched. Everyone must realise that the poor detail in the present transmissions is entirely due to the limitations of the scanning system. After all, they are called "low definition" officially, and the term should be taken literally.

Those B.B.C. Test Cards.

In case anyone *should* be in doubt, he may take it from me that the resemblance

NEW TELEVISION TUBE



This giant tube is the new Cossor cathode-ray oscillograph which is used in the Cossor television system. It will give pictures nine inches high.

between these transmissions and the "high def." that is coming is about as great as that between 1935 broadcasting and 1911 phonographs.

The "test cards" radiated recently by

the B.B.C. have, I am told, been the cause of a lot of correspondence. We all know that a home constructor who can't make his set work will generally blame the designer. But who would have thought that television enthusiasts who couldn't receive the low-frequency test card properly would have written to the B.B.C. and complained that they weren't transmitting it properly?

I find that this card is more difficult to receive really perfectly than the high-frequency card. The other one—the test for picture ratio, with a straight line and a circle—should always be received perfectly. If it isn't, then your apparatus is at fault, and the fault is beyond your control unless you are using a cathode-ray tube.

Most modern scanning discs, however, are extraordinarily accurate, and there should be no need for worry on that score.

Patents for new mechanical scanning systems are still being taken out, and it is significant that most of them are supposed to be capable of operating with a large number of scanning lines and a high picture speed. My own impression of the future is that one or two of these systems will survive, but that the cathode-ray tube will undoubtedly rule the roost—until something completely revolutionary comes along!

A Primitive System.

Looked at with a cool, clear eye, the whole business of scanning seems extraordinarily primitive, doesn't it? Isn't it highly probable that all this clumsy business of dissecting a picture and reassembling it will be done away with some day? What will replace it, naturally, we can't say. If we could it would already be workable. Is "magic-lantern" television just a mad dream, or shall we emerge from all these complications?

But radio is tending to become more and more complicated, and look at the valve alone! The day when every valve was either a diode or a triode seems centuries away, and new types are still springing up. What a future to look to! L. H. T.

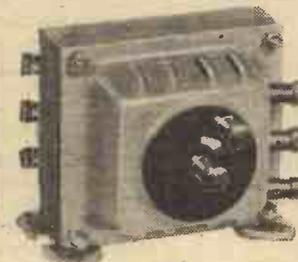
mains home construction than anything which can be written.

It is quite beside the point that mains sets need not be dangerous, so long as there are constructors who firmly believe they are. It is hard to remove such impressions, particularly when, with their bare metal terminals and unenclosed constructions, so many mains components look as if electricity could jump out of them from a dozen different points and give shocks or burn up things.

On the other hand, the Wearite Mains Transformer, which is illustrated in the accompanying photo, not only is safe, but it looks safe, particularly to the eyes of the inexpert. It breathes safety and self-assurance with its neat, battleship-grey metal casing and its insulated terminals. There isn't a crumb of exposed "live" metal on it anywhere.

The arrangement of the mains-input terminals is

EASY VOLTAGE ADJUSTMENT



By unscrewing one of the terminals on the disc seen on the side of the transformer, and rotating the disc, the transformer is quickly adjusted to suit various mains voltages.

quite unique. Of course, both terminals are fully insulated, like all the others, and they are positioned neatly on a circular disc of insulating material. In this there is an aperture in which appear figures

indicating the mains voltage for which the transformer is set.

Thus the only figures to be seen are those applicable to the conditions. To adjust the transformer for a different mains input the one terminal is unscrewed, whereupon it is possible to rotate the insulating disc. It is turned until the correct figure appears in the aperture, and then the terminal is again screwed into position. The disc cannot be turned until the terminal is removed in the above-mentioned manner.

There are a number of Wearite Power Transformers suitable for various purposes. The one we have received for test is the Type T 21A. It has the following outputs: 250-250 volts at 60 m/a., 2-0-2 volts at 1 amp., 2-0-2 volts at 3-4 amps.

It is therefore able to supply the necessary current for three or four A.C. valves, and the 1-amp. winding is for the filament of any "A" type rectifying valve, such as the Marconi or Osram U10, or Cossor 506BU or Mazda U02.

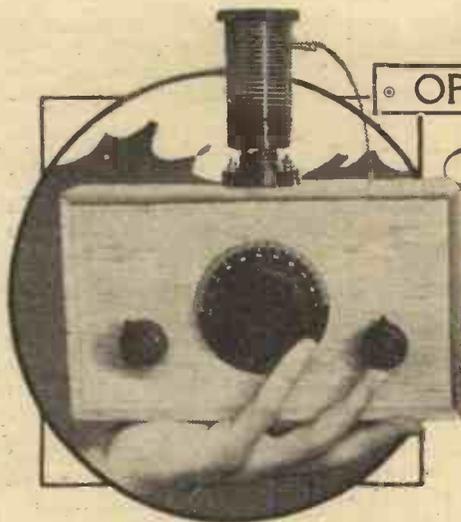
Excellent Regulation.

We have very thoroughly tested this transformer and found it to be quite excellent in every way. There is only a slight temperature rise, and in this respect it is very different from many of the less expensive types.

The voltage regulation is first class. For example, there was hardly a discernible movement on the needle of our voltmeter connected across the heater-supply terminals when a change from three to four valves, and vice versa, was made.

And practically the same applies to the H.T. winding, for doubling the load from 25 milliamps dropped the H.T. voltage only from, approximately, 285 volts to 250, and that for a transformer which costs only 25s. is, as readers will know, a very good performance indeed.

This Wearite mains transformer is made by Messrs. Wright and Weir, Ltd., 740, High Road, Tottenham, London, N.17, and it can be fully recommended as a safe, reliable and efficient component.



The Everybody's KELSEY ADAPTOR

MY concluding remarks last week must have made it pretty plain that the whole secret of success with my new adaptor depends upon the way in which you use the controls. At least, I hope that that was the impression that I left with you, for it really is a most important point to grasp.

For all that, I do not want you to run away with the idea that it is a terribly difficult matter, and perhaps I shouldn't put too much emphasis upon this question of operation. The whole point is that I want *you* to succeed! Never mind about what I have been able to do with it. That is beside the point.

The Maximum Assistance.

It's your results that count, and if I appear to be a bit fussy about this question of the way to go about it, then you must forgive me and put it down to my desire to give you the maximum assistance possible short of coming to see each one of you in person. (If only I could!)

The main thing to remember all the time is that you must operate the controls slowly. I'm always plugging away at this slow-motion theme, but have you ever stopped to consider why it is so vitally necessary? It's nothing whatever to do with the design of the adaptor itself. It's all a matter of wavelengths and frequencies.

I'm not going to dwell on the reasons, but perhaps it will give you some idea of the relative speed at which the adaptor tuning dial should be rotated if I just outline the essential difference between this dial and the tuning dial on an ordinary broadcast set.

First let us assume that both dials are calibrated from 0 to 100 degrees, and that the broadcast-waves dial tunes from 200 to 600 metres and the adaptor dial from 25 to 60 metres. On account of the fact that the frequency increases as the wavelength decreases, and assuming a 9-kilocycle station separation, there is room on the adaptor dial for *seven times as many stations as there is on the broadcast-waves dial!*

Seven Times More Stations.

In other words, between 200 metres and 600 metres it is possible to give 9-kilocycle spacing to 111 stations, and between 25 and 60 metres 777 stations could be accommodated with the same frequency separation. Thus, all other things being equal, it is at once obvious that the short-wave dial

must be operated seven times slower than the broadcast one.

Of course, there aren't actually 777 or anything like that number of stations between 25 and 60 metres, nor are all other things equal. But the reasoning remains the same, and if, when trying to find a particular station on the adaptor, you permit yourself to imagine that you might be trying to find it from 776 others it will give an idea of what I mean by slow tuning.

But now let us get back to this question of the adaptor in general. Last week I am afraid that the operating instructions were necessarily brief. So I propose to outline the whole procedure again in greater detail.

When your adaptor is finished you cannot get very far in your searches for distant stations until you are certain that it is oscillating normally throughout the range of the tuning condenser.

For all practical reasons you may assume that the adaptor is in its most sensitive condition when it is just, but *only* just, oscillating. That condition will be

Full details for obtaining the best results from the guinea short-wave unit which was fully described in "Popular Wireless" last week.

reaction condenser at zero (that is, as far as it will go in an anti-clockwise direction) you will find as you increase it (in a clock-wise direction) that a position is

reached where a sort of "heavy breathing" commences.

That "heavy breathing" is an indication that oscillation has commenced, and when you turn the main tuning control (the centre one) to find stations you must endeavour all the time so to adjust the reaction condenser that the "heavy-breathing" condition is maintained.

There is one thing that is most important in this connection. The change-over to the "heavy-breathing" condition (forgive the continual use of this phrase, but it seems so aptly to describe it) *must* be smooth. It is essential that there should be nothing sudden or "ploppy" about it.

For Smooth Reaction.

If it does show signs of being "ploppy," then it is worth while trying a reduction of H.T. voltage on the tapping that feeds what is normally the detector anode in your existing set.

You may find that at certain settings of the main tuning condenser it is impossible to get oscillation at all. That is where the third or right-hand control comes into it. In general, you should keep that set at the position which completely enmeshes the two sets of condenser vanes; but when you come across a "dead spot," such as I have spoken about above, then variation of this condenser should overcome it.

If you search with the adaptor in the oscillating or "heavy-breathing" condition the first indication of a station will be in the form of a whistle, starting as a very high note, coming down to a very low one and then rising again to the top of the scale, *all in a fraction of a degree.*

The Final Adjustments.

To resolve it, or, in other words, to receive it intelligibly, you must slowly decrease the setting of the reaction condenser until the adaptor just stops oscillating, and then, by very slight readjustment of the main tuning condenser, you should hear what is being transmitted.

By the way, if you want to try for stations below 25 metres I suggest that you wind another coil exactly in the manner I described last week, but using 8 turns for the grid winding (the one that is wound with the tinned copper wire) and 5 for reaction. That will take from 15 metres up to a little over 30 metres. G. T. K.

THE PARTS EMPLOYED

- 1 Polar .00015-mfd. variable condenser, short-wave type C.
- 1 Graham Farish .00015-mfd. solid dielectric reaction condenser.
- 1 B.T.S. .0001-mfd. variable condenser, type K.L.1.
- 1 Dubilier .0002-mfd. fixed condenser, type 670.
- 2 W.B. valve holders, 6d. type.
- 1 Bulgín short-wave H.F. choke, type H.F.3.
- 1 Erie 2-megohm grid leak.
- 1 B.T.S. slotted coil former, type K.F.4.
- 1 Cigar box, size 9 in. x 5½ in. x 2½ in. (approx. dimensions).
Wire, flex, nuts, bolts, etc.

determined by the setting of the reaction condenser, but the position of the knob of this particular condenser to obtain maximum sensitivity, or, if you like, the "just-oscillating" condition, will not remain constant throughout the tuning range of the centre dial.

It will therefore require periodical readjustment as you search for distant stations.

Perhaps you are not clear about what I mean by the "just-oscillating" condition. Let me explain it. Starting with the

DOWN by Waterloo Bridge there is a huge wharf known to all listeners as "Number Ten" studio. Before Maida Vale's roller-skating rink earned greater glory by becoming the main B.B.C. orchestral studio this Waterloo wharf was indeed a rendezvous for musical celebrities.

Now the wharf begins to look, in spite of a brave array of lights, decidedly wharfish again. For only one corner is in use, while the great gaping rest of it stands empty, as though brooding over its imminent demolition.

In that corner Henry Hall and his "boys" have found one more temporary home for their dance-band broadcasts. He has had to roam, has our Henry.

I first met him when he was rehearsing the newly formed B.B.C. dance orchestra in the military-band studio right at the top of the then equally new and not entirely finished Broadcasting House.

Henry has, by the way, the historical distinction of being the first to broadcast a musical programme from the Portland Place headquarters.

Anyway, he was soon moving into one of the studios intended for the Children's Hour—his diminutive cubby hole of a studio BB, down in the bowels of the "Big House," having been taken over by the televisionaries.

He awaits a final and entirely satisfactory home yet. Maida Vale, besides its huge orchestral studio, has other studios in the making, including one for Henry.

At a Rehearsal.

Meanwhile, as I say, one finds him, if one has the magic password, in the wharf. I myself came upon him the other afternoon while he was in the middle of a rehearsal for the following Saturday's Guest Night—a feature Henry has made peculiarly his own.

Leslie Henson was making funny faces into the microphones, while members of the cast of his show were amiably disporting themselves at large. One energetic soul was down on all fours, making grunting noises and leaping about the wharf in a strikingly frog-like manner.

Pretty little June Clyde and another dainty soul were humming away their tunes, breaking into blithe bursts of tap-dancing as the fancy took them.

It was a jolly sight. And there was Henry, smiling benignly, supervising the band, the guests and the whole show—with manager Hodges doing his bit to smooth out the creases as they arose.

How the Guest Nights Are Arranged.

Each guest-to-be did his or her "stuff," and so, after another half-hour, it was all over and the gang made tracks for the exit. "Good-night. (H)all," wisecracked Leslie Henson as he, too, took himself off.

"How do we arrange these Guest Nights?" said Henry Hall, repeating my question. "Well, we first of all go and see the show, and then we write a radio-act version of the numbers we think will appeal to listeners.

"These Guest Nights give just an impression of the people who are invited to them—their songs, their music, their patter and jokes."

HENRY HALL'S GUEST NIGHTS

The popular director of the B.B.C. Dance Orchestra has some interesting things to say in an interview with

ALAN HUNTER

I asked Henry whether, among his large fan mail, there really were many listeners who criticised these "interruptions" to the normal dance music.

"Only from a very minute portion of listeners indeed," replied Henry. "After all, the interruption, if you can call it that, occurs only once a fortnight. Every other night for two whole weeks listeners have solid dance music.

"Besides, how many listeners actually dance to broadcast dance music?"

I pricked up my ears at that, for it is a

BINNIE HALE AND BOBBY HOWES



Two favourite stars before the microphone during one of Henry Hall's Guest Nights. Henry Hall himself is seen to the left.

question that has often puzzled me. I, personally, know of no one who does make use of the 10.30 dance music for dancing. And Henry Hall seems to agree.

"It is very rare indeed for listeners to make use of this period for dancing. Therefore, since it is a listening period, the more variety the better.

"Besides, the total time taken up by the guests is seldom more than ten minutes, so that even if thousands of people are dancing to our straight numbers the time is merely a short break.

"On Saturday nights we are on the air from 10.10 until midnight, surely a long enough period to justify a ten-minute break to hear some of the most famous artists in this country, as well as visiting celebrities from American and other places."

His list of guests who have taken part in Saturday night "parties" is certainly most impressive. To mention only a few, Tallulah Bankhead, Richard Tauber, Mills Brothers, Gracie Fields, Jessie Matthews, Evelyn Laye, Joe Venuti, Binnie Hale, Bobby Howes, Mack Sennett, Noel Coward, Godfrey Tearle, Fay Compton, Victoria Hopper, Frances Day, Buddy Rogers and Sir Henry Lytton.

This list is by no means complete, and

I must say it provides a striking tribute to Henry Hall's success. Artists such as Tauber and Noel Coward would not have accepted invitations unless they were assured of that indispensable right atmosphere.

The fame of these Guest Nights has gone beyond England and even Europe. For example, the night Noel Coward was a guest both N.B.C. and Columbia networks in America took the show—it is very rare for these rivals to share a broadcast.

Praise from an American Listener.

That same night Henry received a cable from an American listener saying how much he had enjoyed the show, which had come over without any trace of atmospherics through the Empire and Post Office circuits.

I asked how it all started, this Guest Night business, which has now become an established Henry Hall feature since it was inaugurated in March, 1934.

"It so happened that we were doing some recording at the same time that Elsie and Doris Waters, Lupino Lane and Flanagan and Allen were also in the studios.

"One thing led to another, and at the end of our session I asked all these artists whether they would like to come along to a little party with the 'boys.' They all agreed it would be good fun, and then I had the idea of broadcasting little informal impressions of these artists. And that's how the Guest Nights really started."

KEEP A RADIO DATA BOOK

WHEN you buy a new component or valve for a home-built set you will generally find explanatory leaflets or booklets enclosed in the carton. This literature is

worth keeping, because it gives essential technical data which enables you to use the component to the best advantage, and is likely to prove particularly useful if, at any time, you should want to do any experimenting with different circuit arrangements in your set.

If, however, you simply stuff the literature away in various drawers, cupboards or desk pigeon-holes you will probably have difficulty in finding any given leaflet quickly.

A Much Better Plan.

A much better plan, therefore, is to compile a radio data book by getting a suitable loose-leaf or "instantaneous" binding case, and inserting in this all the technical data you have relating to your set and its components and accessories.

To facilitate reference, the information can be classified in a logical order. The circuit diagram of your set should occupy first place in the book; then the various leaflets and cuttings should be arranged in an order roughly corresponding to the positions which the respective components occupy in the circuit. Thus you should begin with leaflets relating to aerial and earth equipment, etc., and end with literature about the loudspeaker.

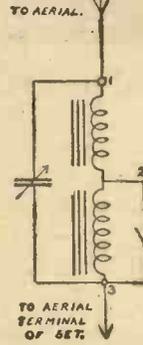
W. O.

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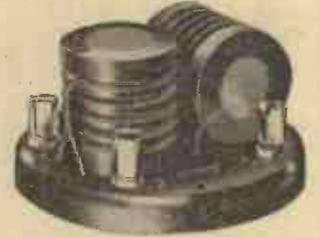
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The April Number

of

WIRELESS

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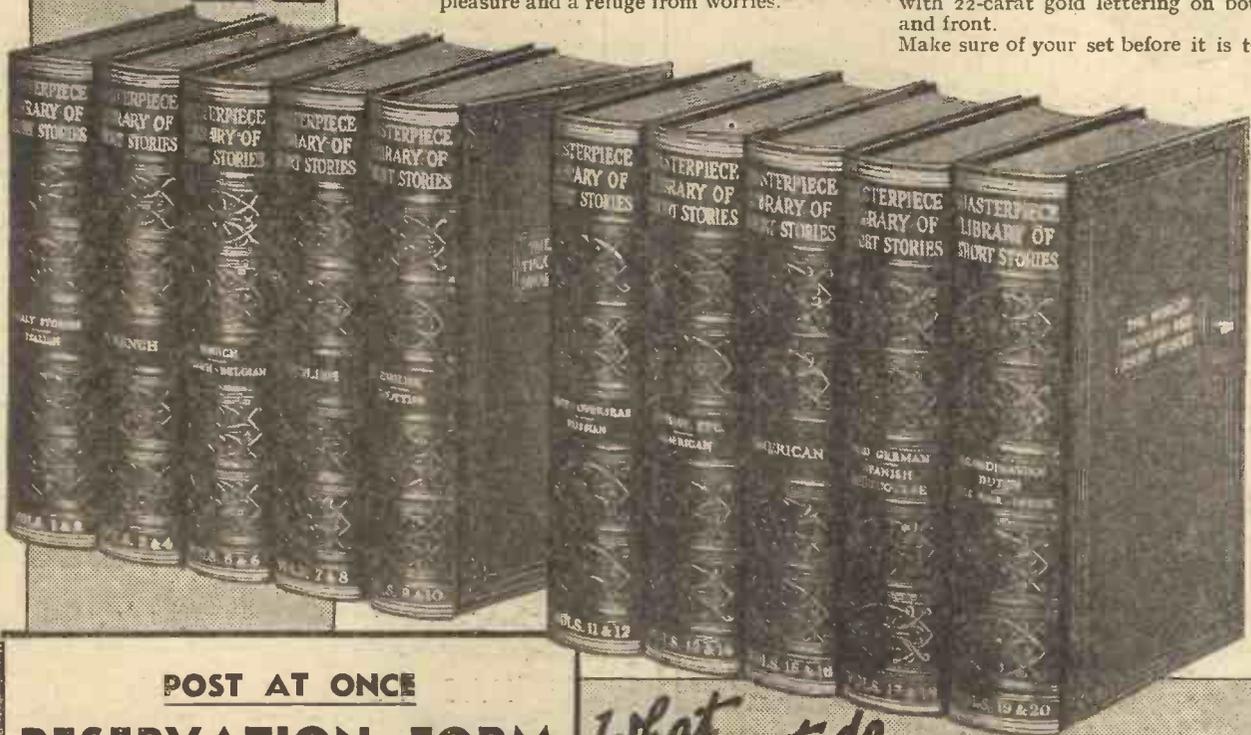
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METALS WITHOUT *Resistance*

METAL wires are devoid of electrical resistance; currents once started go on for ever. Is it imagination—or H. G. Wells?

What would it mean if we could make our coils and condensers with inductance and capacity, but *without* resistance? Or if we could maintain a current of hundreds of amperes with an infinitesimally small applied voltage?

You will hardly believe me when I tell you that it is actually possible to set up a current of a thousand amperes in a small metal ring and that the current will continue without any applied electro-motive force to keep it going.

How does all this come about? These things are so different from our ordinary experience that there must be some drastic change in conditions. And so there is.

Getting Heat from Ice!

Before a metal will act in this extraordinary way its temperature must be reduced to a point where there is practically *no heat*—nearly to the absolute zero of temperature, in fact. Some of you may think that “freezing point” (0°C., to be more scientific) represents “no heat,” but that is far from the truth. In point of fact, it is possible to extract quite a lot of heat from a block of ice and make it very much colder!

A simple experiment will illustrate this. You may have heard of “liquid air.” Well, it has a temperature of some couple of hundred degrees *below* that of ice. Consequently ice, by comparison, is a couple of hundred degrees *hotter* than liquid air. Sounds strange, I know, to talk about ice being *hotter* than anything, but it is so. If you put some liquid air in a kettle and place the kettle on a block of ice the liquid air will rapidly boil away, due to the heat from the ice, and a jet, for all the world like steam, only, of course, very cold, will be seen issuing from the spout. It is, in fact, pretty much the same thing as putting *water* in the kettle and laying it on a block of *metal* at a temperature of 200°C.

Experiments on Gases.

Before describing the extraordinary behaviour of metals at these very low temperatures perhaps I should say something about how the temperatures are produced.

Experiments on gases—hydrogen, nitrogen, oxygen and so on—have shown us that a gas contracts when cooled, according to definite laws, and from these it has been calculated that if the temperature could be reduced to 273° below 0°C. the gas would cease to exist as gas at all; its molecules, instead of continually flying about in all

Can you imagine what it would be like if we could have metals completely devoid of any resistance—super-conductors, with 100 per cent conductivity?

Enormous currents produced with ease. No heating, owing to absence of resistance. Currents going on for ever. But there is a snag. Read what Dr. Roberts, our Scientific Adviser, says in this intensely interesting article. It describes intimate scientific discoveries in the most readable way.

directions, as they do at ordinary temperatures, would finally come to rest, and, in fact, there would be *no heat* whatever in the substance. I should explain that *heat* is regarded as the *energy of motion* of the molecules, so obviously if the molecules were reduced to rest there would be no molecular motion—that is, no heat.

Of course, since there is this heat-molecular motion in liquids and solids too, a substance does not need to be reduced to absolute zero (−273°C.) in order to liquefy or solidify it. The temperature at which

fell a victim, until to-day every known gas—indeed, every known substance—can be reduced to the *solid* condition. Hydrogen, which is one of the most difficult gases to liquefy, was reduced to the liquid form by Olszewski in 1892, and there remained then of all known substances only the gas helium as yet untamed. With the liquefaction of the gas helium (and indeed its final *solidification* by Keesoni in 1926) the last page may be said to have been written to a chapter of brilliant scientific achievement.

Liquefying Hydrogen and Helium.

Under suitable pressure hydrogen becomes liquid at −253°C., or 20° absolute, and becomes solid at −259°C. Helium, the most difficult of the gases to liquefy, yields at 269°C., or about 4° absolute. In appearance liquid helium looks simply like water, but it represents a climax of nearly a hundred years of scientific effort.

I haven't the space to tell you more of the methods by which these amazing results have at last been achieved—intensely interesting though they may be—but must pass on to tell you what happens to metals when subjected to these extreme temperature conditions.

You all know the practically universal rule that the electrical resistance of metals increases as the temperature is raised; the wire element of an electric fire, for example, takes appreciably less current when red hot than when first switched on. Conversely, the resistance decreases as the temperature is lowered. Experiments on the variation of resistance with temperature seemed to show that if the temperature could be reduced to the absolute zero (−273°C.) the electrical resistance of metals would become zero—or vanish.

The “Super-Conducting” State.

In point of fact, it has been found that the resistance vanishes at a temperature not quite as low as absolute zero; the actual temperature is different for different metals. A very curious feature is that the metal, on reaching a certain critical temperature, loses the remainder of its resistance *suddenly*; it is then said to have reached the “super-conducting” state. Mercury, for example, loses its resistance suddenly at about 4·2° absolute. If a current of electricity is started (by induction) in a ring of the metal when in this state it will continue apparently undiminished indefinitely. A ring of lead, immersed in liquid helium, was recently brought over from Holland to London, and a current of 200 amps., started in the ring before it left Holland, was still going strong when it reached London many hours later!

(Continued on page 25.)

IN A LEADING RADIO FACTORY



H.R.H. the Prince of Wales watches a coil winder in operation in the H.M.V. factories at Hayes. If that coil wire had no resistance, and our tuning coils had no resistance, what new aspects of radio reception and receiver design would be opened up!

it becomes liquid or solid depends on the nature of the substance.

Gases such as hydrogen, nitrogen, oxygen and so on long resisted all attempts to liquefy them, and so came to be called “permanent” gases, the idea being that they would remain gases under all conditions and could not be reduced to any other state.

With improvements in methods of producing intense cold, however, first one and then another of the “permanent” gases



PEGGY COCHRANE,
Violinist, jazz pianist, composer and singer of
syncopated songs.

HOW did I start? Three weeks before I was expected! And if that isn't a good omen I should like to know what is. And I carried on the good work, too, because at the age of three I startled the family by singing hymn tunes—and singing them correctly. That decided it. I was to be a violinist.

And so at the age of five I started my first lessons on the piano, learning the notes and trying not to let my fingers slip down between the black ones. A year later the fiddle was added to the list of atrocious noises which I perpetrated. But the piano remained a firm love of mine, and I found that I could improvise for hours on end, much to my own pleasure, at any rate.

"Doing Music" at School.

At the age of twelve I won a scholarship at the Academy and found that I was the youngest there. I think I must have been a most objectionable child, and I am sure that this opinion would be endorsed by the governess who looked after me until I went to school.

Schooldays were rather a trial in many ways. As I was only there on certain days of the week I was looked upon as a curiosity, and there was much laughter at my "doing music." Poor little me! Instead of being able to go out to games with the others, I had to stay behind in the classroom picking up the threads of what the others had been doing during my absence.

At fourteen I had my first great excitement, when a violin piece of mine, "Cradle Song," was published. Two of my ballads were published the same year, much to my own jubilation and the rather suspicious looks of my friends.

"My First Violin Recital."

For six years I remained at the Academy, working hard at the piano and violin and getting special permission from the Principal to accept engagements. And at seventeen came my second great day, when I gave my first violin recital at the Aeolian Hall.

When I first started broadcasting (it was about the time that the Chelmsford station was opened) I was doing "straight" violin recitals. There were no auditions, as there

HOW I BEGAN

This week "P.W.'s" Special Correspondent interviews that versatile broadcaster Peggy Cochrane, who first showed signs of musical ability at the very early age of three.

are now, and I was merely taken into the studio and told to get on with it. Apparently I "got on with it" to somebody's satisfaction, because for several years I was given regular broadcasting dates.

But all this time I had been hankering to write rhythmic music. I wanted to compose things that people could dance to. And gradually I got into a sort of "rhythmic mood." Dancing has always appealed to me, and I did study toe-dancing for some time, but then I got so tall that there was really to point in going on with it.

However, five years ago I started cabaret work and felt very much at home, concentrating on the lighter syncopated side. I knew that I could do it all right; but officials at Broadcasting House (or rather Savoy Hill) were not so sure, and it took me a long time to persuade them that violin recitals were not my whole stock-in-trade. Now they give me as many engagements for light work as they do for the other. So that one week I may be giving a recital on my violin and the next singing syncopated songs at the piano or taking part in a variety show. I have even done all these things in one programme; I wonder if you remember it.

Isn't that enough about me? Look, you

haven't met the dogs yet: come and see them. What are they? Please! Red setters, of course. I breed them as a hobby and create quite a stir in Kensington Gardens when I take them all out together. What else do I do? Well, sun-bathing is my favourite occupation, and I chase up and down England in a car looking for the sun. Ballroom dancing, of course, is another thing I do whenever I have time, but just at the moment I'm busy on the music for a new radio revue which you may hear soon. I hope that they'll let me take part in it, too.

A Tune a Minute.

I think I probably enjoy my "Tune a Minute" programmes best of all—if you insist on my showing a preference. In these programmes I usually manage to push fifteen different numbers into a quarter of an hour, but it needs a great deal of rehearsal and a studio official with a stop watch.

And that's quite enough for one day. You'll stop and meet my husband, won't you? I always thought that being married to a doctor was bad enough, but when I complain he tells me that being married to a radio artist is a hundred times worse. Well, he ought to know!

Peggy Cochrane

BULGIN VALVE HOLDERS

Excellent components we have recently tested.

ONE of the most irritating things which can happen to a home constructor is to have one or more of the terminals of a valve holder work loose in its fixing.

The set has, perhaps, been built up with especial care and all the wiring accomplished with particular neatness. And then an intermittent fault develops!

The first step in locating this is, of course, to run round all the connections, and it is found that in some mysterious way a valve-holder terminal has loosened. Maybe the constructor himself loosens it in applying a little extra tightening!

Unfortunately, such a fault cannot very easily be rectified. All the wires have to be taken off the offending valve holder and the culprit removed from the set for the screwing up of the terminal—fixing calls for the application of a screwdriver or pliers underneath the base of the thing.

Such a fault has been rendered impossible in the new and improved baseboard valve holders made by our old friends Messrs. A. P. Bulgin. They have accomplished this meritorious effect by introducing "shakeproof" washers.

These are one of the most useful engineering inventions of modern times. And they are so simple, too, even though they are extremely effective. The washer lies between the body of the terminal and the bakelite base.

It is made of steel, and it is not unlike a small cogwheel with its cogs bent at an angle. These tend to dig into both the surface of the base and the adjacent surface of the terminal, and thus prevents this from turning.

The soldering tags cannot turn, because they pass through niches in the base. And it should be noted that these, the soldering tags, are solid extensions

of the contacts. The base is hollowed out, and is in fact a most excellent example of bakelite moulding.

The pins of the valve pass through holes in the top of the base and the contacts lie deeply, so that there is no likelihood of an accidental connection. The contacts themselves are not tubular: they are flat springs slotted in the centres. This pattern makes for both an efficient contact and an easy insertion and withdrawal of the valve, and these qualities are not easy to obtain with multi-pin valves. These can have either the split or solid type of pins, and the same effective result is given.

This new Bulgin valve holder is made in two types. There is first of all the five-pin model, which can be used for either four- or five-pin valves. This retails at 6d. The seven-pin baseboard moulded photo holder, which is also shown in the accompanying photo, retails at 1s. 6d., and we consider it to be one of the most satisfactory components of its kind which has yet been produced.

WITH
SHAKE-
PROOF
TERMINALS



★
One of the features which constructors will appreciate in the design of these Bulgin valve holders is that which prevents the terminals from working loose in the mouldings.

ALL CONTINENTS ON THE "B.C.L." TWO

Leslie W. Orton tests the W.L.S. short-waver described in the January 19th issue of "P.W."

I AM very much in favour of POPULAR WIRELESS's campaign to prove to listeners that short-wave listening is not a branch of radio which merely interests persons with an experimental turn of mind, but a branch which every listener should take up, for it is almost as simple to receive America upon a short-wave receiver as it is to receive London on a broadcast set.

Astonishing Results.

Of course, as with everything else, there is a right and a wrong way of going about the business. If, for instance, you expect to receive much below 20 metres during the evening you have "another think coming," as some of our American friends would put it. Likewise, you will not receive very much of a "DX" nature on 50 metres during the mornings. But I will leave the arguing to my friend, W. L. S., and will content myself with telling you of the results I have obtained with his "B.C.L." Two, coupled to a power amplifier. I should perhaps say that all results mentioned in this account were at good loudspeaker strength.

At just after 4.30 p.m. a few afternoons ago I commenced the test of the receiver, and one of the first stations I tuned in was on the 31-metre band. Volume was terrific, and it is no exaggeration to say that music could be heard for over 100 yards from the set. Probably Daventry, I thought to myself, but the station announcer corrected me. He said: "Bombay calling. Call-sign VUB. You have just heard Mr. Frederick England sing 'Old Man Noah'—" and so on. After listening to the band of s.s. Empress of Britain playing "Valse Triste," I switched off until just after 10 p.m. Another surprise was awaiting me, for the first station I heard was, to use the words of the announcer, "COH, Havana, Cuba, the ever-green land." A few moments later I tuned in a station which was so powerful that I mistook it for a European and passed it by. Shortly afterwards, however, I chanced to tune it in as the announcement was made: "You are listening to P R A 5, at Rio de Janeiro, Brazil."

Ranging the World.

From then onwards I was fully occupied in tuning in "DX" stations. YV2RC, 3RC, 4RC, all at Caracas, Venezuela; YV5BMO and YV6RV, also at Venezuela; COE, Havana, Cuba, and many others provided me with a host of different programmes. And as for U.S.A. stations—well, W8XK, on 49 metres, was coming in at such volume that it might well have originated in London.

Since then I have added many stations to my list—all received at good loudspeaker strength—and they include VK3ME, VK3LR, VK2ME, ZTJ, VUC, 2XAD, 8XK, 1XAZ, 8XAL, 3XAL, etc., etc.

In short, I was extremely pleased with the "B.C.L." Two.

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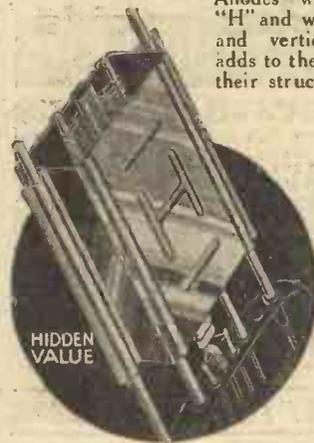
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RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication. A stamped, addressed envelope must be sent with every article.

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

All inquiries concerning advertising rates, etc., to be addressed to the Advertisement Offices, John Carpenter House, John Carpenter Street, 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 specialties described may be the subjects of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS

"A BUBBLING NOISE."

G. E. (Brynmill, Swansea).—"With reference to W. H. W.'s (Plumpton, Sussex) query and your reply regarding gurgling noises like bubbling water, may I suggest this is not caused by anything connected with his set? At least, it seems so in view of the following facts.

"I, too, have heard similar noises on three or four occasions on my set, the S.T.500, and, like W. H. W., I suspected my earth, which was connected to a waterpipe. However, inspection failed to find any signs of bubbling water.

"One morning, following one of these occasions, I questioned several of my fellow workmen concerning this bubbling noise, and three of them definitely had the same experience, at the same time and on the same station, namely London and West National. The sets concerned, apart from my own S.T.500, were another S.T.500, a commercial S.G. Three (I can't remember the make), and the other was supplied through the South Wales Rediffusion Service!

"In view of this, is it possible that this noise is caused through a fault at the transmitting end?

"(P.S.—May I take this opportunity of thanking you most sincerely for the help your Query Department has given me in the past, and for the finest wireless periodical on the market?)"

In your case we think there is no doubt that the fault was occurring at the transmitting end—or perhaps we had better put it that the fault was not at the receiving end!

In your locality any powerful set tuned to the wavelength of 261.1 metres would be capable of receiving the identical programme from both stations radiating it on that wavelength—Western National and London National. The two transmissions, virtually identical in every respect when fed into the two transmitting aerials, would travel thence to your aerial by different routes; and consequently, travelling at identical speeds, would arrive not quite simultaneously, if one route were of appreciably different length from the other route.

Since the Heaviside Layer, which reflects the waves downwards, varies in height at different places, it is probable that one transmission will arrive a little "out of step" with the other, causing burbles and distortion, which are unavoidable in the circumstances.

Sets which are receiving on the same wavelength at distances not so great from either station do not get the trouble, because when one station's programme is so much stronger than the other's there is a swamping effect, and any tendency to distortion is unnoticeable.

But at any point where both stations are a comparatively long way off, and reception is therefore by sky-wave rather than by ground-wave, there is liable to be an effect of the kind noticed by your neighbours and yourself.

WHEN THE L.T. BATTERY IS AWAY ON CHARGE.

D. C. M. (Near Tidworth).—"As there must be many others in the same position as myself

when their one and only accumulator is away on charge, I wondered if you will kindly give us the method of wiring up a crystal detector and phones to a valve set, to change from one kind of set to the other without switching.

"About two years ago you gave the information in 'Radiotorial,' and a friend of mine used to swear that it nearly doubled the value of his set. But he has gone away and I cannot find the back number now I want it, so hope you will be able to give it again.

"For all people say about the crystal being out of date, it is a grand stand-by in the country, where charging the accumulator is more of a problem than it is in the big towns."

The wiring for the crystal-reception circuit is easily carried out as follows:

Near the set's first tuning condenser mount a pair of terminals, labelled "phones." Also the crystal detector.

Join one side of the crystal detector to the fixed-vanes terminal of the first tuning condenser; its other terminal to one of the phone terminals.

Finally, join the remaining phone terminal to the earth wiring, viz. to metal baseboard, earth terminal or similar point.

When no phones are connected to the new terminals the set's working is quite unaffected, and it may be used in the ordinary way as a valve set.

When the accumulator is removed for charging, connect a pair of phones to the new terminals and you will find the arrangement will work as a crystal set.

THE RIGHT TYPE OF ACCUMULATOR.

This subject continues to figure largely in our post-bag, but many of the letters concerning the choice of accumulators, etc., are better answered direct, or cover points which have been dealt with in "Radiotorial" recently.

One good suggestion, however, which comes from G. F. F. (Broadstone, Dorset), in a letter to the Editor, is worth bringing to the notice of those who have been using smaller-capacity batteries than they should.

It concerns the use of batteries in parallel, and since it is self-explanatory we quote it just as written.

"The Right Type of Accumulator.—Commenting on the letter on above subject, of W. E. J. (Highgate), in your issue of February 16th, may I suggest that he connect his two old cells together in parallel and make use of them (together) when his new cell is being charged? If they be still in order they will probably give the same result as his new cell."

This is a good suggestion, and we pass it on with pleasure.

SHORT WAVES ON THE S.T.500.

R. J. W. (Abingdon).—"If I fit the new Kelsey Short-Wave Adaptor to the S.T.500, do you think there is any chance of getting Australia or South America with it? I want to get programmes from the other side of the Equator."

If you will turn to page 772 of "P.W." dated February 16th, you will find a letter from a Surrey reader who listened to Sydney, N.S.W., within ten minutes of plugging in the coils! The Equator is no obstacle to the S.T.500, fitted with a short-wave adaptor.

DISTORTION ACCOMPANIED BY HIGH ANODE CURRENT.

D. N. (South Woodford).—"Quality is my watchword all the time, and when the set

(Continued on next page.)

RADIOTORIAL QUESTIONS & ANSWERS

(Continued from previous page.)

began to sound mushy three or four nights ago I got out the milliammeter and tried to find what was wrong.

"The only unusual fact I found after a whole two hours' test was that the L.F. valve was taking more current than I thought it should.

"Dud valve,' thinks I, so I got out the box of tricks and found another of the same class, which I put in to replace the supposed dud. No improvement.

"With either valve the quality is rotten, and there is absolutely nothing else wrong with the set—only this high reading for first L.F.

"I have tried new valves in all other positions, tested all the usual voltages and so forth, and as everything else seems normal I have come to the conclusion that the high reading shown by the milliammeter must have some bearing on the distortion.

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"I should be glad if you can suggest any cause, for I am unable to listen to such distortion as the set now gives.

"I may say I have checked the shunt-fed transformer, grid-bias connections and voltage, resistance in detector plate circuit, etc., but nothing which might affect the valve's operation seems to be wrong."

Have you made sure that the insulation of that coupling condenser is faultless?

If there is a leak across it this would explain all your symptoms, for H.T. from the detector would be getting on to the grid of the first L.F. valve, and the fault would persist even when different valves were used. Anode current would increase, because the effect would be to remove the negative bias from the grid, though the bias-supply voltage might still show so many volts negative were apparently "on the grid." We think you will find the condenser is at fault.

INDUCTANCES INSTEAD OF CONDENSERS FOR GANGING?

B. R. (Edinburgh).—"Owing to the difficulties usually experienced with incorrect ganging of condensers, would it not be better to break away from them completely and use variable inductances instead of variable capacities?"

"Any discrepancies in a tuned circuit could then be adjusted by a variable coil to make it conform with other circuits, and the whole gang be tuned by matched condensers as now.

"Any objections?"

Plenty of objections could be cited against your suggestion, but instead we will ask what advantages it offers?

Frankly, we cannot see where the improvement over condensers would lie, since these are definitely satisfactory in use if properly installed and set.

The "difficulties usually experienced with incorrect ganging" of which you speak are not inherent

in the condensers, and would be equally troublesome if small variable inductances were used instead.

You are right in assuming that differences of wavelength can be compensated for by inductance as well as by capacity; but in practice a variable condenser offers certain advantages over a variable inductance, and that is why tuning is nearly always by means of condensers rather than by means of inductances.

Arising from this is the consideration that when the set is in use all the circuits will be tuned by variations of capacity; so any self-capacity which exists, and which tends to throw out the tuning, is better counteracted by capacity rather than by inductance to secure uniformity at all points of the tuning range.

A LAZY MAN'S LOUDSPEAKER CONTROL.

E. D. (Brighton).—"I want to control the volume from my armchair without getting up every time. (You ought to hear the caustic remarks coming from the direction of the other armchair, on the opposite side of the fire, about a lazy man and his loudspeaker!)"

"Ignoring all domestic bullying, I have worked out a scheme that seems to be on the right lines so far as it goes.

"On the set the volume control is by the potentiometer that controls the battery bias applied to the variable-mu valve. So I got another potentiometer, identical with the first, and a three-wire flex.

"I joined one set of the ends of the flex to the three respective terminals on the set's potentiometer, and put the new potentiometer on the corresponding points at the other end of the flex—the armchair end.

"This reduces the volume of the set, but it seems promising because I do get some control at the armchair end. How can I improve it and get away from the reduction when the second potentiometer is connected to the first?"

We are rather surprised to hear that it works as well as it does, since you have definitely not gone the right way to work.

By connecting one potentiometer across the other you halved the effective maximum resistance at that point, and, apart from other possible effects this will result in running down your grid-bias battery quicker.

A far better plan would be to take the potentiometer out of the set, connect its wiring to the long flex and then place it on the equivalent flex wires at the armchair end. This would retain the original circuit, except for the lengthening of the leads.

Alternatively, if you cannot get it out of the set, disconnect it and use the other potentiometer as we suggest above, which should get over the present difficulties.

IS THE OSCILLATOR OSCILLATING?

E. S. P. (Coalville).—"Can you give me a reliable test for telling whether the combined detector and oscillator is doing its stuff properly in the oscillator section?"

An easy way to make sure, and one that leaves nothing to chance, is to connect a milliammeter in the plate circuit and then note the effect of shorting the oscillator's reaction coil.

Ordinarily the effect of oscillation is to increase the anode-current reading (unless a leaky-grid circuit is used, when the current will drop), so if shorting the coil in question causes a decreased reading the oscillator can be assumed to have been functioning.

Remember, however, that the results should be independent of outside activities, so take off the aerial and try the effect on various settings of the condensers.

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No. 1—which is on sale Friday, March 15th—contains contributions by such distinguished writers as Warwick Deering ("What Mother Earth Will Give You"), Marion Cran ("Everywoman's Corner of the Garden"), Frances Pitt ("Birds in the Springtime Garden") and Captain Ward, the famous explorer ("In the Land of the Blue Poppy"). There is also the first instalment of a delightful serial, "A Garden by the Avon."

Every copy of "GOOD GARDENING" contains two large Free packets of seeds for raising the exquisite Blue Poppy of Tibet, and Jubilee Larkspur.

WITH THE EXPERIMENTER

(Continued from page 5.)

the valve impedance without losing so much voltage.

We put in—or rather I did—a 50,000-ohm resistance. The anode current measured 9 milliamperes, meaning that about 45 volts was dropped, leaving a good 55 volts for the anode of the valve.

