

THE B.B.C.'s NEW MICROPHONES (SEE PAGE 453)

Popular Wireless

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 ELECTRON
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AND TELEVISION TIMES

No. 683.
 Vol. XXVII.
 July 6th, 1935.



Special
**Short-
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Number

Including



**How to
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The

"SIMPLEX" S.W. TWO

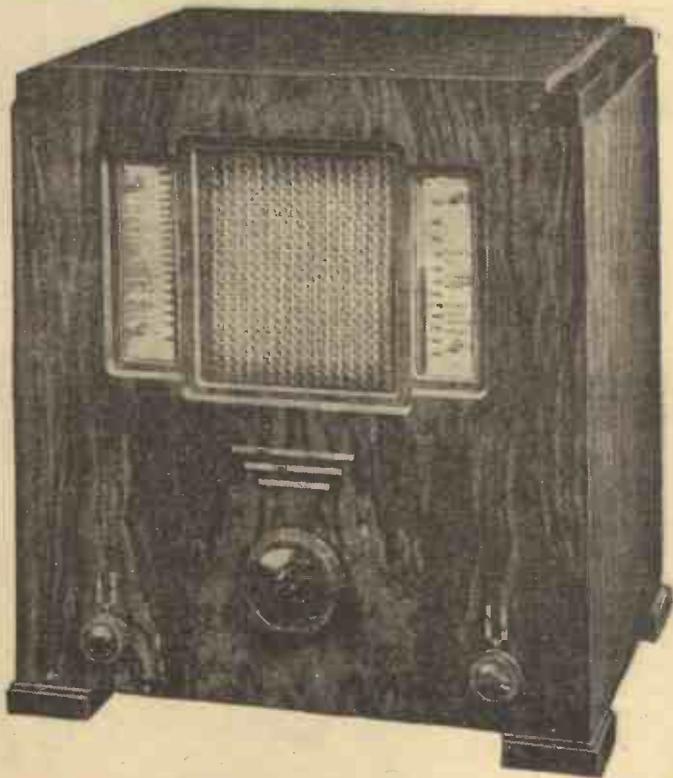
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TECHNICAL EDITOR : G. V. DOWDING, Associate I.E.E.

THOSE PIPS
RADIO AID
JUNGLE "WIRELESS"
MORE PIANOS

RADIO NOTES & NEWS

LESS BALLYHOO
WHO IS "W.L.S."?
S.S. TETELA
"MEDIUM RADIO"

Other Countries' Television.

FOLLOWING the opening of a public television viewing-station in Berlin, the German Post Office decided to extend the experiment, and Potsdam was selected as the site. Another viewing-station has been opened there, in the P.O. administration building, the distance from the Berlin transmitter being about thirteen miles.

In the U.S.A. the Radio Corporation of America is preparing to spend one million "dollars" in the near future, "to lift television out of the laboratory into the field." To get over the difficulty of covering such a big country with short-range television transmitters, the engineers have proposed and designed special telephone lines. The technical difficulties have been overcome, but the Wall Street difficulty ("Who's going to pay for it?") is so far insuperable.

Time Please.

ANY stick is good enough to biff the B.B.C. with, they say, but some of these attacks on it are so patently unfair that they defeat their own purpose.

This latest complaint that the Six Pips from Greenwich are sometimes late, for example—who believes that kind of tosh? If there is one shining example of veritable truth in this wicked world, is it not embodied in the Observatory that standardised time and longitude for all mankind?

By good luck we listeners are permitted to hear the heartbeats of the master clock, corrected to hairsbreadth accuracy by the sun and stars themselves. Poor poons who find this not good enough should use a sundial—for a headstone!

The Flying Doctor Again.

THE Australian Inland Mission reports another striking instance of its radio-aid service. A woman at Alroy cattle station, isolated in the Northern Territory, and without communication with any neighbouring town, became seriously ill. A neighbour rode seventy miles to Rockhampton Downs, where a message describing the

case was tapped out on the pedal-transmitter wireless.

The appeal was heard by a flying doctor, 400 miles away, and early the following morning the Mission's aeroplane flew to the patient, and transported her to Camoweal, where an operation was performed.

The Inland Mission now has thirty sets of these pedal-transmitters at key points in Queensland and Northern Australia. Good work, indeed.

ON OTHER PAGES

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Nature's Wireless.

TAKING up my question as to how "wireless" communication is achieved in the apparatus-free jungle, a New York reader of "P.W." asks if I have ever heard of Charles Kellogg, of Morgan Hill, California.

Charles, it seems, has developed an

inaudible "voice," vibrating on frequencies far too high for the civilised ear, but distinguishable at great distances by birds and denizens of the wild. On one occasion, it is said, the vibrations of his "inaudible voice" were broadcast, and "extinguished a two-foot gas flame at a distance of forty miles." Interesting as this may be, I hold it is not admissible as evidence, the broadcasting and the gas flame being much too modern to count as Nature's wireless. So Charles is disqualified, and the mystery of the wild man's "wireless" communication in the jungle is unsolved.

Down Under, Too.

OUR own changeable weather is merely one sample of a bad lot, it appears, for New Zealand recently experienced its worst recorded telegraphic dislocation, due to violent snowstorms and other meteorological unpleasantnesses.

The telegraphic communications between North Island and the Otago centres in South Island went west, so an amateur Wellington wireless station had to step into the breach with news summaries for the benefit of the Otago newspapers.

It looks as though the Governments of the Empire ought to start officially blessing the radio amateurs soon, for their importance [in emergencies has for too long been underestimated.

"This Is the Note."

WHAT'S this I hear? What's this? After all the moans and groans about wireless ruining the piano business, here is a gentleman standing up in the Peebles Hotel Hydropathic—almost sacred precincts—and hailing radio as a piano trade reviver.

This unimpeachable prophet of piano-boom is no mere guesser, but a man of standing. He is the President of the Scottish Music Merchants' Association ("noon else") with all the trade crotchets and quavers at his finger-tips. In his presidential address he went so far as to say that it was anticipated that the 1935 output figures might be double those of 1932.

(Continued on next page.)

A WONDERFUL PERFORMANCE



This interesting photograph has been sent to us by McMichael Radio, Ltd., and shows one of the firm's standard portable sets in action on the "Flying Scotsman" during the Derby broadcast. Six sets were used in all—three on the "Up" and three on the "Down" train. Perfect reception was obtained throughout, the result of the race being printed on cards and distributed to the passengers on the trains within a few minutes of the result being known.

THE SPEAKER WHO HEARD HIS OWN BROADCAST

Six-Minute Limit.

MAY I step aside a few lines to thank Mr. T. J. Sinfield for his recent interesting contributions to my scrapbook? He sent no address, but some enlightening tit-bits about the progress of radio in the U.S.A. It seems that the Columbia Broadcasting System, nauseated by the "buy-this" and "buy-that" of too-enthusiastic advertisers, is curbing the amount of advertising mentioned in the network broadcasts.



After 6 p.m. the firm that sponsors the programme must confine its commercial announcements to a maximum of ten per cent of the total broadcasting period. So in an hour's concert the U.S.A. will in future get only six minutes of comfortable footwear, slumber suits, hair-livener, or whatever the commodity may be that inspires the programme.

Why not abolish it altogether, ye New Dealers of the West?

U.S.A. on One Valve.

ALTHOUGH I am still getting reports of remarkable long-distance crystal reception, I find there are not many readers who can claim over 1,000 miles.

With a valve, of course, it's a different story. And in reply to a Somerset reader, I gladly set on record my own best one-valve result on medium waves. This was Schenectady, U.S.A., which came knocking at my aerial one night about 2 a.m., and nearly knocked me down with surprise! At the time I was living in Essex, but for a few days it felt like Heaven, for 3,000 miles or so on a one-valve set was no sneezing matter in 1925, I can tell you!

Short-Waves Advance.

THIS revival of general interest in short waves that we hear about is certainly reflected in my recent correspondence. In the first three months of this year I had more letters on the subject than during the whole of 1934—and that's saying a-plenty, for your S.W. fan is a great writer of letters and dropper of post-cards.



Talking about that, may I remind all the low-wave-length wallahs that when writing *technically* on the behaviour and misbehaviour of short waves the "P.W." party concerned is *not* your one and only "Ariel," but a certain chieftain called "W. L. S." I cannot give you his name—that's an Editorial secret. But if ever you meet a very short, fat chap, who burns midnight oil by the gallon drum and hath no language but Q S L—that's *not* him!

National Police Radio Scheme.

IT was years ago that British police radio first crept into the news, and since then it has fallen to my lot to record sporadic progress all over the country—"a chick-chick here and a chick-chick there." Now comes the important news that local efforts are all to be merged into a national system, under Home Office direction.

In England and Wales there will probably be eight areas, the centres being London, Manchester, Birmingham, Liverpool, Nottingham, Bristol, Wakefield and Newcastle—each with a powerful radio transmitter. Through these centres every region will be kept in touch with every other, and the radio-equipped cars, wherever they speed,

BROADCASTING BREVITIES

A programme entitled "Sedgemoor" will be broadcast on July 9th. This will be a reconstruction of the Duke of Monmouth's ill-fated attempt to seize the throne of England, which attempt culminated in the Battle of Sedgemoor on July 6th, 1685. This battle was the last battle to be fought on English soil. The dramatisation of this tragic affair has been written and will be produced by Felix Felton.

On July 9th, Midland listeners will hear a dramatisation of Scott's novel, "Kenilworth." Phillis Bowman, who has made the adaptation, is not new to writing for radio; she was the author of a strikingly original sketch called "How very Bemusing," which Martyn Webster produced last year.

There will be about a score of episodes in this version of "Kenilworth," and the cast includes Stuart Vinden, as the Earl of Leicester; Doris Nichols, as Queen Elizabeth; and Valerie Lark, as Amy Robsart. Mr. Vinden played Charles II in "The Royal Miracle," which was broadcast on Royal Oak Day. The production of "Kenilworth" is by Martyn Webster.