Well, the set oscillated then. But not smoothly, I thought. So I had another look. There was a high-frequency choke in series with the anode resistance—but where was the by-pass condenser to earth? It wasn't. And Bunny wasn't using a differential reaction condenser. A valve must have an anode-earth capacity to rectify efficiently.

When I had bunged a handy .0001-microfarad fixed condenser between the anode and earth the whole set seemed cleaner in its action. Reaction did not start quite so early on the reaction-control knob, but when it did it was smooth.

That left only the horrid high-note quality. I yanked out the .0001-microfarad fixed coupling condenser and inserted

a .1-microfarad condenser instead. I told Bunny he might go up to 1 microfarad if he felt inclined—but not to drop below .1. Needless to say, the shrillness disappeared and quality was tolerable.

I finally spoke firmly about people who expected to get good volume from a running-down high tension. Remarking, as I made tracks for home, that batteries were now absurdly cheap.

The Experimenter

HELPING THE UNEMPLOYED

(Continued from page 6.)

a recital in paragraph form of the year's happenings in the "Land of our Fathers." There was a lot of Eisteddfod news, with records of prize pieces and choirs. This was good entertainment, but much of the news reel was only of local interest.

The Gresford Colliery disaster figured prominently in the programme, and the reminder saddened us. The news item announcing the disaster on the night of the calamity was reproduced. We are, of course, familiar with the B.B.C. voice that announces grave disasters and deaths.

Gerardo and his Sweet Music that followed had a calming effect on the senses, and when Gerardo expressed the hope, at the end of the programme, that we had enjoyed his music I murmured that I had. Variety in broadcasting is essential if listeners are to keep a mental equilibrium.

I have often felt glad that theatre and especially music-hall patrons had abandoned their old-time vociferousness when broadcasting came into being. I mean their habit of always applauding the hero and booing the villain. Occasionally the B.B.C. treats us to a production of this sort, just for old-time's sake, but I am reluctant to regard it as a treat.

One of the week's plays, "The Lottery Ticket," was a noisy affair in the old-time style. It was very amusing, of course. But the audience was encouraged to laugh noisily at anything a certain character said—or so it seemed. Ours is an age of noise. We all profess to hate it, yet we tolerate it. Indeed, we help to make it. But noise brought into the house via the loudspeaker is my *lête soir*.

I dislike it because it is so concentrated noise. I wouldn't mind if the B.B.C. never broadcast noise. I never listen to a dirt-track relay. The noise on this occasion obliterates everything, including the thrill the races are alleged to provide.

I would cut down all crowd scenes if they are rowdy in dramatic productions too. Suggestion is all that is necessary, and I am the first to appraise the efforts of the Effects Department when they get the effects desired by suggestion alone.

Excellent Talks.

Phillip Allingham is a vivid talker, and two talks within a fortnight aren't too much by any means. His subject has a peculiar fascination to people of all classes, and as he has such a command over words, especially adjectives, we get all the colour and detail necessary for the making of the perfect picture in sound. I regard Mr. Allingham as one of the most attractive talkers of the session.

The fact that I haven't said anything for some time now about Mr. C. H. Middleton and his Gardening talks doesn't mean that I haven't listened to him, or if I have that I haven't enjoyed him. I listen to him whenever I can, for I like in him what, if I were describing an actor, I would call his "repose." No irritating mannerisms or affectation here, but a quiet, easy-going style completely characteristic of the profession he follows—and loves.

Rather to my own surprise, the excerpts from the plays now running in London aren't quite the eventful broadcasts I thought they were going to be. This isn't the fault of the people taking part in them each week. The fact is I am never satisfied with an extract of anything.

As a book lover I can never read a novel that is appearing in weekly or daily instalments. It is too great a tax on my patience. I must have the whole story at hand to read at one sitting, or two at the most. It's the same with these London plays. The weekly bit is unsatisfying.

Now for a word of appreciation to Jack Hill and his sextet. They are a new band on the air, and they have made a promising début.

C. B.

THE KING'S JUBILEE BROADCAST

(Continued from page 4.)

Holne Chase, Buckfast, Dartington Hall, Totnes, Dittisham, and finally to the sea.

"Radio Follies" Burlesque.

A feature of the Midland "Radio Follies" next show on Saturday, March 30th, will be a burlesque based on Reginald Arkell's version of "1066 and All That," which has been attracting crowded houses at the Birmingham Repertory Theatre. The burlesque is entitled "1935 and Before That," and it should fit in well with the popular concert-party programme that the "Follies" excel in.

From Northampton.

A company of eight Chinese singers, dancers and instrumentalists, known as Pickard's Chinese Syncopators, who were a big success at the London Coliseum when they last visited England from New York in 1928, will be one of the principal attractions in a relay of a variety entertainment from the New Theatre, Northampton, on Wednesday, March 27th.

This relay is arranged in accordance with the policy of the B.B.C. in the Midlands to give regular broadcasts from independent theatres within the Region, as well as plays from the repertory theatres.

Military Band Programme.

The band and bugles of the 2nd Battalion of the Shropshire Light Infantry are giving a programme in the Birmingham Studio on Monday, March 25th, consisting mainly of tunes to be played at a number of ceremonies that have been arranged to mark the visit of the battalion to its home counties of Shropshire and Hereford, the first visit, by the way, for a hundred and seventeen years.

Plays from Newcastle.

Three short plays, all by North-East authors, are to be presented in the Newcastle Studios on Friday, March 29th. Two of the plays have Tyneside mining settings—"The Diet," by Walter Dierick; and "Geordie's Wooing," by Val Green. The third play, "Just Off Piccadilly," is by James Parish, who originally came from Newcastle, but who now lives in the South.

O. H. M.

METALS WITHOUT RESISTANCE

(Continued from page 19.)

This is so completely contrary to our ideas gained from ordinary experience that it is very difficult indeed to comprehend fully what it means. Certain of the electrons in the metal ring have been set into motion, swinging round and round the ring at an immense speed, and notwithstanding their excessively small mass—or momentum, if you like to call it so—there is not even sufficient resistance to produce any measurable diminution in the motion over a space of many hours!

Let us look at it another way. Instead of having to apply a large electro-motive

force to produce a large current we can produce it with infinitesimal E.M.F.'s.

And again, looking at it in yet another way, since the resistance is zero, a current of thousands of amperes will produce no heating effect whatever. It would be quite useless to employ a metal like this for the heating element in an electric fire!

All this is immensely interesting, and we marvel at the patience and the technical skill of the investigators who, over a century past, have laid bare these secrets of Nature. But don't you think it shows, after all, that things are better as they are? We go to a lot of trouble to discover substances of high conductivity, but supposing all metals suddenly lost their resistance altogether. It would be a bit awkward, wouldn't it?

If Friction Did Not Exist.

When I was a student at Cambridge we were once set the task, by the applied-mathematics lecturer, of describing what the world would be like if there were no such thing as friction. Before we had gone very far we realised how extremely awkward it would be if friction were abolished, and, instead of regarding friction, as we had previously done, as a universal bugbear—something that was always "absorbing energy" and preventing things from happening—we realised that it was most necessary and could hardly be done without.

In the same way it seems that if there were no such thing as electrical resistance we should be very hard put to it to make use of electricity in a great many of the ways we do to-day. All things considered, it seems to be very much better that conductors should have electrical resistance (albeit differing in their resistance—that is most important), and it would be an unqualified misfortune if metals behaved at normal temperatures, as they do when reduced to the very low temperatures we have been discussing. So, you see "Nature knows best" once again.

THAT SCANNING PROBLEM

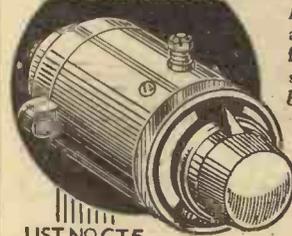
(Continued from page 3.)

a steel wire having a natural vibration period of the six thousand or more per second needed for the horizontal sweep. The mirror and its steel-wire carrier are both mounted on a base, which, in its turn, rocks vertically at the slower frequency of 25 or so per second.

These natural frequencies can, of course, be adjusted by means of tension screws. Energy for keeping the vibration constant is supplied by magnets actuated by the received television impulses. The whole thing seems to be very simple, and report says it has given highly satisfactory results.

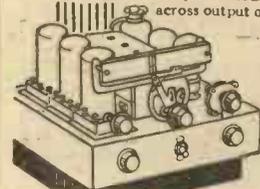
But, even if report exaggerates, I am still not unhopeful of mechanical scanners at prices within the reach of all being available. And even if they have disadvantages—even if the cathode ray were to be the ultimate solution—I should still welcome the "mechanicals," for it is rather to them, I think, we should look for the "popularising" apparatus which will be needed to set television on its feet, and which will force prices down to a real man-in-the-street level.

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HOW THE DIFFERENTIAL CONDENSER WORKS

Random Technicalities of Interest to all Readers.

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

MANY beginners seem to think there is some sort of mystery about a differential condenser and that it works on an entirely different principle from an ordinary variable condenser. This idea is quite wrong, as, in point of fact, a differential condenser is nothing more or less than two variable condensers having a common set of movable vanes. The moving vanes pass from one set of fixed vanes towards the other, so that, as they come out of engagement with one set, they enter into engagement with the other set. Let us call the condenser formed of one set of fixed vanes and the moving vanes, condenser "A"; and the condenser formed of the other set of fixed vanes and the moving vanes, condenser "B." Then as the capacity of condenser A is reduced, so the capacity of condenser B is increased, and vice versa. An important point to bear in mind, however, is that there is always a certain relationship between the capacities of condensers A and B.

A differential condenser is provided with three terminals, one to each of the two sets of fixed vanes and one to the moving vanes.

Controlling Two Circuits.

The particular advantage of a differential condenser is that two circuits can be controlled at the same time in relation to each other. Perhaps the most general use of the differential condenser is for the purpose of controlling reaction, the moving vanes being connected to the anode of the detector, whilst the two sets of fixed vanes are connected to the two ends of the reaction coil. You will notice that if one end of the reaction coil is earthed, which is usually the case, the anode of the detector, being connected to the moving vanes, has a by-pass to earth through one section of the differential condenser.

If the capacity of this by-pass section of the differential is reduced by shifting the moving set of vanes in the opposite direction the H.F. currents will pass into the reaction coil circuit. This is how you obtain smooth control of reaction, and you will see that it is much better than using an ordinary variable condenser for the purposes of controlling reaction, because in the latter case the by-pass from the detector anode to earth is not provided, as it is with the differential condenser.

Used as Volume Control.

Another purpose to which the differential condenser can usefully be applied is as a

volume control for the detector. For this purpose the two sets of vanes are connected respectively to the aerial and earth terminals of the receiving set, whilst the aerial is connected direct to the moving set of vanes. You will see that as you adjust the differential condenser, so you increase the coupling between the aerial itself and the aerial terminal of the set, on the one hand, or between the aerial and the earth terminal of the set, on the other hand; in the latter case this is the same as reducing the coupling between aerial and earth terminal.

Soldering.

Those of you who do your own construction work, or other types of small metal jobs where soldering is involved, know well enough now handy a spirit flux is for getting a quick soldered joint without wasting too much time in cleaning the surfaces to be joined. In most jobs this type of flux is quite suitable, but where electrical work is concerned you want to remember that when you apply the soldering iron to the wet surfaces the flux splutters and a shower of tiny beads of flux is deposited on adjacent parts. If it is left without being cleaned off, when the job is finished, it will rapidly corrode any metal parts and, being quite a fairish conductor of electricity, will cause electrical leakage. I came across a job the other day that had been soldered with liquid flux, and this had found its way into a small fibre washer which was separating two metal parts which were connected to the mains and therefore had a voltage difference of about 230 volts. When the juice was applied a kind of burning spark occurred in this washer, set up by the initial conductivity of the spirit flux. The fibre insulator was pretty well burnt out and the whole thing was useless.

Spirit Flux.

If you use spirit flux for electrical work it is important to clean it away carefully afterwards with a tiny paint-brush dipped into water, or with a speck of cotton wool held in tweezers, or something of the kind. But it is really safer to use one of the special paste fluxes, as these do not splutter nearly so much, and even if they do get about on neighbouring parts they will not do any harm.

I received the other day a sample of the new "Fluxite" gun, which is a sort of miniature grease gun, similar to the type used for

(Continued on next page.)

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HOW THE DIFFERENTIAL CONDENSER WORKS

(Continued from previous page.)

greasing the joints on the chassis of a motor-car. You fill this with the flux, and then, by slightly depressing the gun, you can squeeze it through the tubular nozzle, just enough flux for the job, and, what is more important, you can get it right at the spot where you want it.

A Little in the Right Place.

The usual method of digging a match stick into the flux and pulling out a lump of the paste is not very satisfactory, because you generally get it anywhere except where you want it, particularly on your fingers. This "Fluxite" gun is very handy, and it has the advantage over a collapsible tube of the tooth-paste type that it can be refilled and used over and over again. The price is 1s. 6d., and having used it I can recommend it to constructors and handy men generally.

Long-Base Valves.

Variable- μ valves are often described as "long-base" and "short-base," and readers often are not clear as to what these terms mean. They are really quite simple and relate to the characteristic anode-current-grid-voltage curve or, to be more precise, the grid-voltage line on this curve.

As you will see if you study the above-mentioned characteristic curve for this type of valve, when a certain amount of negative grid bias is applied the curve goes down and eventually touches the grid-voltage line, but the actual negative grid bias at which this takes place differs with different types of valves. In the case of one valve it may take perhaps 18 to 21 volts negative bias to bring the curve down to the base line, whilst in the case of another this may happen to need a bias of only 9 or 12 volts. The former type of valve would be described as a "long-base" and the latter as a "short-base" valve.

For Powerful Signals.

When a set is receiving powerful signals or is very close to a transmitter it is a great advantage to get smooth volume control, and this is done more easily with a long-base type of valve. On the other hand, a short-base valve has the obvious advantage that it does not require such a high voltage grid-bias battery, and another point is that it is convenient in a set using automatic volume control, owing to its greater sensitivity.

Decoupling.

Decoupling is practically a certain cure for motor-boating, but unfortunately, if the frequencies are very low, decoupling becomes troublesome owing to the fact that very high-capacity condensers are required; this is one of the cases where the electrolytic condenser comes in handy.

If you are bothered with very low-frequency oscillation you can do something to get over it by reducing the amplification on the very low notes.

Trouble in the L.F. Amplifier.

Often enough trouble in the low-frequency amplifier is due to some kind of resonance, and this may quite possibly be in the loud-speaker; in fact, the loud-speaker is almost the first place to look when you get resonant

peaks. Resonance will also sometimes occur from the walls of the room, or again it may occur in the actual components in the circuit.

Resonance is all very well for increasing volume, and if you can get the resonance spread over a fairly wide area, as it were, instead of being in actual peaks, it may have a desirable effect. But more often than not resonance leads only to trouble, and, broadly speaking, it is better to take what precautions you can to avoid resonant effects, whether in the circuit or in the speaker or any other parts.

Unspillable Accumulators.

A reader asks me whether it is possible to make up portable accumulator cells containing the so-called "jellified" electrolyte. In particular he wants to know whether he can use gelatine for this purpose.

The answer to the second part of the question is that ordinary gelatine is quite unsuitable for this purpose for several reasons, and one of them is that it would not "set" into a jelly. Perhaps some of you may not be aware that gelatine is prevented from "setting" by the presence of even quite a small amount of acid in solution with it. In fact, digressing for a moment, the "liquid glues" which are now so commonly sold in tubes and so on are generally made by mixing a small quantity of acid with the glue, this having the effect of keeping it in a liquid or semi-liquid condition until it has actually dried off.

The Solid Electrolyte.

To come back to the question of the accumulator cell, the jelly solution which is used is sodium silicate added to the acid electrolyte. The sodium silicate should be in the proportion of about one part in four of the electrolyte. This will take a few minutes to form into a jelly, and the action of it depends a good deal on conditions. You can, however, easily experiment with it until you get the right strength for your purpose.

I should say, however, that unless you require a jellified electrolyte for some special purpose it is far better, from the point of view of actual electrical performance, to use a battery with the conventional liquid electrolyte.

Reflex Circuits Again.

Some of you may remember the reflex type of circuit which was very popular a few years ago, but which has now almost entirely died out. Some people think that the reflex principle will be used again in the future, in an endeavour to make one valve do the work of two, and so to reduce the total number of valves required in a set. I see that in a recent radio exhibition in Germany they were showing a reflex superheterodyne set with three valves; the last valve acted as a second detector, intermediate-frequency stage and power amplifier.

Multi-Electrode Valves.

This scheme of multiplying the number of electrodes in a valve (the valve mentioned above, by the way, was a hexode), and for reducing the total number of valves required, is becoming quite popular. I had a valve manufacturer in my office the other day, and he told me that he was looking forward to the time when we should make a complete heaven-knows-how-many-stage receiver with just one valve only. It would have to be a big valve!

Miscellaneous Advertisements

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All communications should be addressed to:—Advertisement Department, "Popular Wireless," John Carpenter House, John Carpenter Street, London, E.C.4.

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All coils fitted with switching device, knob, etc. **TELSER COMPONENTS.** Bakelite tuning condensers, .0005 (List 2/6), 1/6. Screened binoc. all-wave H.F. choke (List 5/6), 3/3. Standard screened H.F. choke (List 3/6), 1/9. 4-point switch (List 1/6), 9d. Output transf., 1-1 (List 10/6), 2/6. Ace transf., 3-1 or 5-1 (List 5/6), 2/11. Class B output transf. (List 10/6), 3/6. Class B driver transf., 1-5 or 1-1. (List 10/6), 3/6. Multi-ratio output transf. (List 10/6), 3/3. Dozens of other Telsen lines too numerous to list—at Bargain Prices. Lists Free.

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THERE is little doubt that successful Short Wave reception is greatly aided by the use of one or two radio-frequency stages before the Frequency Changer. This is in fact, becoming standard commercial practice as it reduces noise and gives generally steadier and more reliable results.

There are, however, a number of points which need careful consideration in constructing Short Wave H.F. stages, for which, incidentally, the Marconi VS24 and VMS4B valves are very suitable. We have therefore prepared some useful hints on the subject and shall be pleased to send them to you on request.

WRITE TO THE VALVE DEPARTMENT, MARCONI PHONE COMPANY LIMITED, 210 TOTTENHAM COURT ROAD, LONDON, W.1, MENTIONING THIS PAPER.

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G.M. SERVICE. Radiophone Midget 3-gang superhet condensers, fully screened with trimmers, oscillator section. 7/5

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THE NEW MARCH "RADIO GOLD-MINE." (Large supplies ready for immediate mailing.) It has cost nearly £100 for production of copy alone, and is bigger and more comprehensive than ever before. Produced in four different coloured sections covering every radio component, accessory, numerous kits and receivers ranging from 8/6 for a single-valve kit to 29 gns. for our amazing 16-valve 5 waveband superhet chassis. The price level and value for money throughout is the same—astoundingly low. Contains hundreds of illustrations. Printed in three colours. Send, enclosing 3d. stamps, to-day.

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THE "GOLD-MINE" STORES

"RADI" MARKET OF THE WORLD

A NEW Osram POWER PENTODE VALVE

The Osram N41 Valve attains a new high level of performance in its class. It is a Power Pentode fitted with Indirectly Heated Cathode of a new high efficiency design, for the output stage of A.C. Mains Sets which use a low magnification triode or diode Detector.

These are the features which make the Osram N41 supreme.

1. Mutual Conductance or 'slope' attaining the remarkable figure of 10 milliamps/volt. The result is extremely high sensitivity to small grid input voltages.*
(Working grid bias -3.5 to -4.4 volts).
2. Exceptionally large undistorted Power output. This enables moving coil loudspeakers to be fed with adequate Power, and avoids distortion on the "peaks," resulting in improved quality of reproduction.
3. Heavy duty Cathode to ensure ample electron emission.
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* Use with a low magnification Detector stage only.

Osram

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MADE IN ENGLAND

Sold By All Radio Dealers

"A TONIC TO YOUR SET"



THE
N41

PRICE
18/6

NOMINAL RATING

Filament Volts	...	...	...	4.0 A.C.
Filament Current	...	...	2.0 amps. approx.	
Anode Volts	...	...	250 max.	
Screen Volts	...	...	250 max.	
Amplification Factor	...	...	200	
Impedance	...	...	20,000 ohms.	
Mutual Conductance	...	...	10.0 ma/volt	
measured at Anode Volts 100, Screen Volts 100, Grid Volts 0				
Anode Dissipation	...	...	8 watts max.	
Characteristic curves and full operating data sent on request.				

WRITE for the OSRAM VALVE GUIDE (1934 Edition). Sent post free.

THE WORLD'S LEADING RADIO JOURNAL

Popular Wireless

HOW TO MAKE
A SIMPLE REMOTE CONTROL
★ ★
AVOIDING MAINS HUM
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PRACTICAL TIPS FOR ALL
Etc., Etc.

EVERY
WEDNESDAY PRICE 3D

AND TELEVISION TIMES

No. 668.
Vol. XXVII.
March 23rd, 1935.



AIRCRAFT D.F.

Plotting the position of an aeroplane at the new aircraft station recently established at Pulham in Norfolk. This service of direction finding is one of the greatest aids which radio has rendered to the navigation of air liners during bad weather and periods of poor visibility. The procedure adopted by Pulham in working with Croydon and other aircraft stations is described in a special article on page 36.

B.I. STATIC CONDENSERS

for **ELIMINATION OF INTERFERENCE**
in **RADIO RECEPTION**

The causes of interference in Radio reception may be classified under three principal headings, as follows:

1. Atmospheric. 2. Supply Mains. 3. External.

Atmospheric troubles are usually static, and cannot be eliminated by means of condensers.

In the case of No. 2, trouble may be experienced through the interference being conveyed over the Supply Authorities' distribution system.

In the case of No. 3, external interference, this is caused by direct radiation, and originates in electric motors, vacuum cleaners, and any other electrical apparatus in which sparking takes place during operation; for example, violet-ray apparatus, or even when switching on or off any kind of electrical plant.

In attempting to overcome such interference it is necessary to try the application of the remedy at the source.

In many cases the use of condensers alone is sufficient to minimise very largely, and often entirely suppress, the interference.

The Condensers employed must be suitably designed for the working conditions, and should have a 5-ampere fuse inserted between the mains and the condensers.

Our type 212 Condensers, as illustrated, are designed with a liberal factor of safety for this duty. Write for Leaflet.



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Blue Spot Speakers have "Quality" than which there is no greater virtue in a speaker.

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PRICES FROM 35/- TO 11 GNS.

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THRRILLING! Exciting! Enthralling! Instructive! This jolly game is all that and more. It takes you round the world, to lands of romance and mysticism, gives you hours of fun and entertainment and teaches you all sorts of interesting things about the positions of the most important places of the globe. In all there are 500 square inches of Jig-Saw puzzle to be made into a Map of the World. It is an education in itself.

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POPULAR WIRELESS AND TELEVISION TIMES

MANAGING EDITOR: N.F. EDWARDS.

TECHNICAL EDITOR: G.V. DOWDING ASSOC. I.E.E

JOINT DESIGNS
LIGHTNING NOTES
A BIG STAFF
READERS' RESPONSE

RADIO NOTES & NEWS

SLOW WAVES
TELEVISION NEWS
RADIO AGEN AGAIN
FROM THE MAINS

Radio Marconi.

AS a graceful monument to a very great man the city of Bologna, Italy, is calling its new wireless station Radio Marconi.

It is fitting that this name should be thus associated, for it was at Bologna that Marconi was born. Fortunately for Great Britain, he realised that the greatest use of wireless in its early stages would be on ships, and he came to London to try to interest the centre of the world's shipping in his discoveries. A few far-sighted business men backed him for all they were worth, and once the results he obtained became public the whole world sat up and grew radio conscious. Although he has had all sorts of honours showered upon him, we can be sure that he will get a thrill out of this latest monument, Radio Marconi.

For the People:

THIS idea of radio manufacturers combining and co-operating to produce a people's receiver—which originated in Germany—continues to spread and to prosper.

The Italians have tried it, and ten firms there won official approval for their designs and were commissioned to manufacture the special receivers. They now sell them to schools, local civic officials, parish priests and other chosen persons on a basis of ten monthly payments and an undertaking to service the set at their own expense.

Over 50,000 sets have been placed in this way, and the five-valve superhet design is claimed to be far superior to the designs of people's receivers in other countries.

Aerials on Trees.

IN a report of a lecture at Forest Hill by Mr. Dark, Vice-President of the South London Botanical Institute, the question of wireless aerials attached to trees came in for considerable attention.

It was stated that Mr. Dark has charge of all trees struck by lightning in the British Isles, and there is at present no evidence that the vast number of wireless aerials attached to trees has appreciably increased the danger from lightning. (Dismal Desmonds, please note.)

Apart from this reassuring statement, the interesting facts emerged that of seventy trees struck in the past two years twenty-four were oaks, fourteen elms, ten were pines, firs and other conifers. Trees that have been struck frequently recover their full vigour.

ON OTHER PAGES

- Radio Guides For Airmen - 36
- A Simple Remote Control - 38
- Are Electrons Too Slow? - 45
- Avoiding Mains Hum - - - 46

The French Rugby.

BROWSING through my "Daily Telegraph" the other day, I was surprised to read that about 100 men will find employment at the new wireless station near St. Nazaire.

It is designed as a kind of Rugby of France, able to keep in direct touch with vessels all over the Atlantic and with America.

The station is in two sections—one for transmission, at Severac, and the other for

reception, at La Pommeraye—fifteen miles apart, but both near St. Nazaire. Since there will be a 24-hours' service and special facilities for aircraft communication, it can easily be understood that a large staff is now required.

Brussels Sprouts.

LISTENERS in Belgium have been complaining so insistently about the interference from high-powered neighbouring stations that it has been decided to raise the power of the two Brussels stations from 15 to 100 kilowatts.

Wavelengths will remain as at present—483.9 and 321.9 metres; but in the autumn the present power will be doubled, and arrangements are in hand whereby, in place of the existing aerials, new ones of the anti-fading type will sprout up. The full effect of the changes will not be felt until 1936, when the maximum power will come into force.

News Items.

A NEW station at Marseilles will be on the air in September next.

Stated to have quarrelled with his wife over her selection of a radio programme, a man was fined 10s. or five days' imprisonment at Dunfermline.

Tokio now broadcasts a daily news bulletin in English for fifteen minutes, commencing at 9.55 a.m.

The B.B.C. has advised the Mayor of Bangor that the new studio there will be opened in June.

Blatant Thanks.

THE good sports who responded to an SOS I sent out on December 15th are hereby thanked—late in the day, but heartily.

I have just learned from Mr. A. C. Davey, of Greenford, that, by the time the postman had stopped pushing your responses through the letter-box, sympathizers had created a minor financial crisis, and M. Davey was wondering how he was going to buy enough stamps to return all the copies of "P.W." lent to him!

(Continued on next page.)

REPRODUCING EARTHQUAKE NOISES



B.B.C. EFFECTS (1). The sounds of an earthquake are produced by allowing bricks to slide down a board covered with sandpaper on to a bass drum. Note the microphone above the sandpapered board.

"THE VOCAL OUTPOURINGS OF THE FIDGETY MIDGET"

He praises you fellows up to the Heavenside Layer. And I'm bound to agree with him, for the old friendly "P.W." spirit seems to be as eternal as the charm of the seasons. (Nature's, I mean—not the railway variety!)

Tardy Travel.

THESE investigations into the ways in which wireless waves travel seem to be leading to some startling results.

Paris investigators have found that waves received from a station in Buenos Aires linger on the journey from South America to an extent which almost borders on the dilatory — far below the rate of 186,000 miles a second in which the text-books have



inspired so much faith.

But the most amazing example is that of a "P.W." reader in Reading, who begins his letter to me as follows:

"When I switched on last Monday night I heard the finish of the Epilogue."

I cannot explain this. So I remind myself that Reading is a town where they make—and take—the biscuit.

French Television.

OUR neighbours across the Channel may have been a little negligent of radio when it concerned only sounds; but now that television promises them something to look at they are sitting up and taking fervent notice.

There is talk of one or two bright television ideas under development by French scientists. And that the official attitude is not one of lassitude may be gathered from the fact that the P.T.T. authorities have already contracted for an experimental ultra-short-wave transmitter for "look-see" purposes.

It will probably be erected on a site in the Rue de Grenelle, Paris, and work on wavelengths of from 7 to 10.5 metres.

Law and Music.

SOLICITORS, who charge a man 6s. 8d. for a few well-chosen words, are not renowned for dealing in flowery compliments; and yet it was a solicitor acquaintance of mine who recently told me of one of the nicest tributes to radio that I have come across.



After office hours this gentleman becomes quite human, and takes an interest in radio which has resulted

in the purchase of a very elaborate and expensive set.

The other day a musician of some note called at the solicitor's home on business, and while waiting heard a piano being played in the next room. "You are

lucky," he said, "in having such a beautiful instrument in your home, played with such unusual skill."

"That is my wireless set," said the solicitor, to his visitor's astonishment. And in recounting the incident to me the man of law smiled a crinkly smile and said with legal glee: "I had him there! And right on his own ground!"

Radio Agen Again.

QUICK-CHANGE artist Radio Agen, the French station to which I referred recently, continues to live up to the reputation I gave him. Hardly had I penned a notice telling you on what wavelength to look out for him than the mercurial fellow gets up to his old tricks, disappears and then bobs up on another wavelength.

"REQUEST WEEK"

Derek McCulloch and the Children's Hour staff were for ten days completely submerged by charts and letters dealing with the results of "Request Week." Twice a year "Mac" broadcasts an invitation to children to submit their choice of items from past programmes. These replies are then collected, entered up on charts, recording the favoured items, also the age and type of child making the requests. This "Request Week" business is a most important guide to the popularity of material, the age of the children listening to the different features and the general popularity of the "Children's Hour."

The "Request Week" resulting from the replies to the Children's Hour ballot will be broadcast on April 1st onwards. The recording of all these facts has taken three people ten full days' work to reduce the information to the necessary formulae. Barbara, of the Children's Hour staff, said that one interesting fact revealed by the ballot was that a large number of children of approximately six years of age voted for Stephen King-Hall, the "Zoo Man," and the "Star Gazer." First on the list comes "Toy Town," with 4,000 out of 6,000 votes. The "Zoo Man" (David Seth-Smith) was second and Stephen King-Hall third. Next came "The Island in the Mist," a serial play, followed by the "Family Party," made up of various people on the staff at Broadcasting House. A serial story, called "Java Ho," figures next. "Toy Town" is becoming so popular that one day it will undoubtedly reach the "classic stage."

Instead of working on 309.9 metres, to which he had been assigned, he is—at the time of writing—disporting himself on 345.6 metres, immediately above the London Regional wave.

This, mark you, is at the time of writing. By the time you read these words he may have had another flood, fire or earthquake, blown himself up or turned into a long-wave station!

The Kookaburra's Secret.

STATISTICAL experts, who add so much to the gaiety of nations, have been working on the Australian Broadcasting Commission's Report.

Having shown that the revenue was nicely in excess of expenditure and accounted for the last halfpenny of licence money, they went on to work out that Australia is now, of British countries, second only to the United Kingdom in the number of its wireless listeners in proportion to population.

Fired by this discovery, they went on to show that, on a similar basis, but world wide in its scope, Australia comes sixth on the list.

A very creditable showing. No wonder that kookaburra keeps laughing on 31.28 metres.

Misplaced Energy.

FOR the true men of science I have a lofty respect; but even the greatest admirer of the breed must admit that there are certain occasions when they bark up the wrong tree.

This San Francisco professor, for example, who has devised a remarkable amplifier which is so responsive to high notes that "insect noises, formerly inaudible, can now be heard at amazing strength."



While granting that this may be a big technical achievement I consider it a social crime. Who wants to hear gnat calling unto gnat or the vocal outpourings of the fidgety midget?

Take it away, Professor. It may be a good amplifier, but it's mighty poor entertainment.

Song and Dance.

SAINT GEORGE of Merrie England was not the lad to stand by supinely while fair damsels were in distress, was he? No, sir! Any aspersions upon a lady had to be made far beyond his knightly earshot, or out would come his halberd, down would go his gauntlet and combat would ensue.

Now, I am no St. Geo., goodness knows, but I feel a stirring of the old-world chivalry when I see that a fellow scribe (I'm sorry to call him fellow) has been writing unkindly of the singing of the Dancing Daughters. He says they mumble.

I say they do not. I say that their tootsie tattoos may or may not enliven a programme. That is a matter of opinion.

But when those girls sing you can hear their words—which is an art that many a non-dancing singer has not learned.

Saying thus, the knight leapt on to his mustang and was gone.

In Sunny Spain.

A CORRESPONDENT who writes from Madrid tells me a variation of the old story about electric-light fittings that render wireless programmes as well as illumination to surprised householders.

It seems that on certain evenings people in one district of Madrid, sitting quietly in their homes, have heard mysterious whisperings and voices, snatches of love songs, billing, cooing and serenades. And investigation has shown that in every instance the sounds were heard by people in close proximity to an electric-light cable running near to the radio station.

This latter fact seems to be the explanation—the nearest we moderns will ever get to finding, once again, the romantic Spanish main.



With the Wizards of
By **ALAN HUNTER**

Broadcasting Research

AFTER driving up and down Nightingale Lane twice, going into reverse three times and asking in quick succession a milkman, a postman and an errand boy by the way I came upon Nightingale Square. It is that much of a back-water of the salubrious suburb of Clapham.

In the Square's quiet seclusion, at the end of a well-kept green, rises a red-bricked building—once the Convent of the Sacred Heart.

In this day and age its unconsecrated walls hide some of the most revolutionary ideas of modern broadcasting. In place of devout nuns I discovered matter-of-fact engineers taking measurements that may eventually become part of accepted broadcasting technique.

Single-Sideband Tests.

Mr. Kirke, head of B.B.C. engineering research, took me on a personal tour of radio wizardry. I only hope I shall be able to do something like justice to the trouble he took in explaining everything to me for "P.W." readers.

We came first upon the cradle of transmitters. Baby broadcasting stations—strangely miniature beside one's memories of, say, Droitwich—nestle unobtrusively in experimental racks.

There in that room was being evolved what may one day become a revolution in the technique of broadcasting. I was shown a transmitter equipped for single-sideband working.

Under this system the carrier, which is normally at the centre of two equally wide sets of sidebands, can be shifted relatively to one side by the removal of one set of sidebands.

If you take a station like Droitwich, which has a level-frequency response in the audible range up to at least 8,000 cycles, normally the total band-spread of frequencies in the ether will be 16,000 cycles.

Supposing one sideband is taken away, though, the actual space occupied by the signal in the ether is reduced to only 8,000 cycles. This does not mean, as some writers have suggested, that twice as many broadcasters would be able to squeeze into the available waveband.

Better Quality Possible.

Quite obviously, the carriers would remain. If they were brought nearer together than the present 8 or 9 kc. the heterodyne beat note would be very troublesome, to say the least.

As Mr. Kirke pointed out to me, single-sideband working is a development of the future—and not an absolutely certain practical development at that. Meanwhile, he thinks the B.B.C. should know all about it.

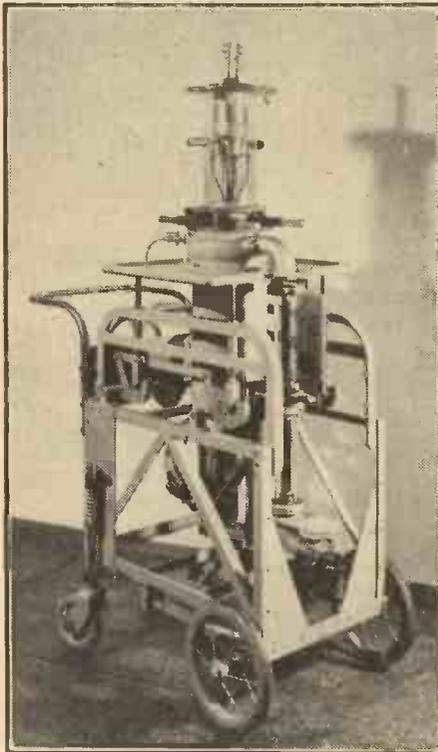
The idea of squeezing more stations into the ether with single-sideband transmissions for all is not the real aim of the new system at all. Better quality transmission is what the engineers are thinking of. Assuming the present carrier separation

How many listeners are there who know of the existence of a special B.B.C. research building? Probably very few. Yet it is here that the work so largely responsible for the constant improvements in broadcasting technique is carried out. Our contributor, who has recently had the privilege of visiting the research building in South London, gives below a vivid pen-picture of this all-important side of B.B.C. activities.

is maintained, a single-sideband transmission would have an audible-frequency response twice as high as at present—up to 16,000 cycles, in fact.

I gathered that the whole business of single-sideband working—at both ends—is full of difficulties. That, of course, is where research comes in. Its job is to capitalise the best in new technique, while suppressing the worst.

A 50-KW. VALVE



Numbered among the jobs allocated to the B.B.C. research department is that of thoroughly testing the giant valves used for transmission. In this work extensive use is made of the X-ray. The valve shown above is one of the 50-kilowatts employed at Droitwich, and it is mounted on a trolley to facilitate handling.

"The system is well enough advanced," said Mr. Kirke, "for us to be able to put a transmitter into action with single-sideband working within quite a short time, if necessary.

"But it may be years before the idea is made use of—if at all. Meanwhile, though, we have to examine these new ideas."

I was then introduced to Mr. Wilson, who is in control of the transmitter research. With him was young Goyder, whom my more seasoned readers will recall as one of the more spectacular pioneers of the short waves. I left him playing with a new toy—a harmonic analyser, if you please.

Into a room where "the trade's" sets are tested. "Just to see what kind of results listeners are getting on commercial apparatus from our transmissions," smiled Mr. Kirke.

"But that isn't a trade product," I exclaimed, pointing to a monstrous-looking affair in a long aluminium box.

Those Valve Noises.

"No, that's a set of our own design we have been using to test Droitwich fading," explained my guide.

He showed me an ingenious oscillograph arrangement for measuring and photographing the vagaries of the Heaviside Layer, whose peculiar behaviour has, to some extent, been the suspected cause of Droitwich's erratic reception in certain districts.

The research engineers, you must understand, do not rest content with designing transmitters. They examine the behaviour of the medium into which their signals are pumped. They have recently gone to great trouble to get to the bottom of this Heaviside Layer mystery.

Then we went into the valve-testing room, where I met a very old friend—Mr. Walker, whom you will surely remember as G 2 0 M of the early days of this broadcasting. No longer an amateur, Mr. Walker is now in charge of all the tests on valves used by B.B.C. transmitters, as well as being responsible for original research work on the highly important question—to the transmitter—of valve noise.

Through the assistance of his department a new non-noisy and non-microphonic valve has been developed by the makers.

As part of his tests Mr. Walker brings into action a specially designed amplifier with a colossal stage gain. So great is the gain, in fact, that a valve sounding perfectly quiet with the normal amount of amplification produces an immense roar in the loudspeaker. Only by such stringent tests can valve noise be studied.

X-Ray Examinations.

Besides checking over all the valves before they are passed out into the broadcasting service Mr. Walker's department periodically examines the big "bottles" actually in use.

Some of those enormous CAT tubes at Droitwich, for example, need careful scrutiny. The trouble is that, owing to the all-enclosing nature of the anode, the state of the filament cannot be seen by the eye. They have to X-ray the tubes and then

(Continued on next page.)

WITH THE WIZARDS OF BROADCASTING RESEARCH

(Continued from previous page.)

examine the state of the valves by the photographic records.

I was shown a pile of these pictures. Very revealing they were. One, for example, showed how a grid had fallen at one end of the valve right over to the anode. Another showed how a filament was beginning to buckle. Yet another how a filament had been fractured.

With transmitting valves they must not suddenly apply the full filament voltage, you know. At first some of the Droitwich valves were started with too high a filament supply, and the great heating effect from cold, caused by the surge of filament current, resulted in more than one fractured filament. Now all these valves are switched on at the very low-filament voltage of 1.8, working up slowly to the maximum of 32 volts.

Complete Isolation.

We left Mr. Walker wrestling with his high-gain amplifier, wherein a "pongy" valve was giving him something to think about. And came upon one of the most extraordinary rooms I have ever been in.

"This little room is electrically and acoustically quiet," explained Mr. Kirke. And, believe me, I could almost feel the silence. The walls, I found, are lined with building board. The door, of great thickness, is lined with rock wool on the inner part and thick copper plating on the outer—acoustically and electrically quiet.

Inside this room any special measurements that have to be taken under perfectly quiet conditions can be taken in comfort. The only possible drawback is the absence of any ventilation. Not that it signifies, because the room is seldom needed for more than half an hour at a time.

Room of "Infinite Echo."

"All the same," added Mr. Kirke, "I should like to design a window letting in light and air, but not noise. It ought to be possible. In fact, I have worked out a way to do it, but I never seem to get time to try it out."

We passed into the recording research room. Here I found a new recorder under scrutiny. "It will play back immediately," summed up Mr. Kirke as I admired it. A great point, that, for the broadcasters. Recording systems for the Empire stations need to be able to deliver the goods very soon after they are "bottled."

I was beginning to appreciate some of the unsuspected sidelines of B.B.C. research. We had not finished, though. The next few steps brought us into a still

more remarkable room—called the reverberation chamber. I mentally dubbed it the room of infinite echo, but then I'm not so scientific.

A maddening room to speak in. A room with walls, floor and ceiling entirely of concrete, faced with highly glazed tiles. Rather like a big bathroom in which the builder had absent-mindedly gone on tiling too much.

Anyway, the period of vibration is amazingly long. Mr. Kirke "ah-ah-ahed," and the echo seemed to ring into eternity. Actually, the reverberation of the initial sounds of Mr. Kirke's manly voice went on for exactly nine seconds. Positively nerve-shattering when one tries to carry on a conversation, I assure you.

"In here we test the absorbing power of various materials," I was told. "As there is practically no absorption by the room itself we can gain a very fair idea of the effect of any material introduced into it."

THE NIGHTINGALE LANE HEADQUARTERS



This is the building used by the B.B.C. for research work. It was formerly a convent.

As a striking contrast we went into the "dead" room. So utterly lacking in any suspicion of echo that "dead" is the only really effective word to describe its effect.

This is the sound-measurement room, with a 6-in. thick door and 4-in. thick walls, mineral wool forming the stuffing, held in place by thin muslin coverings.

In my all-too-superficial survey I ended up at the old chapel. Many thoughts assailed me as I gazed at a once-sacred spot. I had no need to mourn the past. The nuns who used to worship there had all gone back to Belgium.

Soon the chapel will be entirely transformed, and the few pathetic decorations of a bygone sanctity will be seen no more. "We want to do something about smaller studios," said the matter-of-fact Mr. Kirke, not at all saddened by the atmosphere of desolation. "They are much more difficult to design than the larger ones. We shall make a test studio in here. After our research we hope to produce something really good."

What a thought! In a once-consecrated nuns chapel scientific men with reverberation meters and building board slowly but surely develop a better studio for broadcasting.

THE LISTENERS' LIBRARY

A few facts about a very interesting feature of the B.B.C. organisation.

IN the course of its growth the B.B.C. has of necessity formed one of the most extensive libraries in the world—a library devoted to the wants of British listeners.

It is divided into three sections, or, if you prefer it more accurately, consists of three libraries—one for music, one for plays and a third for gramophone records.

The music library contains pretty well everything the B.B.C. orchestras and bands are likely to require, and was started in the early days when the old company was at Marconi House. Then it was an inglorious pile in the corner; now it occupies two large rooms fitted with steel shelves.

In the chief orchestral section there are some 13,000 items, and it supplies all the stations with their music. Special favourites—some thousands of them—are triplicated.

Musical Items.

Then there are about 3,000 band items, 80,000 vocal scores and not far from 10,000 songs. On top of these there is music for piano and violin, piano and cello and the organ! What a library!

The play collection numbers a mere 8,000 odd. It is eight years old, and though only a small number of these 8,000 have been broadcast, they are filed after acceptance so that they shall be available at a moment's notice should any

particular type of play be deemed desirable.

I said after acceptance, for if a library of the unchosen were to be started it would soon outpace the other—some hundreds of rejects a week are returned to disappointed authors.

The Gramophone-Record Collection.

The third library is perhaps the most wonderful of all, though it is the youngest. It contains some 37,000 gramophone records, all collected in about two years. It is one of the finest collections in the world, thoroughly classified by a cross-index system so that anything from Stanelli's "Hornchestra" to Opera can be found at a moment's notice.

From symphony orchestras to the "effects" discs, from present vocalists to the voices of the past—Caruso, Melba—speeches by present statesmen, discourses by characters whose voices would be forgotten were it not for the gramophone—all are there in the card covers, standing on the rows and rows of steel shelves.