A non-stop musical show, in which old ballads will be heard in new settings, will be given on July 13th for Welsh listeners. The artists will be Mary Maddock (soprano), Haydn Adams (tenor), Mai Jones (piano), and the Cardiff Lyrian Singers.

will always be linked with radio headquarters.

There are about one thousand police cars now on the roads, and the radio-linkage scheme will probably result in a large increase of police mobile forces.

"Tetela" Ahoy.

BELAY there, my hearties, and stand by to meet a new chum—the 2nd officer of S.S. Tetela. His address is "Atlantic Ocean," his hobby wireless, and his heart must be of gold, for he comes down off the bridge and writes me a letter that would charm the cardiac cockles of any real radio man.

And what a life he's led! Bitten by the radio bug in 1924, he got crystalitis, galloping valvemania, and radio hallucinations in rapid succession. Loudspeaker fever seized him in 1926. He had two or three years of circuit spasms, after which shortwaveitis stole his sleep, and then in 1931 he got married. (Apparently to a close relation of Arieline herself!)

He now runs an all-mains universal 5-valver with S.W. converter, and his chief trouble is due to the "radio-sharks" on board who pinch his S.T. Radio Manual every time he goes on deck!

Many thanks for your letter, "Tetela," and *bon voyage*.

Blattnerphone Psychology.

THAT'S a good yarn about the nervous radio lecturer who had a presentiment that when the time came to broadcast he would spoil a fine talk by microphone fright. The officials, pooh-poohing this idea, invited him along to the studio for a practice run; and knowing that nobody was listening he was as right as could be.

But when the great moment arrived on the day of the broadcast, he went all to atoms and couldn't say a word. So a polite official gave him a seat in the studio, and turned on a loudspeaker. The astonished nervous wreck then heard his own voice confidently announce and deliver the talk—the engineers had made a Blattnerphone record of the trial run!



Suppressor Aerials.

THE enormous power of the Cincinnati station—500 kilowatts, or ten regional rolled into one!—has not proved an unmixed blessing.

It was found that Cincinnati's far-flung programmes were spoiling the far-off Toronto broadcasts on the same wavelength. So Cincinnati had orders to stop this aerial trespassing.

The engineers, who had put their backs into distributing those 500 kilowatts, were nothing daunted by Toronto's demands. Between their city and Toronto they rigged up a kind of dummy aerial, and energised this from the main transmission in such a way that a silence zone was created—an aerial backwater in which Toronto listeners heard again the untroubled ripples from their local station. The device is called a suppressor aerial, and European sufferers are already hankering after it.

Amusing Slips.

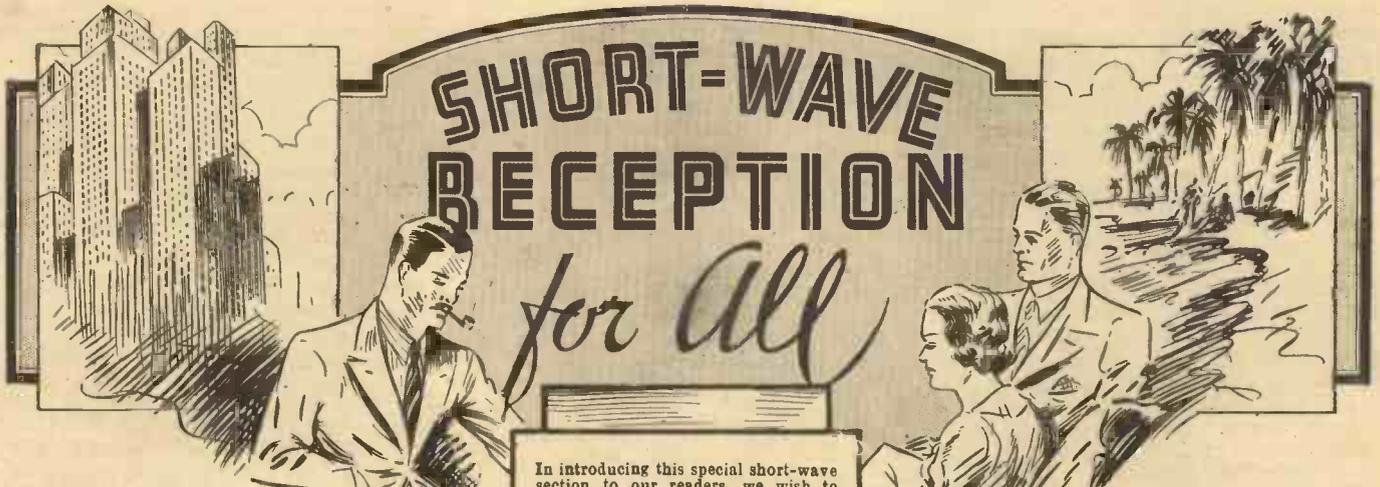
SHARP-EYED readers who delight in misprints will be amused at these which have recently come to hand.

Not long ago the readers of one technical paragraphist were astonished to learn of an amplifier loud-speaker combination in which "attack was good, but not up to push-bull standards"!

I am indebted to A. T. B., of Battersea, for pointing out another amusing slip, in an advertisement for bicycles. This describes a hot-stuff sports-roadster fitted with "medium radio" gear. It's good to know that car radio is not alone on the road, A. T. B.—and, by the way, what nice initials you've got! "A. T. B. of Battersea" trips off the tongue like a lyric.



ARIEL.



SHORT-WAVE RECEPTION

for All

SHORT WAVES are peculiar things — in some ways almost as peculiar as radio enthusiasts themselves! Discovered not much more than twelve years ago, they have not stood still for one moment ever since; nor do I imagine that they will stand still during the next twelve years.

Short Waves as a Hobby.

They are radio's breeding-ground for new theories and new inventions, and they are the magnet which infallibly attracts the man who wants to make radio his hobby.

Why is it that more and more people every week are turning to short waves as a relief from the monotony of their ordinary "radio existence"? Simply because there is a definite limit to what one can do on the broadcast wavebands, whereas with short waves the limit is the sky!

This special Short-Wave Number of "P.W." has been planned largely for the purpose of bringing to your attention the fact that you are missing half the enjoyment that you can get out of radio if you ignore this branch of it.

Nobody is going to ask you to give up listening to broadcast programmes, and to spend your evenings scratching round after weak signals with a pair of phones on. Far from it—short-wave reception is something to be added to the enjoyment that you already derive from radio.

Recapturing Thrills.

Suppose we take a specimen reader and examine him. You, sir, sitting in the corner of the 8.24 from Balham—let's have a little talk with you, please! Did you take up radio, originally, as a hobby? Good; I hoped you had. It was a thrilling business in the early days, wasn't it, building each new set as it came out, and crowing over less fortunate neighbours who hadn't yet heard, for instance, of screened-grid valves? Yes, I remember it all right.

Well, what do you do nowadays? Listen-in? (I thought so.) You found that when you had built or bought a really good broadcast receiver, there

In introducing this special short-wave section to our readers, we wish to emphasise the fact that short-wave reception is a fascinating branch of radio in which everyone can take part. Many listeners are quite unaware of the vast potentialities of these low wavebands on which some 200 broadcasting stations are sending out programmes every day of the week. And yet it is possible to pick up a goodly number of these programmes on a simple two-valve set, often at a strength sufficient to work a loudspeaker. In the following pages our popular contributor "W. L. S." deals comprehensively with short-wave reception, and whether you are an expert, a novice, or a reader who has never before tackled this particular field of radio, you will find the whole story put forward in an interesting and understandable manner.

wasn't much more you could do, so you have gradually developed into a "broad catcher." And so have many more like you, sir, so don't worry!

Well, how would you like to recapture the thrills of the "good old days"? How about a little work with screwdriver, pliers and the dear old kitchen table once again? (Never mind the wife—she's had plenty of peace the last few years!)

Right you are, then. Get down to the short waves right now. Don't believe a word that anyone tells you about them;

get right in and find out for yourself. You will find in this issue a very straightforward, simple two-valve short-wave set to start off with. If you have been reading "P.W." regularly for the last few years you can turn back and find something even simpler, or something more advanced.

A Trial At First Hand.

Whatever you do, though, it's about time you gave the business a trial at first hand. Build your own set, and if you don't get the charm and thrill of the old days of radio back again, I'll clear right out of radio and keep pigs.

Let us look at the thing from an unbiased point of view. Why are the short waves so neglected? Well, for one thing they're the newest branch of radio, with the exception of television. Next, they are still in a constant state of change and development. Lastly, few firms turn out complete short-wave receivers, and those that do hardly advertise them at home, since most of their sales are overseas.

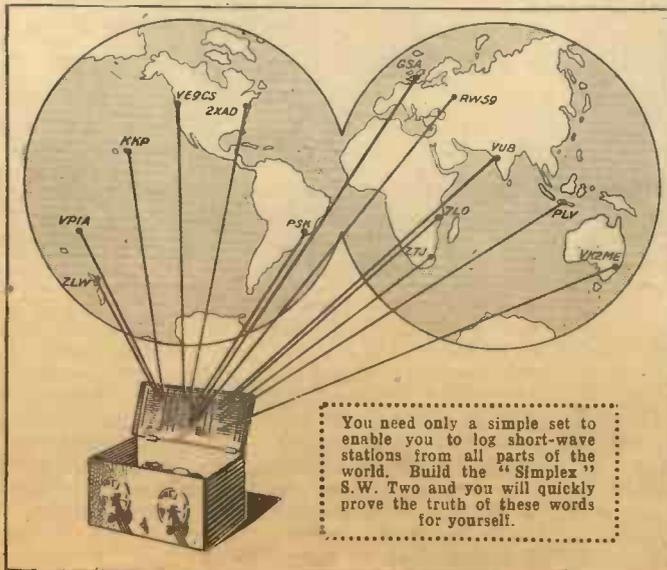
The plain fact of the matter is that the ideal short-wave set is a far more simple affair than the broadcast receiver of 1935. It hasn't yet been invaded by double-dial triodes, A.V.C., silent tuning, tone control and all the rest. A short-wave set that will give really excellent results is still as simple as the kind of broadcast receiver you used to build in 1927, when Europe wasn't just a forest of aerials with 150 kilowatts in them.