It is a giant vocal portrait gallery of present and past, serious or humorous, a priceless collection that is ever being enlarged for the benefit of listeners. Your own library.

K. D. R.

TELEVISION

S-W. TELEVISION RECEIVERS

Some notes on the design of superheterodyne receivers for the high-definition television programmes on short waves.

By L. H. THOMAS.

I HAVE already covered, briefly, the main points that one has to understand about the operation of the cathode-ray tube and its associated gear for television scanning. Before we can deal with the important question of how to link it up with our receiver it is obviously necessary to have the said receiver, and this week I must go right back to the aerial lead-in and talk about suitable receivers for high-definition television.

At the present time everyone seems to be assuming that the superheterodyne is the best, if not the only, receiver for the job. Personally, having had considerable experience of 5-metre receivers working at signal-frequency only, I am inclined to think that a new technique will spring up later on. Meanwhile, however, let us sort out the superheterodyne.

An Essential Difference.

What is the essential difference between a superhet for ultra-short-wave television and one for ordinary short-wave reception? Well, briefly, we can dismiss it by saying that whereas selectivity is essential for a straightforward short-wave superhet it is the one thing that has to be avoided like the plague when we are concerned with television.

We have been told that our receiver for "high-def." transmissions must be capable of reproducing up to 1.6 or even 2 megacycles. This, as a matter of actual fact, represents the ideal condition only. Quite satisfactory reception will be obtained if we are so fortunate as to keep our band-width as great as 1 megacycle.

But compare this 1 megacycle—1,000 kc.—with the much-vaunted 9-kc. separation that is given by a good broadcast receiver. It shows that we have to adjust our ideas to a completely fresh scale.

First of all, we cannot use the same sort of frequencies for our I.F. amplifier that we have been accustomed to. The technicians tell us that the width of the resonance curve of the average single-tuned circuit is roughly 10 per cent of the frequency on which it is operating. In other words, a tuned circuit on 900 kc. (in the medium broadcast band) will have a resonance curve roughly 90 kc. in width.

Several I.F. Stages.

If we add other tuned circuits in cascade (with valves in between) we can sharpen this enormously. On the other hand, it is possible to add flat-tuned circuits in such a way as to obtain considerable amplification from the intermediate valves without sharpening the curve very much.

Now think in terms of an I.F. amplifier

operating on $37\frac{1}{2}$ metres (8,000 kc.). This should give us a band-width of about 800 kc., and if all our tuned circuits are flat or inefficient we can maintain this band-width throughout the amplifier.

The fig. represents a schematic diagram of a television receiver. Our first detector is picking up the signal on $7\frac{1}{2}$ metres (40,000 kc.) and our oscillator is supplying a beat in the region of 10 metres (say 32,000 kc.). The resulting "signal" (the combined beat with a frequency of 8,000 kc.) can be passed into our I.F. amplifier working on that frequency.

In an ordinary short-wave superhet we should use perhaps two very efficient tuned circuits, and quite good selectivity would result. In our television superhet we use six inefficient tuned circuits—I.F. transformers with the primaries deliberately damped by means of parallel resistances. I will go into the practical aspects of their construction later on.

it straight from the second detector. It is perfectly practicable to obtain a sufficient voltage change in the anode circuit of that valve. But it is, alternatively, quite an easy matter to arrange one stage of resistance-coupled L.F., using special circuit constants, which is almost linear right up to the high frequencies that we want to keep.

One commercial design splits the output from the second detector, one branch operating the cathode-ray tube directly, while the other passes to a peaked 4,500-cycle amplifier for bringing up the synchronising signal. This, of course, is for 180-line transmissions; for 240 we should need an amplifier peaking at 6,000 cycles.

And now I have rather put the cart before the horse. I have been dealing with the method for amplifying our signals before we have really collected them from the ether. What of the aerial?

The Di-Pole Aerial.

The method that will be favoured by the firms supplying complete receivers is quite straightforward. A vertical di-pole (another way of describing two quarter-wave lengths of stout copper wire or tubing) will be mounted on a little pole on the roof or in the garden, and a lead-in of the cross-feeder type will couple it to the receiver.

A quarter-wave at $7\frac{1}{2}$ metres is about 5 ft. 6 in. (quite a workable size), and there should be no difficulty in hauling a nice little vertical di-pole up to the top of an existing aerial mast. The cross-feeder lead-in, or transmission line, is already familiar to short-wave enthusiasts who have installed noise-reducing aerial systems, and presents no difficulty whatever.

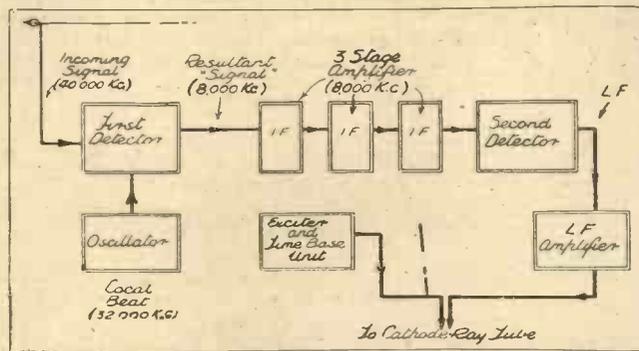
It may be constructed of twin flex or of two lengths of enamelled wire separated by little porcelain "transposition blocks" every few feet. At the "home" end it is inductively coupled to the receiver, and the length of the feeders is not an important matter.

The Final Chain.

Now we can survey the whole chain of apparatus. We start with the di-pole aerial "out in the clear," after which the order is—noise-reducing feeders; first tuned circuit, first detector; oscillator "mixing" with this; the "mixture" applied to a three- or four-stage flatly tuned I.F. amplifier; second detector and possibly L.F.; cathode-ray tube.

Associated with the latter, exciter unit and double time-base supplying scanning frequencies of 25 and 4,500 or 6,000 cycles per second. A formidable list, but it will do the work. Not inexpensive, perhaps, but costs will come down later.

THE UNITS OF A COMPLETE OUTFIT



The various stages and items of a short-wave television receiver are shown, together with their sequence, in this special diagram.

Assume, for now, that we manage to keep a band-width of 800 kc. or more in the I.F. amplifier. We detect this very flat-tuned signal on $37\frac{1}{2}$ metres, probably using an H.F. pentode for our second detector. And now we have got to add L.F. amplification, still without losing all that "super-top" in the signal.

I have actually seen a published circuit diagram advising the use of a transformer-coupled amplifier. Unfortunately, the writer didn't give any particulars as to where one could obtain that L.F. transformer which would give a straight curve up to nearly a million cycles!

As a matter of fact, the cathode-ray tube being a voltage-operated device, it will probably become common practice to work

LOW-DEFINITION TELEVISION

Some notes on the present transmissions sent out by the British Broadcasting Corporation.

THERE is little doubt that the B.B.C. is making use of the present 30-line transmissions to gain valuable experience in television technique. Crude though they are, compared with 180- or 240-line television, they certainly have their possibilities, and the energetic staff is not losing many opportunities.

One or two readers have remarked upon the improvement in the presentation of the programmes and also on the apparent increase in the amount of detail that is transmitted. I think the latter must be mostly imaginary, since we all know just how much scope for "detail" is given by 30-line scanning.

Future Possibilities.

The all-important question of whether these transmissions will die a natural death when the new service starts is still cropping up. Since even the B.B.C. has not made up its mind on the subject, any conjecture is futile at present. I am of opinion that they will be considered to serve a useful purpose for some little time after the new service starts.

The change in wavelength—and site—of Midland Regional seems to have caused considerable trouble among the television enthusiasts. Personally, I don't notice any change in reception, except that the new station does seem a little more inclined to fade during daylight.

Rumours reach me, however, of people along the South Coast who now have to put up with "soundless" television on account of the weak reception of Midland Regional. A better "sound" receiver seems to be called for in these cases, and, while admitting that it is hard luck, I can't admit that they have a right to expect to receive their sound on any old set of 1925 vintage.

At a lecture the other day I heard a man express the view that the change-over from 30- to 240-line television was just about as revolutionary as that from spark to valve-generated C.W. Actually, of course, it's nothing of the kind. It is simply a logical development that happens to have taken rather a large-size jump all at once.

Cathode-Ray Advantage.

In cold fact the only change is that the light-spot used for exploring the subject being televised is made to travel over eight times as many lines. That's all! The complications arise from the fact that the band of frequencies required for doing this is considerably more than eight times as wide.

Out of the "band-width" question springs the other question of "ether-space." Out of that springs the logical use of ultra-short waves. There are rather too many simultaneous changes for the average man to care for, and then, on top of that, we have the other fact—that the cathode-ray tube, instead of being "just another way of scanning," becomes, for the time being, almost the only way. But that's only for the present, I think.

Putting this the other way round, we

can say that the cathode-ray tube has always been one of the best methods; but it so happened that 30-line transmissions could be scanned much more cheaply by mechanical methods. The C.R. tube is such a flexible device that the sudden multiplication of

THE SOUND SIDE



the number of scanning lines by eight doesn't worry it at all. The mechanical methods are worried—distinctly so just now.

It's just another case of a "latent" advantage suddenly showing up, to the detriment of possible rivals.

But to compare all this with the change from spark to C.W.—no, it isn't in the same boat at all.

Television societies continue to spring up like mushrooms, and the demand for club-rooms will be in excess of the supply if things don't quieten down soon. There are hardly any plain "radio societies" these days—they nearly all go in for short waves, or television or both. Television will certainly be responsible for an enormous awakening of interest on the part of one-time radio fans who have dropped their hobby for the time being.

A New Television Society.

Leytonstone is the latest district to possess a television society, and readers who are interested are invited to apply to Mr. A. W. Read, the founder, at 71, Montague Road, Leytonstone, from whom they may obtain full particulars.

Meetings are held on Mondays and Wednesdays, the Mondays being devoted entirely to theoretical considerations. At the other meetings a varied programme is arranged, including demonstrations of disc, mirror-screw, mirror-drum and cathode-ray apparatus.

It is hoped to fit up a laboratory for the use of members who have not sufficient facilities in their own homes for carrying out experimental work. L. H. T.

The photograph to the left shows the Baird short-wave sound transmitter for use in conjunction with their television programmes.

AN EVENING FOR EVERYTHING

Our broadcast critic pleads for more organised listening and regular evenings for certain well-defined types of programmes.

WEDNESDAY night for my purposes is always a dud night. For music-lovers it must rank as the night of the week. It has long been evident that the B.B.C. is reluctant to present anything of sufficient magnitude to rival seriously the big music it always presents on this night.

On the contrary, it seems to take the opportunity of cleaning its slate of those miscellaneous items which, because of the frequency with which they occur, must sooner or later kill keen and intelligent listening.

Nothing, I imagine, could stand between real music-lovers and Sir Hamilton Harty, plus Wilhelm Backhaus, especially as Berlioz (whose works, "Romeo's Reverie" and the "Capulet's Fate," were in the programme) is alleged to be one of Sir Hamilton's favourite composers. Admittedly, such fare is grand for the musically minded.

But what of the rest? Wednesday offers them nothing really substantial and satisfying. Indeed, it can never be said that lovers of the other arts have ever had one evening a week so regularly and satisfactorily filled as the music-lovers' Wednesday is.

Whenever the B.B.C. feels the time is ripe for a drastic alteration of its programme arrange-

ments I do hope the change will take the form I have hinted at. Broadcasting divides itself conveniently into departments as specific as the three R's. As there are seven days in the week a division under seven headings immediately suggests itself.

I would suggest, then, that each night be in turn a bumper night for one kind of fare. For instance, Monday night might be set aside for Drama; Tuesday for Talks; Wednesday for Music, and so on, till Saturday, which should always be a Light Entertainment night.

The Suggested Scheme.

I don't ask, of course, that Monday night should be Drama night to the exclusion of everything else. What I do ask for is that on every Monday night there should be a good play. Not a 45-minutes' affair made out of material for 3 minutes only. I mean and ask for a good play. Similarly, Tuesday night should be primarily devoted to good Talks. There could, of course, be musical interludes. In fact, there would have to be, as on every other night.

My scheme does not demand the abolition of the miscellaneous small items, for they are indispensable. It merely insists on listeners getting a full measure of their favourite fare regularly one night a week.

In this way every individual's listening would fit in conveniently with his other after-office-hours pursuits without clashing with them, as it often does to-day. Or, at any rate, it could be made to. Under the present arrangements time for listening often has to be stolen.

Owing to the present uncertainty in programme arrangements, it is almost impossible for listeners to plan anything very far ahead. Except the musical brotherhood, of course, who for some long time now have been able to

(Continued on page 51.)

RECOMMENDED WRINKLES

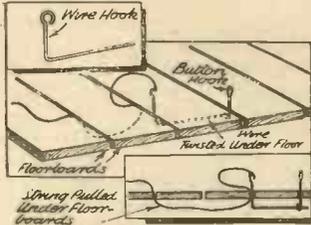
UNDER-FLOORBOARD WIRING.

NEARLY all of us, at some time or other, have thought we would put wires between the cracks in the floorboards instead of putting them on the top of the picture rail or some other place on the wall.

When we have examined the floor we have found that the boards were laid in the other direction.

This difficulty can be easily overcome. Bend a piece of copper wire to the shape of "L," with a small loop at the top, and make sure that the wire forming the bottom part of the "L" is a little longer than the width of your floorboard.

Insert the wire forming the bottom part of the "L" in a crack in the floorboard where you wish to commence,



A simple but particularly effective scheme.

and twist until the end can be seen through the next crack. Pull the end of wire through with a button-hook; affix a piece of string in the loop at the other end of wire and pull the string under one board at a time.

Of course, after the string is under all the boards the wire can be pulled under by the string.

A WATER-TAP EARTH.

THE sketch accompanying this wrinkle is practically self-explanatory. It shows a neat method of attaching an earth wire to a water tap.



Ensuring a sound earth connection.

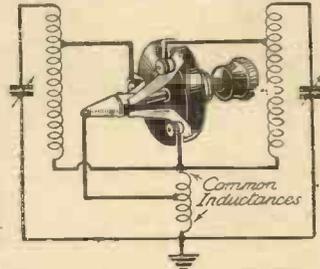
The washer is made of a brass disc, with a hole large enough to clear the thread on the tap.

A tag is left on the edge of the washer to allow for soldering a wire on. This wire goes to the earth on your set.

DUAL-RANGE BAND-PASS.

THE following hint may be of use to those of your readers who, having experimented with band-pass tuning, and having arrived at an ideal size of common inductance for the medium waveband, have switched over to the long waves and found the degree of coupling far too loose to give even adequate signal strength.

I think my sketch is almost self-explanatory, but, briefly, the usual three-point wavechange switch is used, with a flexible wire soldered to the tip (a four-point switch could be used, but



One method of switching a common band-pass inductance.

the above arrangement will be found quite satisfactory in practice).

The object of the additional connection is to allow of a larger coupling coil to be used on the long waves, this coil being shorted out at the same time as are long-wave windings on the coils when the switch is "pulled," and the receiver operated on the medium waveband.

Aerial coupling and reaction windings have been omitted to simplify the sketch.

The actual coils used were Lissen Shielded Dual-Range Coils.

The common inductances can best be found by the "trial-and-error" method, and are, of course, of quite small dimensions wound on 1/2 in. diameter tube.

A POLE FINDER.

A SHORT piece of glass tubing about 1/2 in. in diameter is fitted with a cork stopper at each end, through which a short length of copper wire has been forced before fitting in the tube. The tube is half filled with a solution made up of phenolphthalein, 10 grains (about a



The construction is quite simple.

pennyworth), sodium sulphate (Glauber salts), 1/2 oz. and about 2 oz. of water. Shake the solution before filling the glass tube, as only a small proportion of phenolphthalein dissolves in water. A resistance should be placed in series when used on a source of H.T., but voltages up to 6 may be applied directly across the pole finder. The negative pole will turn the solution around that particular wire a red colour, which will disappear when the solution is shaken.

NON-CORRODIBLE TERMINALS.

ACCUMULATOR terminals and the spade tags screwed under them usually give a good deal of trouble owing to corrosion, and it is frequently difficult to obtain a sound connection on account of the green deposit which is often to be found on these parts. The remedy usually recommended is to scrape the parts clean and then smear them with vaseline.

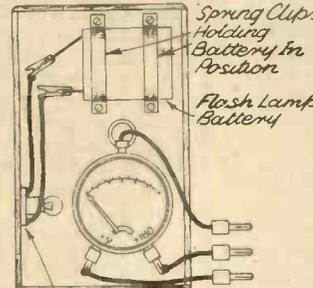
A cleaner, much more effective and permanent method is as follows: Clean the terminals and space tags thoroughly and coat them well with a good soldering flux. Melt some scraps of lead in an old tin over the fire or over a Bunsen burner, skim off the impurities which rise to the surface and coat the terminals and tags with lead.

The tags may be held in pliers and dipped into the molten lead, while the terminals may be coated by using a soldering iron. Repeat the process two or three times, so that a thick deposit of lead is applied to the parts. Acid and acid fumes will not corrode lead, so that the contacts will remain clean indefinitely.

Alternatively, solder may be used instead of lead, but this is not quite so effective.

HOUSING A VOLTMETER.

QUITE a lot of batteries are kept under tables or in dark places, and when testing, either a flashlamp or



Fuse Holder

Ample illumination and convenience are combined in this voltmeter mounting.

match is required. A voltmeter housed as follows will be found very convenient: An old cigar box holds everything. Some method must be devised to fix the voltmeter. In my case one of two screws was removed from the back of voltmeter, and a longer one, through bottom of box, held the voltmeter in place. The type of wander-plug with a hole in the top was used to fix leads to positive points on voltmeter. The leads are soldered to split ends of wander-plugs.

The flashlamp battery is held in position by means of two brass or steel clips fixed by two screws to bottom of box. The fuse holder, which holds bulb, is screwed to side of box, and two leads with crocodile clips connect this with battery, one clip being disconnected when not in use.

ONE GUINEA FOR THE BEST WRINKLE!

Readers are invited to send a short description, with sketch, of any original and practical radio idea. Each week £1 ls. will be paid for the best Wrinkle from a reader, and others published will be paid for at our usual rates.

Each hint must be on a separate piece of paper, written on one side of the page. Address your hints to the Technical Editor, "Popular Wireless," Tallis House, Tallis Street, E.C.4, marking the envelope "Recommended Wrinkles."

Will readers please note that the Editor cannot, in any circumstances, guarantee to return rejected Wrinkles, and that payment for published hints is not made until ten days after they appear?

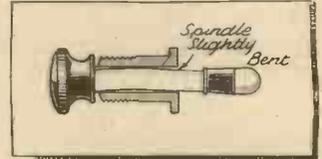
The best contribution in our last selection of Wrinkles, published on March 18th, was sent by Mr. G. C. W. Addison, 35, Hillside Avenue, Douglas, Isle of Man.



If box is not deep enough to have bulb above level of voltmeter it can be fixed inside lid of box, and one lead to battery made of such a length that it keeps lid from falling right back.

FOR FAULTY SWITCHES.

SOME on-off and wavechange switches of the push-pull type give trouble through the spindle being a loose fit in the bushing. This trouble manifests itself by cracklings from the



The slight bend in the spindle ensures that it makes firm contact with the switch bush.

loudspeaker owing to faulty contacts in the defective switch.

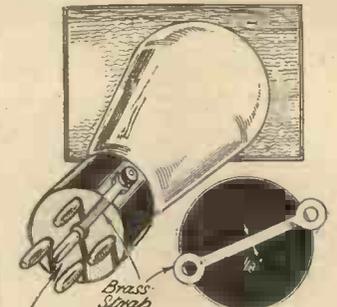
Such a switch need not be discarded. It can be easily repaired by removing the spindle and giving it one or two coats of solder with a soldering iron. This will increase the diameter of the spindle and make it a good fit in the bushing.

Alternatively, the spindle may be very slightly bent. It will then bear against the bushing in the middle where it is bent.

A PENTODE CONVERSION.

A 4-PIN side-terminal pentode output valve may be converted to a 5-pin in the following manner:

Obtain a pin from a 6-pin coil former and remove sufficient "thread" to leave 1/2 in. of thread from collar. Cut out a piece of brass or copper to shape to fit from centre-pin hole to side terminal (copper wire will do). File a notch in bakelite base where "strap" will pass, to keep it in place and prevent short-circuiting.



Valve Pin (Screwed In) Or Pin From Six-Pin Base

By adding the metal strap shown in this diagram and an extra valve leg a 4-pin pentode can be made to fit into an ordinary 5-pin holder.

Fit "strap" over centre pin and side terminal, adding shake-proof washer to each, screw up tightly and you have a 5-pin pentode, handier than the 4-pin type; no floppy flex lead to short-circuit to screening, etc. The centre pin will cut its own thread.

One advantage of the scheme is that the valve can still be used in many cases in a set intended for a 4-pin valve, since a flex can still be attached to the side terminal.



A view of one of the transmitters used at Pulham for communicating with aircraft.

AIR-LINERS may be seen leaving Croydon Airport for the Continent with amazing regularity in the worst of weather conditions. No matter whether it is foggy, windy, or, in fact, what the weather is like, the various air services remain practically unaltered.

Without the assistance of radio the development of air lines, both to the Continent as well as internally, could not possibly have progressed at anything like the rate it has. In the past Croydon's radio station has carried out most of the work of guiding pilots in "thick" weather.

Six Mobile Stations.

The work evolving on this station has recently increased to such an extent that other stations have proved necessary. In view of this six new direction-finding stations of the mobile type are to be put into operation this year for use by internal air lines, and a few new permanent stations are to be erected.

The new station at Pulham, in Norfolk, is already in operation, while one at Heston will shortly, it is expected, be put into service. Eventually, there will be six or seven D.F. stations for use on the Continental airways.

The service of direction finding is perhaps the most valuable of those rendered to aircraft by radio stations. It enables a pilot who is not sure of his position, or who is flying above the "dirty weather" in bright sunshine, to obtain his exact position in a few minutes.

The procedure adopted when a pilot requires his position is as follows: First of all he calls up, say, Croydon, and says he wants a check on his position. Then Croydon gets into touch with one or two of the other aircraft stations and asks them to stand by for a bearing test-call from the machine.

Checking the Bearing.

As soon as the O.K. comes through from these stations Croydon calls the plane and asks the pilot to transmit for a bit. The ground stations get their direction-finding equipment to work and take the bearing of the machine in relation to each station.

on a map, and noting where they cross one another.

The crossing point indicates the exact position of the aircraft, its distance from the nearest town, or other identification landmark, being measured by means of dividers. Once the position has been plotted, it is but a moment's work to communicate it to the pilot of the aeroplane.

Actually, two bearings only are needed to find a plane's position, but three are desirable, since the third acts as a check on the first two. Similarly, a fourth bearing is also helpful in ensuring absolute accuracy. When three bearings are known and they do not cross one another at exactly the same point, they can be "averaged out" by taking a point approximately in the centre of

The bearings are next all communicated to one of the ground stations, say Pulham, where the operation of co-relating them is carried out in the manner depicted in our cover photograph this week. It simply consists of plotting the various bearings

the small triangle produced by the crossing lines.

Speed is most important, since an aeroplane travels fast and may be rapidly getting further and further off its course while its position is being plotted. But every step possible is taken to ensure speedy working.

An ingenious scheme is employed on the plotting map, and can be followed from the cover photograph. A marker is arranged to swivel at each of the D.F. stations on the map, while round the edge of the map are marked the various bearings in relation to each of the stations.

Information Soon Obtained.

Thus the operator at Pulham just notes the bearing from Croydon, finds it on the Croydon scale round the frame of the map, and quickly swings Croydon's marker into position. Similarly, the markers for the other stations' bearings are swung into position.

It is finally a moment's job to note the machine's position, and but another moment serves to let the pilot know, so that he may proceed on his way assured that he is on the right course.

And with the rapid increase in British air-lines the new stations can be assured of plenty of work.

A. S. C.

A WEARITE IRON-CORED COIL

Our report on a compact dual-range component.

SCREENS for coils have become almost universal, so much so that one is apt to forget at times that a "can" may, in certain conditions, be quite unnecessary.

When this is the case obviously one is paying more than one need for the article. Therefore constructors will be glad to learn that Messrs. Wright and Weaire, of 740, High Road, Tottenham, London, N.17, are now manufacturing an iron-cored dual-range coil for sale at the pleasantly low price of 5s.

It has a range of 190-580 and 850-1,950 metres. Neatly built on an ebonite base, this Wearite coil is most compact, its dimensions being 3½ in. by 1½ in. by 1½ in., and it weighs under three ounces.

An unscreened iron-cored coil such as this will enable many constructors to appreciate for the first time how small the iron-core principle enables coils to be made.

Glance at the accompanying photo. You will gain a clear idea of the size of the little unit if you think of the two sections as bundles of half-pennies, for the diameter of each former is exactly that of a half-penny.

It may be wondered by some why it is that screens for iron-cored coils are not made smaller, for it is patent that there must often be a fair amount of

space between the shields and the windings. Of late there has been a tendency to constrict the sizes of coil screens. But they must not lie too close to the windings, or losses of an appreciable order would occur.

Even with a well-spaced shield there must be some loss of efficiency. Which would clearly indicate that there is an actual advantage in using an unshielded coil of the nature of this particular Wearite component, where there is no possibility of instability being caused.

This does not necessarily rule out the use of two of the units in, say, an H.F.-det.-L.F. type of receiver, because partition screening could be adopted. And it would not have to be particularly lavish in the majority of instances. With the axes of the coil at right angles a simple vertical shield would be adequate for such an arrangement.

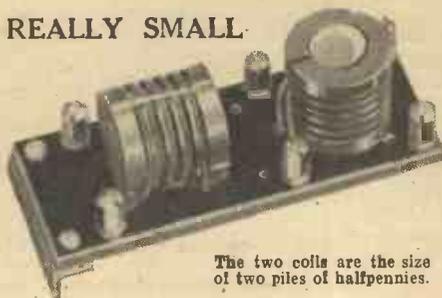
It must not be thought from the rather "skeletonised" appearance or the price of the unit that its efficiency is questionable because of that. Actually, its efficiency is high; in point of fact, it is superior to that of a larger air-cored coil and is well up to the highest standards of iron-cored-coil effectiveness.

In so far as the results which it will give in practice are concerned, much will obviously depend upon the way in which it is used. However good a coil may be as a coil, its performance must be controlled by the circuit and the other components with which it is used.

Undoubtedly many constructors will see in this Wearite component just the article they want for building compact portable sets for summer use.

In conclusion, mention should be made of the admirable terminals fitted to it. Not only are they slotted so that they can be tightened with a screw-driver, but their nuts are every long ones, and so it is easy to grip them with the fingers or to apply pliers.

REALLY SMALL



The two coils are the size of two piles of half-pennies.



With the

EXPERIMENTER

CONNECTING UP THE MAINS

IT seemed such a simple job, connecting up to the mains. The A.C. came to a light bulb fixed to the roof of the hut where I do my experimenting. I had only to put an adaptor thing on that, and heigh-ho for "juice."

But one thing led to another. I had a horror of a wire trailing down from the adaptor to the bench. It all seemed so casual. So I decided to call in the services of the good Bob—who, among other things in life besides Experimenter's "stooge," is an electrician of local repute.

Making a Start.

He brought with him a length of lead-covered cable, which he proceeded to expose at one end to make a connection with the uncovered lamp socket in the roof. Needless to say, before this all the mains had been switched off at source.

To cut a long and somewhat tedious story short, the lead-covered cable eventually ended up by the bench—and then what? It was at that moment I had a minor brainstorm, and the rest is history, or will be when I have finished this.

There flashed upon that inward eye (poetry!) a picture of a natty little test board, complete with sockets, switches and what not. So we made an evening of it, did Bob the electrician and I.

You will recall—or I hope you will—that our magnificent aerial came into the hut through a down-turned tube, the wire inside being the useful end of a continuous length that started way up near the old oak tree.

This wire was just dangling about the bench, waiting to be taped up. Same with the earth wire from the tube outside the window. Both came into the scheme of things.

The Two Schemes.

We decided to put the board across the top part of the window and run a couple of brass rods underneath, separated by about 18 in. from each other. These rods to form the aerial and earth contacts for leads fitted with crocodile clips.

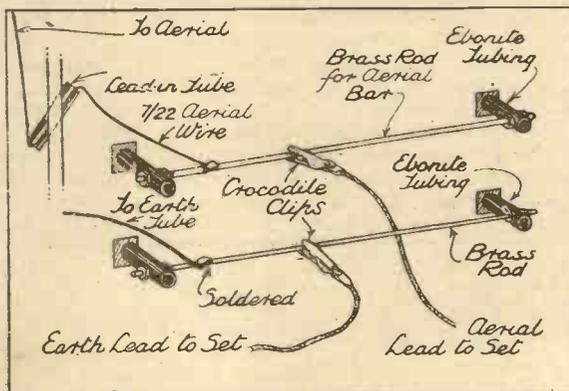
But the board came first. A nice chunk of wood, 24 in. by 10 in., was our foundation. I ordered it ½ in. thick, just to give Bob an idea. His old man is a bit of a dab with tools and, because he could not get hold of a piece ½ in. thick, proceeded to

plane it down, if you please, from ¾ in. That shows what sort of sturdy stuff my helpers are made of.

I always say Bob's a chip off the old block—but he says now that he's a shaving off the old test board. A bit of a wit is Bob.

Anyway, there was the board, ready for

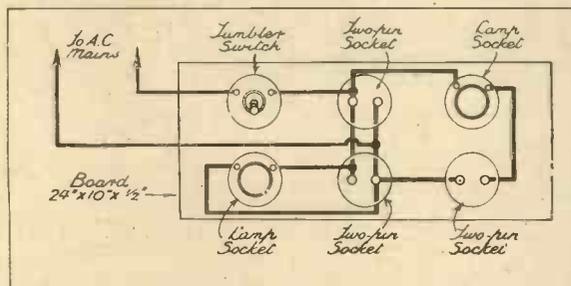
FOR AERIAL AND EARTH LEADS



Quick connection of aerial and earth is facilitated by the use of brass rods and crocodile clips.

the gadgets. I decided on six. The drawing will, I hope, show you what it all means. In the top left-hand corner is the main tumbler-type switch. Below that is a lamp socket, which can be used either for a lamp to help light up the bench or for any mains connection you like.

THE SWITCHBOARD ARRANGEMENT



A useful arrangement of two-pin sockets and lampholders. Note that two of them are in series.

At the centre are two straightforward wall-type sockets, to take ordinary 5-amp mains plugs. So far, then, we have a mains switch and three parallel mains connections—two wall sockets and one bayonet holder. But now glance along to the right. At

the top is another lampholder, and just below it another two-pin plugholder. These two are not paralleled with the others, but are in series with one another—the two of them forming, of course, a parallel connection across the rest.

The idea of this peculiar arrangement is: by putting one of those little "Osglim" ½-watt neon-tube lamps into the top socket you can test all kinds of things for continuity when they are plugged into the lower socket.

At the voltage of the mains this ½-watt tube takes practically no current, so that the continuity-tester idea is pretty wide in its application. If the gadget is "oke" the tube will glow. If "dud" it won't.

Quite Simple Wiring.

I strapped across the pins of a two-pin plug, so that, normally, this is pushed into the lower right-hand socket. Then, when the mains are switched on, the lamp glows, because, of course, it is then directly in parallel with the mains. This is a reassuring sort of sign, I may say, especially when testing sets that don't work.

The wiring of the board is perfectly simple, as you can see from the drawing. I used nice thick rubber-covered wire for the job. Breakdowns behind the fitted-up board are certainly not wanted.

Heaps of variations of this board arrangement—many better than mine—will no doubt occur to ingenious readers. If you have any particularly wonderful stunts pass them on to me, please. I'm not too proud to accept them. On the contrary, I'd be glad to pass them on.

It is no use telling me a board of this kind is useless. It is absolutely invaluable. Yet I can hear some of you saying: Well, it may be useful as it stands, but it could have been carried a lot farther.

Battery Connections.

A sentiment with which I cannot concur. Battery connections, for example, might have been all neatly brought out to sockets beneath the mains. But that would have meant more than half a dozen flexes between the sockets and the sets.

While you are doing all that you might just as well connect up the batteries right away direct to the set, I think. And, meanwhile, keep the batteries where they ought to be—high and dry.

(Continued on page 50.)

HOW TO MAKE A SIMPLE REMOTE CONTROL

With this handy device you can switch your set on or off from any room in the house. Its construction is fully described below

By E. E. BARNES

THE main features of this relay are: very simple to construct, only needs two wires to operate and is purely electrical. All the tools required consist of a brace and drills, screwdriver and a pair of pliers.

The Parts that are Required.

The following parts are required to make the relay: 2 electric-bell bobbins (complete), about 2 ft. of brass strip $\frac{1}{8}$ in. wide by $\frac{1}{2}$ in. thick, one magnet out of an old headphone or a small bar magnet. (If a magnet is used from a headphone the projecting poles should be broken off. As these magnets are usually cast they will break off quite easily if bent with pliers. If there is no hole in magnet a small brass clip should be made to fix same.) A piece of ebonite or hard wood $\frac{1}{4}$ in. square and $1\frac{1}{2}$ in. long, 6 B.A. nuts and bolts, 4 terminals and a baseboard $4\frac{1}{2}$ in. long by 4 in. wide complete the main parts. The bell bobbins are best bought, if an old bell is not at hand, and they usually cost about 6d. each. Two iron bolts may be used as cores. First mount bobbins on wood base as

shown, placing a piece of ebonite or wood packing underneath about $\frac{3}{8}$ in. thick and leaving about $\frac{1}{8}$ in. between the cores. The straps are made out of the brass strip and screwed down by two round-headed wood-screws.

The bearing bracket, contact bracket, pivot stop and pivot base are next cut to size out of the brass strip and drilled. The contact strip is next, and is made out of a piece of spring brass about $\frac{1}{4}$ in. thick, so that it will bend easily and spring back straight afterwards.

The armature carrier is next made and the magnet and contact strip fixed. The pivot is made from brass wire $\frac{3}{32}$ in. diameter, or a nail may be substituted if cut to right length. A hole is drilled in centre of armature carrier to be a tight fit on pivot, and fixed with a little Secotite to prevent it from slipping down.

Next mount these parts just described as shown in sketches, but do not connect bobbins up to terminals yet. The connection from the contact strip to bearing bracket is made by a piece of flex.

To understand how the relay operates

this, one must first understand magnetism. If a current is induced in a coil which has an iron core the latter becomes magnetised, with a N. pole at one end and a S. pole at the other. But if the connections to the bobbin are reversed the polarity of the core is also reversed.

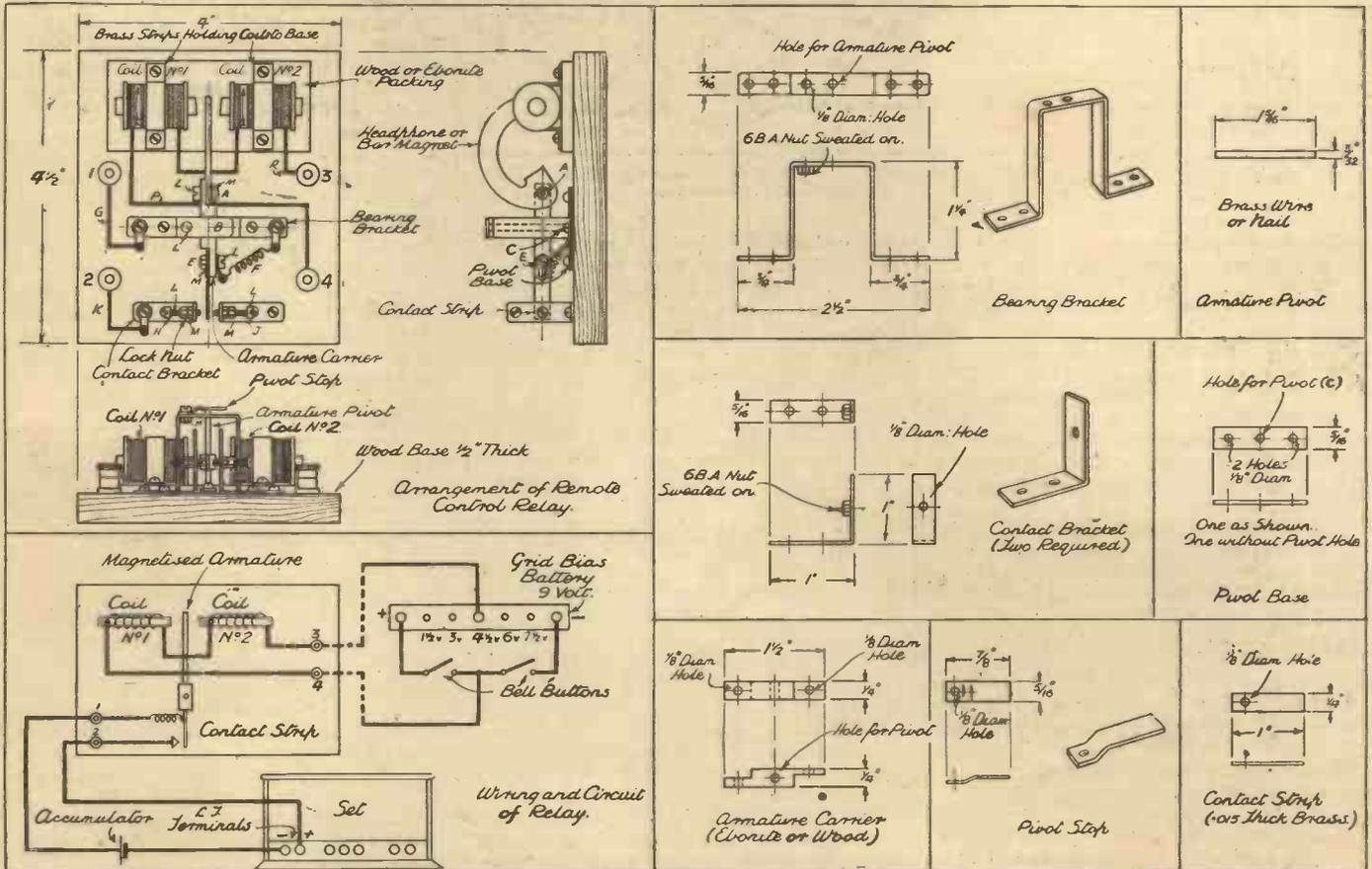
If we connect two bobbins in series so that the windings are rotating in the same direction, say clockwise, and connect to a battery, the two poles facing one another will be of opposite polarity. If we connect the bobbins to the terminals in this way the magnetised armature will be attracted by one core and repulsed by the other. If we reverse the connections to the terminals the opposite will take place.

Reversing the Current.

The core that attracted the armature will now repel, and the one that repelled will attract, so the armature will fly over. When the current is switched off the magnetised armature will stick to the core it is touching, and stay there until the connections are reversed and the current switched on again, when it will fly over to the other core. The reversing is done by means of two bell buttons, and the current is obtained from a 9-volt grid-bias battery, which is connected as shown in diagram.

A certain amount of adjustment will be found necessary to get smooth working, but this will not be difficult, as adjusting screws are provided on the two contact brackets. These screws should be adjusted so that the contact strip touches them before the armature touches the core.

(Continued on page 52.)



Here are the necessary dimensions and other details for building the unit. The lettering on the top left-hand diagram is as follows: (A) Fixing for magnetised armature to carrier. (B) and (C) Bearing holes for pivot; (C) is the lower bearing. (E) Fixing for contact strip to carrier. (F) Flexible connection from contact strip to bearing bracket. (G) Connection from bearing bracket to terminal 1. (H) and (J) Contact and adjusting screws. (K) Connection from contact bracket to terminal 2. (L) 6 B.A. screws. (M) 6 B.A. hexagon nuts. (P) and (R) Connections from bobbins to terminals 3 and 4.

HI! HI!

HERE WE ARE —

These imps are on the cover of the second number of RADIO CONTACT. They bring you, hot from the Press, the finest, brightest wireless budget ever published. The first number was a huge success, the second is even better—and bigger, too. 48 pages of appetising fare, a remarkable new 3-Valve Receiver you'll itch to build, even if you had never built before; first news of some surprising inventions, expert articles, all the regular Contact features and magnificent full colour pages. Don't delay your order for this bumper Magazine.

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★ CLAUDE HULBERT, who is well known to listeners. Claude numbers among his most amusing experiences that of being asked for his autograph on a paper bag at Woolworth's.

GOOD-EVENING, Everybody. This is Claude speaking, by kind permission of Enid. I wish you hadn't asked me how I started. It's a sore point with me, as brother Jack will tell you—he tells everyone. You see, I was born on Christmas Day (what Christmas Day?—well, 1900, if you must know) and now I only get one lot of presents for Christmas and my birthday. Enid told me the other day— Oh, here she is. It's an interviewer, my dear. He wants to know why I started. Give him a cup of tea and turn the children off the sofa and let's get on with it.

I went to school, more or less, but that was not very successful, and nobody could see any signs of my being brilliant at anything. So the governor got rather fed up, and thought the best thing to do would be to send me to a tutor. After a year, and with a great deal of difficulty, I passed Part I of the entrance to Cambridge. After another year's intensive study (isn't it time the children were in bed?) I passed Part II, which I understand is normally done by mere babies. Still, I managed it at seventeen and went to Cambridge.

Trouble With Logic.

Here again I showed no signs of academic brilliance and failed in Part II History three times. And I'd only taken History because I was told it was the easiest. I also failed three times in Logic—but don't let Enid know about that. However, I managed to stay at Cambridge, for some amazing reason, for three years without being sent down—despite the fact that I helped to write and acted in two of the productions of the Footlights Dramatic Club.

Unlike the traditional father, my father was quite willing for me to go on the stage, chiefly because brother Jack had just burst on to the public and was a great success. I think if my father had half a chance he would go on the stage himself.

The first thing that happened to me was that I got the bird completely in that

HOW I BEGAN

In this the third article of a short series "P.W.'s" special correspondent interviews the popular Claude Hulbert.

memorable show "Fantasia" in—when was it?—1921, I think. Then I joined the "Cigarettes" concert party, and it was on the second tour of this that I met the missis—or, rather, I persuaded her to come on the tour. With a great deal of fuss and trouble I managed to get engaged to her, and subsequently married good and proper.

It was just about this time that I first started broadcasting, and from then dates the nightmare which always hangs over me—the nightmare of having to write material and always leaving it to the last minute. I am not one of those meticulous people who work everything out to the last detail months beforehand. I talk a lot and think a lot, but don't do anything about it until I suddenly realise that I am broadcasting to-morrow. Then I have to sit down and do it, and it always ends in a panic and a rush. Still, my brother is worse than I am.

I always used to enjoy the broadcasts of "Those Four Chaps." We all used to scream with laughter and pull each other's legs. It's even funnier when I broadcast with Jack. He will change the whole thing at the last minute—we get the stuff typed, then rewrite it in pencil—and then can't read what we've written. One thing Jack always does is get terribly excited and shout so much that he has to walk away from the mike. Then he drops his paper and loses the place, comes up and tries to read mine, can't understand what I've written, and we have to fill in with impromptu remarks while he picks up his paper and tries to find where he had got to.

We Manage Somehow.

Funniest of all are the rehearsals in the morning. The chances are we haven't got the stuff finished, and we try to bluff that we have the whole act set and ready. We start off properly, get to the middle and then start arguing what comes next, and the B.B.C. people are never quite sure whether it's part of the act or not. Still, they don't worry, because when the evening comes we've managed to sort it out somehow or other.

But best of all I enjoy the things that I do with my missis. Everything we do is definitely based on what happens at home. It's no good your arguing, Enid; you know the children's nannie says that for every row we have on the wireless we have twenty at home. We seldom agree until the last minute as to what we are going to do—in fact, that's what we argue about, because Enid says I always leave things to the last minute and she has to learn the beastly thing in the taxi on the way to the B.B.C. But it all comes right in the end—or, at least, it always has up to now, and we're going on hoping for the best.

You won't stop to dinner, will you? Because I know Enid will make me change,

and if there's one thing I hate— Home life's all right if I'm allowed to take off my shoes and smoke a pipe, and a visit to the pictures once in a while is not too bad. Have I had any amusing experiences? Most of my experiences are amusing, but I do remember once being sent by Enid into Woolworth's for something she had forgotten (she's always forgetting something and sending me out for it) and then being asked for my autograph on a paper bag.

Not going already, are you? Enid hasn't started yet, and I'm sure she's got lots to say—she always has. What's that? Aren't we broadcasting to-night? By Jove, so we are! I must get busy. Throw me over that writing pad and a pencil as you go out,—and fetch me a taxi, will you? Thanks very much. Good-night! Good-night!