Experimental Work.

Furthermore, short waves lend themselves to quite a lot of experimental work of what I call the "unskilled" type. There aren't many home-designers of broadcast receivers who can claim to beat the commercial designers on their own grounds. I doubt whether there are many short-wave enthusiasts who would have the temerity to make the same claim; but they do get results that make the commercials sit up and think.

Even nowadays one hears almost every month of an

YOU CAN RECEIVE THESE STATIONS



You need only a simple set to enable you to log short-wave stations from all parts of the world. Build the "Simplex" S.W. Two and you will quickly prove the truth of these words for yourself.

(Continued on page 461.)

I AM going to start at this point by imagining that my opening talk has inspired you to take the plunge and to join in with the band of short-wave listeners. It isn't a very frightening plunge, after all, because you have everything to gain and nothing to lose by it.

You need not give up a single thing that you have at present; probably you have enough spare parts already on hand to make quite a good short-wave receiver. On the next page you will find a description of the simplest type of short-wave set, which can be built and operated by anyone.

All that you need is a little spare space on which to stand it, an accumulator and an H.T. battery, a pair of headphones, and a good aerial and earth.

If you haven't already an outside aerial I rather advise you to put one up. I don't mean by this that you have got to buy a 40-foot mast and an incredible quantity of 7/22's, together with dozens of insulators. That type of aerial, fortunately, has gone out of fashion.

A Large Aerial is Unnecessary.

If, however, you have a tree in your garden it will be worth your while to get a rope to the highest point. If you haven't, a neat little 20-foot pole will be worth having. The aerial need not be more than 30 ft. in length, and certainly *should not* be more than 60 ft. Keep it as clear of all surrounding objects (including the house, and especially the gutters) as you can.

If you can't erect an outdoor aerial, an indoor one in the loft is a good plan, but you must keep the down-lead as clear of the walls as you possibly can. Failing a "loft" aerial, erect a single wire across the room in which you intend to operate the set. *Don't* take it all round the picture-rail unless you can keep it at least 6 in. cut from the wall all the way round. If you can't do that, it's best to keep to a single wire right across the centre of the room. You will get quite good results with it, although they will naturally be short of what you would expect with an outdoor aerial.

About the Earth.

The earth is a different business. Most short-wave sets work equally well with or without a direct earth connection. Notice that I don't say "with or without an earth." You can't avoid having an earth on a short-waver, because, at the high frequencies we are dealing with, the capacity of the set and batteries to earth may easily form a lower-impedance path than an actual wire, especially if the latter has to be long.

When we come to the set itself we have a bewildering variety of possibilities. You may start with a single-valver, or with a simple "Two" like the "Simplex,"

described in this issue. You may use an adaptor, either of the type that just uses the L.F. side of your broadcast receiver, or of the superheterodyne type.

The main thing to remember is that a *quiet* set is worth its weight in gold. There are very few short-wave stations or signals that are too weak to receive, but there are many which are sufficiently weak to be

taking part and has been the most successful receiving station in the Empire at logging and checking their call signs.

What is the receiver that has put him at the top of the list? A perfectly straight and simple two-valver—detector and one L.F. In the first place, it was based on a "P.W." design, although Mr. Allen has naturally developed it and brought it up to date along with the times. But there's an object lesson for you—one of the simplest possible receivers coming out top in the whole of the British Empire.

Furthermore, the location in which it is situated is far from ideal, with an electrified railway running at the bottom of the garden at a *higher* level than the aerial itself!

From all this you will see that "making a start" doesn't mean buying a tremendous lot of ambitious gear and moving to a house on the top of a hill. Short waves at the moment are improving steadily. Conditions vary from one period of the year to another, and also over a long cycle of eleven years.

Conditions are Improving.

We have passed the trough of this eleven-year cycle, and things are going to improve for about the next four years at least. Look at the set on the next few pages and at the short-wave station list farther on, and decide whether "making a start" is going to be worth while. I sincerely hope that you will decide that it is.

Plunging into short-wave work is like plunging into many things, including cold water! The first attempt is rather apt to result in a nasty fright, or, at least, a certain amount of discomfort or disappointment. Once that is over, the pleasure that you will derive from it will be immense.

I cannot possibly enumerate the things that elevate a short-wave enthusiast above his less fortunate brethren; he has some few thousands of stations to listen to, which are simply not available to the man who doesn't own a short-wave set.

Expense Slight.

The beauty of it all, of course, is that there isn't the slightest need to regard short-wave work as an alternative to anything else that you're doing. The initial expense is very slight, and you will have no extra upkeep costs, unless you're in the habit of throwing valves about.

This useful addition to your radio apparatus, and your radio experience, will give you unlimited pleasure, and the only fly in the ointment will be the sarcastic remarks of friends who have not taken the plunge. It's a remarkable thing that most people who really don't know anything about short waves will always go out of their way to "crab" them. Don't let *that* worry you—just go ahead.

Making a Start

Some practical hints on erecting an aerial and choosing the right type of set.

smothered in the "hiss" and "mush" generated by a noisy receiver. For this reason the man with a good pair of phones and keen ears will often hear, with his two-valver, stations that are lost to the owner of a ten-valve superhet. It all depends upon the angle from which you approach short-wave reception.

A big set will give you marvellous loud-speaker reproduction of the more powerful and better-known stations, but may easily put you at a disadvantage when you are out after the little chaps using 50 watts on the other side of the world.

The short-wave stations of the whole world are divided up into classes and allotted various wavebands for themselves. The broadcasting stations, officially, have to work in bands in the neighbourhood of 49, 31, 25, 19, 16, and 14 metres. The amateurs have narrow bands in the regions of 80, 40, 20, 10, and 5 metres.

Any ordinary set will bring in the whole lot, but it should be your first job to find

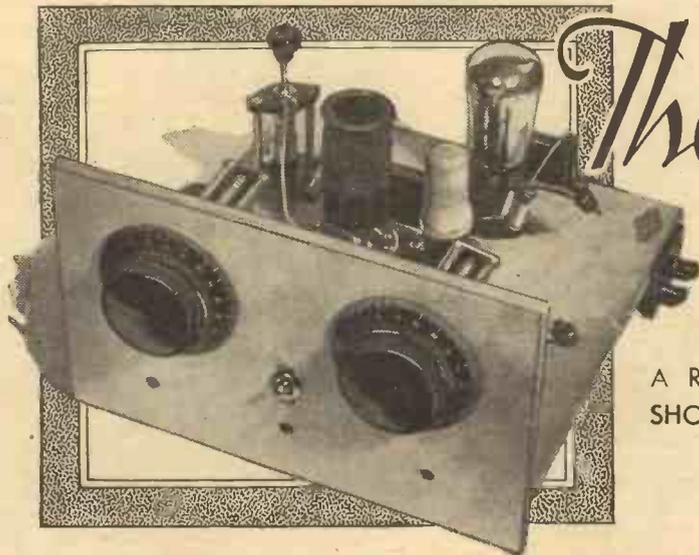
WINNER FOR TWO YEARS RUNNING



Mr. G. C. Allen at the dials of the receiver with which he has won the B.E.R.U. receiving contest for the last two years. The set is a simple detector—followed by one L.F. stage, with band-spreading.

your way round so that you know *where* to listen at any given time.

The photograph on this page shows Mr. G. C. Allen (BRS 250) at the controls of the receiver with which he has won the British Empire Radio Union receiving trophy for two years running. This means to say that during the annual B.E.R.U. contest, held in February, he has kept a watch on all the amateur transmitters



The "Simplex" S.W. TWO

A REMARKABLY EFFICIENT SET THAT WILL BRING IN SHORT-WAVE PROGRAMMES FROM ALL PARTS OF THE WORLD.

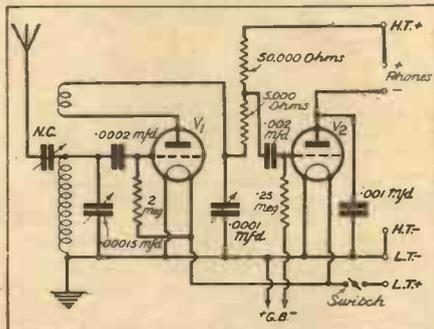
Designed and Described by "W. L. S."

SOME time ago, when the plans for this special Short-Wave issue were first being discussed, I visited the Editorial sanctum with the idea of settling the design of this receiver.

Should it be a big set or a small one? A cheap set or an expensive one? Complicated or simple? All these points were brought up, and, finally, it was agreed that as the main point of this issue is to bring the joys of the short waves to the notice of a new public, *simplicity* should be the keynote.

We have had lots of simple sets before,

RESISTANCE-COUPLED



The circuit is a straightforward two-valve arrangement consisting of a triode detector followed by a resistance-coupled L.F. stage.

and the old stagers who patiently wade through my writings each week, eagerly jumping on anything new and impatiently skimming over my advice to novices, may be a little bit annoyed. Let me reassure them.

"Anyone Can Make It."

First of all, this set is meant for the novice. Anyone can make it, and I am equally sure that anyone can get good results with it. But—to my own surprise as well as other people's—I find it is a better set than several more pretentious affairs that I have owned. It's just a kind of lucky strike, I suppose, but I have never before met a set that went off at the first test with such complete satisfaction and gusto.

I had intended to make this a kind of "Junk-Box" Two that anyone could make out of spare parts lying about the place; but I found that my own junk-box

had some rather good components in it, and I couldn't resist the temptation to use them rather than making it a real junk receiver.

If you read the article on "Making Your Own Short-Wave Components," however, there is no reason why you should not be able to make a highly satisfactory version of this receiver from the spare parts that you probably have on hand.