Claude Hulbert.

INTERFERENCE SUPPRESSING DEVICES

MESSRS. Ward and Goldstone, Ltd., of Frederick Road, Salford, Lancs., have asked us to remind our readers that they run a free technical service in connection with electrical interference.

Anyone who has any questions to ask about the subject are invited to write to Messrs. Ward and Goldstone for their advice.

This firm has recently published a pamphlet in which is gathered together for rapid reference details of all the various interference-suppressing devices which they manufacture. These include such well-known articles as "Metocel" Screened Down Lead, Aerial Statoformers and a wide range of interference compensators for eliminating noises at their source.

The Problem Thoroughly Tackled.

From this, all those who appreciate the problems of electrical interference will realise the thoroughness with which Messrs. Ward and Goldstone have tackled them.

For example, what of the other-borne electrical interference which gets into an aerial system? It is the purpose of "Metocel" and the Aerial Statoformer to deal with that.

But in addition to these and the many other devices figuring in the pamphlet Messrs. Ward and Goldstone have recently introduced a further Interference Compensator which retails at 9s. 6d., and which is listed as the R36/SK11.

This consists of two 1-mfd. condensers, with fuses suitable for use across A.C. mains and various electrical appliances.

ON THE SHORT WAVES

Conducted by W.L.S.

QUITE a long while back I devoted a whole page to the why and wherefore of the superhet, and I have only just realised that I promised, at the end of it, to go into the more practical aspects at a later date.

Well, seven months having elapsed, this certainly is a "later date"—but no one can say that I haven't kept my promise. Let's talk about the circuits; but first let us examine the principle once more in very concentrated form.

The Beat Frequency.

You receive a 30-metre signal (frequency 10,000 kc.). You generate locally an oscillation with a frequency of, say, 10,400 kc. This will produce a beat frequency of 400 kc.—the difference between the other two.

Now if you pass this "mixed" output through a series of circuits selective enough to respond to the "400" component, and ignore the other two, you will have the equivalent of a brand-new signal with a frequency of 400 kc., corresponding to a wavelength of 750 metres.

H.F. amplification on short waves is difficult, but on 750 metres it's easy. So you can amplify up this new signal, detect it *again* (second detector) and there you are.

Now, we used to have a rather disolute idea that one little triode would combine the functions of first detector and beat oscillator. We argued that 400 kc. "off frequency" was nothing on short waves, and that we didn't lose any efficiency or selectivity.

Second-Channel Trouble

That was a mistaken idea. An ordinary tuned circuit, 400 kc. off frequency, when the actual frequency was 10,000, would still have quite a good response to the signal. When the whole circuit is regenerative, however, to put it out by that amount leads to quite an appreciable loss, since its natural resonance curve is so much sharper.

But the worst disadvantage is second-channel interference. Imagine your oscillator, as before, on 10,400 kc., supplying its beautiful little 400-kc. beat with the signal on 10,000 kc. What's to prevent it supplying an equally beautiful beat with another station on 10,800 kc.? The difference is the same, and if there happens to be a station on that frequency you'll get a lovely hash-up between two stations.

If we use a separate oscillator and our *actual* incoming signal is injected into the set by means of a separate tuned circuit and a separate valve, then we can make

SUPERHETS

In this article W. L. S. gives some helpful advice to those intending to make up or experiment with short-wave superhet receivers.

that circuit discriminate between a signal on 10,000 and another on 10,800, while the oscillator remains stationary and independent on 10,400.

So let's talk about the arrangement of a detector and oscillator for the front end of a superhet. First, the layout. Now, a short-wave superhet should always be a single-control job. If it isn't it is not going to have any tremendous advantage over other types of set. Add to this the fact that ganging is so very, very easy and you'll probably agree with me.

Right. Let's gang them. Fig. 1 shows an admirable way of doing it. Two midget condensers of .0001 capacity are coupled together and provided with a nice slow-

unduly. The trouble in most short-wave superhets is that there's too much of it. I have been obtaining excellent results with a layout similar to that of Fig. 1, and with no *intentional* coupling whatever between the two valves.

The output of the average short-wave oscillator (say a straightforward regenerating detector without an aerial) can generally be heard 100 yards away! The mere fact of its presence on the same baseboard as the detector will ensure plenty of "injection," and a volume control on the *oscillator* may be necessary.

The Heptode "Mixer."

Otherwise you will have a beat generator of more or less constant strength, whose job it is to mix with signals of every conceivable size and shape, and it obviously can't be equally efficient on all of them.

Now, of course, someone will put his hand up and say: "But what about the heptode?" Yes, I was expecting that. Well, the whole idea of the heptode is that the two components—the incoming signal from the detector and the local beat from the oscillator—are mixed actually in the electron stream inside the valve.

For this reason we want to prevent any extra mixing from taking place externally; and, in practice, a heptode certainly does work at its best when the two circuits are screened from one another.

At the moment I have a funny little three-valve superhet on my bench. It uses a heptode as combined first-detector-cum-oscillator, an H.F. pentode for the single I.F. stage and an L.F. pentode as second detector. I have christened it "Ode to the Departed Triode," but there seem to be so many different types of "odes" coming along that I can't quite see where we shall stop.

Get It Right First.

If anyone is thinking of playing with heptodes let him remember this straight tip from me: If you don't take care to keep your two sets of tuned circuits either screened or well

apart you will have lots of trouble with interaction between the two tuning controls. You know the effect—find him on the oscillator; adjust the detector. Darn, he's gone! Readjust the oscillator—there he is! Final touch on the detector. Whoof!—off he goes again.

Of course, you can gang them and remain in blissful ignorance of all this, but it will work better if you get it really stable to start with. And don't rush the construction. Go slowly and carefully.

A DETECTOR-OSCILLATOR LAYOUT

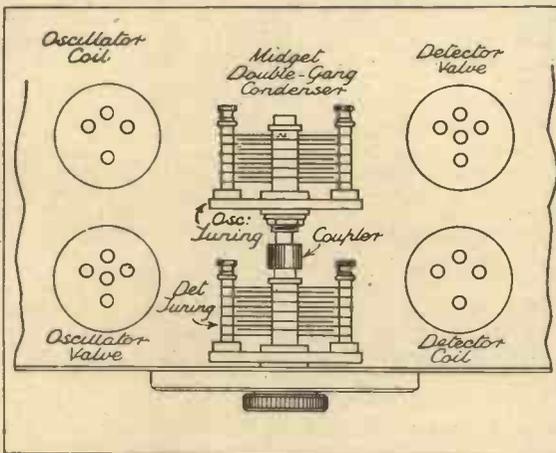


Fig. 1. This is an admirable layout for the front part of a short-wave superhet. Note the ganged tuning condensers.

motion dial. The back one is to tune the oscillator; the front one the detector.

We don't want our two sets of coils sitting too close together, so we do the obvious thing. We put the detector coil on the right of its tuning condenser and the oscillator coil on the left. The appropriate places for the two valves seem to be just beside their coils, so there you are. What could be nicer or more straightforward?

As far as the coupling between oscillator and detector is concerned, don't worry

Points from the POST-BAG

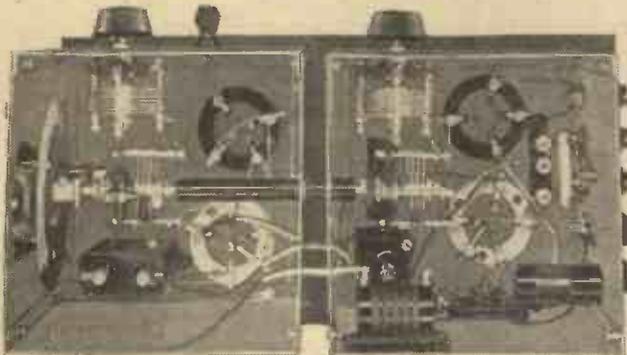
N. E. S. (Wavertree) made the "Pen-Det" last September, and has been very pleased with it until recently. He borrowed a milliammeter and found that it was taking 18 milliamps! It shouldn't, needless to say. The original set worked at less than 8 milliamps for the total consumption, and the pentode detector was operated with a very low priming-grid voltage.

The rest of N. E. S.'s letter must be boiled down into questions.

1. Is there any point in using "pot-meter" return for the grid leak these days? And, if so, must the wires be kept short? I don't favour it myself; but if you do use it there's no reason why the control shouldn't be on the front panel.

2. Are there any ready-made "quench coils" on the market for super-regenerative receivers? Yes, Eddystone make a set.

A USEFUL GANG ARRANGEMENT



This photograph shows a ganged short-wave layout which can be adapted for many different purposes.

J. C. P. (New Brighton) says he is very relieved to read my opinion that no licence is needed to transmit speech along a beam of light, but remains blissfully ignorant of how to do it. Will I tell him? Well, J. C. P., my job is radio, and that *isn't*! Furthermore, the apparatus needed is very expensive and complicated. Sorry, but if I gave it all in detail I should have to leave short waves alone for a fortnight.

Adding "Band-Spreading."

B. P. L. M. (Belfast) wants to know the most effective method of adding "band spreading" to an existing set. The easiest and the most effective method is simply to connect a very small variable condenser in parallel with the existing tuning condenser. In the "B.C.L." Two I suggest that the small condenser should be added in the position now occupied by the reaction condenser, which could be moved along a bit.

In an interesting letter from Brazil G. A. gives some details of short waves in that part of the world. He has built a "hot-stuff" one-valver, but is sorely troubled with hand capacity.

Sorry, G. A., but Brazilian hand-capacity effects must be much the same as the home

variety. It's *layout* every time, and more than that I can't tell you without seeing the set. But what results you're getting—G S C, D J A, W 8 X K, W 2 X A F, F Y A, C N R, etc., all R 9!

J. E. (Leeds) sends me a circuit diagram of his set which he claims to be ideal for headphone reception. It looks like it to me, too, with a tuned S.G. stage, detector and resistance-coupled L.F. J. E. finds, as I do, that a tuned stage is just as good as a mere "buffer" in getting rid of instability, and it gives plenty of amplification as well.

Police Messages from America.

J. F. (Forest Hill) has received official confirmation of his reception of the American Police station W P D T (Indiana) on 120.5 metres. Pretty good going, that, with 500 watts only at the other end and 150 miles south of Chicago. Can anybody beat that one?

A letter from H. H. (Shipley) is typical of many that I receive, and I will quote it in tabloid form. Saw "standard-base-board" single-valver; looked in junk box; found all parts necessary; two hours' work; ten minutes' try-out. Results: Paris, Zeesen, Moscow and Sydney at the first session!

Re your query about G5YW, H. H., he is a Bradford amateur, probably transmitting on 40 metres. The reason for his "spread" is probably just the fact of his closeness to you, and he may be using high power. Take it from me, he's not transmitting on Fécamp's wave, although he might be in the 160-metre band.

Quite a few letters have reached me in which the writers point out that their dial settings for the "B.C.L." Two don't

agree with mine. Don't worry about that—I didn't expect them to. Mine were only given with the idea of showing roughly the spacing out of the various stations.

Receiving Tokio.

Lots of people, too, have written claiming reception of Tokio, J O A K, on about 30.3 metres. I'm dreadfully sorry, but it is my duty to point out that what they have been receiving are regular Sunday relays of Tokio via the Italian station I R M on 30.52 metres.

The photograph on this page indicates a useful layout that may be adapted for many purposes. Originally used for an S.G.-and-detector set, it may be used for the detector and oscillator of a superhet, as described on the previous page. If a leptode is used it should be mounted horizontally through the screen.

Fig. 2 shows a suggested layout for those who like their coil changing to be simple. It involves the cutting of a hole in the front panel, after which the coil holder is mounted on an upright inside the set. This lends itself to quite a nice layout, since the coil holder probably comes quite near the "back end" of the tuning condenser.



ANYONE who hears G 5 H O is asked to note that it is the call sign of the Hoddesdon and District Radio Society. Reports will be welcomed by Mr. T. L. Franklin, Station Road, Broxbourne, Herts.

Empire listeners to all five transmissions from Daventry will have an opportunity of hearing the Boat Race broadcast this year. Transmission 3 will be giving the actual broadcast at 2.30 p.m. on April 6th, and the other four transmissions will include an electrical recording of it at other times.

The King to Speak.

On Monday, May 6th, his Majesty the King will speak at the conclusion of the special programme celebrating the twenty-five years of his reign. Both this programme and the Service of National Thanksgiving at St. Paul's Cathedral will be broadcast to the Empire.

We mention events like this quite casually nowadays, but I wonder how many of us ever pause to reflect on the difference that radio has made to the dweller in "Outposts of Empire." He's never far from home these days—if he has a short-wave receiver.

One of the features of short-wave conditions recently has been the improvement in reception from Asia. I have been hearing Japanese amateurs on 20 metres in the early mornings, when, presumably, they are received the long way round—via the

EASY COIL CHANGING

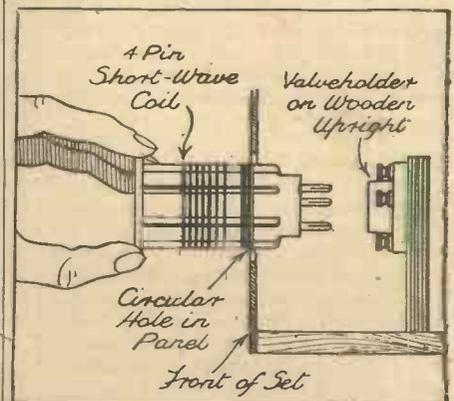


Fig. 2. Coil changing is considerably simplified if this scheme is adopted, the coils being changed from the front of the panel.

Pacific and across America. I can't recollect having heard them before at this time, although, doubtless, several readers will tell me that it's nothing.

V U B, Bombay, on the 31-metre band, is extraordinarily consistent and good. Z H J, Penang, S.S., on 49.34 metres, has been logged in this country, and the Javanese stations Y D A and Y D B are also being heard quite often.

W. L. S.

THE B.B.C. by LOOKER-ON A SURVEY

The last of the series of articles on the British Broadcasting System goes into the matter of the Regional scheme and makes some constructive suggestions as to how it could be improved.

NO general consideration of the Corporation and its programmes would be complete without some survey of the vexed question of the Regions. The exact function of Regions and Regional Directors is one of the problems most consistently shelved and least satisfactorily answered in the whole field of British broadcasting.

According to more or less reliable rumours, Regional policy at Head Office has been something in the nature of a tug of war between those who believe that the Regions should be largely self-supporting and those who believe that they should act as contributors to the main body of broadcast programmes.

The Question of Centralisation.

Needless to say, the Regional Directors themselves are to be found in the former camp. Responsible directly to none but the Director-General, they have upheld the standard of Regional autonomy, and Regional prestige as such, with vigour, determination and, for the most part, with success.

A true sense of proportion in the matter has been less conspicuous. Yet in their favour it must be remembered that if it is true that there exists a strong body of powerful opinion in favour of centralisation, the Regional Directors could probably ill afford to make concessions of any kind, lest in yielding the inch they be compelled to give also the ell.

Actually it would seem that as things stand a compromise of the least adequate kind has been achieved. The Regions have their prestige, their independent programmes, their freedom from any direct control by the Programme Division. Yet they have neither the staffs, the equipment nor the money adequately to represent such independence in programme output.

A Better State of Affairs.

It is true that with the appointment of Regional Programme Directors, the interchange with London of Regional producers, the more frequent visits of Head Office chiefs to Regions there are agreeable symptoms of a better state of affairs. But the fundamental factor of the problem remains firmly ignored, or perhaps has never yet been appreciated.

The Regions are actually so many geographical expressions, like Italy before Italy became a kingdom. They are convenient for map making and statistics. But do they correspond to the exigencies of practical broadcasting? The reply must be very doubtful.

For Scotland, Northern Ireland and Wales there can be little adverse argument.

Political requirements, as voiced by minorities of a most virile type, must be satisfied. Genuine cultural and educational needs of small nations must be met by Broadcasting House as definitely as by the signatories of a Versailles Treaty.

Claim to Special Representation.

He would be a brave man who would deny to the North of England its claim to a special representation. Further, he would be an ignorant and an unsophisticated man. For the traveller from the South of England may easily find himself as much, if not more, a foreigner in Lancashire than in Paris.

But what is the specific culture of the Midlands and Birmingham? What dramatist has achieved greater success in the metropolis than Mr. Eden Phillpotts, representative *par excellence* of the so-called West Region? Such divisions have about as much relation to reality as would have been a system under which the old Saxon kingdoms might have been taken as simple geographical divisions: Wessex, Sussex, Mercia, Northumbria and the rest.



Miss Yvette Darnac, one of our popular broadcasters, with Gerald, whose Tango Band and his "Sweet Music" need no introduction to listeners.

No doubt certain engineering difficulties had to be taken into account. But the fact remains that because Scotland demands and deserves special independent recognition, therefore the English Midlands should receive likewise, is neither common sense nor good economics.

It is no reflection upon the ability and enthusiasm of the Regional Directors concerned that so much of their task can

be fitly compared to the making of bricks without straw. Their success in the circumstances has been remarkable. But could not such ability and enthusiasm make a greater contribution to broadcasting as a whole if less rigidly confined within Regional limits? And would not British broadcasting benefit by a cessation of the inevitable conflicting points of view, represented occasionally by the opinion that on the one hand London is metropolitan and "high hat"; on the other that Regions are provincial and bristling with an inferiority complex?

Greater representation of Regional programme work, where Regions can supply genuine Regional programme material in the National programme, would be a good thing. Diminution of material in Regional programmes, because, though its origin is Regional, it is not meritorious, would be another good thing.

The Greatest Danger.

A far freer interchange of opinions and experience between the staff at Head Office and the staff at Regional stations would be best of all. The greatest peril to the B.B.C. is the danger that it may lose touch with its audience. The correspondence test is almost completely fallacious. And the average listener, certainly the average consistent listener, is probably found less in London than anywhere else in these islands.

The Regions can supply this knowledge and contact of the listening audience far more accurately and easily than the Head Office staff, confined within its towering concrete walls. Yet how much influence do Regions wield on general programme policy? Instead, Regions endeavour to compete, with small staffs, on equal terms with the London experts who have at their disposal every programme resource.

The Regions should use the experts. The experts should use the Regions. There is plenty of room for both. But competition between the two is absurd. It leads to the Regions biting off more than they can chew; and to the Head Office experts leaving the Regions to stew in their own juice, instead of looking to them for the help, and material which they can undoubtedly give.

LOOK OUT FOR OUR
SPECIAL
ANNOUNCEMENT
NEXT WEEK!
Of Vital Interest to All Readers

ALTHOUGH not going the full distance to meet the trade demands, the B.B.C. has done something to make the summer programme service this year more substantial than last year. There will be alternative programmes until 6.30, and then only one service until 8 o'clock. But the period of the single service will be filled with much better and more expensive programmes than in previous summers.

The real reason for the curtailment is not lack of money; it is shortage of staff, because the programme staff cannot get its leave in the ordinary way. Which is an admission reflecting seriously on the administration of the B.B.C. Shortage of staff is not a good excuse for starving programmes.

Reorganisation Plans.

Broadcasting House is full of rumours of new reorganisation plans. It looks as if the autumn will see even more far-reaching changes than accompanied the appointment of Colonel Dawnay as Controller of Output two years ago. A certain number of these changes will be of purely internal interest and will not affect programmes. Others, again, will have a bearing on programmes, and are therefore important to the outside world.

If red tape can be reduced it will be a good thing. Also a simplification is desirable. Regions, too, should come into the picture more definitely and continuously. The whole situation is still fluid, and will remain so for some time. What I hope is that people like Val Gielgud are given the chance of promotion which their ability and experience deserve.

The Children's Hour.

It has always struck me as curious that the Children's Hour should have such poor status within the B.B.C., when its popularity outside is as great as ever. Captain Derek McCulloch is one of the best known and most effective broadcasters. He has an international reputation. The London Children's Hour is one of the assets of the Broadcasting Service. Yet when there are meetings of programme department heads at Broadcasting House, Captain McCulloch is left out. Why is this? The official reason is that Mr. R. H. Eckersley, the Director of Entertainment, answers for Captain McCulloch. But then he could answer equally well for Mr. Maschwitz, who is always present.

Parliament and the B.B.C.

Both the Prime Minister and the P.M.G. remain coy about their intentions concerning the expiry of the B.B.C. Charter and Licence next year. I wonder why all this mystery when it is common knowledge in the inner lobby that the Cabinet has decided to set up a Departmental Committee, which will include a woman member. The Opposition is definitely restive about the secrecy, attributing it to an intention on the part of the Government to "steal some kind of march." Anyway, there is to be a lot more said in the House about the B.B.C. during the next twelve months than during the past five years.

The Talks Battle.

The great talks battle within the B.B.C. has been resumed again after a brief truce. The main issue is the same. Should the B.B.C. allow its talks to be purposeful and tendentious? Is it part of the duty of broadcasters to stir their listeners out of



ARTHUR SALISBURY, whose orchestral broadcasts from the Savoy Hotel are a popular Monday afternoon feature.

sensitive about the observation of 'All Fools' Day in the radio programmes.

There may be good reasons for this, of course, such as, for instance, the satisfaction the B.B.C. may derive from the knowledge that some people imagine the Corporation is fooling them on every day of the year, and that there is no necessity to make a special effort in that direction because the date happens to be April 1st.

However, on Monday, April 1st, Midland listeners are to hear a programme about which very little can be said other than that it will be produced by Martyn Webster and that the title of it is "How Very Regional." Of course, the whole thing may have nothing to do with All Fools' Day at all, but there it is, all very hush-hush at the moment.

In the West.

The West Region is affected in the same way, only more so, because an opportunity has been taken from the fact that, Monday being April the First, anything can happen during the week.

Accordingly, Western listeners are to have a Crazy Week, in which all types of programmes will be represented. Among the various items will be a Mad Tea Party on Wednesday, April 3rd; a Musical Mania—a Potty Pot-Pourri—and a parody on the feature "For Western Farmers in Particular" on Thursday, April 4th, and another of the series of character studies called "Queer People" on Saturday, April 6th. There will also be crazy items in the Welsh language on Tuesday and Wednesday, April 2nd and 3rd respectively.

What Sort of Weather?

What sort of weather do you want to-morrow? This question has never been debated

before the microphone, which is probably the reason the North Regional programme director has arranged to include it among the items to be heard on Monday, April 1st.

The speakers will include a farmer, a schoolboy, an organiser of charity fêtes, a street cleaner, an unemployed man, a shop girl and some fishermen (both deep sea and fresh water). All will tell us what sort of weather they would like to-morrow, and, what is even more interesting, why they want it as they want it.

"Microphone at Large."

Many centuries of English history will be represented in the next of the series of Midland "Microphone at Large" broadcasts to be included in the main Regional programmes on Tuesday, April 2nd. The scene chosen is the Shropshire market town of Much Wenlock, and the broadcast will reflect much that is so distinctively a part of its character, and will also include some of the music and literature associated with Wenlock Edge.

There will also be an episode representing in dramatic form the story of Wenlock Priory, which was founded by St. Milburga in the seventh century, destroyed by the Danes, restored by Lady Godiva, demolished after the Conquest and restored again by Roger de Montgomery in 1080.

It will be remembered that these events

(Continued on page 52.)

THE B.B.C. AND SUMMER PROGRAMMES

News and Views About Broadcasting

mental lethargy? The entertainment school of thought, who would make talks a side-line to the main service, seem to be gaining a little ground in the early stages of the new struggle.

You might think that this kind of a controversy is too remote to be of interest.

That's just where you are wrong. If you want bright, cheerful talks, informative but not propagandist, then you want to see the entertainers win, and if you accept this you should write to the B.B.C. and say so. Also write to your local M.P.

All Fools' Day.

The B.B.C. has always been rather

LISTEN TO THESE NEXT WEEK

REGIONAL: Friday, March 29th. A light musical comedy called "Hearts and Harmony." Story by Max Kester, music and lyrics by Peter Mendoza.

MIDLAND: Wednesday, March 27th. Variety relay from the New Theatre, Northampton, featuring Pickard's Chinese Syncopators.

WESTERN: Monday, March 25th. A programme which will take Welsh listeners back to the period of depression following the Napoleonic wars will be broadcast under the title of "Dic Penderyn."

NORTHERN: Wednesday, March 27th. Variety, relayed from the Winter Gardens, Morecambe.

NORTHERN IRELAND: Monday, March 25th. A relay of a concert given by the Belfast Singers in the Ulster Hall, Belfast. Henry Wendon (tenor) is the soloist.

Are ELECTRONS Too Slow?

THE use of ultra-short waves (of the order of centimetres) raises an interesting point in connection with the passage of the electron stream through a valve. The electrons start, as we know, from the cathode and travel across the space inside the bulb under the influence or combined pull of the voltage on the plate and grid.

Naturally, it takes a certain amount of time to make this passage, but until recently the actual speed or velocity of the stream did not seem to be a matter of any particular importance.

But when a valve is handling a wavelength of, say, one metre it is dealing with a frequency of no less than three hundred million cycles a second. That is to say, this number of impulses have to pass across the electrodes every second.

Of course, if the electron stream travelled at the same speed as a wireless wave or of a ray of light all would be well, and it would cover the necessary ground even if the valve electrodes were spaced a full metre apart. But, as a matter of fact, the stream travels very much slower than this, and so, in the case of "dwarf" waves, is unable to pass



One of the special Marconi "Midget" valves designed for ultra-high-frequency work. The close spacing of the electrodes enables the electron stream to "get across" fast enough to keep pace with the very rapid oscillations employed.

across the few millimetres between filament and plate in the time allowed.

The ordinary valve begins to break down in this respect at a wavelength of about 5 metres. The shunt effect of the capacity between the electrodes has, of course, something to do with the failure, but it mostly arises from the "sluggish" movement of the electron stream inside the valve.

An Ingenious Scheme.

One ingenious way out of the difficulty is due to Barkhausen and Kurz. They apply a high positive potential to the grid of the valve and a negative one to the plate. This first piles the electrons up around the open grid, and then sets the whole mass vibrating bodily across it. Each time the electrons pass through the grid they impulse it.

But because the path to and fro across the grid—or, in other words, the distance through which the stream has now to travel between successive impulses—is

much shorter than the path between cathode and anode it becomes possible to deal with wavelengths only a few centimetres long.

Another plan is to use the new "Midget" valves, which have an overall length of less than three-quarters of an inch and electrodes set only a few thousandths of an inch apart. The plate and indirectly-heated cathode take the form of two small

The title of this article may make you wonder when you remember that the speed of an electron may amount to thousands of miles per second. But when ultra-short wavelengths, such as those of one metre or less, are being handled the question of electron speed is a vital one and has a definite bearing upon the design of the valves used. This and other highly interesting aspects of this fascinating subject are lucidly explained.

By J. G. JEVONS.

discs or caps, which are placed back to back and are separated by a thin wire mesh forming the grid. Both the plate and grid are made sufficiently light to be carried by the lead-in wires without any other support, whilst the heater is fixed inside the hollow part of the cathode cap.

The absence of a supporting structure for the electrodes helps to cut down the capacity, whilst the close spacing of the electrodes enables the stream to "get across" them fast enough to keep pace with wavelengths as low as 20 centimetres.

Enormous Variations in Speed.

The actual speed at which an electron travels under the influence of an applied E.M.F. varies enormously in different cases. For instance, it is commonly said that an electric current travels through a wire at the speed of light. Now, we know that an electric current is caused by electrons in movement, and it is, therefore, very easy to jump to the conclusion that each individual electron moves forward through the wire at the rate of 300 million metres—or, roughly, 186,000 miles a second.

This, of course, is all wrong. The effect of an applied E.M.F. travels at this rate, but the individual electrons do not. Those that move out from one end of a conducting wire are not those that start to move at the other end.

The action is comparable with what happens if one end of a bar of iron is placed gently against a glass window and the other end is then struck with a hammer. The window will certainly break, but the

molecules which do the damage are not those which make contact with the hammer.

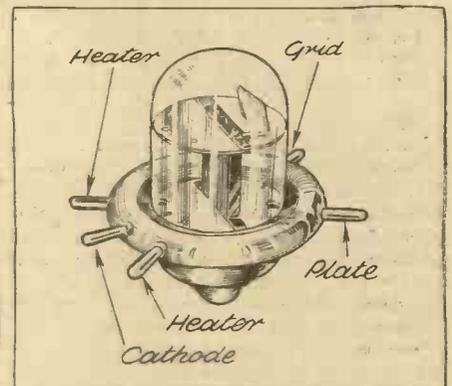
Actually, there is only a very slow drift of individual electrons through a conductor—so slow that it takes any particular electron eight seconds to travel an inch. That, for instance, is the speed at which they pass through the electric mains into one's home.

On the other hand, electrons are never really at rest, even when there is no current flow. They are constantly vibrating in the neighbourhood of each atom at a rate which depends upon the local temperature. The average speed of these small orbital movements varies from about 750 miles a second at normal temperature to ten times that figure at the temperature of a heated filament.

Behaviour in a Gas.

Conditions are somewhat different in the case of a gas. Normally a gas is an insulator, and so is the almost perfect vacuum that exists inside the glass bulb of a valve.

But electrons can be forced through either if a sufficiently strong voltage or field of force is applied, though they can only be handled in comparatively small numbers. For instance, there are more



This sketch shows the constructional details of the American "Acorn" valve. The inter-electrode capacity is extremely low, the connections to the electrode being brought out at various points round the bulb instead of being "bunched."

free electrons in a cubic inch of copper than there are drops of water in the Atlantic Ocean, and they are all set in motion by an applied E.M.F. This is, perhaps, a more picturesque than scientific way of putting it, but it will serve to illustrate the point in view.

On the other hand, the density of the electron stream passing through an ordinary valve is comparatively small. Each of

(Continued on page 53.)

Avoiding Mains Hum

I HAVE heard people say: "I won't have an all-electric set—you can't cure the hum." Frequently facts seem to justify their decision, though there is no theoretical reason why a mains set should not work as silently as a battery set.

Nothing is more annoying, having designed and completed a new mains receiver, than to be met with a hum on switching on. Such trouble can be avoided by bearing in mind the practical information contained in this article.

By M. C. PICKARD.

Our problem is clearly to separate the direct voltage from the alternating voltage that accompanies it, and for this purpose we connect the two condensers and the choke coil, as shown. The peculiarity of the condenser is that it allows an alternating current

That is, provided our ears are to be the only criterion; for there must always be a small residual ripple on direct current that is drawn from an alternating-current source by means of rectifiers, no matter how elaborate the smoothing circuits may be.

What Happens in a Rectifier.

For instance, take the circuit shown in Fig. 1. This is an ordinary high-tension-supply unit with a valve rectifier, such as you might find in a battery eliminator or a mains receiver. Fig. 2 shows the behaviour of this piece of apparatus stage by stage.

Thus A shows the wave form of the 50-cycle alternating voltage in the primary of

to "pass through it," but behaves as a non-conductor to a direct current; therefore the first stage of the smoothing occurs in the condenser C1.

But C1 acts mainly as a storehouse for the pulses, and does not contribute, as might be supposed, to the smoothing; for in order to effect complete smoothing at this stage it would be necessary to make the capacity of C1 very great indeed, and damage to the valve would result because too large a pulsatory current would flow through it.

In practice, where the frequency of the mains is 50 cycles, the largest safe value of C1 is four microfarads. With such a capacity the alternating voltage across C1 will be reduced to about a fifth of the magnitude of the direct voltage.

Now, the peculiarity of a choke coil is exactly opposite to that of a condenser; it offers a small resistance to the flow of direct current, but a high impedance to the passage of an alternating current. Thus the whole of the direct voltage in C1 is transferred to C2, but not so the alternating voltage.

The alternating voltage is engaged in causing an alternating current to flow through the choke and the condenser

that shown in Fig. 1 to separate the direct from the alternating, or "hum," component of the output of the rectifier.

We must make the capacity of the condenser C2 as large as possible, so as to make its alternating-current impedance small, and make the inductance of the choke coil high for the opposite reason—so that it will have a high impedance for alternating currents.

A high-impedance choke coil means many turns of wire wound on an iron core, and unless we are to lose a great part of the D.C. voltage of our H.T. supply the wire must not be too fine. A really efficient smoothing choke is therefore both a bulky and a costly piece of apparatus.

But fortunately, when it comes to designing a complete set, we can have recourse to other means of improving our "smooth-

CURRENT CHANGES

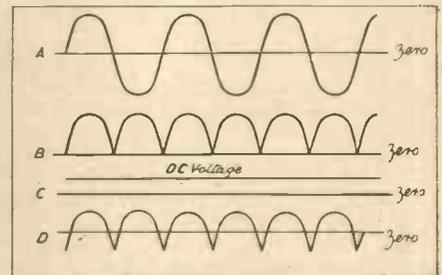


Fig. 2. This diagram illustrates the behaviour of currents in the Fig. 1 rectifier circuit.

A SIMPLE MAINS CIRCUIT

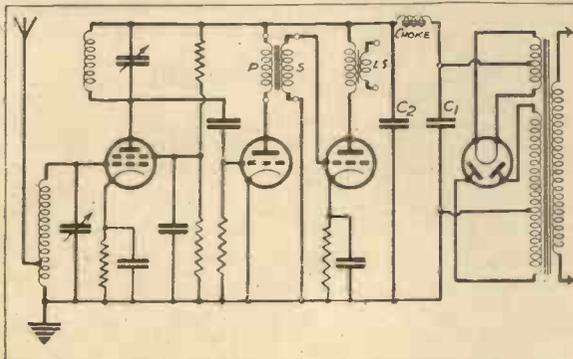


Fig. 3. A typical three-valve mains receiver with a single choke for smoothing.

the mains transformer, and B shows the wave form of the voltage that appears between the points X and Y in Fig. 1 if the two condensers and the choke coil L are disconnected from the circuit. Instead of having a pulsation of current in one direction, followed by an equal pulsation in the opposite, as in A, we have in B a series of pulses all in the same direction. But this is not true D.C. voltage: it is only unidirectional voltage.

"Sifting" the Currents.

It is the equivalent of a direct voltage with an alternating voltage of rather peculiar wave form superimposed on it, and these two component parts of the output from the rectifying valve are shown separately in C and D. It is clear from the picture that the frequency of the alternating component D is twice as high as the mains frequency A. Its fundamental frequency is 100 cycles, but there are also higher frequencies present—harmonics, they are called.

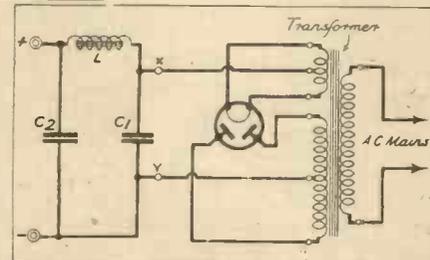


Fig. 1. An ordinary full-wave rectifier circuit. Fig. 4, to the right, shows how the smoothing in Fig. 3 can be improved.

C2; but since the impedance of the choke is high, and that of the condenser low, nearly all the voltage is used up in the choke coil, and only a small fraction of it appears across C2.

We have now reached a stage where we can say quite definitely what must be done with a simple circuit such as

ing" than the somewhat expensive principal smoothing choke. To see how this can be so look at Fig. 3, which shows the circuit diagram of a typical three-valve mains set.

The first thing we should note is that perhaps two-thirds of the total current supplied by the H.T. unit is used by the output stage, if this is a real "power" valve. So that, if we could isolate the H.T. supply to the power stage, we could use a choke of much smaller current-carrying capacity for supplying the earlier valves; and, that being so, the limitation of expense need not prevent our using a choke of really high inductance for providing smoothing for these valves.

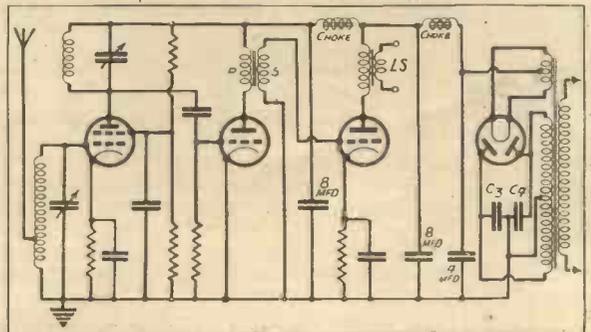
Analysing the Circuit.

But before making any such decision we shall want to know that we are going to derive a real advantage from doing so, and to settle this point we shall have to consider Fig. 3 still more closely.

Now, the anode current to the detector valve passes through the primary of the

(Continued on page 53.)

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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 subjects of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS

A CURIOUS FADING EFFECT.

G. S. (Eastchurch).—"Can you explain why it is that on my present set, though not on the one I had before, there seems to be less fading on the distant stations if I use a lot of reaction for them? With reaction well advanced, and then left alone, they seem far steadier than when little reaction is in."

To explain this would require careful measurement and observation and full particulars of both sets on which the different results have been noticed. And even then careful experimentation might not discover with certainty the cause.

But there is one possibility to bear in mind—detector overloading. If your reaction takes place in an overloaded detector circuit the lowered detector efficiency at full input volumes might tend to give a levelling-up effect if the station tuned in were subject to fading.

AN UNEXPECTED IMPROVEMENT IN STRENGTH.

T. G. G. (Edgware).—"While browsing through my back numbers of 'P.W.' I came across a suggestion for placing an extra tuned circuit between the aerial and the first tuned circuit. As I had the necessary coil and tuning condenser on hand I hooked this up in accordance with the description, being quite prepared to put up with a little loss of signal strength if I could get the additional selectivity which I needed.

"Well, it makes a wonderful difference and gives me all the selectivity I had hoped for. Moreover, I find it is very easy to operate, and I wonder more sets do not include this scheme. But that is not what I am writing to tell you.

"What puzzles me is this: I find that in addition to the extra selectivity I get extra strength as well. There is no doubt about this, though it is contrary to theory and to expectations.

"Not only do the opinions of everybody in the house agree that reception is stronger, but it is a measurable difference on the milliammeter in the plate circuit of the detector which I use for sharp tuning.

"As you know, such a milliammeter drops in reading when tuned in to a station's programme, and the stronger the programme the greater is the drop in the reading.

"Formerly the most careful tuning and adjustment brought the London Regional's milliammeter reading down to 1.8 m/a. On the new tuning arrangement I can always bring it down to 1.6 m/a. And other stations are also definitely lower in reading on the milliammeter and stronger in the loudspeaker.

"Knowing that you would be interested in this unusual increase in punch, I have been all over the set and connections very carefully before writing to see if there is anything that could account for my results. And I can assure you that nothing has been altered.

"Aerial, earth, valves, H.T. and L.T. voltages, are all checked up and are all exactly as before; in fact, I have gone to the trouble of cutting out the new circuit, only to find, as I expected, that the drop in strength to the former level occurs at once.

"So it comes down to this—the new circuit definitely improves strength as well as selectivity, though the only alterations made when using it are to change the aerial to the new terminal and connect the other side of the tuned circuit to the set's aerial coil on a different tapping.

"The new condenser is a .0005-mfd. J.B.

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and the coil a Colvern. How do you explain the extra strength they give over and above the sharper tuning for which they were intended?"

If you will try the following experiment we think you will see where the apparent discrepancy lies. First, revert to your former arrangement, noting strength on any steady station. Then insert the new circuit again, but leave the coupling at the same aerial-coil tapping. You will get enhanced selectivity and the usual slight drop in strength.

In the past you did not stop at this point; but, finding that your new coil and condenser gave surplus selectivity, you altered the aerial coupling as well. It was this that gave you the extra strength you noticed.

By greatly improving the selectivity you enabled the aerial coupling to be increased, and in this way you obtained a second gain.

It would not be possible in all instances, but where the original selectivity is very poor the extra tuned circuit has often been known to bestow the double benefit that you have secured.

SAFETY WHEN USING PHONES WITH A MAINS SET.

T. C. A. (Gorleston).—"When telephones are to be used in connection with a mains-driven receiver it seems reasonable that an

ordinary choke-filter arrangement should not be considered perfectly safe, since only one large condenser is employed to isolate the H.T. from the person using the phones. And conceivably the condenser in question might break down.

"But why is it that a transformer for coupling the phones is preferred to a choke-condenser system in which two condensers are placed in series with the phones?"

"If the circuit is arranged across the choke terminals there appears to be only the voltage of the D.C. drop across the choke, and not the full H.T. voltage for the condensers' insulation to withstand. And in the very unlikely event of two condensers becoming faulty at the same time there would be no worse danger to the person wearing the phones than if the insulation of a transformer's windings broke down.

"Why, then, is the transformer preferred?"

The transformer is unusually safe because, if it is installed in accordance with official recommendations, it has an earthed core separating the two windings. In the event of a breakdown of insulation the "live" section of the apparatus can, at the worst, only make contact with earthed wiring, since the core is interposed between the two windings. This is an advantage not possessed by the condenser arrangement you refer to.

USING THE HOUSE LIGHTS AS RESISTANCES FOR CHARGING.

C. G. Y. (Bolton).—"At the end of the quarter I am moving into a new house, with direct-current electric-light supply. I want to use this to charge my accumulators—two small 2-volters, which I use with an 'Air-sprite'."

"Can you give me the particulars you gave to another correspondent, some two or two-and-a-half years ago, of how to use the electric lights of the house as a charging resistance?"

"I cannot find the article now, but I know it explained that this method really costs nothing at all to run, because the current used for any lamp in the house is utilised to keep the accumulator trickle-charged.

"I do not know much about electric-light wiring, but could follow the plain instructions which you have given for similar jobs before."

You are mistaken in supposing that we can give plain instructions to anyone not accustomed to electric-light wiring; it would take up far too much space to set out all the necessary precautions. For we must emphasise, what we have said again and again, that it is not safe for any inexperienced person to attempt alterations to the house wiring.

You can, however, get an experienced electrician to do the necessary wiring, and provided this course is taken the work is both easy and economical.

All that is necessary is to get the qualified man to break the earthed main close to the point where it enters the house, arranging for a switch there, and charging-board with accumulator shelf.

Whether you had better charge one accumulator continuously, or charge both in turn, is a matter for the man on the spot to decide when he has discussed with you the amount of current that will be required for the lamps you will use. But if this current is considerable he will be able to arrange that it will charge your accumulator "free" from the lighting current.

THE KICKS OF THE MILLIAMMETER NEEDLE.

T. S. (Clifton Junction).—"In the ordinary way, I am always able to keep one eye on the functioning of the set, because I have a milliammeter, given to me by a friend, who wired it in the H.T. negative lead.

"It is a good check on what is happening, and when I changed over to mains valves I retained this idea, thinking it might prove useful, not in warnings to get new batteries, but in proving that the current flow to the valves was O.K.

"Over the week-end, when we did some spring-cleaning in the room where the set is, I renewed some of the frayed leads, blew the dust from inside the set and generally had a clear up.

"When this was all over I switched on, just to see that all appeared O.K., though the

(Continued on page 50.)

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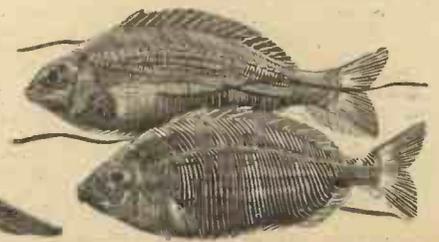
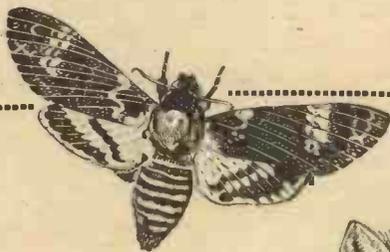
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RADIOTORIAL QUESTIONS & ANSWERS

(Continued from page 48.)

North Regional was not supposed to be working at the time. And a sort of tick-tacking noise drew my attention to the milliammeter needle after a few moments, and I saw it was kicking about as though demented. So I switched off, quick!

"I cannot see anything wrong inside the set, but perhaps you can tell me where I ought to look when this sort of thing happens?"

There is quite a number of things that could cause the symptoms you describe. Obviously you should check over all the wiring you renewed, making sure that it is sound from the electrical and mechanical point of view.

The best way is to start your inspection at the mains connection, working right through to the set itself, and checking every lead and component.

The action of the switch and the efficiency of the fuse connections should come in for special attention. Make sure, also, that the rectifier has not had a knock, and that any transformer, etc., in that section of the circuit has not suffered from an accidental blow or strain when you were cleaning that part of the apparatus.

If the most careful inspection fails to reveal the cause of the needle's fluctuations you will have to get an expert to run over the set for you, since the trouble will not be of the kind that an inexperienced set-owner can put right by himself. If the kicking is regular the set is probably motor-boating.

CIRCUITS USED FOR METAL RECTIFIERS.