Four-pin Plug-in Coils.

The "Simplex" is a very conventional two-valve, using a triode detector resistance-coupled to an L.F. stage. Four-pin short-wave coils, fitting into a valve holder, are used, and may be home-made in accordance with the instructions given in the June 8th issue of "P.W.," some of which are repeated elsewhere in this issue.

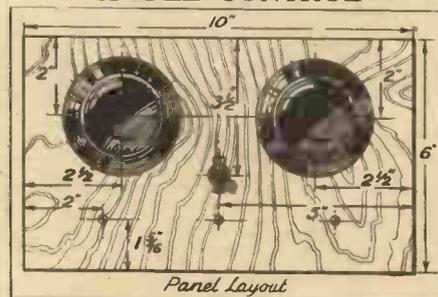
The layout is of the simplest possible kind, using a "Metaplex" panel and baseboard with most of the wiring carried out directly on top. Although the baseboard is raised an inch and a half from the bottom edge of the panel, no components have been mounted underneath; the leads to the terminals at the rear, however, go under the baseboard at the nearest convenient point, and are thereby kept out of the way of the more important H.F. wiring.

The circuit employed for the detector is the one that I invariably use for a set of this kind. It is series-fed, which does away with the need for a really first-class H.F. choke; the reaction condenser is arranged in such a way that one side is at earth potential; and the aerial is coupled through a small capacity to the live end of the grid coil.

The first point is important, the more so as it is now possible to use a resistance instead of an H.F. choke. The 5,000-ohm resistance, between the reaction coil and the 50,000-ohm anode resistance proper, serves to give a beautifully smooth reaction

control, completely free of those dead spots which sometimes appear when an unfortunate choice of choke has been made.

SIMPLE CONTROL

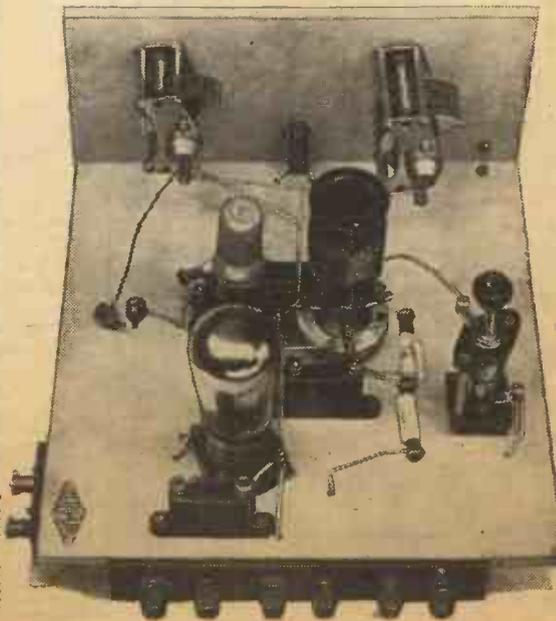


Simplicity is the keynote of the design. There are only two real controls, viz., the tuning dial on the left and the reaction dial on the right.

The second point implies that the reaction condenser can be mounted on the front panel without complications in the way of bushing, and that this control is (or should be) free from hard capacity.

(Continued on next page.)

EASY TO CONSTRUCT

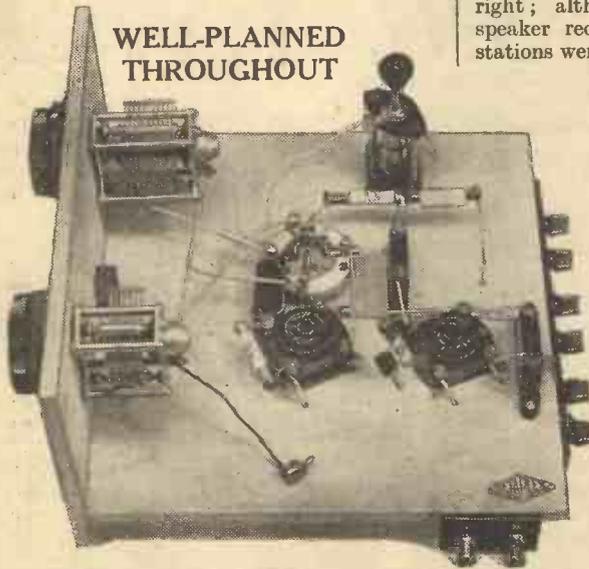


The layout is arranged to provide simple construction combined with the maximum efficiency. Note how the components are grouped so as to keep the lengths of certain vital leads as short as possible.

THE "SIMPLEX" S.W. TWO

(Continued from previous page.)

The capacity-coupled aerial, whatever we may find to say against it, is the only way out if we are to use four-pin coils; and,



WELL-PLANNED THROUGHOUT

The detector valve holder (V1) and the "neutralising" type condenser are mounted on small blocks of wood to keep them about a quarter of an inch above the metal-coated baseboard.

provided that we don't try to make the coupling too tight, it is absolutely satisfactory. Some people will tell you otherwise, but don't believe them until you have tried it for yourself!