A. C. B. (Waringham, Surrey).—"I have noticed that full-wave metal rectifiers appear to be arranged on two different principles—in some, both ends of the transformer secondary go to a pair of rectifiers, but in others one secondary lead goes to a pair of fixed condensers instead.

"What is the effect of this difference, in practice?"

The arrangement in which each lead from the secondary is joined to the connection between different pairs of rectifiers is known as the bridge circuit. (When the D.C. output connections are completed the circuit bears a superficial resemblance to the Wheatstone Bridge.)

The chief advantage of the rectifier bridge circuit is that it enables a comparatively large D.C. output to be obtained, so it is commonly employed for rectifiers in which a large D.C. output is an important requirement.

In contrast with the above arrangement there is the system in which one lead from the transformer secondary goes to the junction between a pair of condensers, instead of to that between a second pair of metal rectifiers. This is known as the voltage-doubler circuit.

Although the name must not be taken too literally, it is a feature of this type of circuit that when connected in the same general style as the bridge circuit, the D.C. output obtained is of relatively higher voltage; though against this must be set the fact that only a comparatively small D.C. current can be obtained at this higher voltage.

Thus the voltage-doubler circuit has an advantage where only small D.C. current output is needed; and a further recommendation is that it is less liable to suffer from the effects of an accidental short-circuit than its rival, the bridge circuit.

WITH THE EXPERIMENTER

(Continued from page 37.)

Similarly with the charging. I have a 1-ampere charger for my little accumulators which I simply plug into one of the wall sockets at the centre of the board and switch on from the top left.

Thinking to be all professional-like, I put the neon tube into the top right-hand socket and plugged in my strapped gadget to the underneath socket, so that I might be reminded in the morning the charger was actually switched on to the mains.

The glow had our village Robert worried, though. He peered in and thought the place was beginning to "fire"—and promptly had me out of my divan to tell me the awful news. It is things like this that make life interesting, I suppose.

Oh, I nearly forgot those aerial and earth bars. Quite the cheese, they are. Two 3-in. lengths of 1/2-in. diameter ebonite tubing stand off the rods from the wall, the rods having nuts at each end of a short threaded portion.

These extend the length of the power board—2 ft., that means. Croc. clips can be pinched on to any part of the rods, so that several sets can be left connected up at once, though not all worked at once, of course.

Solder the Two Leads.

I think the parallel bars—wireless variety—a great convenience for fans with more than one set on their hands. All the best Experimenters have this kind of thing, let me assure you.

Solder, for the love of Mike, the aerial and earth leads. Don't just twist them round the rods. It is not too easy to solder a seven-stranded wire to a rod, but it is well worth while. The secret is to give the rod a jolly good coating of solder before you twist the bared strands around it. Also smear a dab of the flux on.

Then, with the tinned and bared ends of the wire nicely bound round the soldered end of the rod, you can apply the bit, and the whole thing will run into as solid a connection as you would find anywhere from Watchet to Westerglen.

Which reminds me. One of the main reasons for putting in two wall-type sockets at the centre is my passion for the electric soldering bit—quite one of the most treasured of all my gadgets. And it costs only 7s. 6d. Worth double, I always say.

The Experimenter

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(Continued on next page.)

THE WONDERFUL WAYS OF NATURE

(Continued from previous page.)

its deepest mysteries and most unexpected beauties to those who love and understand it.

Part 1—which will be on sale Thursday, March 21st—contains a 4-page photogravure inset and a special plate in full colours showing the migration of British birds. Among many profusely illustrated articles are "Noisy Neighbours in the Tree-Tops," "The Life Story of the Lofty Larch," "Rocks that Build Up Britain's Scenery," "Who's Who in a World of Mud and Water" and "Untamed Sharers of Man's World."

When this work has been completed many readers will want their parts bound, and this they will be able to have done sumptuously and at very low cost.

Nature lovers of the British Isles will find in "OUTLINE OF NATURE" a book without parallel—a book as charming as it is comprehensive and instructive.

AN EVENING FOR EVERYTHING

(Continued from page 34.)

say: "Wednesday is my listening-in night." As a lover of the Drama: I would very much like to say: "Thursday is my listening-in night," and at the same time be confident of getting a good play to listen to.

"Two for Dinner," by Sacha Guitry, lost no time in getting under way. There was no waste of words either in any of the scenes. The dialogue was so crisp and continuous that one thought: "Here's something that will want every one of 30 minutes to get through." As long as one thought this one's attention was held.

But at 9.16 p.m. (the play began at 9) there was a painfully long pause. What had gone wrong? Nothing, for some seconds later an announcer declares the play over, and at once introduces some stop-gap gramophone music till 9.30. This play was a disappointment. With another scene at least it might claim to be a play. Without this scene "Two for Dinner" deserves no bigger name than a short story.

It rather interests me to know why 30 minutes were allotted to a play that was easily through in 16 minutes. Extraordinary miscalculation here. Wasn't the play rehearsed? When one puts off everything else, if only for a 30-minute play, it is irritating to find it finishing after 14 minutes.

Leonard Henry's concert party ran the full hour, as advertised. Here there was a waste of words. The hiccupping turn was much too long, especially as it hadn't a vestige of originality about it. Some of the sketches were quite good and amusing, while there was one that was subtle to the point of pointlessness. The singing was adequate.

By no means the most insignificant thing of the week was Wednesday evening's Children's Hour from the North. Apart from the benevolent uncles who controlled the proceedings, children from the Ancoats Children's Theatre, Manchester, wrote, performed and produced two plays. There was a play for boys and a play for girls.

This struck me as being an excellent idea, and one that should be encouraged to spread. We rarely hear children on the air, and when we do they usually sing songs of "Eventide" or of death going roving somewhere or other.

The boys' play was a thriller called "The Ghost of John Black," while the girls offered as a contrast a fairy story, "Rona and her Shadow." The girl who played the title rôle in the latter played with confidence and spoke clearly. In fact, all the children excelled in the matter of clear expression, and for this reason I am inclined to award this item my weekly bouquet. C. B.

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THE B.B.C. and SUMMER PROGRAMMES

(Continued from page 44.)

were portrayed at the Ludlow Pageant last summer, and parts of the episodes then given will be introduced into the broadcast. It has been decided to use the old Guildhall as the central "outside" broadcast point.

That this is possible only because an offer of £70,000 to sell the building to America was declined will always be a matter of satisfaction to those who love England. Equally it is nice to know that Much Wenlock still retains its old movable stocks and the wrist fetters on the old entrance pillars of the Guildhall that were used as whipping posts.

A Midland Talk.

A talk of the kind that will appeal to the majority of listeners will be broadcast on the Midland wavelength on Tuesday, April 2nd, when Mr. Ernest G. Beach will describe the methods of charcoal burners in the Forest of Dean, in which he was born nearly forty years ago. Mr. Beach worked for fifteen years as a miner, but had to find another occupation following a severe injury received in a pit accident. Besides other things, he has been a charcoal burner.

When I heard that five tons of timber are required to make about two tons of charcoal, and that about ten days are necessary to ensure slow and complete combustion, I decided to hear more about it when Mr. Beach faces the microphone. I have no doubt that other people will make up their minds to do likewise.

Town Planning.

So much has been said about town planning that it will be a change to hear a discussion upon planning the country, especially when one of the speakers happens to be Sir Fabian Ware, whose charming manner before the microphone is well known to listeners.

The discussion will be broadcast to Midland listeners on Wednesday, April 3rd, and will be between Sir Fabian Ware and Mr. Geoffrey Boumphrey, who is giving the "Ripe for Development" series of talks of which this will be one.

Sir Fabian Ware lives in a delightful cottage on the brow of Amberley Hill, and he has done some valuable work in the preservation of amenities in the Cotswolds.

Duchess of York to Broadcast.

Commander D. A. Stride, who last December gave a running commentary on the launching of the Orion from the shipyard of Vickers Armstrong's Naval Construction Works at Barrow-in-Furness, Lancs., is to give a similar description of the launching of the 24,000-ton P. and O. liner Strathmore from the same yard on Thursday, April 4th.

The vessel will be christened by the Duchess of York with her father's name, and her voice will be heard by listeners to the main Regional programme in which the commentary will be included. Microphones in the slipway will pick up the sounds of the vessel taking the water.

England v. Scotland.

In addition to the running commentary by Mr. George Allison and Mr. Robin Russell on the International "Soccer" match between Scotland and England at Hampden Park, Glasgow, on Saturday, April 6th, Scottish listeners are also to hear a talk on Friday, April 5th, in which Mr. R. E. Kingsley will sum up the prospects of the Scottish team.

As a writer on football Mr. Kingsley is an accepted expert, and most of the Scottish contingent among the 132,000 spectators who will witness the match will want to hear what he thinks of Scotland's hopes of winning. Scotland may, of course, but there will be eleven Englishmen doing their best to prevent them.

O. H. M.

How to Make A SIMPLE REMOTE CONTROL

(Continued from page 38.)

This not only makes a definite pressure contact for the L.T., but also prevents any tendency for the armature to stick to core when the current is reversed. As this relay is very sensitive only a small voltage is required to operate. On test it was found that only 1½ volts was required to operate relay with 40 ft. of flex as a connection from battery.

The battery may be placed in a wooden box with the two bell buttons mounted on the front. A neat wooden case may also be made to house the relay if so desired. Any number of control points, with two buttons and a battery at each point, may be used.

Efficient Operation.

If the relay is properly adjusted it will be found to operate efficiently without attention. It will be found best to use heavy extension leads when the loudspeaker is a very long way from the set, as there may be such a loss of current in passing through the leads that the relay may fail to operate.

The set should also be fitted with an output filter choke or transformer, so that the loudspeaker is isolated from the set.

Finally, the relay will be found to operate best horizontally, though it will also work quite well vertically.

WONDERFUL ONE-VALVE RESULTS

—A Reader's Experiences.

Dear Sirs,—In the issue of "P.W." dated 22-12-34 you published the details of a one-valver. This little receiver I have built, and I am sure that you will be pleased to hear that in my opinion no praise is required for this remarkable little receiver. It is quite capable of speaking for itself. This it does, and to a far greater extent than I should have thought possible. To say the least, it is a little marvel.

The number of stations received is twenty-three on the medium waves and six on the long waves. What more can one expect from such a small set?

May I ask if there is a cabinet on the market suitable for this receiver, and from whom it can be obtained?

In conclusion, as a reader of "P.W." I should like to congratulate you and all those who contribute such a host of valuable information each week for readers of the above paper.

Yours truly,
G. F. MOORE,

Brandon, Suffolk.
(A cabinet can be obtained from Pe'o-Scott, Co.—Ed.)

ARE ELECTRONS TOO SLOW?

(Continued from page 45.)

the electrons is, in fact, fairly widely spaced apart from the others.

Largely because of this the individual electrons travel at a comparatively high velocity—roughly of the order of 5,000 to 10,000 miles a second, according to the H.T. voltage applied to the plate.

In special cases, such as the cathode-ray tube, where high voltages are used, the speed of the electron stream may be anything from 20,000 to 60,000 miles a second, whilst in the latest form of Coolidge tube its velocity has been brought within measurable distance of that of light.

The figures given do not represent a constant or uniform velocity, because, in the case of a valve, the effect of the grid must also be taken into account. The electrons may leave the filament at a speed of several thousand miles a second, and immediately afterwards be stopped almost dead by the space charge below the grid. After passing the grid they naturally speed up again on their way to the plate.

But the fact remains that they do take an appreciable time to "get across," and this definitely puts an upper limit to the frequencies which the ordinary valve can handle.

AVOIDING MAINS HUM

(Continued from page 46.)

interval transformer PS, and any alternating component it may contain will appear, in an amplified form, in the secondary. Here it will be applied to the grid of the output valve and be still further amplified.

It is easy to understand from this that poor smoothing in the H.T. supply to the detector is a far more virulent cause of hum in the loudspeaker than imperfect smoothing of the supply to the power stage. An additional stage of smoothing for the high-frequency amplifier and detector will thus more than adequately repay us by the greatly increased immunity from hum it provides. In Fig. 4 is shown the scheme of connections to provide such smoothing.

And finally, one point more. I have already mentioned that besides the fundamental frequency of 100 cycles there are a great number of higher frequencies present in the output from the rectifier. Most of these are adequately dealt with by the smoothing equipment; in fact, they are easier to cut out than the fundamental.

Preventing Tunable Hum.

But it sometimes happens that there are frequencies present so high that they can skip across the choke through the capacity formed by adjacent turns of wire, and so reach the set. It may happen that such a frequency falls within one of the wavebands to which the set tunes, and then we have the phenomenon of "tunable hum."

This can often be eliminated at its source by connecting a small condenser, not greater than 0.1 mfd. in capacity, between the anodes of the rectifying valve and earth—that is, the metal chassis of the negative high-tension wiring. These condensers are shown as C3 and C4 in Fig. 4. Though tunable hum does not always occur, it is wise to take this simple precaution.

VOLTAGES FOR TELEVISION

Random Technicalities of Interest to all Readers.

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

A POINT about television receivers that has not been commonly recognised is the fact that the receiver requires the use of a relatively high voltage—much higher than any commonly used for ordinary domestic purposes, and therefore requiring special precautions. For receivers which incorporate a cathode-ray tube a voltage of 1,000—and sometimes much more—is used. Voltages like this invite a certain amount of respect, and it seems that appropriate regulations or recommendations will have to be made in due course in order to deal with this.

Standardising Construction.

As to how these high voltages are to be obtained; they can be got quite easily by means of a step-up transformer using A.C. supply. All the necessary components will be inside the set and can, of course, be properly shielded; I don't mean shielded in the ordinary electrical sense, but guarded. As a matter of fact, there is really nothing different in principle in safety precautions with a television set from what we are accustomed to in mains radio receivers.

In the latter case it was laid down several years ago that proper precautions should be observed in accordance with the recommendations of the I.E.E., and manufacturers have followed these as a matter of course ever since. The same thing applies with television sets. Perhaps the need for proper regularised construction is a little greater, but when properly done a television receiver will be as harmless as a present-day radio set.

Supersonic Sounds.

I have before me a very interesting account of some experiments conducted at the University of Harvard, in the United States, on supersonic sounds—that is, sounds which, although of "audio" frequency, are yet above the upper limit of average audibility. These very high-frequency or short wavelength sounds have certain special properties which make them very valuable for communication purposes in special conditions and also for certain other applications, and for these reasons they have been much studied since the war. They can be used for under-water signalling and are also now employed for what is called "acoustic depth sounding."

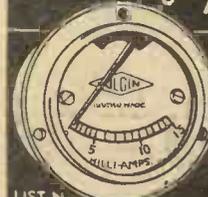
Instead of a ship dropping a sounding line to find the depth of the water, she sends out a sound (of short duration) and receives the echo, the interval between transmission and reception giving a measure of the depth, since the velocity of the sound waves in sea water is well known.

Beam Transmission.

The particular advantage of the short-wave or supersonic sound here is that it can be directed in a beam (just like radio waves), and so sent in any desired direction. If this were not so, and the sound went out

(Continued on next page.)

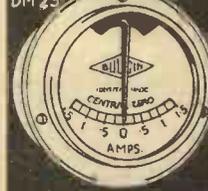
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List No. Scale Ohms
D.M.1 0-3 v. 40
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D.M.6 0-3 A. 0.5 v.
D.M.7 0-6 A. 0.5 v.
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VOLTAGES FOR TELEVISION

(Continued from previous page.)

in all directions, you never could be sure that you were getting the reflected sound from the intended object (the sea floor, for example), and not from various other objects.

In the particular experiments I refer to tests were made on various birds and insects, and it was found that quite a number of creatures emit sounds which are too high in pitch to be audible by the human ear.

I haven't the space to go into this any further at the moment, but those of you who want any more information on this subject should write to me and I will tell you where it can be obtained.

Cathode Rays.

People frequently ask me whether television is all going to be on the cathode-ray system or whether the mirror-drum or scanning-disc systems are going to have a "look in." Perhaps this is a natural question, because we have heard so much about the "all-electric" system (the cathode-ray method, using gas-relays) and its advantages that it would certainly appear to any ordinary person that there was very little room left for the mechanical systems.

I can only give you my own opinion on this point; as, of course, no one knows how television is going to turn out when it does start. But my opinion is that we are very far from having heard the last of mechanical systems. We all know their drawbacks, but it is remarkable how these drawbacks have been overcome or, at any rate, reduced during the past year or two.

The Mirror Drum.

One of the difficulties of the mirror-drum system, for instance, was the very large number of mirrors that have to be mounted on a drum (for high definition) and the difficulty of adjusting each of the mirrors accurately. Both of these difficulties, however, have been very much minimised, and they cannot now be considered to be serious. Another point was the question of the amount of light that could be passed into the received picture; this has been so increased that a good mirror-drum picture is now extraordinarily realistic and savours very much of a small cinematograph picture.

A Psychological Point.

There is, moreover, the very important psychological question I mentioned the other day of the appearance of the received pictures. The picture received on a cathode-ray screen has a curious quality, very hard to define to those who are not accustomed to it, whilst the mirror-drum picture, as I have already indicated, has at least the merit that it more resembles the type of picture people are used to.

I have seen all kinds of cathode-ray reception—good, bad and indifferent—and I have also seen some very good mirror-drum pictures. All things considered, it seems to me that there will still be a place—perhaps a very important place—for the so-called mechanical systems when television finally and fully enters our homes. We shall see!

The Tuned-Grid Circuit.

The tuned-grid circuit is a very popular one in these days, but there are one or two points which ought to be noted about it if you want to get it working efficiently. As you know, it involves a tuned circuit consisting of inductance and variable condenser, this being connected to the anode of the screened-grid valve. In the lead to the anode is inserted a fixed coupling condenser. This coupling condenser allows the high-frequency currents from the anode to pass to the grid circuit with the minimum loss. Another purpose of the condenser is to prevent the H.T., which is applied to the anode of the screened-grid valve through an H.F. choke, from flowing between the grid and anode-circuits.

You will see from this latter condition that the condenser has to stand the H.T. voltage, and consequently you must take care to use a condenser rated for a sufficiently high break-down voltage.

Importance of the Coupling Condenser.

But in the anode circuit we will get a certain amount of L.F. variations, which may come from the low-frequency part of the set or from a mains unit, and these will tend to flow through this coupling condenser to the detector grid. If this is allowed to take place to any appreciable extent it will set up motor-boating or hum in the output. For this reason we want to keep the capacity of the condenser as small as possible. But at the same time we do not want to make the capacity so small as to interfere with the passage of the H.F. currents. The result is we have to choose a value which is, as it were, a compromise between these two opposing conditions. A suitable value is generally about 0.002 mfd., but if you get in trouble with hum it is worth while to try a smaller value, until you get one which is as low as possible consistent with allowing the H.F. currents to pass.

Tastes Differ.

We have all noticed how people's tastes differ in the matter of quality of radio reproduction. Perhaps it is a good thing they do, because it gives all the different manufacturers a chance in their corner of the market. Every radio dealer knows only too well from practical experience how one customer will fall for one particular type of reproduction, whilst another wants something entirely different. If there is any general preference I think it is for a rather "boomy" type of bass reproduction.

I do not know why this should be so, but I have noticed myself that most people seem to like that very deep "basso-profundo" sort of quality. Whether they think it has a rich character about it or whether they like the impression of strength and robustness is difficult to say. As a matter of fact, it is not at all a true reproduction of the original.

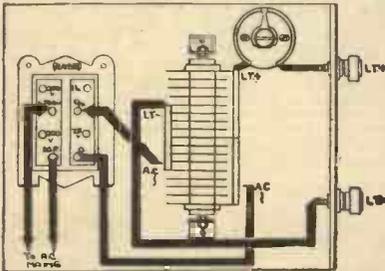
The Announcer's Voice.

The announcer's voice is given an added depth and roundness which may, in some people's opinion, be very flattering or very attractive, but which gets quite away from the true quality of the voice.

Purists would argue that there could be nothing better than the absolutely true and faithful reproduction of the original, but I am not altogether sure that this is the case.

(Continued on next page.)

CAN YOU FOLLOW THIS?



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VOLTAGES FOR TELEVISION

(Continued from previous page.)

After all, a successful portrait painter is one who paints *successful* portraits, and this may not be quite the same thing as one who paints portraits only too true to the subject. And if you prefer that your radio set gives you that extra something that the original hasn't got I can see no reason, artistic or otherwise, why you shouldn't have it.

Loose Terminals.

I was using a set the other day in which one of the most aggravating things kept happening. Every time I went to tighten a terminal the wretched thing would turn in its socket so that there was no security anywhere, and I felt like the man in the scriptures who built his house on shifting sand. Do you know anything quite so annoying as loose terminals? They are particularly bad when they belong to an instrument or component (say a transformer) where a fine wire is soldered to the inner end, so that when you feel the whole thing give a turn you have a sickening feeling that something must surely have come adrift inside.

A Dodge Worth Trying.

There is no excuse whatever for this sort of thing on the part of manufacturers. It's just carelessness. And, so far as you are concerned, the best thing you can do is to dismantle the apparatus, whatever it may

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be, and go over the terminals and make everything tight. It is much quicker and less trouble in the long run. Incidentally, it may help if you dab the inner end of the terminal with cellulose varnish (or glue, for that matter), as this will tend to prevent the nut, which I am assuming you have previously tightened up, from working loose and giving you the same trouble all over again.

Electrolytic Condensers.

I have many times noticed that amateurs are apt to forget that electrolytic condensers have a polarity—like batteries—and must be used one way round only. If an electrolytic condenser is connected the wrong way round it will pass current and will be damaged. It will, in fact, act very much like a battery, and the chemical changes which will then take place will change its composition and damage or destroy its function as a condenser.

In some cases it is comparatively easy to see which way round the condenser should

be connected, but in others there may be some difficulty. Always think of the condenser in the same way as you would of a battery (it is a battery in a sense), and then you will remember how to connect its positive and negative terminals. If two condensers are to be used in series connect them with positive terminal of one to the negative of the other—exactly like batteries.

Those Old Valves.

Those of you who are newcomers to wireless will not remember the old valves we had in the early days of broadcasting, with clear bulbs and rotten vacuums (all right, *vacua*!). That was before somebody found out how to clean up the traces of residual gas in the bulb, after the pumps had done their worst or best, by means of a piece of magnesium.

"Gettering" and Performance.

Nowadays valves have that silvered appearance which is due to the deposit of magnesium upon the inside surface. The Americans, I believe, introduced this dodge; at any rate, whether they did or not, they named the piece of magnesium the "getter." It is introduced during the construction of the valve, generally being attached to one of the electrodes, and is "fired" or fused by means of a high-frequency induction current. On vaporising or volatilising it combines with the remainder of the gas in the bulb and leaves practically a perfect vacuum. A simple little dodge, but one that makes all the difference to the performance of the valve in your set.

L.F. Stages.

At one time we used to think nothing of using three stages in the L.F., but nowadays, with the great improvements in the efficiency of valves, we rarely go beyond two stages of L.F. and usually employ only one. As a rule, it is better to use only one step-up transformer, so that if you decide to have two stages of amplification it is better to make one of them a resistance-capacity stage. If a transformer stage is used with this ratio should not exceed about four to one.

The above applies to battery sets, but if the set is mains driven, then both stages should be resistance-capacity coupled.

Improving Stability.

When you are trying different dodges for improving the stability of the set you want to bear in mind that a decoupling condenser becomes less and less efficient as the frequency becomes lower. This has a bearing on the question of the L.F. amplification, because as you increase the amplification, and so, amongst other things, bring up the strength of the low notes, you may find it necessary for stability to increase the decoupling. Increasing the values of the resistances or the capacities of the condensers will help to do this. If you increase the resistance, however, you lose H.T. voltage, and so it is generally better to rely upon an increase in the capacities of the condensers.

Sometimes you can do a good deal towards curing L.F. instability by simply reversing the connections to the primary of the L.F. transformer. The transformer terminals are generally marked H.T. and plate, but you can often get good results by changing the connections in this way.

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NOTE.—We make no extra charge for deferred terms. **RECEIVERS.** 3-valve Class B Burgoyne Receivers. Complete with Mullard valves: Exide H.T. and L.T. batteries. M/c speaker. Artistic cabinet of highly polished walnut. Chromium fittings. Brand new in original cartons; 1935 Model. List £6/10. Our price 53/18/6. Carr. Paid.

COILS. Lincoln-Stewart dual-range coils with circuits, unscreened, 1/9; screened air core, 2/9; screened iron core, 2/6. All with terminal connections. Lotus triple-ganged bandpass coil unit, complete. Suitable for mains or battery sets. Comprises 3 screened coils on metal base, wave-change and radiogram switch; all terminal connections shown engraved. Full instructions with every unit. List 27/6. An outstanding bargain at 12/11 each. New Lucerne coils, 1/8 each.

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CABINETS. Ultra polished walnut receiver cabinets (for set and speaker combined). Height, 17 ins. Width, 15 ins. Depth, 8 ins. Only 5/11 each.

CROMWELL Cabinets (for set and speaker combined). Horizontal type, 23 ins. wide, 8 ins. deep, 11 1/2 ins. high. Polished walnut veneer, additional baffle behind speaker grille. Just secured on terms which enable us to offer them at the astonishingly low price of only 4/11 each.

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BRITISH RADIOPHONE 2-gang condensers, '0005, semi-screened, with trimmers, nidget, 5/-; 3-gang, 7/-.

DUBILIER dry electrolytics, 8-mfd., 500v., 2/10. T.C.C., 6-mfd., 50v., 7d.; 25-mfd., 25v., 1/3; 50-mfd., 12v., 1/3. Formo, 1-mfd., 1/-; 2-mfd., 1/3; 4-mfd., 2/3.

WESTINGHOUSE Rectifiers: H.T.8 and 9, 8/11; L.T.2, 3/9. Western Electric Microphones, 2/3. Transformers for same, ratio 100/1, 2/3. Plessey shrouded L.F. transformers, ratio 6/1; 1/6 each. Erie resistors, all values, 6d. Truwind wire-wound resistances, 100 to 50,000, 3/6 doz. Chassis mounting valve holders, 4/5-pin, 1/3 half doz.

LUCERNE iron-cored canned coils, boxed with circuits, 2/6. Tubular condensers, .1 and .01, 6d. Pye S.W. valve holders, 4d.

Trade list ready; enclose trade heading and stamp. **WOBURN RADIO CO.**, 9, Sandland St., W.C.1. Holborn 7289. (First turning on right up Red Lion Street from High Holborn.)

Miscellaneous Advertisements continued on next page.

MISCELLANEOUS ADVERTISEMENTS

(Continued from previous page.)

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CONDENSERS. Plessey Four-Gang Condensers, with Oscillator Section for Superhet. Fully screened with trimmers, 7/3 each. This is the piano type of condenser and standard full-size 0.0005 (not midget). Lotus 3-gang 0.0005, 11/- (List 19/6). 2-gang 0.0005, 7/3 (List 14/-). All Lotus condensers are brand new, fully screened with trimmers, complete with dials, escutcheons, etc. Igranac 1-mfd., 1/3; 2-mfd., 2/- Dubilier 4-mfd. (2-1+1), 2/9. 1,000-volt test.

COILS. Igranac Superhet 4-Coil set (1 osc., 2 I.F. with pigtales and 1 I.F. plain), 9/- per set (List 50/-). Varley constant square-peak coils, B.P.S., with all accessories, 2/3. Telsen twin-matched coils, type W.287, screened with switch, 7/9 (List 17/-). Triple-matched screened, type W.288, with switch, 10/9. Telsen Twin-Coil Unit, type W.478, 12/6. Type W.477, 17/6. All brand new and boxed.

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RECEIVERS. Burgoyne Class B 3-valve sets, complete with 3 Mullard valves. Exide batteries and accumulator. Magnavox moving-coil speaker. In modern cabinet, beautifully finished in chromium plate. Brand new in sealed cartons, 63/18/6.

Osram 4-valve (and rectifier) A.C. receivers, 2 H.F. stages. Complete with 5 Osram valves, moving-coil speaker. Pedestal cabinet. Ready for use on all voltages A.C. In sealed cartons, 65/10/0 (List 65/15/0).

TELSEN 3-valve Battery Sets. Model S.93, complete with 3 Mazda valves, 30/- (List 75/-). Contained in exquisite bakelite cabinet.

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STOCK TAKING PARCELS. We have gathered at our Mail Order Dept. a large quantity of odd lines from our various branches. It is impossible to list these articles individually. We are, therefore, offering them in parcel lots at 5/- per parcel.

Each parcel contains components to the value of at least 20/-, and include Switches, Fixed Condensers, Transformers, Coils, etc., etc. Every article is of present-day use in radio. Telsen and Ready Radio circuits, numbering to different circuits, are included in each parcel. 5/- per parcel.

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RADIOMART. British Radiophones, fully screened, 2-gang, -0005, top trimmers, latest compact type, 5/11.

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RADIOMART. British Radiophone, 2-gang as above, but fitted Uniknob trimming; wavelength moving-scale dials, 8/3.

RADIOMART. Radiophone I.F. Transformers, 110 k.c. top trimmers, 2/6. Also few 117 and 126 k.c.

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ELIMINATOR Kits, including transformer choke, Westinghouse metal rectifier, condensers, resistances, and diagram, 120v., 20 m.a., 20/-; trickle charger, 8/- extra; 150v. 30 milliamps, with 4v. 2-4 amps. C.T., L.T., 25/-; trickle charger, 6/6 extra; 250v. 60 milliamps, with 4v., 3-5 amps. C.T., L.T., 10/-; 300v., 60 m.a., with 4v. 3-5 amps., 37/6; 200v. 50 m.a., with 4 v. 3-5 amps. L.T. 27/6.

PREMIER Chokes, 40 milliamps, 25 hys., 4/-; 65 milliamps, 30 hys., 5/6; 150 milliamps, 30 hys., 10/6; 50. milliamps, 80 hys., 2,500 ohms, 5/6; 25 milliamps, 20 hys., 2/9; 250 milliamps, 30 hys., 20/-.

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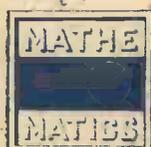
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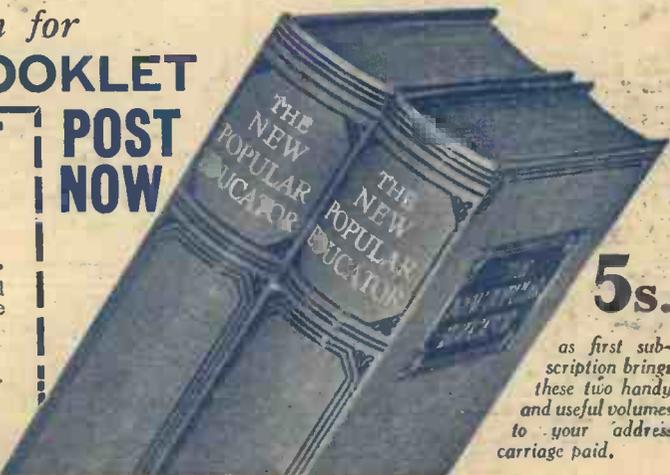
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THIS COUPON BRINGS FULL DETAILS

POPULAR WIRELESS AND TELEVISION TIMES

MANAGING EDITOR: N. F. EDWARDS.

TECHNICAL EDITOR: G. V. DOWDING ASSOC. I. E. E.

OLYMPIA AGAIN
MORE STATIONS
"TELEPHANT"!
WEATHER REPORTS

RADIO NOTES & NEWS

THE "NAB"
VALVE STORY
SOUND AND VISION
"YOUNG THINGS"

Oyez! Oyez! Oyez!

THE National Radio Exhibition is to be held at Olympia, London, from August 15th to August 24th, 1935—now rub your eyes and read that again!

It may seem a little premature on my part to give you nearly half a year's warning of even such an important event, but there is more in this than meets the optic of the casual observer. For one thing, you now have only a slender excuse for fixing your holiday—as some of you did last year!—regardless of the Olympian Revels. And what is more, I have done my duty in the matter of an early reminder; for the wicked man, even mine enemy, cannot say that I gave you short notice this year!

Receiver Epidemics.

ONE of the curious things about wireless is the way in which the popularity of old sets blossoms out again in patches. Sometimes they are very old sets indeed—I have recently had quite a batch of early "P.W." crystal-set letters.

"Magics" and "Comets" are always liable to commence an eruption, but why is it a set like the "Filadyne" should suddenly crop up in a number of different readers' letters?

The latest example is a not-very-old set, the "1933 Four." Everybody seems to be mentioning this design in correspondence, and A. E. W., of Kendray, Barnsley, takes the biscuit, for he has converted it into a seven-valver!

What the Technical Hounds would say to A. E. W. I blush to think, for he has fitted a pentode to work one high-note loudspeaker, a super-power valve to work another (for low notes) and another S.G. valve in front just to ginger things up generally. Ingenious, I admit—but no longer the "1933 Four."

New Services.

SO many new stations swim into my ken nowadays that there is hardly room to refer to them. But I must mention Bulgaria's, because that country is as yet comparatively little known to British aerials: The Bulgars propose to put up a couple of 2-kilowattérs at Stara Zagora and Varna and a high-power station at Sofia.

While on the subject Japan may be mentioned. A representative of the Ministry of Communications in Osaka was recently overheard having an experimental chat with Berlin. So apparently a new service is contemplated between those far-distant points.

Finally, Chicago claims to have worked with New York on a new picture service—almost television—capable of handling twenty complete black-and-white pictures in one second.

There are plenty of others, but no more room this week to tell you of them.

handled by only one transmitter and receiver, instead of by a separate pair for each channel, as in the original arrangement. The wavelength—if you can call it a length—is only about 4 metres, and the contract has gone to Standard Telephones & Cables, Ltd.

Highly interesting developments, these, and evidence that it pays to keep an eye on ultra-shorts, which seem to be making headway as fast as any other branch of radio, and faster than most.

The Would-be Newcomer.

YOU may have noticed that I have studiously avoided being drawn into any argument about the new terms that will be necessary when television becomes general. I have politely raised the question, but carefully refrained from the cut and thrust of conflicting opinions as to whether we shall "televise" a Derby, or "televatch" it or merely "look-in" at it.

Now, however, I must cast my neutrality aside, because some genius has come out with the suggestion that the correct name for a television transmitter is a "telephant." I cannot allow that to pass without a protest. "Telephant" indeed! Who wants a great hulking, shambling word like that in the language? Let us all pretend we have never seen it, and probably it will go away and not disturb our peace any more!

.....

ON OTHER PAGES	
With the Experimenter- - -	61
On the Short Waves - - -	63
Television - - - - -	65
THE SILVER KING - - -	70

.....

On Four Metres.

THE success of the telephone service on ultra-short waves between Great Britain and Northern Ireland, to which I referred some months ago, continues apace. So much so that the G.P.O. has decided to extend the original six channels to fifteen.

The new nine-channel equipment will be

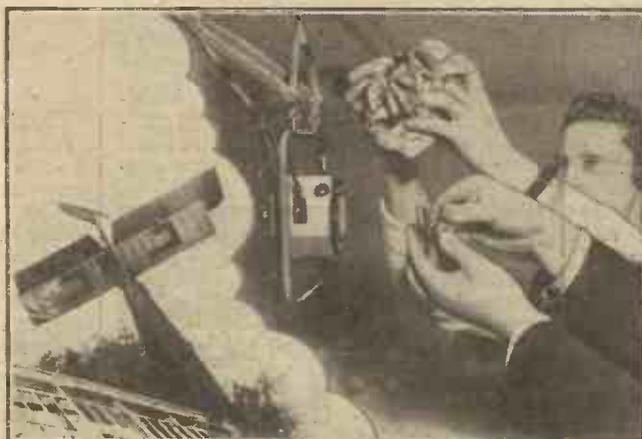
Roll Away, Cloud!

ALL budding airmen, meteorologists and Nosey Parkers will be interested to know that it has been decided to expand the programme of wireless weather reports now transmitted from Heston, Middlesex. The construction of a new transmitter of much higher power is well advanced; and when this fellow gets going the news of anti-cyclones and the depressions that follow them (as surely as post-influenzal depressions follow high temperature and aspirin) will be roared throughout the length and breadth of the country.

Any lingering doubts there may be about Old Man Visibility will be cleared up by an R.A.F. stentor, who will denounce not

(Continued on next page.)

WHEN AN AEROPLANE CRASHES



B.B.C. EFFECTS (2). The realistic sounds of an aeroplane crash are produced by the very simple procedure of crushing a match box and rustling and tearing brown paper close to the microphone.

WHEN SOUND AND VISION SIGNALS INTERMINGLE

only fogs, but also light mists and even the poetic haze.

"Date of opening—none issued."

Cavalcade of Sound.

SOME of my readers are so alert to radio activities that I verily believe that if an announcer at Tashkent or Nyireghyháza developed hiccups the poor chap's predicament would certainly not go unnoticed by them, however quickly he took the three sips of water or bolted the lumps of sugar.

One such alert "P.W." "Watcher of the Skies" asks if I heard the broadcast from Warsaw of Chopin's Nocturne in D flat, played on the composer's own piano. Alas, no! I missed that; but it gives me an idea. Surely there are other equally historic instruments available which could be incorporated with success into forthcoming programmes? There should be enough of them to give us a half-hour's Cavalcade of Sound.

In Notts.

BEESTON, Notts., is an appreciably brighter town in the eyes of F. A., one of its inhabitants, since the new Midland station at Droitwich came into operation.



He is one of those unfortunates cursed by aerial limitation: for if he tries one of the outdoor type it picks up all the interference from miles round; while if he tries indoor

aerials he gets hum, or low-signal strength or a piece of his wife's mind for stretching wires about where they offend her housewifely instincts.

Even the earth is difficult, because there is a concrete surround to his house which defies anything but a road-breaker to pierce.

Through all these troubles there now comes stealing a balm—a beautiful, robust, penetrating voice from Droitwich, which gives F. A.'s loudspeaker a new lease of life and inspires him to write to me in praise of Droitwich. Thanks, F. A., and may it last.

Light and Air.

WHEN the Southampton Harbour Board discussed the radio beacon to be installed at the Nab Lightship the interesting fact emerged that it may be used for aircraft as well as for ships. The Board had written to Trinity House, it was stated, expressing the hope that the work would be put in hand forthwith; and Trinity House replied that the plans and description of the beacon were not yet in their final form.

Alderman Sir Sidney Kimber said they were now trying to ascertain whether, in addition to being a help to ships, the radio beacon could also be of use to air navigators. The Finance Committee talked of sending along a cheque for £1,000, so the brass-tacks stage has been reached and "Nab" will be on the job before many moons.

Foreshore Mystery.

AN S.G. valve, of American type, has been found on the foreshore at Rampside, having apparently been washed up by the sea. A letter from a



Barrow-in-Furness reader tells me of this unusual occurrence, and adds: "Your taste for the unusual radio tit-bit should find this washed-up valve very acceptable. Bet you can't explain it."

Certainly I can, and here goes. The S.G. valve in question once belonged to a rich American, who doted on radio and spent oodles of boodle on a new hyper super set. To the wealthy owner's chagrin this master set would not

BROADCASTING BREVITIES

Many B.B.C. programmes bring in a large mail, but few such an enthusiastic one as the Old-Time Dance-Music broadcasts by the Theatre Orchestra. The appreciations invariably emphasise that advantage is taken of the opportunity given to the writers of being able to dance to the old tunes.

Apropos of which, one writer stated, "..... what pleasant memories it awakened and made me feel. Blow the Income Tax man; it's grand to be alive. I felt I must dance, and, being alone, I grabbed the dog and had a whirl or two, and he, being a Scotsman, was very perturbed at my behaviour."

Famous statesmen, a physician, authors and M.P.'s will take part in a "Freedom" series of talks shortly to be broadcast. The speakers will be asked by the B.B.C. to state their ideas of freedom, and to say what they are personally prepared to sacrifice or concede in order to achieve it.

work properly; and after he had been let down before all his friends, Mr. Rockefeller—or whatever his name was—found that one of the S.G. valves was to blame.

He thereupon gave orders that a ship should be chartered specially to take this valve to mid-Atlantic, where it was to be formally cursed and cast into the briny. This was done with due solemnity, and now the valve has turned up again at Rampside owing to the action of the Gulf Stream. (This may not be true, but it's a complete explanation. What next?)

What the Eye Doesn't See . . .

SELECTIVITY, in the ordinary broadcasting set, is important enough, goodness knows. But what will it be like if there is a failing in this respect on a combined sound-and-television set?

Already there is a story going round of a chap who tuned in a majestic Bach cantata which sounded grand, though the effect was completely spoiled by the accompanying vision, which showed a couple of knock-about comedians doing their stuff in a snowstorm.



It will be a tragedy if "The Girl With a Delicate Air" appears in our homes as a hefty college chum with Junoesque shoulders, a hockey stick and a beret over one glinting eye. The Technical Hounds answering queries on this topic have my advance sympathy—such a contretemps will want a lot of explaining.

Youth Will Be Served.

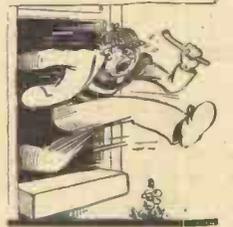
THE International Broadcasting Union, at the winter session, discussed the interchange of broadcasts between different countries, and reached a very happy conclusion.

It has been decided that national concerts by students shall be organised next autumn. And the "Daily Telegraph" says the series is to be known as "The Young Thing Beyond the Frontier."

Yes, that's the official title, and you can bet that many a student is already getting highly delighted at the prospects of making acquaintance with a "Young Thing" from abroad.

"Who's There?"

NORTHAMPTON has recently been in the news owing to an unusual burglary there. It appears that a nefarious collector of other people's jewels called late at night, accidentally turned on a wireless set instead of a light and scared himself right off the premises.



Evidence of the neighbours, told later to the police, was to the effect that about 10.30 p.m. noises were heard in the premises entered. There is a double switch beside the bed controlling the light in that room, and also the wireless in a study in another part of the house.

The B.B.C. happened to be broadcasting a ghost story, so probably the gentleman upstairs heard scraps of it through the intervening walls, and promptly altered his bedside manner to what is known as a hasty exit. Burglar-alarm inventors should be able to develop this into something really spectacular.

World Horoscope.

THE end of the world has always been an interesting matter of speculation, but I think Sir Arthur Eddington's remarks on the subject deserve special notice. That eminent scientist draws attention to the possibility of our universe's protons and electrons all releasing their energy ultimately in the form of radiation—not just yet, but in a few billion years' time.

"It would seem," he says, "that the universe will become a ball of radiation . . . passing into longer and longer wavelengths."

"I may describe the end of the world as one stupendous broadcast."

What a conception—all creation broadcasting itself into oblivion and nobody left to tune it in!

ARIEL.



Your OUTPUT CIRCUIT

In this article our contributor, Mr. Bernard Barnard, gives a simple explanation of that often-used but frequently little-understood term "optimum load." In addition he also describes how you may find the correct transformer ratio for best results.

WE have progressed a great deal since the day when the loudspeaker terminals were marked + and - and were connected direct to the plate of the last valve and H.T.

The pentode valve and moving-coil speakers have complicated our output circuits to a great degree, but that these complications are necessary will be obvious to anyone who has tried connecting an old cone speaker directly in the last anode lead of a modern set.

As far as home construction pure and simple is concerned, these complications are troublesome only to the extent that

increase in resistance produced no corresponding increase in volts.

This would mean that we had exhausted the power capabilities of this particular circuit, and the value in ohms of the final resistance would be the "optimum load" of the circuit.

In our radio output circuit we are dealing with an alternating current, but the same reasoning applies, and optimum load is simply the A.C. resistance (i.e. impedance) which expends the greatest number of watts when placed in the plate lead of the output valve.

The example quoted above and a simple output circuit are shown side by side in Fig. 1, and the similarity is obvious.

In practice, the impedance that provides the optimum load in an output circuit takes the form of the primary winding of an output transformer or a tapped L.F. choke.

It is well known that the useful power available—as distinct from the anode dissipation—in the output circuit is limited to a few watts only,

that this load is "optimum" so as to give us the biggest voltage possible.

This voltage, multiplied by the feeble current, gives the watts that we have available to operate the loudspeaker.

Fig. 2 shows a rough graph of the load employed against the power developed. It is clear that the point "X" is the optimum load, since an increase in load beyond this point produces no further increase in power.

The Optimum Load.

The optimum load for various output valves is usually given by the valve manufacturers, and can always be relied upon to be the best average value. When it is remembered that the impedance of any load in an output circuit varies considerably according to the frequency of the signal A.C. passing through it, it will be apparent that an exact value cannot be given.

We now pass on to a consideration of the loudspeaker itself.

If the A.C. resistance of the speaker is nearly the same as the optimum load of the valve that is to feed it, obviously no transformer or choke need be connected between the two.

This is very seldom the case, however. The impedance of the speech coil of an M.C. speaker is usually only a few ohms, whereas the required optimum load may be about 8,000 ohms. Obviously, a transformer of some sort is essential.

The greatest care must be taken in deciding upon the ratio of this transformer, since it will have to fulfil two separate functions: the primary winding must provide the requisite optimum load—since it will be connected directly in the plate circuit of the valve—and the secondary must be of suitable impedance to match the loudspeaker winding itself.

(Continued on page 81.)

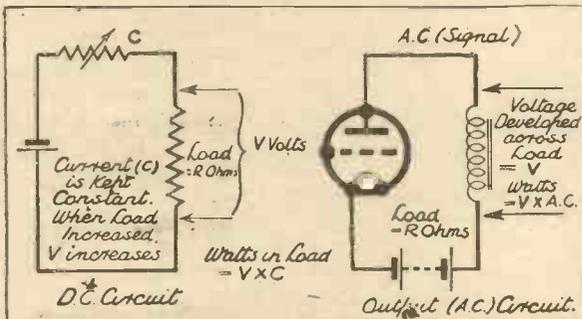


Fig. 1. On the left is the hypothetical D.C. circuit used by our contributor for explanatory purposes. On the right is a simplified arrangement showing a choke or transformer primary in series with the anode of an output valve.

greater care than ever must be exercised in keeping to designer's specifications.

The technique of the modern output circuit is, however, not without interest, and some knowledge of the problems involved is essential before the amateur can experiment in this sphere with any hope of success.

These problems are almost entirely bound up in the frequently recurring term "optimum load" of the output valve, but the exact significance of this rather vague expression is not widely realised.

Maximum Power Consumption.

In a hypothetical D.C. circuit, supposing we have a constant current flowing and wish to place in this circuit an ordinary resistance which will consume as much power as the circuit is capable of giving:

Since the power (in watts) is equal to the current in the circuit multiplied by the voltage across the circuit, and since the current is constant, it is obvious that we shall have to use a high resistance in order to develop as many volts as possible across it.

We would go on trying higher resistances as long as the volts—and consequently the power—continued to increase, and would eventually find a value whence further



Modern moving-coil speakers are often fitted with a switching device to enable the output circuit to be properly matched up to the output valve.

and we must therefore make the best possible use of this small supply in the loudspeaker.

Actually, all we have to "play with" is a feeble alternating current from the last valve, which is, in reality, our signal.

In order to turn this into useful watts we have to interpose a load so as to make the current develop a voltage, and we make sure

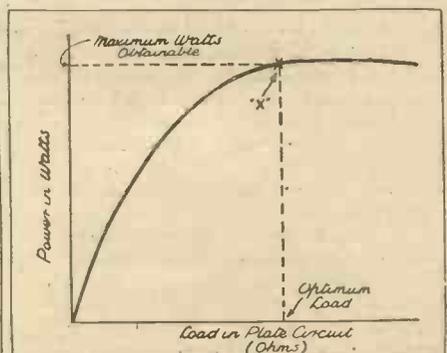


Fig. 2. The point "X" in this simple graph indicates the optimum load. It will be noted that after this point the power commences to fall off with increases in the load.

TELEVISION FOR MANCHESTER

News and Views About Broadcasting

By BARRY KENT

I HEAR that Gerald Cock, the new Television Director at the Big House, has got all his plans worked out. His idea is to start service in London in November and to extend to the provinces as soon as the transmitters are ready. Gerald is having a lot to do with what the Americans call "musclers"; that is, all and sundry who imagine they can make something out of television. But the new Television Director is no tolerator of "rackets," as was discovered by some of those who used to attempt to organise song plugging on the air. By the way, it will be Manchester and not Glasgow that will get the second transmitter.

Brighton Wins.

There has been a lot of competition behind the scenes to get into the programmes for the Jubilee Week.

Brighton has won among the holiday resorts and will be well represented. First of all, there will be a Variety show from Brighton from 8.10 to 9 o'clock on the Monday evening; then at 11.30 the B.B.C. will go back to Brighton for dance music until 1 o'clock the following morning. Blackpool is reported to be much disappointed; but the B.B.C. remarks that while the northern resort has been on the air a lot lately, Brighton has not had a show for four years.

The Coy Young Men.

After years of searching the B.B.C. has at last engaged three young men to train for jobs. I met one of them the other day. He was coyness itself. These recruits are being schooled in all departments before being allotted to any job in particular. Why not some young women as well? I know several who would do.

Sir John Reith's Frugal Lunch.

Sir John Reith's shyness makes him avoid all social occasions. He hardly ever lunches outside the office; lately he has also stopped going to the canteen or restaurant. He has an apple and a glass of milk served in his room, with a sweet sometimes added.

But this meal is not allowed to divert the Director-General from work. He goes right on just the same.

If members of staff are with him at lunch-time he does not mind their having a meal served in his room, but it must be on much the same simple lines as his own. He cannot bear to watch people tackle overflowing plates of meat and vegetables. Sir John leaves the office about 7 on two nights a week; other nights he carries on until 10 or midnight, reinforced with a sandwich about 9. He is, of course, a rigid teetotaler.

Anna May Wong.

Anna May Wong is to be engaged by the B.B.C. in one of the special Jubilee programmes in May. Eric Maschwitz is preparing a sketch as the setting for Anna. They have been friends for years.

Bigger Empire Orchestra.

Three wind instruments and three strings have been added to the Empire Orchestra. This will make it much more effective and

"P.W.'s" NEW BROADCASTING COMMISSIONER

We have great pleasure in introducing to our readers this week our newly appointed broadcasting commissioner, Mr. Barry Kent.

Mr. Kent has had many years of experience of all forms of broadcast entertainment. He is a well-known journalist who will write in future exclusively for "Popular Wireless."

Watch his weekly article, for in it you will be certain of finding exclusive announcements concerning all phases of activity at Broadcasting House and other B.B.C. centres.

Mr. Kent will be glad to receive suggestions from readers which, from time to time, he can incorporate in his articles, and which he can also pass on as readers' suggestions to executive heads at Broadcasting House.

better able to compete against the formidable competition of the German short-wave service. But I wonder where all this expenditure on the Empire service is going to stop. Listeners in badly served areas such as Newcastle and North Wales are getting restive.



BARBARA COUPER, the well-known B.B.C. star has featured, in every type of radio play. With her husband, Howard Rose, Miss Couper adapted "Jane Eyre" and "Wuthering Heights" for the microphone.

Variety Auditions.

There is tremendous congestion in variety auditions at Broadcasting House. There are 250 on the waiting list, and only about 25 can be dealt with in an average week. So it is being arranged for the auditions to be extended until 8 o'clock at night.

B.B.C. Chairman.

The Prime Minister has not yet made up his mind about who to appoint as Chairman of the B.B.C. to succeed the late Mr. Whitley. The job is a "plum" of government service; it carries a salary of £3,000, with the usual "out-of-pockets." There is a Board meeting once a fortnight. This, with an occasional signature and attendance at functions, completes the duties. I have heard several names mentioned. Mr. Norman, the Vice-Chairman, who is Acting-Chairman, is in the running, with the active support of Sir John Reith among others. Lord Selsdon is also strongly fancied in influential quarters.

The Duke of Gloucester.

You will have an opportunity of listening to H.R.H. The Duke of Gloucester when he tells those present at the Empire Societies' dinner, on April 3rd, of his experiences during his recent tour in the Antipodes. The speech will be broadcast to Regional listeners.

Those Talks!

"Talks are to be more cheerful"; so I am told with great confidence. I wonder!

WHAT I THINK

Candid Comments by our Broadcasting Critic on recent B.B.C. programmes.

It was unfortunate for Herr Krauss (Leo Von Porkony), appearing in "It Seems Only Yesterday," that Walford Hyden and his Café Colette Orchestra had finished electrifying the air for forty-five minutes only fifteen minutes previously. It was more unfortunate still for listeners. The one was a perfect replica of the other in the style of tongue he employed, viz. the excited foreigner's.

In reasonable measure this broken English can be very amusing, but to make an excited foreigner the central figure of successive items is over-doing it and a rank bad arrangement. There is a limit to what we can stand. However, Joan Carr's lovely speaking voice and the general sparkle of this "personal tale" saved the evening from being remembered as a "foreign manufacture" one.

John Watt told his story quite well. The manner of production employed in "It Seems Only Yesterday" calls for careful timing on the part of the narrator. I didn't think Mr. Watt was completely faultless in this respect, for there were one or two pauses that seemed unnecessarily long. The music was adequate without being conspicuous.

A Distinguished Performance.

Café Colette gave quite a distinguished farewell performance, and Walford Hyden was in tip-top form. He can drive away any man's blues, but his show does forfeit some of its entertainment value by dishing up every now and then what is just noise. I like the way the Café Colette Orchestra uses its American organ. I wish other bands would use these instruments more. Besides filling up, they do soften where softening is wanted, and this, in my opinion, is frequently. Bea Hutton and Cavan O'Connor are a pair of singers second to none in their class of singing.

The other day I read a letter from a listener from one of the outposts of the Empire urging the B.B.C. to keep women away from the microphones. This is a bit hard on the women, for the comparatively few women who have been engaged in the past to entertain us have been fairly successful. I think Jean Hamilton, the last of the rolling stones, by no

(Continued on page 80.)



With the EXPERIMENTER

"SERVICE AFTER PURCHASE"

AS Bill and I, without a care in the world, were shambling along the High Street the other day we espied a gesticulating figure in the office.

"Too late," muttered Bill, sensing my desire for flight; "the Rabbit's seen us."

So he had. Bunny, shaken out of his accustomed lethargy, bore down on us, obviously with a tale of woe. "Just the chaps I wanted," he said, and we knew the worst had happened. "My uncle's in an awful tear because that set I advised him to buy at Christmas has given up the ghost. For goodness sake help me!"

"Symptoms?" I asked, hoping a brief diagnosis would be possible. "Just dead—dead as mutton," wailed Bunny. "I've tried the aerial and earth—and that earthing switch you helped me fix up. They seem oke."

So the next thing we knew was that we were in his uncle's hall, a vast barn of a place where the radiogramophone was sulking. I switched on. Loud hum—too loud to be healthy, I thought.

I touched the screened grids. Warm. I touched the detector and the power valves. Warm, too. Then I touched the rectifier, but not for long. Gosh, it was hot!

I lunged over to the mains switch and put the wretched thing out of its misery. So that was it—the rectifier valve. Or was it? I didn't know. But I very soon had

my old voltmeter—A.C. variety—on the job of finding out for me.

I tested between the anodes—it was a full-wave rectifier, you gather—and the earth line. No voltage did I measure, for there were no volts to be measured.

Then I asked if they happened to have a circuit of the set. Fortunately they had.

I frowned over the unusual way the circuit had been drawn—just to puzzle the poor service man a little more, I supposed.

It all boiled down to the more or less usual arrangement of rectifier, condenser, choke and condenser. I have drawn the circuit just for reference.

The rectifier condenser was an 8-mfd. dry electrolytic—why did they use an electrolytic there?—

which I had perforce to suspect, little as I wanted to. Having switched everything off, I gently unscrewed the condenser by its chassis bolt and untied the wire from the centre terminal.

"And now that you've practically disembowelled the set, what next?" sneered the fatuous Bunny. "Oh, I go home, I think," was my answer, just to show there was no ill feeling. "Don't be a cad, sir!" chimed in Bill. "Can't you see he's doing his best?"

Taking it to Pieces.

So they left me alone with my sorrows. I applied my usual little test for suspected condensers—a high-tension battery and phones in series with the electrolytic. And did I get a plonk? Enough to blow out the phones. A dead short, obviously.

Now, electrolytics have always rather scared me—I know not why. The vision of having to take one to pieces simply shattered my nerve; so I nipped down the road and dug out Bob, the wireless dealer-cum-electrician and a good many other things rolled into one.

He gazed at the condenser in my hand and shook his head. "Can't do, I'm afraid," in answer to my plea for a new one, same as the dud.

"Life is mostly froth and bubble; two things stand like stone: kindness in another's trouble, courage in your own," he chanted. "So courage, mon ami, courage."

But he came along with me, just to lend

a little moral support to the fearful dissection of the condenser. I have tried to draw the idea—goodness knows if the poor artist will be able to make head or tail of my effort. If he does you will see what I saw.

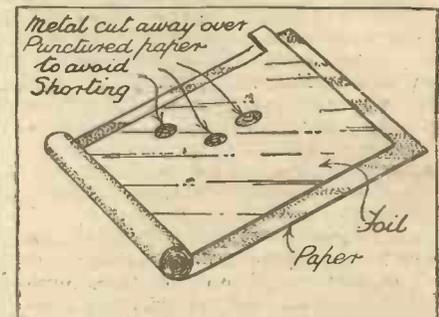
The outer case of an electrolytic is, of course, aluminium, and forms one of the contacts through the bolt at the bottom. The other contact goes up through an insulating bush to a short length of threaded rod, as in the sketch. The whole condenser is in the form of a rolled-up bundle of foils and insulating paper.

Punctured Right Through.

We got the roll out of the case and began to unroll the layers of foil and paper. Dry, did somebody say? Stickily wet, I found it. And the trouble was that in the air I realised the wetness of the electrolytic would evaporate if I did not hurry up with the job.

But I did not have to unroll very far to

REMEDYING THE FAULT



The Experimenter cut away the metal around the points where the condenser had broken down, and so effected a satisfactory repair.

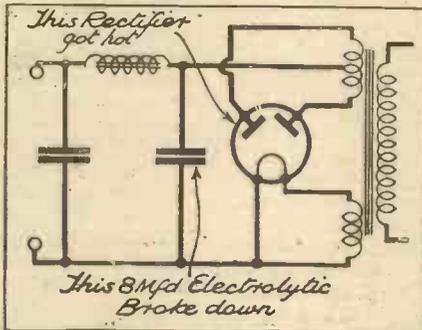
see the cause of the short. There were four or five punctures—little holes going right through the paper layers.

With a pair of nail scissors I cut round the metal foil, so that wherever there were holes in the paper there was an ample clearance of metal. Seeing that the paste stuff was getting less and less sticky, I hastily rolled up the doctored layers again and popped them back as a complete roll into their case.

When everything was connected up again, to a running commentary from my "helpers," I switched on—and prayed hard. Presto! The air was filled with music.

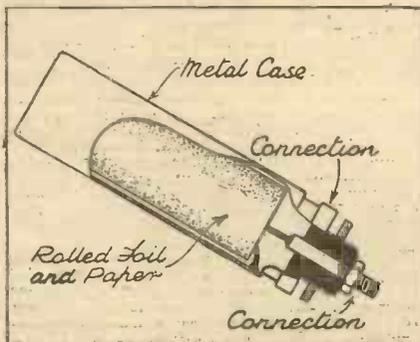
The Experimenter

THE CIRCUIT USED



The power-supply arrangements in the set discussed by the Experimenter.

A DRY ELECTROLYTIC



This sketch shows the main features of an electrolytic condenser of the dry type.



Bobbie Comber, who has a varied and wide experience of acting and singing.

HOW I BEGAN

Continuing his exclusive series on the careers of broadcasting stars, our Special Correspondent deals this week with popular Bobbie Comber.

unable to hear a thing. There was no time to do anything about it, and so for the whole of that first performance I just opened and shut my mouth, looking like a rather particularly stupid goldfish! You see, I didn't dare sing anything, as I couldn't hear the music.

I was in various musical comedies until the war, when I was stationed at Walton-on-the-Naze, running concert parties. Incidentally, I have always considered concert parties to be the backbone of the musical stage.

The war over, I toured for two years with "Chu Chin Chow," which produced some amusing experiences. Two stories come back to me now. One concerns a member of the company who was travelling between Blackpool and Manchester and heard a man in the train say to a friend: "Have you seen 'Chu Chin Chow' this week?" "No," replied the other; "I suppose it's just a lot of conjuring, like Ching Lung Soo." And the other was when a man came up to me and said most indignantly: "Look 'ere, lad, it says on t' programme 'As at His Majesty's Theatre.' Well, it's not t' same at all. Where's t' camel?" It was the one thing we hadn't brought with us! (Ah, that must be the milkman. Out you go, Bimbo!)

My First Broadcast.

For three years I was with Jack Hulbert and Cicely Courtneidge, and during that time I first broadcast. John Sharman, who was then in charge of the musical programmes, sent for me and asked if I would like to broadcast. "But," he informed me gravely, "don't ever croon on the wireless. Crooners are ten a penny."

MOST of the people who broadcast nowadays seem to have started with a University education. The best I can do in that line is to tell anyone who is interested that I went to "Bury." I don't always add "St. Edmunds," but I am most careful to add "28 miles from Cambridge."

From the very beginning I was interested in the stage, but my parents (in the way that parents have, despite what Claude Hulbert has told you) had other plans for me. So, at no little expense to my mother, I came to London and went to work in the War Office—but I am afraid I just walked out. Which, perhaps, was as well, as I might have been thrown out sooner or later. For at that time—as now—I had a passion for first nights, and I would often, with the aid of a sixpence, so arrange the lights that they would fuse as soon as switched on, leaving the whole of the War Office in darkness. By the time they were put right it would be too late to start any more work, and so we would leave early and I would get my first night. One particular first night I remember was the opening of the New Gaiety Theatre with the famous "Our Miss Gibbs."

How I Started on the Stage.

Now let me introduce you to Bimbo. Bimbo, here's a gentleman come to interview you. Ah, he seems to like you. Probably thinks you have some connection with the milkman. Bimbo meets him every day, and the man blows up a paper bag for him to play with.

What were we talking about? Oh, yes; how I began. Well, one day when I was at the War Office I went out to lunch and bought a copy of "Songs of Araby," which I took along to a voice trial. As a result I got a job in a touring company of "The Geisha." I shall never forget the first performance of that tour. We opened in Bournemouth, and during the morning I went for a swim. I returned to the theatre with both ears filled with water and quite

The first thing I ever broadcast was a burglar sketch of my own. A few days later, when I went for my holiday, I heard the same sketch done twice. What thieves people are!

No, I don't think I have ever knocked over the microphone or anything like that, but rehearsals with Claude Hulbert and Co. for "Those Four Chaps" were like a football match. Claude would always hang on to the microphone (it was in the old days, when the mike was in a sort of box affair), and the rest of us had to butt in when we could. I remember once having to play the part of a German in a sketch with Jack Hulbert. Not knowing a word of the language, I just learnt the first three words and the last three of my part and invented the rest. The next day I had a letter from a listener who told me that he had spent ten years in Germany and congratulating me on my fine accent. "Not only that," ran the letter, "but almost every word you said could be understood."

Digging Up Bricks.

What are my recreations? At the moment I haven't much time for anything, as I practically live between the studio and the microphone. Filming is almost as hard work as broadcasting! But I do like watching professional football and I must have my annual holiday in Devon. Incidentally, I am a very keen listener as well as being a radio performer.

By the way, you'd better come and see my hobby. It consists in digging up bricks out of London gardens. There's a whole kiln in ours; come and see. We'd better bring Bimbo, too; he knows all about it!

Bobbie Comber

THE "GOLTONE TELESTAT"

A very useful new connecting cable.

IN the near future a great deal will be heard about "Di-Poles" and other special short-wave devices, for television is to occupy high-frequency channels. These differ in some ways from those used for ordinary broadcasting, though many of the problems are common to both.

For example, electrical interference will have to be countered in a proportion of instances on the "new" channel, though here it will be experienced by listeners from a source new to them. This is the ignition systems of motor-cars.

The Aerial "Feeder."

It has been found that the ignition of a car of average size can cause interference in the region of 7 metres over a distance of a hundred yards or more. But that does not mean that television reception without serious interference will be impossible in London or any other city served by one of the new stations.

There are several ways in which the interference can be minimised. For example, the aerial used for

picking up the ultra-short waves can be made very directional.

Messrs. Ward and Goldstone, to whose constructive contribution to the problems of eliminating "man-made static" we recently referred in "P.W.," have already produced practical schemes for dealing with this particular difficulty.

We have before us as we write a blue print prepared by this enterprising concern giving details of a complete Di-Pole Aerial System using balanced sections. These balanced sections have to be connected to the set by means of a "feeder."

For this they have a special twin short-wave cable which is termed "Telestat," and which is to retail at the modest price of 6d. per yard.

For Medium-Wave Use.

Although we have referred to one of its short-wave uses, it can, of course, be employed for other "lead-in" purposes, and Messrs. Ward and Goldstone inform us that they are at present producing data for a medium-wave transformer, so that their aerial system can be available for universal reception.

"Telestat" is an easy-to-handle material, being both flexible and tough. It is not much thicker than the single rubber-covered flex that is widely used for battery and other set connections.

Yet it comprises two well-separated and efficiently insulated leads buried in a stout rubber covering. If it were not for the fact that Messrs. Ward and Goldstone are able to list special cables and wires for almost every conceivable purpose, we should have no hesitation in suggesting that constructors will probably find many other jobs for "Telestat" to do besides those for which it has been designed.

ON THE SHORT WAVES (Continued from previous page.)

WHAT READERS ARE SAYING

LOTS of letters; short answers; staccato style. Sorry! First, will the owner of the wind-driven generator in Ontario, whom I mentioned recently, please get into touch with Mr. W. H. Beazley, St. George, Ontario? He will hear of something to his advantage.

K. B. (Bournemouth): You want the Radio Amateur Call-Book, obtainable from the R. S. G. B., 53, Victoria Street, S.W.1. It gives the addresses of several of the commercial stations, as well as those of all the amateurs in the world (over 50,000 now, by the way).

The diagram on this page is a graph plotted from the log of W 8 X K, sent in by a reader. As his variations in strength were considerable I took the average of every three days and plotted on that. Since doing so I have received a log on the same station, over the same period, from N. H. (Malmo, Sweden), and the two fit together perfectly except for one or two isolated dates on which the reception has obviously taken place at different times.

Getting Rid of "Blisters."

N. H. comments on excellent reception from Bombay, which "sounds as an old ragged organ"! Native music hath charms. Receiver, by the way, is the "H. A. C." Three-Valver.

H. H. A. (Middleton) tells me that all readers who have reported the "Effie Morrissey" (W-10-X D A) may now expect their Q S L cards, as he has received his, and a very nice one, too.

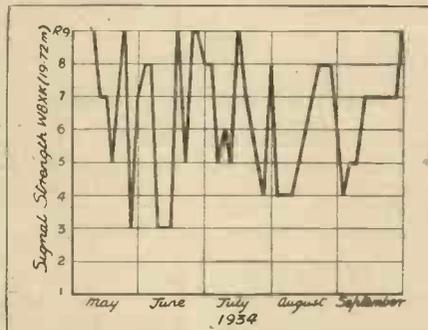
D. P. (Ealing) wants to use an untuned S.G. stage for getting rid of "blisters" in the tuning, and wants to know the value of resistance suitable for providing the screen voltage straight from the main H.T. tapping. Use a potentiometer, D. P., even if it's only a fixed one made of two fixed resistances. 30,000 going from the screen to

H.T. positive and 40,000 down to negative will provide 4/7ths of the anode voltage on the screen, and that appears about right in my case.

Regarding grid bias in this case—personally, I never bother. 1½ negative is correct, but you don't get any sort of swing on the grid of the first valve unless you tune the aerial circuit.

M. W. (Barnoldswick) tells me that he rigged up a set that I recommended and didn't think much of results. However, instead of taking the obvious course of turning and rending the designer he played around, and then played around some more, and now his results are the envy of all his friends. He concludes: "Thanks to your decisive orders on layout, neatness and scrupulous care I seem to be meeting with

HOW W 8 X K VARIED



This signal-strength chart is compiled from a log kept by a reader.

a fair amount of success." There's a moral in that.

Will D. D. (Sheffield), to whom I recently referred, please get into touch with Mr. Thomas Wills, of 2, Jessamine Road, Shiregreen, in the same town? Thanks!

Likewise if **S. T. H.**, of Norfolk, will drop a line to Mr. H. J. Lewis, Sunny View, Withcombe, Exmouth, Devon, the latter gentleman will be pleased to send him a World Map, for which he asked. **H. J. L.** reports a goodly number of U.S.A. amateurs, and also two which he can't identify. Pleasant

surprise, **H. J. L.**—ZS 6 C is a South African and H I 7 G is in the Dominican Republic, Central America.

J. E. (Burnham College, Somerset) confirms my remarks about the friendliness of amateur transmitters. He says that numbers of his return Q S L's contain offers of help, and one Scottish "ham" replied with a four-page letter and two magazines.

A Real Test of Reception.

F. V. E. (Tottenham) encloses his full log for February, and doesn't appear to have missed very much that's going. All these logs impress me by virtue of the tremendous amount of long-distance amateur telephony that is to be heard these days.

E. S. (Dundee) comments on the excellent short-wave reception in that district. Among other minor excitements he has had Sydney "filling the room on the speaker." He encloses a list of stations heard, his test being "loudspeaker only and at least 15 minutes' clear reception." If one or two others applied this searching test their logs would be somewhat diminished, I'm thinking!

C. H. R. N. (Kington, Herts) asks two questions that are of general interest. First, would a pair of reed-type headphones help to bring in weak stations better? That, of course, depends entirely on the goodness (or badness) of the phones at present in use. I use that type myself and find them excellent.

Next, will the "H.A.C." Three-Valver be upset if a pentode is used for the output? No, not at all. No alterations are necessary except for the extra connection to the pentode itself.

Keep Your Questions Short.

Lastly, may I appeal once more to readers to try to keep their questions short? I simply haven't time nowadays to wade through eight or nine pages, picking out the queries as I go along. Newy letters are nice, but don't mix the queries up with them, please.

So keep your questions as short as you can and I will do my best to answer them all in turn. **W. L. S.**

IN my opinion the outstanding record release that I have to deal with this week is *The Scrapbook* for 1910, made by Columbia. It is an all-too-brief memento of one of the famous "Scrapbook" series devised by Leslie Baily and broadcast during the last year or so.

If this record is the precursor of a number, and Columbia intend to give us the full quota of the "Scrapbooks," then I for one will be well pleased.

The "Scrapbook" series is to me one of the highest lights of recent broadcast programmes, and I hope that the brilliant author will take them right up to the present time, thus completing a most interesting and eventful score or so years of British history.

A Very Appropriate Record.

The 1910 "Scrapbook" record is a particularly appropriate one for Jubilee year, as it deals, among other outstanding events, with the accession of our present monarch, in whose honour this year's celebrations are being held.

As in the broadcasts, Charles Brewer assists Leslie Baily in the production of the record, and they have made of it a most interesting and fascinating recollection of an eventful year. Let us have more of these—and soon, too. (Columbia DX 670.)

And while on what may be called "reminiscence" records, let me introduce you to a very fine light musical twelve-incher made by Sidney Torch, the famous cinema organist.

Appropriately enough, Sidney has taken "I Want to Sing a Torch Song" as his signature, and he has made a very tuneful and interesting potpourri of well-known dance numbers on his *Torch Song Parade* which Columbia have just issued.

The number is DX 674, and if you have anything like a decent radiogramophone you should certainly buy this record. If your machine is not up to scratch



I advise you to give it a miss, for fear of spoiling a really good bit of recording.

It is wonderful how "memories" hold the public fancy and how many records of the potpourri type make really first-class sellers. Every month the gramophone lists hold a plentiful supply of these records, nearly all tuneful and often extremely well recorded.

I have mentioned what I consider to be the best two of the last lists, but there are others that you may like to hear. Of these two are in the Regal-Zonophone list and are made by Reginald Dixon and the London Accordion Band respectively. The titles are *Blackpool Switchback* and *Memories of Horatio Nicholls*. The numbers are MR 1595 and MR 1593.

Are you fond of the mouth organ? I mean listening to it, not playing it. If so you will be interested in that virtuoso of the instrument, Larry Adler, who has made an astonishing record. It is Columbia DB 1516, and of all the pieces he has chosen to play *The Londonderry Air* and Ravel's *Bolero*.

There is no denying his skill in the art of playing this peculiar instrument, but I am not so sure about

the musical aspect of the case. To me there is something approaching musical sacrilege in the former instance and a complete insufficiency in the effect reached by the playing of "Bolero."

This piece of music is not everybody's pigeon. Those who like it usually rave over it, while those on the other side of the fence rave at it. Neither will be satisfied with this performance, I think, unless the latter find a grim sense of satisfaction in an attempt to play on a puny reed instrument a composition that requires a full orchestra.

It is a clever performance technically.

What is of far greater musical value is the performance of *Beethoven's "Eroica" Symphony* on H.M.V. DB 2346-51. It is a superb piece of work, and Serge Koussevitsky, who conducts, has brought it out in its full grandeur.

Of Historic Interest.

The records are interesting from an historical point of view, too, for when Beethoven first conceived this symphony he planned to dedicate it to Napoleon, who at that time was the great apostle of freedom in France. By the time the composition was completed Napoleon had taken the title of First Consul of France, and Beethoven, who regarded the action as a betrayal of Napoleon's republican ideas, tore up the title page of his work bearing the dedication and exclaimed: "So he's only as other men! Now he will trample other men under his heel."

From that day in 1804 until seventeen years later, when he heard the news of the Emperor's death, Beethoven did not mention the great Frenchman's name, and then all he said was: "I have already written music for this catastrophe"—referring to the slow movement, the Funeral March of the symphony.

(Continued on page 80.)

TELEVISION

SOME ULTRA-SHORT-WAVE CHARACTERISTICS

The differences in the way waves above, and those below 10 metres travel are explained in this article

By L. H. THOMAS.

LAST week we discussed the general "shape" of a high-definition television receiver, as far as its circuit arrangements were concerned. This week, in view of recent developments, I want to try to clear up another important question that is in everyone's mind.

People in North London are anxiously asking whether they will be able to receive transmissions from the Crystal Palace. Likewise, in view of the recent hints about the Alexandra Palace, people (like myself) who live down south are wondering what their position will be.

It has suddenly been brought home to me that, apart from the amateur transmitters and their enthusiastic following with receivers, very few people know just how these ultra-short waves behave.

That "Quasi-Optical" Business.

The amateur transmitters who have been working hard on 5 metres for two or three seasons are absolutely hardened to the apparent vagaries of these waves. Far from being difficult to understand, they show a greater disposition to respond to ordinary reasoning than do most other radio phenomena.

How that word "quasi-optical" must worry readers who haven't yet had any experience of the ultra-shorts! I, personally, have never agreed with this "optical" and "quasi-optical" business. I believe that the relatively small range covered by these wavelengths below 10 metres can be explained by simple reasoning, without any need to resort to hypothetical terms beginning with "quasi."

Somewhere in the neighbourhood of 10 metres is a "critical wavelength." Above this figure a transmitted wave will be reflected by the ionised layers so that it comes down to earth again, probably at a great distance.

By the time we have started using something considerably shorter in wavelength than 10 metres, however, we find that no trace of this reflected ray can be found.

Transmission, therefore, is limited to the distance that we can cover with the "ground wave," which every transmitter puts out. The ground wave of a 300-metre station may cover a tremendous distance; that of a 30-metre station might, with luck, be heard one or two hundred miles away.

The "Soaking" Effect.

The limit of a 10-metre ground wave appears to be 20 miles or so, unless the station is located on very high ground. By the time we come down to a normally

situated station working on 5 metres the ground-wave coverage is probably limited to a very few miles indeed.

Why is this reduction noticed? Why, simply because it is a well-known fact that losses by absorption become more severe as the frequency is increased. I imagine that it is a pure coincidence that the coverable distance happens to be about the same as the optical range from the same point.

Logically, once more, if we raise the height of our transmitter the ground wave will "soak through" to greater distances before being completely absorbed.

It is this "soaking" effect that is going to make high-definition television possible. I have already apologised for the use of such a crude term, but all the technicians are beginning to use it! And it certainly does describe the effect.

Experiments that have been carried out indicate that a station situated on very high ground, in or near London, will put a good signal into every part of Greater London, possibly with the exceptions of certain very poorly situated areas.

Both theory and practice indicate that the range obtainable will be about twice the visible range from the transmitting station, but it does not follow that signals at this distance will be strong enough to give really good television reception.

Hills Form Radio Shadows.

The worst spot you could possibly be in, for the purposes of the argument, is one which is at the bottom of a very steep hill, on the other side of which is the transmitting station. Imagine that you are on the edge of a large flat plain. To the east of you, over the top of the hill and out of sight, is the transmitter. To the west the ground runs flat for many miles.

The chances are that you will only receive very weak signals, but that if you were to take your receiver westwards, away from the transmitter, you would find them becoming stronger and stronger. In other words, you are suffering from a kind of "shadow effect" from the hill.

When we carried out our 5-metre tests from the Crystal Palace tower in 1933 this effect was noted over and over again. A mobile station in a car would lose us as he went down a hill; but as he ran along the flat ground at the bottom signals would gradually pick up, until they resumed normal strength.

One of the effects of the great television boom has been to renew amateur activity on 5 metres, and already there are more than a dozen stations working in South London. Doubtless other areas will be showing signs of activity by the time these notes appear. Next week I am going to deal with the construction of a simple 5-metre receiver, so that you can get used to ultra-short-wave technique in plenty of time for the television transmissions.

Start Now.

There is no point in starting, at this stage, to build a complicated 7-metre receiver; but you can start experimenting with detector circuits and "finding your feet" on the ultra-shorts, and the amateur transmitters will be delighted to co-operate when they find that 5-metre receivers are becoming more numerous.

There is quite a lot to be learned in the reception technique of the ultra-shorts, and the sooner you start the better.

WHERE GIANT TUBES ARE MADE



This section of the Baird works at the Crystal Palace is the laboratory in which experimental giant cathode-ray tubes are being produced.

Luckily for us, even 5 metres isn't really an optical wavelength. From my own station, G 6 Q B, with an input of only 3 watts on that wavelength, I can work with many stations that most certainly are not within optical range, even from the top of my 50-foot mast.

By the time we get up to 7 metres, which is probably one of the wavelengths to be used for television, the range has increased still further. I wonder whether any readers remember that there was a lot of activity among the amateurs on 8 metres as far back as 1926. Quite good distances were covered then.

TELEVISION RAMBLINGS

Some notes on various aspects of present and future television broadcasts, including reference to R.C. versus Transformer coupling.

INTEREST in the 30-line transmissions seems to continue unabated. In fact, one of the manufacturers of inexpensive kits for low-definition reception tells me that trade has improved since the publication of the Committee's report. This is probably due to two things.

First, people are becoming anxious to give themselves a foretaste of television, even if it is crude. Secondly, others have been scared by the suggestion of the high prices of high-def. receivers, and have decided that if they don't start now on the low-def. stuff they'll never see any television at all!

Don't get unduly worried about the high-price suggestion. A complete high-def. receiver is definitely going to be a home-constructor proposition, and, I hope, quite an economical one at that.

Good Makes Are Essential.

But to return to our 30 lines. It has always been my experience that a good transformer-coupled amplifier will give results that do not fall short, in any way, of those obtained with resistance coupling.

Readers, on the whole, don't agree with me. I have had several letters accusing me of making misleading statements and saying that R.C. gives results that are streets ahead of those obtained with transformers.

The answer to that is obvious. People have been comparing a good R.C. amplifier with a bad transformer-coupled model. In this connection I might mention that most of the cheap transformers on the market are only intended for work with a parallel-feed circuit, and that a good

many home constructors refuse to believe that it makes any difference.

I could show you a couple of curves taken on the same transformer, one with no D.C. flowing through the primary and the other with a steady current of 6 m/a., and the proverbial difference between chalk and cheese is insignificant compared with the difference between these two curves.

My own amplifier uses push-pull transformers of a really good make, and the overall characteristics up to 10,000 cycles are distinctly good. But I tremble for those who try to do the same thing with

FILM TRANSMISSION



A 180-line Baird scanner for use in the transmission of films by television.

for the beginner is gently led through the various steps in television with both speed and remarkable facility. Before he knows that he is grasping the subject he finds himself in full possession of the main vital facts and well on the way towards an understanding of modern practice.

A Comprehensive Account.

A great number of the latest developments are dealt with with sufficient simplicity for the man in the street to get a good general knowledge of the facts and with sufficient detail for the experimentally minded to obtain a useful groundwork for his researches.

I do not suggest that the book is one that will form a standard text-book on the subject; television at the moment is so much in the melting-pot that a text-book can hardly be forthcoming with any degree of finality in its treatment. Rather is the book a comprehensive account of television development treated as fairly as possible, without the ponderousness that would be inevitable if great detail were provided.

As a start to the understanding of television I consider that Mr. Reyner's book is almost invaluable, and recommend all readers who are interested in the subject (and who is not nowadays?) to

some of the cheaper transformers, unless they parallel-feed them.

Needless to say, this argument won't hold good when we start designing amplifiers for the high-definition transmissions. Your "L.F." side (so-called) will have to handle frequencies, not up to 10,000, but up to a million or more, and the vogue of the L.F. transformer may well be over.

Some interesting points about the future of television have been raised in musical circles. When one comes to examine them they are very obvious, and it is strange that no one has brought them up before.

Will There Be Less Music?

Briefly, the argument is this: that now, in the era of sound broadcasting, the broadcast matter is necessarily limited to speech and music. If we add "sounds" we have covered the whole range of effects that it is possible to broadcast.

Naturally, music occupies the greater part of the programmes; but when television comes along things will be completely changed. No one will want to sit for hours at a time "looking-in" to orchestras and solo artists. Action will replace sound, and the amount of music broadcast will, doubtless, be enormously reduced.

The musical profession foresee in this the revival of interest in concert going and the falling off of the popularity of the broadcast concert. Whether they are right remains to be seen.

What we don't know as yet is what the effect of the television service is going to be on the arrangement of the programmes for ordinary "sound-only" broadcasting.

The scope of television transmissions on 240 lines is going to be almost unlimited, and will bear no resemblance to the very restricted vogue of the 30-line transmissions. We are at the beginning of a completely new era, and it is futile to conjecture about the future at this stage.

L. H. T.

TELEVISION —THEORY AND PRACTICE

A book you should read.

IHAVE recently been reading the latest edition of J. H. Reyner's book on television, "Television—Theory and Practice," published by Chapman and Hall, and costing 12s. 6d. It is a very useful book for the man who wants to know a fair amount about the rudiments of television, but does not want to be involved in very heavy mathematics of technical details of the subject.

Mr. Reyner has taken the reader through the early stages of the science in brief, and has dealt most lucidly with the fundamental requirements of television before going on to the more advanced practical aspects that pertain in modern television transmission and reception.

Understanding Modern Practice.

At a first glance at the chapter headings the completely non-technical man might be somewhat perturbed as to whether he would be able to understand the work; but there is little need for such trepidation,

get a copy. They will learn a great deal, and, just as valuable, they will whet their appetites for more. And that further knowledge which they will inevitably desire is available to all who will take the trouble to experiment and to follow the rapid advances that are reported from time to time in the technical Press.

Television is a new science. There remains a great deal to be done before perfection is even approached, and in engendering in the minds of his readers a true desire to follow up the subject by personal research, as Mr. Reyner must inevitably succeed in doing by his book, I consider he has rendered a great service to the particular branch of radio with which his work is concerned.

K. D. R.

SOLDERED JOINTS.

The Editor, POPULAR WIRELESS.

Dear Sir,—POPULAR WIRELESS has always advocated good soldered joints and has published helpful hints on this matter from time to time. For the past week my set has been distorting badly on loud passages. I found this due to a defective joint. For the automatic grid bias I use a variable resistance soldered across a 2-mfd. condenser. A bad joint was discovered, and on putting this right the set is now as good as formerly.

"P.W." has always been very good, but I am of opinion that of late it is getting even better, and it is splendid value.

W. LEVER.

1a, Mayfair Street,
West Perth.

VALVE filaments, unfortunately, do not last for ever. With even the most carefully treated valve there comes, at last, a time when the filament can no longer carry on its allotted function with efficiency. Without the filament actually breaking or being accidentally burnt out the valve slowly but surely becomes useless.

First, in this ageing process, you notice that the valve takes more L.T. current to develop a given strength of signal. Then a peculiar distortion crops up in the reception. You look over the set, take the valve out of its holder, inspect it carefully and then replace it, but the distortion is still there. In fact, it becomes worse and worse.

The set seems to lack power. And more and more you notice that the valve will not take anything like as much grid bias as it did formerly.

Such is a characteristic picture of the dying days of a valve. It is a state of affairs which all keen radio workers have experienced.

Slowly Losing Emission.

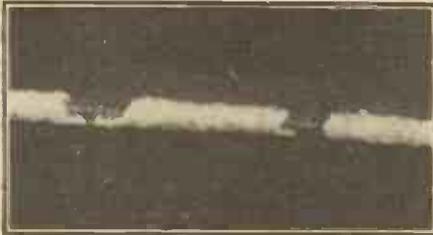
What is actually wrong, of course, in the vast majority of such instances, is that the valve is slowly losing its emission. That is to say, the filament is becoming unable to emit the vital stream of electrons under the heating influence of the low-tension current.

And why?

Plainer than any written words, the high powers of the modern microscope disclose the reason for the filament's disappearing emission. You see on this page the pictorial story which the microscope reveals.

Many valve filaments are of the "coated" type. By certain delicate processes of manufacture thin filaments of platinum, or, as is more usually the case, of tungsten, are

TROUBLE BEGINNING



Showing how active material first commences to flake away from the filament, leaving the inner metallic core bare in places.

coated with a thin layer of certain metallic oxides which possess the property of giving off a copious shower of electrons at a comparatively low temperature.

The Flaking-Off Process.

In the early days of valve manufacture great difficulty was experienced in getting these active coatings to adhere to the filament. Consequently, many of the first valves of this general type had a life which was short and sweet—and, probably, much shorter than it was sweet. The active coating flaked away from the early filaments under the slightest provocation, leaving the bare metal behind.

Bit by bit manufacturers devised methods of getting the active material to stick on the filament. The result was, of course, a gradual improvement in the working life of the valve. Nowadays the preparation of "coated" filaments for valve construction has developed into such an extremely fine and specialised industry that the life of a modern valve, provided that it is consistently treated with reasonable care, is very much greater than that of its progenitors of, say, ten years ago.

WHEN THE FILAMENT FADES

Did you know that the filament of a valve "sheds its coat" when it gets old? It does, and the process is clearly shown under a powerful microscope, as described on this page

By J. F. Stirling, M.Sc., A.I.C.

Still, even the best valve will grow old and infirm during the course of time, and the high-power microscope pictures which you see on this page show you precisely the progress of the filament's decay.

Despite the fact that it carries an outer coating of active material, a valve filament is finer than a hair. The filament's coating is finely granular, and it is fairly evenly applied along the length of the filament.

Now let us see what happens during the working life of a filament. During the first five hundred hours of its burning the filament is very happy indeed. It gives off electrons abundantly. There is no lack of "life" in it.

Then, as the filament is passing through its "six hundreds" of working life, you happen to remove the valve from its holder rather jerkily. Or perhaps you have a habit of turning on the filament's juice abruptly.

So far as you can tell, nothing untoward takes place when the filament receives a jerk or a sudden rise in temperature. The valve functions as satisfactorily as ever it did.

The "Grain" Gradually Increases.

After a few hundred hours of working life, however, the "grain" of the active coating on the filament begins to increase in size, and as it increases in size it decreases in holding-on power. Consequently, when a valve filament which has attained this condition receives a sudden jerk, or even when it is subjected to a sudden rise in temperature, it tends to shed a tiny particle of its active coating.

Only a tiny particle, mind: a minute white particle many times smaller than a speck of dust. Nevertheless, when this particle is shed, the filament—and, consequently, the valve—begins the downhill stage of its life.

The filament coating becomes weakened in one tiny spot, or perhaps in several of such minute spots.

Then the valve receives another jerk or two, and more active material falls away. Gradually the metal of the filament is laid bare, first in one place and then in several areas.

Naturally, with successive losses of active

material, the valve filament decreases in electron-emitting power. As it thus becomes lowered in efficiency the operator of the receiving set turns on more current to the filament. And thus the vicious circle begins.

For, in supplying more current to the filament in an endeavour to make up for loss of "life," the set owner heats up the filament beyond its normal temperature range. This results in a still greater increase in the granularity of the filament's coating. Still more of the coarsened grains fall away from the filament. The emission becomes less and less and, in proportion, the functioning of the receiver as a whole becomes more and more unsatisfactory.

Often this unenviable state of affairs goes on until, eventually, either the filament refuses to function at all or more in its now semi-naked condition or else the radio amateur, tiring of increasingly inefficient reception, hurls the offending valve away from him and replaces it with a new one.

It goes without saying, of course, that a very prolonged period has to elapse before any modern valve will fall into this condition.

Why Not Detachable Filaments?

A perfectly ideal filament, I suppose, would not behave in the manner I have described. Like the wallpaper on my late landlady's front room, an ideal filament coating would still be hanging fifty or more years after it was first put on.

Perhaps, in time, a "permanent" filament may become a matter of fact. There is no real reason why it should not eventually materialise.

But, at the present time, even the best

NEARING THE END



The final stages of decay at the end of a valve's life. The filament possesses merely a fraction of its normal coating.

of filament coatings are not entirely indestructible articles. Like us poor humans, after their time of greatest efficiency they all have their period of gradual decline.

Since, however, an ideal indestructible filament is not forthcoming at the present day, why not, at least, in receiving valves, a filament which can be removed and replaced by a new one when it loses its electron-emitting powers?

The devising of such a valve is, admittedly, a poser for even the keenest of inventive minds.

But, as we know, the whole matter of wireless constituted a difficult problem at one time—and that not so very long ago!

"DEATH AT BROADCASTING HOUSE"

Sidney Parsons was murdered in front of the microphone! How? Why? Go and see this exciting film! It has now been released for public exhibition. It is by Val Gielgud (Drama Director of the B.B.C.) and Holt Marvell. It has been highly praised by the critics, and will give you a wonderful idea of life inside Broadcasting House.



Julian Caird (Val Gielgud) warns Inspector Gregory (Ian Hunter) that if he is not careful he will meet sudden death. This is another exciting incident from the film.



Mary Newland and Austin Trevor and Henry Kendall discuss with the producer (Val Gielgud) the production of the radio play. The scenes are faithful reproductions of the studios and offices in Broadcasting House.



In the above photograph Inspector Gregory is not committing a murder, but reconstructing the crime which took place in the studio.



Inspector Gregory hears news of an arrest! This film is generally released for public exhibition on the 22nd of April, and we advise all readers of POPULAR WIRELESS to go and see it.

TECHNICAL TESTS

Number Sixteen:

THE H.M.V. "SUPERHET FOUR-FORTY-ONE"

WE test a lot of sets: superhets, straight sets, portables, in fact anything and everything that comes along to our labs. marked "for test and report." And sometimes when we set about recording our impressions of a particular model we find it a little difficult to decide which, of its many features, are the ones most likely to appeal to the ordinary listener.

It's probably as well that we do not all think alike about these matters. It might be bad for the industry and for broadcasting as a whole. But the fact that listeners do have widely differing views as to what constitutes the ideal radio set has convinced us of the desirability of conducting these tests not on technical grounds alone, but more particularly from the angle of the listener who may ultimately use the set under review.

The Set for the Million.

And that is where the difficulty arises, for it is a fact that no two listeners hold precisely the same point of view! Some shout "Quality, quality, and to Hades with the foreigners!" Others want the whole wide world on the nearest commercial approximation to a piece of Galena and a bent hairpin that it is possible to obtain. Then there is always the man—or is it his wife?—who persists that "looks" and the "locals" are the only things that matter.

Well, it's all very difficult, and were we to attempt to cater for the individual we fear that some of the institutions for mental cases would have to find room for a few extra cases, and they would be from the technical department at Tallis House!

But, fortunately, it's not as bad as that. By a sane consideration of relative values we are able to assess the value of any set on the strength of its appeal not to the one or two, but to the multitude. In other words, to our good old friend the "average listener."

Knowing from bitter experience with what difficulties the set manufacturers are placed in trying to arrive at a design likely to appeal to the multitude, and not just to the perhaps eccentric few, we do feel as a result of our latest test—and we feel it very sincerely—that H.M.V.'s are deserving of special congratulation for having succeeded in producing a set which is about the nearest approach to being the set for the million of any we have yet tried.

The H.M.V. "Superhet Forty-One" is rather an amazing instrument, for it carries out all sorts of highly technical operations completely automatically! Robot radio is not in it. Something approaching magic would be much nearer the mark. And isn't that just the very set we have all been waiting for?

Let's get this matter of "ideal broadcast reception" straight. What is "ideal broadcast reception"? It's a little difficult to say. But few of us would have cause for dissatisfaction with an instrument capable of receiving a large number of alternative programmes with the minimum amount of trouble and inconvenience, and, perhaps more to the point, an instrument capable of giving really high-quality reproduction not just on the locals, but on the distant stations as well. And it superadded to that,

the instrument is available at a price that is within the reach of most of our pockets, then there would indeed be something worth throwing our hats in the air about.

Well, we can justifiably throw them in the air as high as they will go over this new set of H.M.V.'s, for it has rung the bell with a vengeance! Twelve guineas, a "good looker," an amazing performer and a "won't-let-you-go-wrong" set that is even capable of correcting weaknesses in the Heaviside Layer, or virtually so.

It's a funny thing, this Heaviside Layer. If it didn't exist you would probably not hear distant stations at all. And yet it has "holes" in it: "holes" which make distant stations

And when the station rises in strength, and again before the change is apparent, the ingenious automatic device steps in. The result is that the station is received to all intents and purposes dead constant. And that applies to every station received.

You may have heard of automatic volume control before. It is not exactly new. But the method in which it is applied in the "Superhet Four-Forty-One" and the ingenious inter-station noise-suppression scheme with which it is bound up are quite 1935-ish—in fact, one might almost say 1936-ish, for it is difficult to foresee any improvement on this perfected system for many years to come.

It Appeals to Everybody.

And do you realise the significance of that technical-sounding phrase "inter-station noise suppression"? It means that this is one of the few sets with which it is possible completely to dispense with "thunderstorms" between stations—that awful racket which nearly splits the ear-drums and which is inherent to all really sensitive receivers.

No doubt about it, this new set of H.M.V.'s has knocked the "ire" out of wireless. And it is the sort of set that appeals to everybody: father, because it does not make a gaping hole in his financial budget, and because he knows that he is on one of the best propositions yet; mother, because it appeals to the feminine idea of a tasteful furnishing piece; the family—well, because they can all use it and be certain of amazing results.

Amazing results! Yes, they certainly are amazing. Using quite an ordinary aerial system, we found it easily possible to receive the pick of the European programmes at excellent speaker strength, and there was none of them that we had to rule out because of fading.

And adequate confirmation of this apparent above-average sensitivity was forthcoming when we made our tests with the laboratory synthetic transmitter and screened cabinet reception equipment. For a given input—the input corresponding with our standard for this type of set—the measured output was appreciably in excess of the average superhet of its type. The only obvious reason for that is, simply and solely that it bears the trade mark of H.M.V.; and as such it is immediately identified as the product of one of the most vast radio research departments in the world.

That is where experience counts; and although it is rather outside the scope of our tests to subject the instrument to a "life" test, the name alone, to us, is a sufficient guarantee of its unflinching reliability.

We do not wish to labour you with the technicalities of the design—they are tabulated elsewhere on this page for easy reference—but are bringing this review to a close some reference to quality of reproduction is not only called for but merited. It can most faithfully be summed up in just three words—"His Master's Voice"—literally. That dog—the knowing look, in very truth, that world-famous trade mark—was never more applicable than to the "Superhet Four-Forty-One." And more than that there is no need to say.

FOR A.C. MAINS



TECHNICAL SPECIFICATION

GENERAL DESCRIPTION.—Five-valve (including rectifier) all-electric table-model superhet for operation on A.C. mains, 200-250 volts, 50-60 cycles.

CIRCUIT ARRANGEMENT.—V₁—MX40 heptode frequency changer, which is preceded by a band-pass image rejector; V₂—VMS4 intermediate frequency amplifier; V₃—MHD4 double-diode triode, combining the functions of demodulation, L.F. amplification, and A.V.C. rectification; V₄—MPT4 two-watt output pentode. The rectifier, an MU12, is of the indirectly-heated type. Circuit is provided with automatic volume control and an advanced type of inter-station noise-suppression device.

CONTROLS.—(1) Single-knob ball-bearing main-tuning control, which works in conjunction with illuminated, easily

readable medium and long wavelength scales; (2) "Silent-tuning" control, enabling an instant choice of "Q," or amplified, A.V.C.; (3) Tone control; (4) Combined wave-range, pick-up and on-off switch; and (5) Volume control, which is effective both on radio and gramophone.

SPECIAL FEATURES.—High performance at low cost, almost unlimited programme entertainment, immunity of distant stations from "fading" (due to special A.V.C. device incorporated), complete absence of tuning "images" and tasteful cabinet appearance.

MAKERS.—The Gramophone Co., Ltd. 98-108, Clerkenwell Road, London, E.C.

CASH PRICE AND HIRE-PURCHASE TERMS.—12½ guineas, or 30/- deposit and 12 monthly payments of 21/-.

vary in strength for no apparent reason at all. They just mysteriously fade, and then, for no rhyme or reason, they come back again. A most wrath-provoking phenomenon, especially when it happens with a distant programme which you particularly want to hear. It robs it of ninety per cent of its entertainment value.

And this H.M.V. 12½-guinea masterpiece completely and quite automatically overcomes all that!—They call it "automatic volume control," but it seems worthy of a much more glamorous name than that. What happens is that as soon as the station begins to go down in strength—and even before you have had time to notice it—a robot electrical device inside automatically compensates for that diminution

ANNOUNCING THE

IT is very seldom these days that there is anything entirely new in radio.

There are always plenty of novelties, enough and to spare, anyway, to keep home construction always fresh and interesting.

But major developments are rarities. Maybe some of you are thinking that it would be difficult to decide exactly what constitutes a "major development" and that there can be differences of opinion in making the classification.

A New Era in Home Construction.

Well, next week we shall be publishing full details of the "Silver King," a POPULAR WIRELESS Jubilee set, and we have no hesitation at all in leaving it to our readers' judgment as to the importance of this event. We are confident that they will agree with us in considering it to be not only a "cut above" the usual star set (we believe all "P.W." designs are that), but something which signalises a new era in home set building.

There can be no denying the fact that home construction is as popular a hobby as ever it was; there is convincing proof of this to be found in the great successes of the recent S.T.600 and Kelsey adaptors, but there are no longer any large benefits of a financial nature or in performance to be gained by the building of ordinary sets for broadcast reception.

Money can still be saved in this way and there is interesting and instructive work for the constructor in building "standard" apparatus for "standard" results. That, however, is not what we of POPULAR WIRELESS aim at. We think that that sort of thing savours of an uninteresting and unimaginative rut.

Of course, it is a temptingly easy rut for designers, and there will always be a big enough proportion of home constructors to support such methods. But surely home construction ought to go further than that.

It can, and it does. The "Silver King" provides a first-class illustration of the ideal in home construction. It is a set which anyone can build at reasonable cost, and it can do what no existing factory-built set can do.

Mind you, that could be a negative virtue, and so I must at once make it clear that the "Silver

King" features are not differences merely for the sake of being differences.

Any competent designer could produce a radio set which would receive only one station, and no more. Such a set would be different from what any existing set at least claims to be. But who would want a one-station set?

In the "Silver King," however, you will find a new feature which will as assuredly appear in factory-built sets of the future as it is certain the sun will rise.

We have said something about this feature in a previous article briefly descriptive of our Jubilee set. We are now in a position to say more about it, though you will have to wait until next week for complete technical details.

Actually, the "Silver King" is so full of novel departures, is so different from the set of the present that I find it hard to compress even a bare description within the limits of this article. It is also difficult to decide as

SILVER

A "P.W." J

Once more "Popular Wireless" leads the way in the development of two-channel reception. The Silver King feature, is the precursor of a new technique in radio design. It is a major advance incorporating an entirely new principle of construction. Read the striking details.

By G. V. DOWDY

to which of its points deserves the greatest prominence.

I have said that it possesses something, and a big something at that, which no other set of to-day has, but which is bound to find its place in the set of the future.

This is complete all-wave coverage: ultra-short waves, short waves and medium and long waves. The last two give you the normal B.B.C. and European stations, with perhaps, an American or two when the conditions are propitious.

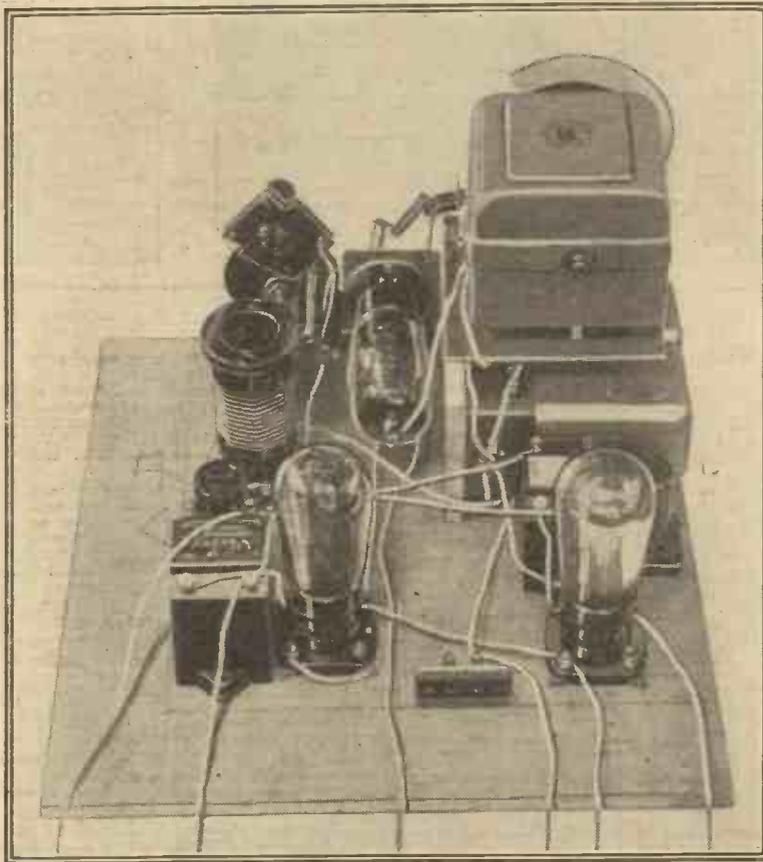
Exceptionally Efficient.

On these wavebands the "Silver King," with its powerful high-frequency amplification and well-engineered detector and output circuits, has proved exceptionally efficient. There have been no sacrifices of selectivity or sensitivity in order to make way for specialties.

The "Silver King" is a three-valve set (only three valves, remember), and you will have to go a long way and search many shops and houses to find a battery three-valver able to beat it for bringing in the broadcasts at full volume on the loud-speaker and with high-quality reproduction.

As a short-wave set, too, the "Silver King" has proved exceptionally good. And it would be surprising were this not the case in view of the fact that none other than G. T. Kelsey designed and tested this section of the set.

BEGINNING TO TAKE SHAPE



One of the preliminary designs embodying the new "P.W." two-channel principle. Many were the experiments that had to be carried out before success was finally achieved.

INEXPENSIVE WORLD-WIDE RECEPTION

KING - 1935

UBILEE SET

! This time with the revolutionary development of the Silver King, with its world-wide range and all-wave radio reception. It is not merely a unique idea, but a reality, a new valve, and available only to the home owner. Details in this history-making article.

ING, Associate I.E.E.

G. T. Kelsey's reputation on the short waves will be known to all readers of POPULAR WIRELESS, though it may be worth while mentioning, for the sake of our newer readers, that G. T. Kelsey is the father of all short-wave adaptors.

His original POPULAR WIRELESS short-wave adaptor was the very first piece of apparatus of its kind ever to be produced. Had he patented the scheme he would now be a very wealthy man, for literally millions of adaptors based upon his original "P.W." conception have since been home made or manufactured in this country, the United States (particularly the United States) and in other countries.

So, needless to say, expert short-wave enthusiasts will find the "Silver King" a delightful instrument for roaming the Antipodes and other far-distant quarters, and it will make those whose experience on the high frequencies is limited wonder at the ease of operation and the multiplicity of stations available.

No Compromise.

The high efficiency of the "Silver King" on these fascinating wavebands has been achieved largely by a clever separation of the short-wave circuits. They have their separate controls, too, so that there has been no compromise.

The tuning condenser, for example, does not have to serve all purposes. And

neither does the reaction condenser. There are picked parts for all the jobs in the set.

Further down the radio-wave spectrum we come to the ultra-short waves, and

these, too, are well within the powers of the "Silver King." Its great value here is that it will be able to receive the television broadcasts.

And from distances considerably in excess of that twenty-five miles you have all heard about. Don't think that if you are farther away from London than that you will be unable to join in the great television experiment when it begins.

But exactly how far away the sound section of these will be heard we simply cannot say. But we do know from our own tests, that 7-metre telephony has been picked up hundreds of miles away from a low-power 7-metre transmitter.

Possibly the B.B.C. high-power transmissions will be receivable on "Silver Kings" at scores of areas in the north and west. We shall, in fact, confidently

anticipate receiving reports of successful 7-metre reception from all over the country.

You see, there is a considerable difference between the powers needed for vision and sound reception. That twenty-five miles applies to the vision.

But the sound broadcasts on 7 metres will percolate over vastly greater distances.

And they will add much to the enjoyment of "Silver King" owners. These fortunate ones will be able to share in the television entertainment.

Two hours of it every night. Maybe, in cases, the sounds will be incomplete without the accompanying vision, but in a majority of cases they must assuredly constitute complete entertainment by themselves.

Covering the Television Waveband.

As suggestive of the soundness of this prediction I can remind you of the talking-film broadcasts which have been put over by the B.B.C. in their normal "sound-only" programmes.

And when you come to think of it there can be few ordinary turns which will not form good "sound-only" material, however the B.B.C. present their television programmes.

Presumably, such turns as Gillie Potter, Clapham and Dwyer, noted vocalists and so on will find their ways into the two-hour television sessions. With an ordinary

set you will be unable to hear anything at all of them. With the "Silver King," however, you will be able to go down to the television channel as easily as up to the long waves.

Personally, I should hate to think that I was barred from so much promising programme potentialities. Undoubtedly the B.B.C. will do its utmost to make the television programmes representative and highly attractive. Many will be induced to purchase or build complete television outfits, but not all will be able to afford that this year.

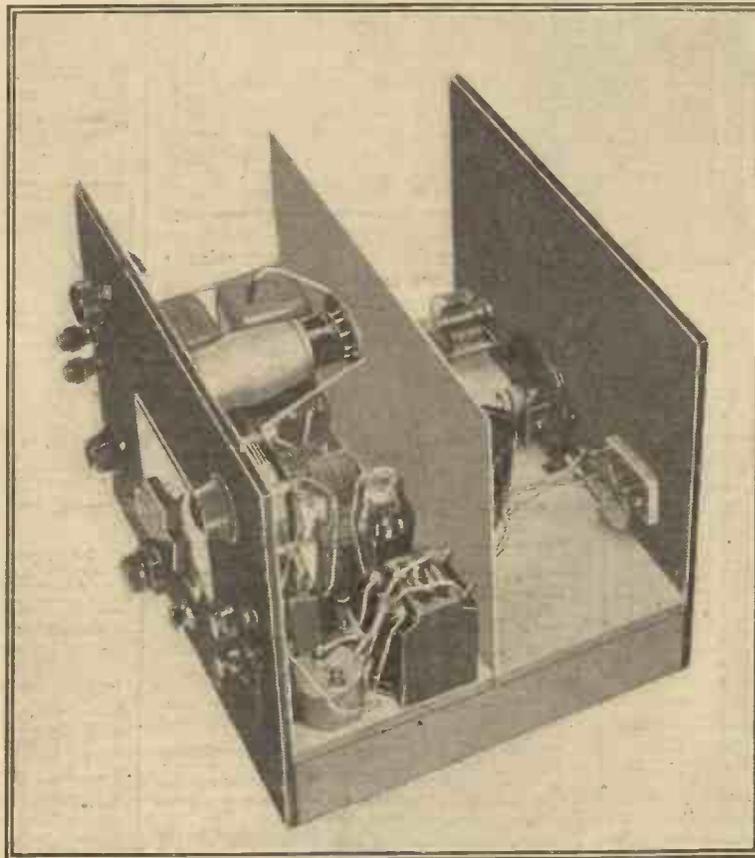
The next best thing is the "Silver King," which is a broadcast receiver, plus short waves, plus television sound channels, all in the one instrument, easy to build and comparatively inexpensive.

If it were nothing else at all it would still stand as a revolutionary achievement. And it is only after careful thought that I have made use of that word. But it is revolutionary, isn't it?

There are no sets to be bought which can take in the whole of the present and future gamut of sound

(Continued on next page.)

THE SUCCESSFUL CONCLUSION



Success at last! The Silver King in its final form. Full constructional details of this remarkable design will be given next week.

AND TWO-CHANNEL LISTENING FOR ALL

ANNOUNCING THE SILVER KING

(Continued from previous page.)

radio entertainment. As certainly there will have to be such sets in plenty in the future, for they will be demanded by the listening public. Therefore, in that the "Silver King" is a precursor of a new technique, it simply must be revolutionary, and there is no other word for it.

The "Silver King" does not stop there, though. I have yet to deal with what is perhaps its biggest point of all. I refer to its two-channel powers.

Just as the "Silver King" is and will for ever stand as the first ultra-short, short, medium and long waver, so it is the first true two-channel set.

Only Three Valves.

Again let me remind you that there are only three valves, and that all three contribute to the "broadcast" reception. The ultra-short and short waves are confined to a separate channel. Incidentally, this is—and I have already made oblique reference to the fact—the reason why such a high all-round performance has been made possible.

Incredible though it may sound, the "Silver King" permits the simultaneous reception of both medium or long-wave broadcasting and ultra-short or short-wave stations.

It can be pumping full-bodied loud-speaker results out on an extension loud-speaker in one room, while the owner of the set (or someone else) is scouring round with headphones or speaker to pick up

SUITABLE VALVES

Make	V ₁	V ₂	V ₃ Small Power	Super- Power
Cossor	—	210H.F.	220P.A.	230K.P.
Hivac	J.240	H.210	P.220	P.P.220
Marconi	—	H.L.2	L.P.2	P.2
Osram	—	H.L.2	L.P.2	P.2
382	—	H.L.2	L.P.2	P.2
Tungsram	—	H.R.210	L.P.220	S.P.220

ultra-short television, or amateur stations, or short-wavers of the normal variety!

It is a wonderful experience, almost weird, to be squeaking round the carriers in search of a short-waver on the "Silver King," the while the same set, using the same aerial and batteries, is imperturbably delivering first-class speech or music through its other channel.

It is even more wonderful to sit with phones on, listening to a short-waver, while someone else oscillates like anything in a clumsy attempt to tune in a distant

Continental station on the medium or long waves. And all with three valves!

Not three ordinary valves, however. The "Silver King" makes use of an entirely new valve: a valve which has never before appeared in either a factory-built or a home-made set.

It is a special valve we have developed ourselves. And appropriately enough we have named it the Jubilee valve, though only the initial appears upon the valve itself.

This special valve is not a greedy H.T. current eater. It actually absorbs far

ALL THE COMPONENTS USED

- 1 Formo 2-gang .0005-mfd. variable condenser with dial.
- 1 Wearite 2-gang coil unit, type WLQ and WLT.
- 1 J.B. .0002-mfd. solid dielectric differential-reaction condenser.
- 1 Bulgin standard screened H.F. choke, type H.F.8.
- 1 Varley L.F. transformer, "Nicore" II.
- 1 Polar-N.S.F. 10,000-ohm potentiometer.
- 2 Dubilier 2-mfd. fixed condensers, type BB.
- 2 T.C.C. 2-mfd. fixed condensers, type 50.
- 2 Graham Farish 30,000-ohm "Ohmite" resistances with horizontal holders.
- 1 Graham Farish 10,000-ohm "Ohmite" resistance with horizontal holder.
- 1 Clix 9-pin valve holder, chassis-mounting type, with screw terminals.
- 2 Benjamin 4-pin valve holders (Vibroholders).
- 1 Bulgin "Steatite" low-loss valve holder, type S.W.21.
- 2 Dubilier .0002-mfd. fixed condensers, type 670.
- 1 Graham Farish 2-meg. "Ohmite" grid leak.
- 1 T.M.C.-Hydra .25-mfd. fixed condenser, type 25.
- 1 Colvern set of 3 special short-wave coils.
- 1 Colvern special ultra-short-wave condenser.
- 1 Polar .00016-mfd. type "E" short-wave condenser.
- 1 Graham Farish special slow-motion drive for above.
- 1 Varley "Niolet" L.F. transformer.
- 1 J.B. .0001-mfd. reaction condenser (Midget type).
- 1 Bulgin short-wave H.F. choke, type H.F.3.
- 2 Bulgin on-off switches, type S22.
- 1 Bulgin L.F. choke, type L.F.20.
- 1 Dubilier .002-mfd. fixed condenser, type 670.
- 1 Dubilier .001-mfd. fixed condenser, type 670.
- 1 Erie 2-meg. grid leak.
- 6 Belling-Lee terminals, 7 wander-plugs and a wander-fuse.
- 2 Belling-Lee battery spade terminals.
- Peto-Scott cabinet, panels, screen, etc.
- Loudspeaker, W.B. "Stentorian."
- 1 pair Ericsson headphones.
- 1 G.E.C. 120-volt H.T. battery.
- 1 G.E.C. G.B. battery (to suit output valve).
- 1 Exide 2-volt accumulator.

less H.T. power than most ordinary valves! For this we have to thank K. D. Rogers, "P.W.'s" valve expert. His special scheme, applied to this special "P.W." valve, results in the marvellously low H.T. consumption of about only half a milliampere! The whole set takes no more than approximately eight milliamperes!

The new valve was developed by our own Research Dept. especially for this great new "Silver King" set and it constitutes the keystone of the whole design.

THE "BATTERY ECONOMISER"

Praise from a reader who halved his H.T. current.

The Editor, POPULAR WIRELESS.

Dear Sir,—May I take this opportunity of congratulating the designer of the "Battery Economiser" described in "P.W."?

The following figures may testify to the efficiency of this unit:

Test made with "Airsprite" and with Mazda super-power valve in output stage on West Regional News bulletin.

Without the Economiser the consumption of the set was 15 milliamperes at 120 volts.

With Economiser in circuit the consumption varied between 5 and 7 milliamperes.

The above readings were taken with reliable meter.

It will be gathered from the above that the H.T. should last at least twice as long.

Again thanking you,

Yours faithfully,
"SATISFIED,"

Stroud, Glos.

RADIO REPAIRS WHILE YOU WAIT

By W. OLIVER.

MINOR breakdowns in a radio set can often be put right in a "jiffy" if you have appropriate replacements handy. But amongst the mass of spare gadgets and "junk" of various kinds that the majority of keen radio constructors accumulate it is seldom possible to lay hands instantly on the particular replacement that is wanted.

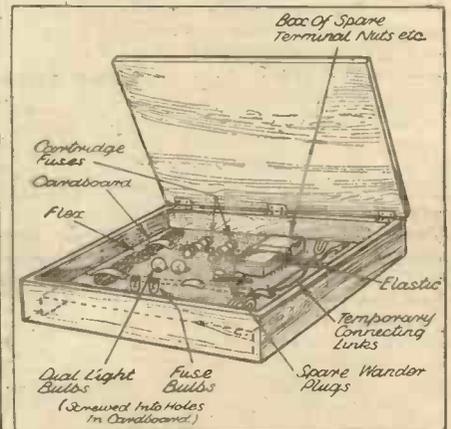
Unless you happen to be one of those very methodical people who always have a place for everything and always keep everything in its place, the chances are that you will have to spend a good deal of time hunting for a spare fuse, for instance, when one "blows" unexpectedly.

All waste of time in searching for replacements such as spare fuses, dial lights, etc., can, however, be avoided if you make up a neat little outfit of "spares" that can be kept handy for immediate use when required.

Any small wooden box will do for the case, and a piece of stiff cardboard should be cut and bent to form a false bottom about half an inch above the real bottom of the box. Strips of elastic or rubber, firmly secured at the ends, should be threaded in and out of slots cut in this card, to hold the various spare parts in place. The accompanying sketch shows the idea.

Among the items that it will be advisable to include in the outfit are a length of twin flex to replace defective battery leads, speaker leads, etc., spare fuses (cartridge or

A BOX OF SPARES



Illustrating an idea that will save time when minor repairs are required.

bulb type, or both, according to the type used in the set), dial-light bulbs, spare wander-plugs to replace any that get broken from time to time, a matchbox full of terminal nuts, etc., to replace any that may work loose and get lost, and a couple of temporary connecting links.

These connecting links are useful for making temporary connections when an existing wire breaks, or for shorting faulty components out of circuit in cases where this can be done safely and profitably. The links can be made by soldering spade tags or small crocodile clips to the ends of pieces of flex a few inches in length.

Tatsfield

THE WATCHDOG OF THE ETHER

FROM Limpsfield you ascend the 1-in-4 gradient of Titsey Hill, turn about to your right and, if it is night-time, you see two red lights piercing the gloom. The aerial lights of Tatsfield, they are, warning airmen that there stands the B.B.C.'s Kentish watchdog of the ether.

Inside, now. Meet Mr. H. V. Griffiths, who runs the show. Picking up American short-wave stations is child's play to him. So is the measuring of frequencies to an accuracy of one part in two million. I'm coming to that later.

Have you heard some of those wonderfully clear Saturday afternoon relays from America—in the "Five Hours Back" programme? If so you must have wondered why there was so little fading, so little background.

A Special Aerial System.

Two short-wave superhets down at Tatsfield account for this fine reception. As I entered the building they were putting W 2 X A D on the loudspeaker. It sounded almost like London to me.

"How is it done?" smiled Mr. Griffiths, repeating my natural question. "Well, for a start we make use of a diversity-aerial system. Two or more receiving aeri-als are placed several hundred yards apart."

Which is one reason why these engineers score over us amateurs. They have the space to put up as many widely separated aeri-als as they like—and the cash. The point of such an arrangement? Briefly, this. If there is a fade-out in the vicinity of one aerial the odds are that signals will be strong at that same moment in the other aerial's vicinity.

With diversity aeri-als complete fade-outs—beyond the compensation of even the best of automatic volume control circuits—can be more or less prevented or, anyway, greatly reduced.

Using Two Receivers.

Then about those two receivers. Very cleverly designed, I thought. Their A.V.C. circuits are interlocked in such a way that only the sum of their signals is heard, not the sum of their background noises. When one set is right down in its trough of reception, with consequent high-background noise, the other set, having at that moment a strong signal and weak background, knocks the first set out of action.

When I was at Tatsfield they were picking up just one American station on the two sets. Mr. Griffiths told me that later on they will have four receivers, each pair handling a separate channel of broadcasting, and so helping still further to strike a happy mean

between the swings and roundabouts of the ether.

For the Saturday afternoon relays of "Five Hours Back" the Tatsfield engineers ask America for whichever channels are known to be doing best at that particular

How B.B.C. engineers pick up America and how they check up the frequencies of Europe's broadcasters are features of this description of a visit to the B.B.C. Tatsfield station.

By ALAN HUNTER

time. Sometimes you hear W 2 X A D on 19 metres—nearly always good in the after-noon, I know. At other times you hear W 8 X K, either on 19 or 25 metres. Then, too, W 3 X A L sometimes comes to Tatsfield's aid.

You would, I am sure, like to know something of the circuit arrangements of these Tatsfield superhets. They begin, of course, with some kind of aerial coupler, which precedes a high-frequency stage. Then follows the first detector and separate oscillator, after which are arranged three

The automatic volume control, playing such an important part in these sets, is applied to the high-frequency stage and to the first two intermediate-frequency amplifiers. The actual control works over an audibility scale of not less than 60 decibels—quite impressive.

Aerials for short waves? It was too dark to see exactly what they had down at Tatsfield, but Mr. Griffiths made me envious by enumerating just a few of his "pets." They include inverted V's, horizontal di-poles, di-pole curtains, Franklin aeri-als with reflectors—and the usual half-wave aeri-als such as well-informed amateurs make most use of. "For 31-metre reception," said Mr. Griffiths, "the half-wave aerial is often as good as anything we have down here." A comfort, is it not?

Multitudinous Duties.

"You must not imagine that our work at Tatsfield is simply picking up a few American stations," emphasised Mr. Griffiths. "We have to track down interfering stations on the medium waves, relay foreign stations to the B.B.C. and, most important of all, check home and foreign broadcasters in a regular schedule."

For the musical people at the B.B.C. the Tatsfield engineers often pick up and reproduce concerts from foreign stations—especially when important new works are being performed. Then, too, talks are often needed from foreign capitals, as when the international political situation demands close contact with foreign opinion. Sometimes, I gather, foreign talks are picked up and reproduced on the Blattnerphone machine in London, to be translated at leisure later on.

Imposing Superhets.

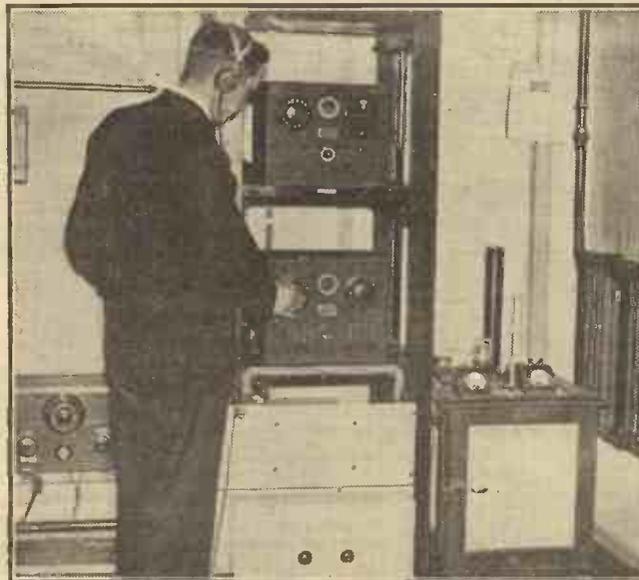
There are some imposing medium and long-wave superhet receivers at Tatsfield, arranged, like the short-wavers, in neat and efficient-looking racks. One of the superhets has variable intermediate-frequency filters, the band-widths being fixed at 6, 4 and 2.5 kilocycles—the last two super-selectivities being most useful for interference chasing.

I also saw a high-quality receiver with a 9-kilocycle selectivity, which, as with all B.B.C. receiving apparatus, has a diode for the second detector. This set is perfectly standard, but it can give points to many of the much-boosted super quality sets you and I could mention.

As I left the room I noticed that the walls were treated acoustically and that there was a carpet on the floor. Pampered engineers? Not at all. These things are

(Continued on next page.)

THE WAVELENGTH CHECKING GEAR



Accuracy of measurements in checking the frequency of broadcast stations is assured at Tatsfield by means of tuning fork and crystal-controlled standards.

tunable stages of intermediate-frequency amplification, which hand on a healthy signal to the diode second detector, coupled finally to the usual form of low-frequency output.

ADDING PRESET TUNING TO YOUR SET

Details of a useful scheme for local station reception.

By S. R. RAFFAN, B.Sc.

IF you were to analyse the number of hours that the "average listener" spends in listening it would be fairly safe to assume that the majority of the time is spent on British stations, and in fact on the two local stations.

With a set used in this way the addition of a tuning device which can be preset to the stations usually received so that they may be obtained at the touch of a switch, without at the same time affecting the main tuning control, is an asset which adds greatly to the pleasure of listening.

IN SIMPLE FORM

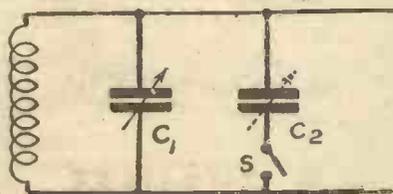


FIG. 1.

One of two stations may instantly be selected in this case by means of the switch S.

In the following description we shall assume that the set is one having only one tuning coil and a corresponding tuning condenser. Although especially suitable for such a set, the devices to be described are by no means limited to such application.

TATSFIELD: THE WATCHDOG OF THE ETHER

(Continued from previous page.)

essential to make the room suitable as a listening point.

Down at Tatsfield they can check with a syphon recorder the depth of modulation of any B.B.C. transmitter. The syphon makes a printed record—so that, as an engineer grinningly remarked, there can be no argument afterwards about those "peaks" of over-modulation.

Tatsfield also provides the B.B.C. with its final check on transmission quality. "Really, we are the last outpost of the B.B.C. system," summed up Mr. Griffiths. "As you can understand, we are in a specially favoured position down here—free as we are from electrical interference."

In the Frequency Test-Room.

Free, I admitted, of all that particular kind of nonsense (for I had remembered to stop the engine of my car outside the door!), but not of dirty weather, I murmured, remembering all too well the perfectly ghastly drive I had experienced in getting up to Tatsfield from Sussex.

We went into the frequency test-room,

It has to be remembered, however, that it is never wise to interfere with more or less complicated commercial sets in particular, and it is left to the discretion of the reader to decide whether his set is suitable for modification.

How the Scheme Works.

The preset control is obtained by the use of one or more auxiliary variable condensers which may conveniently be of the preset type, such as the Formodenser. Each of these is separately tuned to one of the stations it is desired to receive, and is arranged to be switched in selectively at will.

The simplest arrangement is represented diagrammatically in Fig. 1. This method is especially suitable when the set is not likely to be used a great deal apart from local reception. The adjustments necessary are as follows:

Changing From One To The Other.

Assume, for example, that the London National and the London Regional stations are to be received. With the switch in the "off" position the National (or the one of lower wavelength) is tuned in on the original tuning condenser. The switch is then put in the "on" position and the London Regional is tuned in, using the preset condenser alone. It is then possible to change from the Regional to the National and vice

where I felt Mr. Griffiths really was in his element. He has set himself a very high standard of accuracy—and keeps to it. He has two standards of frequency to measure all stations by—whether they are short, medium or long. A crystal with a frequency of 250 kilocycles provides one standard and a 1,000-cycle tuning fork the other.

The fourth harmonic of the crystal is selected and passed on to a multi-vibrator at 1,000 kilocycles, which in turn locks multi-vibrators at 100 kilocycles, 10 kilocycles, 1 kilocycle and .1 kilocycle, this arrangement providing any harmonics needed for frequency tests. The .1-kilocycle multi-vibrator drives, in addition, a synchronous clock.

It is this clock that provides the real check on the accuracy of the standard frequency by comparison against the Greenwich time signal. The link between frequency and time is, of course, the second—for when we speak of a station's frequency we refer to the number of cycles per second.

At Tatsfield the second of time is taken as the absolute standard, and since the standard-frequency generator—the crystal, that is—is linked by the multi-vibrator to the synchronous clock a check on time is a check on frequency.

They pick up the Rugby astronomical time signals, which are even more accurate than the famous six pips from Greenwich,

versa without touching the condenser merely by operating the switch S.

When at any time it is desired to use the set in the ordinary way the switch S is put "off" and the main tuning condenser is made use of. It will then be necessary again to tune in the National programme on the main condenser before the preset control can be used. The setting of the auxiliary condenser need never be interfered with.

In Fig. 2 an arrangement is shown by

AN IMPROVEMENT

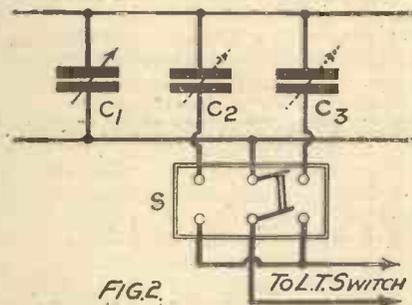


FIG. 2.

With this arrangement the preset tuning is brought into operation by simply setting the variable tuning condenser to zero.

which the controls are reduced to a minimum, for one switch is used to act not only as a station selector, but also as a low-tension switch.

Two auxiliary preset condensers C_2 and C_3 are arranged to be switched in, in parallel with the main condenser C_1 , and in this case the main condenser should be turned to a fixed reading which will usually be most conveniently the zero reading.

Once the principle has been grasped the details of the device can easily be modified to suit special circumstances. There is no need for the number of stations to be limited to two, for example.

although they originate from the same observatory. These Rugby signals, which are sent out twice a day, are guaranteed accurate to within one-hundredth of a second, while the six pips are accurate to within one-twentieth of a second.

If the clock is checked by Rugby the frequency check available is one part in a million. From the deviation of the clock from Rugby time the engineers can quickly work out and allow for any drift in the frequency. Elaborate methods are adopted to keep this crystal frequency constant. The crystal itself is in an electric oven to keep its temperature constant, the heat turning on and off automatically as slight temperature changes occur.

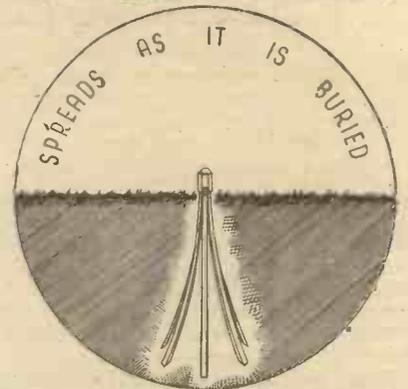
A Calibrated Oscillator Used.

For working frequency checks of broadcasting stations a calibrated oscillator is used, which is, of course, checked with the standard Tatsfield frequency. Within a few moments a station's carrier frequency can be given to within an accuracy of one part in a million.

If any of you imagine a wavemeter is still used to find out a station's wavelength don't let Mr. Griffiths hear you say so. Several years of development have been spent in evolving the present extraordinarily high standards of accuracy, but B.B.C. engineers still read about Tatsfield testing with a wavemeter—and sigh accordingly.

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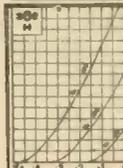
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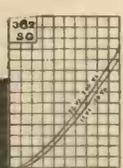
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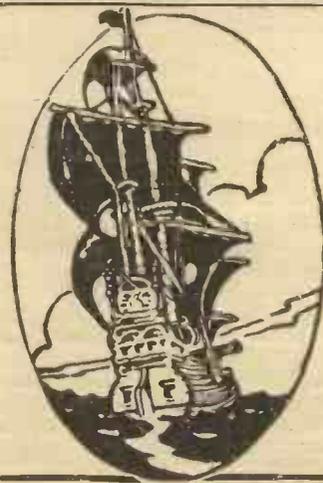
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FITTING A DIAL LIGHT

The whole subject of fitting dial lights to different types of existing receivers is covered in this practical article

By L. A. Hodges, Grad.I.E.E.

LIGHTING behind the condenser dials adds distinctly to the appearance of any receiver, but there are numerous constructors with sets in operation without such lighting.

Yet it is simply and quickly attached, as most condensers (ganged or otherwise) and dials are fitted complete with a miniature screw lampholder ready for connecting in circuit to the low-tension side of the wiring.

Amongst reasons for listeners being without dial illumination may be uncertainty concerning a suitable bulb to connect in the circuit, or just where to wire it up in the circuit, especially in sets employing heater circuits other than the usual 2 or 4 volts for the low-tension wiring.

Bulbs Are Easily Fitted.

Possibly battery users may be worried about the current consumption from their batteries which would be caused by fitting a light; so, to clear up all these possible difficulties, suitable bulbs for such circuits, together with current consumptions and the right place to wire them in circuit, are given below.

Perhaps the introduction of neon-light visual tuning and other lighting arrangements on the new commercial receivers, and the fact that for some time now most commercial receivers have had ordinary dial lighting, may inspire those constructors without dial lighting to make their old sets a little more attractive and modern, and so to approach the trend of recent design by adding a lighting effect to their receiver.

BATTERY CONNECTIONS

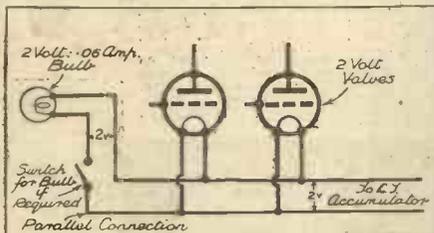


Fig. 1.—For battery sets a low-consumption bulb with a switch should be used.

Apart from the appearance point of view to the set, dial lighting has one very definite use. The fact that the dial is lit up is an indication that the set is switched on, and usually that the filament circuit is intact because the dial light is connected across or in series with the valve filament part of the circuit.

Constructors' circuits consist generally of valves by recognised British manufacturers operating at 2 volts usually for battery sets, 4 volts for A.C. mains sets, 13 volts for circuits employing universal valves and 16 volts for D.C. mains sets.

Taking the 2-volt battery circuits first, these, of course, require a 2-volt bulb with a low-current consumption because of the drain on the low-tension accumulator. It

would not be good practice or efficient to use a bulb requiring so much current as two or three valves together, yet this is the case if some types of flash-lamp bulbs are used.

A bulb to be recommended for low consumption, efficiency and long-burning life is the 2-volt .06-amp. Bulgin "Competa" bulb, continuous-burning type, price 6d. With a bulb of this description the drain on the accumulator need not cause any concern.

If, however, flash-lamp bulbs are used, which take anything up to .3 amps., it is a good plan to fit a switch in circuit with the bulb, using the illumination just for tuning or on special occasions.

The bulb should be connected in the circuit as shown in Fig. 1—that is, in parallel at a convenient point with the filament wires, or attach the leads from the

FOR MAINS CIRCUITS

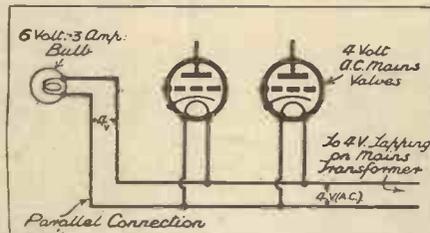


Fig. 2.—A 6-volt bulb run from the heater circuit is best for A.C. mains receivers.

bulb direct on any pair of valve holder filament terminals.

Coming to the customary A.C. mains circuits using 4-volt valves, a 6-volt bulb is to be recommended. As current consump-

tion here is not so important a 6-volt .3-amp. bulb of reliable manufacture is very suitable, the current taken when connected to the 4-volt circuit being about .2 amps. As in the case of battery circuits this bulb is also connected in parallel with the heater wires. (See Fig. 2.)

We now come to the D.C. mains sets in which are employed valves operating at

A SERIES ARRANGEMENT

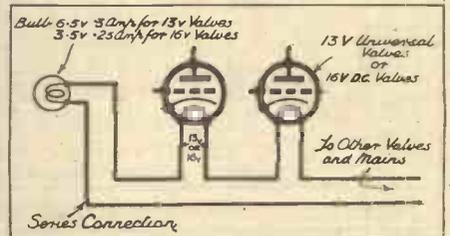


Fig. 3.—In the case of sets using universal valves the dial light can be run in series with them.

16 volts, the filaments of which are wired up in series, the same current (.25 amps.) flowing through all filaments. Here a suitable type of bulb to fit for dial lighting is a good make of 3.5-volt .25-amp. bulb.

In this case, however, the bulb must be wired in series with the heater circuit, as shown in Fig. 3. An easy way to connect up would be to take a heater wire off a valve holder (near the dial to be illuminated) and run it to the bulb, the return wire from the bulb going back to the now-vacant filament terminal on the valve holder.

The remaining type of circuit on our list is that employing 13-volt universal valves. These valves, again, are wired up with their heaters in series, but taking a current of .3 amps. throughout. The same arrangement for connecting in circuit the dial bulb must be employed as in the case of the D.C. mains circuits—that is, in series with the filament wiring, but this time employing a 6.5-volt .3-amp. bulb. These bulbs, in the last two cases (13-volt and 16-volt), will also act as fuse bulbs.

A RADIO set which has been in use for a considerable time often suggests in an almost undefinable manner that it is not so young as it used to be. Even after replacement of the valves and a general clean-up, the set still

arouses suspicions that sensitivity, selectivity, tone purity and volume are not nearly so satisfactory as they once were.

The chief cause of deterioration in a set which has nothing radically wrong with it is dust. Complete dismantlement of the set, particularly with a closely packed commercial receiver, is usually impracticable. Consequently, though you can keep the set clean enough to make it work, you cannot, by usual methods, keep it clean enough to make it sound like new.

Your feminine relatives could tell you that a very effective dust remover is a vacuum cleaner. But it can exert effective suction only if the nozzle makes close contact with the dust. It is, however, possible to blow from a distance far more

WHEN YOUR RADIO GETS "TIRED"

Dust works slowly but surely, and may play havoc with a set's results. Why not blow the dirt away, as suggested below?

effectively than it is to suck.

Most vacuum cleaners can blow as well as suck. If you examine the instruction booklet, which your wife has probably hidden away unread, you will find how to make them do it. If the booklet is

lost your masculine ingenuity should show you the way. And if it doesn't you can always ask the advice of the makers.

Greatly Improved Reception.

Then give the inside of the set a thorough blowing, paying particular attention to the condenser plates and to all other parts which could not be readily reached by other methods. The dislodged dust can afterwards be sucked up from the more accessible places to which it has been blown.

A two-and-a-half-year-old radiogram was transformed by this treatment, and the number of stations which could be received was more than doubled.

R. A. S.

RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication. A stamped, addressed envelope must be sent with every article.

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

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

QUESTIONS AND ANSWERS

THE FUNDAMENTALS OF GANGED TUNING.

G. P. P. (Scrooby).—"If the use of ganged tuning condensers, trimmed by smaller condensers, is fundamentally sound, as stated in 'P.W.' will you explain in simple language what is the principle on which it works?"

"Within ordinary limits I understand capacity, and inductance, and tuning to different wavelengths. But why do we have 'stray' capacities to complicate matters? Surely matched coils and matched condensers should be enough to keep the circuits of a ganged set in tune?"

Let us consider the "bare bones" of the tuning requirements of a multi-wave receiver, starting with matched inductances, assumed to be all exactly alike and all of negligible self-capacity.

There will be one inductance for each tuning circuit, and a corresponding number of matched tuning condensers.

We will assume that these tuning condensers are, like the coils, almost too good to be true; they have an identical minimum capacity when "all out," and if the control is turned there is an exactly corresponding and simultaneous alteration in the capacities, so they will always remain in tune.

So, before starting, we have the perfect coils and the perfect condensers, with no apparent need for trimming and all its snags. Why then do we trim?

Simply because it is essential to connect the coils to the condensers and to the set itself, and in doing this we throw out, in effect, the perfect matching achieved by the makers.

The valves, wires, etc., have capacities and inductances of their own, and it is the necessary connections of the components that make trimming necessary, to counteract these added complications.

In ordinary practice the unwanted (or stray) inductances are so comparatively small that they can be ignored; but the unwanted capacity of the valve across the circuit, the inter-capacity effects of leads, etc., all combine to make a *different* (stray) capacity across each tuned circuit.

As you know, any combination of equal inductances with unequal capacities will result in differing wavelengths—exactly as we want to avoid. So we trim to restore the balance, in the following manner.

A small variable capacity, called a trimmer, is joined across each circuit, and is first adjusted to minimum capacity. This leaves us with the matched coils, the matched tuning condensers, and the unmatched stray capacities (that now include the capacities of the trimmers themselves).

Then the object is to match the stray capacities also; which is effected by re-setting the trimmers, so that the lower stray capacities are increased to the point where they all equal the highest stray capacity.

When that has been achieved the effect is to leave us with our matched coils, our matched tuning condensers, and our *matched* stray capacities.

The ultimate effect of the stray capacity is to increase the minimum tuning capacity across the inductance—otherwise the stray capacity may be regarded as part of the tuning capacity. So between the new limits of capacity variation the circuits are all adjustable *equally*; in fact, the inductance is a fixed quantity, *equal* in all circuits; and the capacity alters between the limits of maximum and minimum, by *equal* steps as the main tuning control is operated.

And in this way our aim is achieved, for the proportions of capacity to inductance will be adjustable, to give different wavelengths; but at any given wavelength all the circuits will contain identical capacity and inductance values, so giving identical tuning.

HOME-MADE IRON-CORE COILS.

L. C. (Sheffield).—"It may sound a bit ridiculous to you, but the good old maxim, 'Nothing venture, nothing win,' led me into trying my hand at making iron cores for ordinary tuning coils. The iron part of it is not so ridiculous as it may sound, because I am in a position to get any amount of various sorts of iron."

"I must admit, though, that so far I cannot find any improvement resulting from the use of an iron core. Is it absolutely essential to use fine separated particles, each separated from its neighbour by insulation, in order to gain the benefits of an iron core?"

Yes, we are afraid that is an essential preliminary to success along these lines. And it is not an easy manufacturing process to ensure that the particles of iron are correctly distributed in this way.

Unless, however, the individual particles comprising the core are separated, there will be the old objection to the use of iron in an H.F. magnetic field—viz. eddy currents, causing losses.

Frankly, we do not think you are experimenting along a promising line; we should say that, for all practical purposes, the use of a properly designed and constructed iron core is essential if improvement over a good air coil is to be achieved.

BATTERIES RUN DOWN TOO QUICKLY.

A. R. (Wangford, Suffolk).—"Something is wrong, making the battery run down in a fortnight. I am getting the loan of a milliammeter to put in the H.T.—lead. If it shows there is current flowing when the set is switched off, how do I trace where the leak is?"

It is a task requiring expert knowledge or infinite patience. The basic idea is, in turn, to pull out valve after valve, disconnect lead after lead, and component after component, until, by a process of elimination, the leak can be localised. If you fail to trace the leak by yourself, get someone experienced in fault-finding to give you a hand.

STRENGTH AUDIBILITY AND TONE.

E. V. B. (Gt. Yarmouth).—"I have been looking back to find out what is the correct number and letter to use for reporting strength of a distant station—'R6,' or 'QSA5,' or what. There seems to be a diversity of ways used by correspondents, and after a search I am still not sure what is the recognised best method, especially for short waves."

"If you will give the officially approved method of reporting I am sure it will be appreciated by many besides myself, who have been puzzled by the abbreviations at present used for this purpose."

Confusion often arises because it is not realised that there are several different scales in common use. Sometimes it is desired to report on the *strength* of signals, sometimes to comment upon their *audibility* (a very different matter), and sometimes to report on the *tone* or note of a distant short-wave transmitter.

For strength, use QSA scale, 1 to 5, as follows:
QSA 1, hardly audible, unreadable;
QSA 2, weak, occasionally readable;
QSA 3, fair readable with difficulty;
QSA 4, good, quite readable;
QSA 5, very good easily readable.

For audibility, use the R scale, as follows:

- R 1, faint signals, just audible;
- R 2, weak, barely readable;
- R 3, weak, but readable;
- R 4, fair, easily readable;
- R 5, moderately strong;
- R 6, good;
- R 7, good and strong;
- R 8, very strong;
- R 9, extremely strong.

The two scales are mostly used, but there is also the T scale which can often be heard on short waves when transmitter adjustments have been made upon which it is desired to obtain reports.

The meaning of this scale is as follows:

- T 1, poor 25-, 50- or 60-cycle A.C. tone;
- T 2, rough A.C. tone;
- T 3, poor rectified A.C. tone (no filter);
- T 4, fair rectified A.C. tone (small filter);
- T 5, nearly D.C. tone (good filter, but key thumps or back-wave noticeable);
- T 6, nearly D.C. (very good filter);
- T 7, pure D.C. (but key thumps and back-wave noticeable);
- T 8, pure D.C.;
- T 9, pure crystal-controlled D.C. tone.

PREVENTING FADING.

A. S. (Dublin).—"Is it true that the B.B.C.'s new station at Lisburn will be immune from fading troubles, because it will employ a radiating mast instead of a non-radiating mast holding up an aerial?"

Well, that is the general idea, but there is no saying yet what the result will be. Experiments abroad with this type of mast have been sufficiently promising to persuade the B.B.C. to try it; but not until the station has been in service and subject to measurements can it be said how much immunity from fading the radiating mast will confer.

S.G. AS DETECTOR.

C. H. (Chatham).—"You have given particulars of the proper way to use an S.G. valve as detector, but have you ever come across a case where an S.G. valve (an S215B) worked perfectly as detector *without any alteration whatever to the set*?"

"I should not have found out except for accidentally smashing my H.L.2, and having the other in the valve box I put it in the valve holder—to my surprise it went just as well as the H.L.2, but there was no connection to the top terminal!"

We have known of plenty of similar cases, and substitution of this kind is worth remembering when no detector valve is available.

What happens, of course, is that the screen acts as an anode, and the true anode is left "in the



FREE CHARGING

An ingenious windmill-charging device erected by one of our readers in the Shetland Islands. The batteries and dynamo are arranged to rotate with the wind vane and an automatic cut-out ensures safety when the wind drops and charging ceases.

air." This gives rise to queer effects sometimes, and is seldom as satisfactory a detector as a recommended valve.

AERIAL WIRE.

L. W. T. (Tankerton, Kent).—"Back from ten years in Shanghai, where I had no opportunity for wireless, I find it is one of the most fascinating amenities of home life. But I am woefully ignorant of the principles on which it works and also of the everyday practical considerations."

(Continued on next page.)

IMPROVING RECEPTION



Now is the time to pay special attention to small but important details such as the efficiency of your Aerial and Earth contacts.

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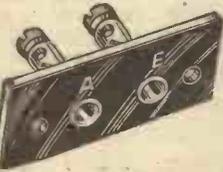
allow Aerial and Earth leads to be taken direct to set sockets or terminals without any breaks or joins; the special metal to metal wiring device takes any insulated wire up to $\frac{1}{8}$ in. overall.

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RADIOTORIAL QUESTIONS & ANSWERS

(Continued from previous page.)

"For instance, aerial wire. Is there any advantage in using the coated, as against the bare, copper wire? What do you recommend?"

"The proposed new aerial will be about 35 ft. high, and just over 50 ft. from the end to the window where it enters the house. Will this give much better reception of foreign stations than the round-the-room aerial now in use?"

To answer the latter part of the question first, the effect of using a good outdoor aerial as compared with a good indoor aerial is usually very marked; but the extent of the improvement cannot be forecast. It will greatly depend upon the type of set which is being used.

Anyway, we expect you will find a big improvement, as that is the general experience.

From the electrical point of view, the use of covered or of uncovered wire is of no importance—a covering protects against corrosion.

The chief difference of importance to listeners in coastal areas is that bare copper wire is easily acted upon by salty atmosphere, but a coating of enamel prevents this. So as you are not located well inland we advise the enamelled type of wire.

A TWO-VALVER FOR SHORT-WAVE RECEPTION.

M. E. H. (Grantham).—"I want to get the whole wide world on two valves—short waves, of course. And I want to learn something about proper layout by arranging that for myself.

"Will you give me a good circuit, leaving me to work out the details? I do not want even a diagram—just words that will leave me to find the correct positions for everything.

"All I stipulate is that it should be a two-valver, using S.G. and detector; and that it should incorporate most of its components from the following, which I have on hand.

"Plug-in S.W. coils; '00015 tuning condensers; plenty of fixed condensers; several 'neuts.'; and S.W. chokes, of which I have three. Also, I have two S.G. valves to choose from, and an H.L.2, grid leak, metallised panel and baseboard, screen, etc.

"As you see, I have plenty of stuff to work with."

Good luck to your bold endeavour. We are tempted to give just a couple of hints, but as you have specially asked for the bare details here they are.

Aerial to one side of a neutralising-type condenser. Other terminals of this condenser to aerial coil holder, to one side of '00015-mfd. tuning condenser, and to grid of S.G. valve holder.

The remaining sides of this coil holder and condenser to earth and to screening, whether separate screens or metallised surfaces.

Earth also goes to L.T. — and H.T. —; to one filament terminal on each valve holder; to a second '00015-mfd. tuning condenser; to a '0002-mfd. reaction condenser; to a .25-mfd. H.F. by-pass condenser; and to a second coil holder.

The other filament terminals on the valve holders are joined together, to one side of a 2-meg. leak, and to one side of the on-off switch. The other side of the switch goes to L.T. +.

To the screen (A or P) terminal of the S.G. valve holder, connect the other side of the .25-mfd. condenser and a flex to H.T. + 1.

The S.G. Anode Connections.

The top (anode) terminal of the S.G. valve goes to an S.W. S.G. choke and to the coupling condenser, for which component we recommend another variable of the "neutralising" type.

The other side of this S.G. choke goes to one phone terminal, to a largish fixed condenser (say, '0005 or '001-mfd.), and to the flex for H.T. + 2.

Remaining phone terminal, and remaining fixed condenser ('0005 or '001 mfd.) terminal to one side of another H.F. short-wave choke.

The plate terminal of the detector valve holder is joined to the other terminal of this choke, and also to a third coil holder; this is for the reaction coil, so it must stand close enough to the second coil holder to couple properly.

The remaining terminal of this reaction coil holder goes to the remaining (fixed) terminal of the reaction condenser.

To the grid terminal of the detector valve holder join the free side of the 2-meg. leak, and one side of a '0001-mfd. grid condenser. The other side of this grid condenser goes to the "fixed" vane of the second tuning condenser, and to the free terminals of the second grid coil holder and coupling (neut.-type) condenser.

This ends the wiring, and begins the excitement. Good luck to your efforts. It is a fine long-distance, get-the-world hook-up, quite straightforward in operation.

CONTROLLING THREE COILS WITH ONE SWITCH.

"ACCRINGTON STANLEY" (Accrington).—"Fired by 'P.W.'s' All-Wave Super, I, too, have been designing a set for the long, medium, and the short waves. And although mine is only three valves, I seem to spend whole evenings on scheming this and that without getting very much 'forrarder.'

"I am putting it into a big gramophone cabinet, so there is plenty of room for everything. And I have mounted the coils to my satisfaction.

"The long and medium are on an ordinary coil unit, and the short-wave coil holder is placed near, at right angles, with room for the switch between the two.

"I want the switch to cut out both the medium and the long-wave windings when I am over to short waves, leaving the condenser across the short-wave coil only.

"Then I want to arrange it so that the switch cuts out the long and the short coils, leaving the condenser to tune on the medium waves.

"Finally, there is the long-wave position, when the long- and medium-wave windings are used together, as is usual in a coil unit. But how can I do all that changing about with the one switch?"

READ "POPULAR WIRELESS" FOR ALL THE LATEST TELEVISION NEWS

It is really quite an easy-to-arrange switch operation, but you have not been working along the right lines.

The secret of getting an easily-switched scheme in operation is to leave the short-wave coil in circuit, and not attempt to cut it out when on the medium or long wavebands—it has so few turns that this can always be done without making a ha'porth of difference to the other tuning.

Then all you need to fulfil your requirements will be an ordinary single-pole two-way switch. But it must be one that is capable of standing, also, in the neutral or "off" position.

It Is Easily Arranged.

This will be the "long-waves" position. The other two switch positions will give you respectively "short" and "medium" waves.

This is how it is done. In the coil unit you already have the long-wave and the medium-wave windings joined permanently together, and when the switch is connected across the long-wave winding the closing of the switch shorts the long-wave coil and the tuning condenser, joined across the two coils, will therefore tune only to the medium waves. If you open the switch contacts the two coils come into action and the set tunes to the long waves instead.

To make the new method (for three coils) perfectly clear and straightforward, take a pencil and draw a diagram of the new arrangement as follows:

At the top of the paper draw the symbol for a coil, and mark it S, for short waves; below it draw another coil, marked M for medium waves; and directly below that a third, marked L for long waves.

Connect the bottom of S to the top of M, and the bottom of M to the top of L. This will leave free the extreme ends, and you now have, in effect, a single coil that consists of the three sections, S, M, and L. Got that?

To the left of the three-coils-in-one, draw the sign for a tuning condenser, and connect the top of it to the free end of S and the bottom of it (moving vanes) to the free end of L.

The Switch Contacts.

Now, to the right of the coil, draw in a "switch" by putting three dots in upright line, giving the middle one a little sloping arm to denote that it can be joined either with the upper or the lower dot. Mark the upper dot "Short Waves," and the lower one "Medium Waves."

Finally, join the "Short Waves" dot (switch contact) to the junction between coils S and M; and join the "Medium Waves" dot (switch contact) to the junction between coils M and L. Connect the centre dot (moving arm) to the bottom of L, and mark this point "Earth." This completes the new tuning arrangement.

(Continued on next page.)

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RADIOTORIAL QUESTIONS & ANSWERS

(Continued from previous page.)

You see how it works? If the switch arm is touching neither the short-waves nor the medium-waves contact, all three coils are being tuned by the condenser, and you are on long waves.

If, now, the switch arm on the middle dot of the switch is joined to the short-waves contact of the switch, M and L coils are put out of action by it, and coil S is across the tuning condenser. So you tune in only the short waves.

In similar fashion, if the connection on the middle dot of the switch is brought, instead, into contact with the lower-switch contact (medium waves), the tuning condenser is, in effect, across only the medium-wave coil, M. For the L coil is put out of action by the switch arm across it, and S has so few turns that it makes no difference.

Easy, isn't it? All you need do is wire from the diagram which you have just drawn.

DROITWICH COMES THROUGH ON "GRAMOPHONE."

S. P. (Wolverhampton).—"I have fitted a gramophone pick-up switch across the detector, according to your diagram, and it goes O.K., except for one peculiarity. I hear Droitwich on 'Gramophone.'

"If you can tell me how this can be put right I shall be very pleased, because it is quite loud enough to come through and sometimes clear enough to hear the words."

When the switch comes off the "Radio" contact and goes over to "Pick-up," you must be provided with not only a break in the wiring at that part of the circuit, but also a good separation of the wiring of the grid circuit from that of the pick-up leads.

Apparently your wires run very close, or else your switch is a dud, with unusually high self-capacity.

If it is one of the well-known gramophone switches the fault is not likely to be in that component, so look carefully over your wiring with the idea of separating the two circuits more completely. Good separation will cure the fault.

NEW WEARITE WAVETRAP COIL

AERIAL circuits are usually relatively inefficient because of the damping effect of the distributed capacity of the aerial itself. But, generally speaking, this is to some extent removed from the first tuning circuit of the set by means of very loose coupling.

Indeed, the quite common practice is to use the aerial purely and simply as a collector, and no attempt is made to bring it to resonance with any one particular wavelength by means of tuning.

The "initial" tuning is the task of the grid circuit, and the aerial is more usually coupled to this somewhat loosely.

A MISTAKEN IDEA.

No doubt it is because of this procedure that there is a kind of universal depreciation of anything connected with the aerial. Many constructors seem to say to themselves that because of the inherent deficiencies of the aerial it is waste of time, trouble and perhaps money to use anything good in any circuit concerned with it.

In consequence has grown up the tradition of hand-wound coils for loading aerials, and for wavetraps, etc. And a hand-wound coil is merely a bunch of any old kind of wire loosely or tightly coiled up.

From the point of view of radio engineering it isn't a coil at all, any more than a watertight packing case is a ship.

Therefore it is not surprising that wavetraps haven't a very good name. Hundreds of thousands of rejector types of wavetraps have been tried, but we wonder what is the percentage of successes.

A rejector wavetraps comprises a complete tuning circuit (a coil with paralleled variable condenser) in series with the aerial, and its purpose is to form a barrier against the wavelength to which it is tuned.

HIGH EFFICIENCY IS ESSENTIAL.

To do this effectively it must be able to assume an extremely high impedance, and it cannot do this if the circuit it forms includes either a condenser or coil possessing a disproportionate high-frequency resistance. Particularly does this apply to the coil.

With a well-designed "low-loss" coil much more than half the battle is won, and wave-trapping becomes an eye-opener to those who have never previously given the idea a fair chance. A local station which has been thumping in pretty well all

round the dial can be narrowed down to the sharpness of tuning of a foreign station.

But not, we repeat, unless the trap circuit is efficient. In view of the vital importance of obtaining the utmost efficiency in the coil it was only to be



A COMPACT TRAP

This Wearite wavetraps incorporates two iron-cored windings and costs only 7s. 6d.

expected that the modern iron-cored principle would be recruited to the purpose.

This has been done by Messrs. Wright and Weaire, Ltd., of 740, High Road, Tottenham, N.17. They have produced a highly efficient iron-cored coil especially for use in wavetraps.

To make a complete wavetraps all you want is one of these coils (it costs 7s. 6d.), an on-off switch for wavechanging (the coil covers both medium and long waves) and a '0005-mfd. variable condenser.

A preset condenser works with this coil quite well, but it will do its station-suppression job with even greater effectiveness if an air type is used.

EXCELLENT RESULTS OBTAINED.

The coil is extremely neat and compact. There is no screening, but this is not needed, and would, indeed, tend to some extent to reduce its efficiency.

That such a small coil construction, bearing so few turns of thin wire, can give low-loss, optimum-trapping results on both medium and long waves will no doubt prove a source of perplexity to many readers. Of course, the secret lies in the iron cores. Not cores of ordinary iron, but of a special subdivided iron in which wasteful eddy currents cannot develop.

Any reader who is troubled by the swamping interference of a local station ought to make up a trap using this coil. It is not a costly procedure and is certainly quite simple. Moreover, stations at other points on the dial are not affected: even those only a few degrees away from the suppressed station will be reduced in strength but a negligible amount, although previously they could not be heard at all behind the loudly swamping interferer.

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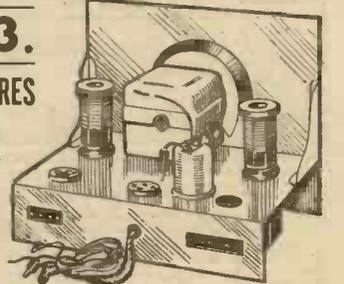
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WHAT I THINK

(Continued from page 60.)

means disgraced the series. Nor was she expected to. Otherwise she wouldn't have been booked to speak last, a position always calling for a performer above the average. Jean Hamilton held one's attention from start to finish. Indeed, I could have gone on listening to her indefinitely. She is no milk-and-water personality, and must have appealed straightway to our dissatisfied Colonial friend.

It often happens that directly one has been a bit uncomplimentary about a certain thing, that thing crops up as if to defend itself to the point of making one ashamed of ever having condemned it. You may remember that recently I expressed only a lukewarm appreciation of the weekly excerpt from the theatre. This week George Robey comes along with an excerpt that I should say everybody wanted to hear, and thereby demonstrates the value of the excerpt item.

In my own defence I must say I think this week's excerpt from "Henry IV," Part I, is an exceptional one. Ever since it was announced that George Robey was to play Falstaff in this production speculation and wonder have been rife.

An Opportunity for Listeners.

Since the first performance all the critics have been concentrating on the new Falstaff. We have read these criticisms with great interest. Now we are all anxious to see Robey. We can't all see him at once. Most of us have to wait for the opportunity. To many that opportunity will never come. To the latter especially, then, the fact that the B.B.C. put Robey on the air at such an early date is something to be really pleased about. Many thanks, B.B.C. I take back a lot of what I said.

One of a park-keeper's jobs is to keep adults out of the "Children's Corner." We love to trespass there sometimes, don't we? Where children's broadcasting is concerned there is no keeper to keep us out. Commander Stephen King-Hall, not to mention past and present broadcasters like Professor Lloyd Jones, Eileen Power, Walford Davies, etc., would talk to considerably smaller audiences if there were.

I always listen to King-Hall when I can. Unfortunately, his hour isn't always convenient. I always read him. Whether it's a talk or an article all the facts are there, couched in the simplest words. His unique style of address compels listening. His is the proud record of having carried on a series to the 200 mark. I generally welcome changes, but not so here. The "Here and There" series should go on for ever. Vive le Commandant!

Capt. Wakelam's running commentary of the Scotland-England Rucker match was all that could be desired. In fact, if it is possible to say so he even eclipsed his past excellent performances. I should say that Irish listeners would give this item first place in their week's listening for sheer enjoyment.

"Gale Warning" was only mildly interesting. Too much of a busman's holiday for a lot of listeners. I think it would have been better received on any other night. Saturday is a holiday for the majority of listeners. They want holiday fare. C. B.

ROUND THE RECORDS

(Continued from page 64.)

Did you get that record with the amazing title, *I've Got a Pain in my Sawdust*? A good one for kiddies, isn't it? But not what you thought it was about, I bet. Well, here is another good one for the young folk, *Tiny Little Finger Prints*, on Decca F5401, by Roy Fox and his Band. Quite tuneful, and your young folk of four or five will like it, just as those a little older, especially doll lovers, will enjoy the Sawdust record. Now I have given the game away, haven't I? Well, you had to know; I could not keep the sad story behind that inscrutable title in the dark for ever. It explains such a lot.

Seriously, however, I think that the gramophone people rather take it for granted that on reading their lists the public will take the trouble to hear all the numbers rather than to pick out those that appeal to them. And with a title of that description only the absurdity and apparent sheer ridiculousness of the title is apparent, until one has some inkling of what the bother is about. A little explanatory note on the list would do wonders in such a case.

Or do they rely on the record reviewers to spill the beans? If they do it is a wrong outlook, for reviewers cannot possibly review all the records they receive, and unless such a title is explained the public is more than likely to pass the number by as sheer absurdity. That is why I wrote as I did about it last time. The record is one for children only, in my opinion, and as such it should have been suitably labelled so that prospective purchasers get the right impression. Far better sales would accrue, I am sure, if it had been so designated.

E. D. R.

COLVERN SHORT-WAVE COILS

ALTHOUGH they would appear to be considerably simpler propositions than the medium and long-wave types, short-wave coils are really much more difficult to produce.

At least, it is more difficult to preserve uniformity in their production. There are relatively few turns of wire needed, but those few turns have to be disposed with very great care. They have to be separated from each other in order to keep their self-capacity down, and they cannot be solidly wound and mutually self-supporting.

They must also maintain their positions. One of the nightmares of the short-wave enthusiast is to develop loose turns on his short-wave coils! An odd turn or two coming loose on a medium-long coil, even if this could easily happen in the simpler construction it is possible to employ for such, is not likely to affect the characteristic of the coil to any appreciable extent.

But on the short waves the wave-range and efficiency of a coil can be seriously upset by the shifting of merely a turn or two.

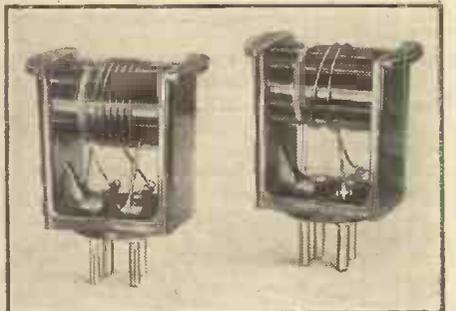
There are other aspects of short-wave coil construction which need the very closest attention if good results are to be obtained and maintained.

High Grade Former.

Dielectric losses must be reduced just as far as is possible. This is generally done by using ribbed formers on which to wind the wire, so that the wire for the most part is separated by air from the main bulk of the supporting former.

All this and various other requirements indicate that the manufacture of short-wave coils can successfully be undertaken only by those who are well

HIGHLY EFFICIENT



These Colvern short-wave coils have been used in the "Silver King."

versed in the technique of the short-wave craft, and in addition are coil experts and specialists.

Messrs. Colvern, Ltd., of Romford, answer the description, as "P.W." readers will know, and an examination of their new short-wave coils fully confirms the fact.

Indeed, we feel able to state definitely that these are the neatest and best short-wave coils we have yet had the pleasure of examining and testing.

Often a short-wave coil tends to be a rather large and clumsy component. The Colvern short-wave coil is small and neat. The ribbed former is only one inch in diameter and but little longer. It is carried in a distinctive and polished bakelite-moulded frame.

Satisfactory in Every Way.

The turns are wound on tightly, and as an added preventive of loosening they occupy small niches in the ribs so that their separation is fixed and permanent. The reaction winding occupies its own niche, and in this case air separation of the turns is not required.

Four pins in valve-base formation are fitted so that the coil can be plugged into a valve holder. Thus they are easily interchangeable.

The range of Colvern short-wave coils comprises three coils, giving complete coverage of the whole working band from 14 to 100 metres.

This set of three coils retails at 12/-, and in our view they comprise very good value for money, in view of their precision design and construction.

We have tested them carefully and find them to be absolutely satisfactory in every way. The reaction turns are just right for smooth and effective regeneration.

But in that we are specifying these Colvern short-wave coils for our great new Jubilee set, The "Silver King," it will be clear to all that we consider them to be above criticism.

YOUR OUTPUT CIRCUIT

(Continued from page 59.)

To find the correct ratio mathematically we must know two things:

(1) The optimum load required for the circuit; and (2) the impedance of the L.S. winding (usually given by the makers as "so many ohms at 1,000 cycles").

The ratio is then found by dividing (2) into (1) and taking the square root of the result.

Expressed as an equation, the process is as follows:

$$\text{RATIO} = \sqrt{\frac{\text{Optimum load (ohms)}}{\text{Speaker impedance (ohms)}}}$$

Here is an example using figures that provide simple calculation:

Supposing the optimum load of our output valve as given by the maker's instruction slip is 1,200 ohms and that the impedance of our speech coil is stated to be 3 ohms at 1,000 cycles per second.

Then the ratio of the output transformer that will match up speaker to valve will be:

$$\sqrt{\frac{1,200}{3}} = \sqrt{400} = 20$$

That is, a ratio of 20 : 1.

In all probability, however, the calculation will be a little more involved when practical values are taken.

A NOVEL RADIO-RHYTHM SCHEME

ONE of the best ideas I ever had has not yet seen the light of day in a big way. Or, I should say, has not illuminated the night. I called it "Rhythmi-Colour," and it was a most spectacular scheme, although I say it.

There were a number of different coloured electric lamps giving an overall light sufficient to illuminate a ballroom. By means of a special rotating resistance-switch affair the light changed colour (not intensity) in a subtle, very smooth manner, in a rhythm exactly corresponding with that of the music played by the band.

The tempo of the apparatus was controlled by the conductor, and, incidentally, it tended to regularise the playing of the band. Made the wagging of a baton or hands quite unnecessary for that purpose.

I can hardly hope to be able to convey an impression of the striking effect obtained with visual rhythm added to acoustic rhythm. Intoxicating! Rhythm gone mad, if you like!

Sad to relate, the original Rhythmi-Colour rheostats and other of its bits and pieces to-day do mundane duties as set-test current adjusters and what not.

Try it Yourself.

But during the Rhythmi-Colour experiments I adopted an expedient which will amuse some of you and slightly horrify others. Having no automatic gramophone to play dance music constantly, and there being a shortage of radio dance music at convenient hours, I devised a little piece of apparatus which changed everything to "jazz."

It didn't matter what the programme item was that happened to be on—chamber music, symphony, whatever it was when it left the B.B.C.—it arrived transformed into "red-hot rhythm."

How was it done? Easy. There was a rotating contact, driven by a small mains motor, which walked around a special resistance. This made the music rise and fall in loudness. Gave it a defined rhythm, in fact. The rise of loudness corresponded to the beat of whatever I wanted it to be—quick-step, fox-trot or, in the case of less uniform rhythm, there were repeated series of correctly spaced beats accentuated and unaccentuated.

Apart from being extremely useful for my experiments, I found it most intriguing to hear ponderous "concert" stuff jazzed up for dancing. You can try it easily enough if you have an easy, free-working volume control. Turn the music on full blast, and then with quick twists of the wrist make the volume rise and fall to fox-trot tempo.

I pass the idea on to the experimenter who may require constant rhythm, perhaps for television experiments.

G. V. D.

"MAN-MADE" STATIC

Random Technicalities of Interest to all Readers.

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

THE subject of interference entering the set via the earth lead or the mains leads is one which is continually cropping up. I have recently had several letters from readers on this point, and in answer to many queries I think perhaps a few notes on the various types of interference and the methods for overcoming them may be useful.

Different Types.

The cases where the use of an earth connection to a receiver increases the amount of interference may be divided roughly into three classes, namely those in which there is:

- High-frequency interference from near-by machinery.
- H.F. interference falling on earth lead.
- Low-frequency interference entering the receiver via the mains.

In greater detail these are as follows:

Electric Machinery.

(a) Electric machinery may create two forms of interference—first, symmetrical (i.e. H.F. currents passing along one supply lead and returning by the other); or, second, unsymmetrical (consisting of H.F. interference passing out along both mains together and returning via the earth). In the latter case the earth is a necessary part of the H.F. circuit; this can be shown by isolating the frame of the machine from earth, when little or none of this form of interference will be receivable.

The source of interference may be looked upon as a small transmitting station, using the mains wiring as the aerial; it will obviously transmit less interference if it is not earthed and less interference will be picked up by a receiver near by that is not earthed. This follows because the earth on the receiver is part of the path taken by the interference that is radiated on to the aerial, on its way back to the source.

Pick-up on the Earth.

In a similar way we can take the view that this form of interference is "injected" into the earth at the source and passes up the earth wire of a receiver the aerial of which will provide a path (by capacity or radio pick-up) back to the source.

In the case of (b), where H.F. currents are actually picked up by the earth lead, this can be proved by plugging the earth wire into the aerial socket of the receiver. Often different types of interference can be picked up, and the interference may be more pronounced than when an open aerial is used. This shows that the average earth is not necessarily at true zero potential and that a listener's earth lead can have an "effective height," just as in the case of the aerial.

(Continued on next page.)

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"MAN-MADE" STATIC

(Continued from previous page.)

Earth Resistance.

The longer the earth lead and the higher its resistance, the greater is the amount of picked-up interference, especially if the lead passes near any conductors of interference. Thus it is of great importance that the receiver earth be kept as short and of as low resistance as possible.

"Rough" D.C. Mains.

With case (c), when a receiver is operating from "rough" D.C. mains (such as obtained from mercury-arc rectifiers), the use of an earth may introduce more low-frequency hum or "splutter." This is no doubt due to earth currents, but is not troublesome if sufficient smoothing is included in the supply to the receiver.

These observations on forms of interference which are more noticeable when an earth connection is used tend to indicate that the earthed point on a receiver is not such an absolute datum line of high-frequency voltages as is commonly supposed. The point is that almost all radiation is accompanied by a reaction in or upon the earth.

What to Do.

One of the most interesting letters I have received on this subject is from Messrs. Belling & Lee, Limited, who, as you know, are specialists in the design and manu-

ultra-short waves. This aerial is about 10 feet long and is intended to be erected high up, outside the house, but it can be connected in almost any position in which an ordinary aerial is used, and can even, at a pinch, be used indoors. Naturally, better strength of reception is obtained, as with the reception of sound broadcasting, if the aerial is used under the specified conditions. The sets will be so arranged that, once adjusted, it will only be necessary to switch on to receive the pictures, with synchronised sound.

A Convenient Cabinet.

The whole arrangement packs into a cabinet much about the same size as a conventional present-day radiogram. The picture obtainable is about six inches square or slightly larger.

People often ask me whether it will be possible to see these television pictures in an ordinary lighted room or whether it will be necessary to have the room darkened, as with a cinema show. The answer is that it is quite easy to see the pictures, as a rule, in a room that is reasonably lighted—lighter than you would have it for a cinema show—although, of course, you would hardly expect to see the picture in full daylight. A good deal depends upon whether what light there is falls directly upon the television screen. Provided the light does not fall directly upon the screen, it is possible to have the room quite well lighted without interfering seriously with the visibility of the pictures.

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facture of apparatus for suppressing disturbance, and the foregoing notes are to a large extent based on information supplied by them, which they have acquired from long experience of this field.

Those of my readers who are troubled with interference of any of the types mentioned would do well to get in touch with Messrs. Belling & Lee.

Television Receivers.

I understand that several firms in the radio trade are now making active preparations for marketing television receivers at popular prices as soon as the new high-definition service begins. One of the leading firms, of course, will be the Baird people, who have already two types of set in preparation. These sets can receive television such as that which is being experimentally sent out from the transmitter at the Crystal Palace.

There will be a mains connection for power supply and another connection to a short aerial, of special form to receive the

Transmitted and Reflected Light.

The reason for this is that the television pictures are seen by transmitted light, whereas a cinema screen is viewed by reflected light. Perhaps it is not strictly accurate to say that the television pictures are seen by transmitted light, but something of the same kind of effect enters into it and accounts for the fact that they can be seen in a lighted room.

The size and brilliancy of the pictures can be instantly adjusted by means of the control knobs. The wavelength of reception can, of course, be adjusted in the usual way, and, moreover, controls are provided for adjusting the receiver for different definitions and for different numbers of pictures per second—the "scanning frequency" and the "picture frequency," as they are called.

What Will the Price Be?

As regards price, it has been freely stated that sets will cost about £50, but it

(Continued on next page.)

"MAN-MADE" STATIC

(Continued from previous page.)

must be remembered that until the sets are being actually made and sold in quantities it is almost impossible to know what the lowest economic price will prove to be. It may be that sets will cost as much as £80 at first, but after a time this will undoubtedly be reduced, just as it was with radio receivers in the early days. The figure of £50, to tell you the truth, has always struck me as rather an optimistic one, but many people think that before television sets have been long on the market we shall see them selling at prices as low as £30.

Using the Space Charge.

You know that the electrons passing from the filament or cathode of a valve towards the anode will, in certain conditions, form a "cloud" or space charge of electricity. This was for a long time regarded merely as a nuisance, and means were introduced to get rid of the space charge or prevent it from accumulating, so that the valve behaved itself in more regular fashion.

More recently, however, methods have been found for making use of the space charge and turning it to account. In the new Osram N40 valve, for example, which is an output tetrode valve, the negative space charge is used for the purpose of repelling the secondaries produced at the anode and preventing them from reaching the other electrodes. In this way it becomes unnecessary to use a suppressor grid.

New Output Pentode.

An output pentode valve having a high slope is the Osram N41, which has a 4-volt heater taking 2 amps. This valve has the special feature that it requires only a very small input grid voltage, whilst giving a high undistorted power output. It bears a general similarity in characteristics to the N40 just referred to above. The amplification factor, incidentally, is over 200. The N41 is available now, but the N40 is, I believe, in the experimental stages.

Loudspeaker Extensions.

I have had occasion more than once to remark upon the very high qualities of the Stentorian loudspeaker, and I mention it again now—the W.B. "Stentorian Baby"—to point out how useful it is for "extension" purposes. With this object in view it is provided with a number of sockets, and when connection is made to these different sockets, by means of a plug, different transformer ratios are obtained. This makes it very handy when the loudspeaker may follow different types of pentode or triode output valves. The actual ratios on the "high" side are about 100, 75, 55, 40 and 30 to 1 respectively, giving the equivalent of impedances varying from about 35,000 ohms down to 3,500 ohms. On the "low" side (to be used when an output transformer is fitted to the receiver) the equivalent impedances are 11, 6, 3½, 2 and 1 ohm respectively.

Mastless Aerials.

There is quite a fashion just lately in "mastless" aerials. These take the form of a compact type of aerial or collector,

which, instead of being mounted on a mast, is secured, by means of a metal bracket, to a chimney stack or to a wall of the house, being connected there by a suitable down-lead to the set.

The Cage Pick-up.

One of the latest is the Golden Arrow, which consists of a kind of "cage" containing 30 ft. of continuous wire, completely insulated, with 40-ft. lead-in. The "cage" is mounted on a short vertical post, which is secured into a porcelain insulator, the latter being in turn supported in a metal bracket or stay for attaching to the wall.

The mastless type of aerial obviously has the advantage of being much more easily erected than one requiring a mast, and, further, it is very convenient for flat-dwellers. It gives something of outdoor aerial advantages with indoor aerial convenience.

Photo-Cells.

Photo-electric cells are now finding increasing uses for commercial and industrial purposes, and it may be said that they have long since passed out of the purely laboratory stages. Apart from their main uses for television and talking pictures, they are also used for purposes of alarms, counting devices, grading coloured goods and numerous other purposes. Until recently information on the various types of photo-cell and their applications was somewhat scattered, but latterly the information has been collected and co-ordinated in a number of textbooks. One of these, which I have just been reading, is "Photo-electric Cell Applications," by Walker & Lance (Pitmans), and this forms a very useful and practical handbook for those of you who wish to take this subject seriously. The uses of photo-cells in connection with television, advertising, cinemas and phototelegraphy are fully described, and a mass of other information is collected together which is most useful.

Interest in Short Waves.

Up to now interest in short-wave reception has been confined to a relatively small percentage of listeners—or experimenters—although this number has been steadily increasing. I think, perhaps, this is due to the comparative difficulty of getting really reliable reception on the short-wave stations. But the coming of high-definition television—and sound—on ultra-short waves has already given a fillip to this type of experiment, and the interest shown in the very high frequencies has increased enormously during the past few weeks.

Value of the Superhet.

For short-wave telephony reception there is nothing to beat the superhet type of receiver. The trouble where an ordinary straight receiver is used is that you have to keep the circuit on the verge of oscillation the whole time in order to get suitable reception. If the first valve is the detector this becomes specially troublesome owing to the fact that there may be points in the tuning range at which no reaction can be obtained. A stage of screened-grid high-frequency amplification will, however, get you out of the difficulty, the stage being untuned.

A TELEVISION LIGHT FILTER

Simplicity is the key-note of this useful idea.

AMATEURS who are conducting experiments on television principles often feel the need for a light or colour filter which, by being placed in the path of the beam of light impinging upon the selenium or photo-electric cell, will alter the characteristics of the light rays.

Orthodox colour filters, such as those which are used in photography, are rather expensive articles. They have, however, the advantage of giving very pure colours to the light.

Addition of a Lens.

For experimental purposes a very efficient light filter can be prepared by taking a flat-sided bottle, one of those, for instance, which has contained cosmetic or medicinal preparations, and by filling it with coloured liquid.

If a small bull's-eye lens is attached to the outer side of the bottle by means of two pieces of plasticine or adhesive wax a light-condensing as well as a light-filtering system will be formed.

In all optical experiments connected with the action of light on selenium or photo-electric cells one of these easily made gadgets will be found in practice to be of much use. Water-colour paints or coloured inks are ideal for preparing tinted liquids. J. F. S.

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