There's not much more to say about the circuit; the L.F. part of it is quite straightforward, the purpose of the .001 condenser from the plate of the output valve to earth being to by-pass any stray H.F. that may possibly have got through as far as that. Such H.F. would show itself by "live" phone-cords, and a change in tuning when

hardly be suitable for a broadcast receiver, and would certainly lead to a loss of bass. These values are desirable in a set of this kind, however, since the detector will nearly always be operated in its most critical condition—on the edge of oscillation—and the amount of reaction applied will naturally result in a certain loss of "top" (or emphasis of bass, whichever you like to call it).

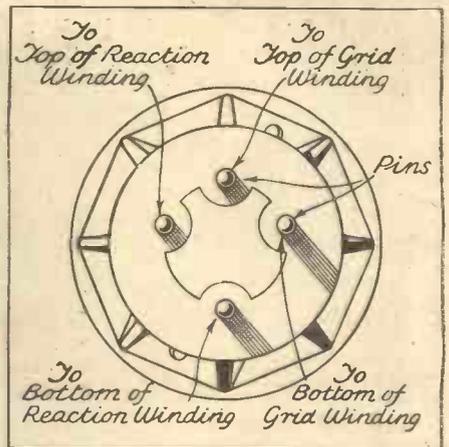
The degree of correction seems about right; although not intended as a loud-speaker receiver, several of the stronger stations were received on a speaker, and the quality was excellent. For headphones it is definitely just right.

An Important Point.

The small sketch shows the connections of the four ends of the coil windings to the pins on the base, and is drawn looking up at the base of the coil former from the bottom. The valve holder into which the coils are plugged is wired in circuit in such a way that the coil windings must be arranged in that manner. As it stands, the set will take Eddystone four-pin coils, but no other commercial four-pin

The wavebands covered by these three coils, with the aerial coupling condenser

THE COIL CONNECTIONS



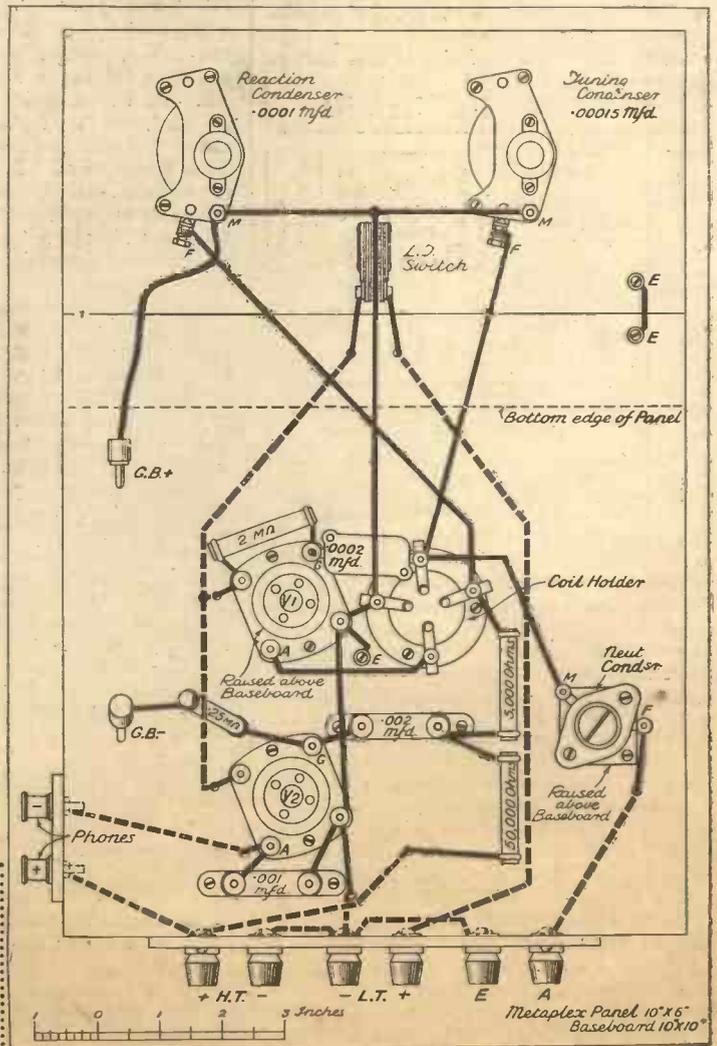
This diagram shows how the windings of the four-pin coils are joined to the pins on the base of the former. Full details of the windings were given in the June 8th issue of "P.W."

half way in, will be roughly 40-90 metres, 24-50 metres, and 14-25 metres.

If this is your first short-wave set, naturally the operation will seem pretty strange

(Continued on page 462.)

HOW THE SET IS WIRED-UP



coils can be used without an alteration in the wiring of the coil holder. This, of course, is most important, as any experiment with other makes of coils would probably result in a burn-out of some kind.

Turn Numbers.

The home-made coils, for covering all wavebands, must be three in number. The largest has a 12-turn grid winding and 7 turns for reaction; the next, 7 turns grid and 5 reaction; and the smallest, 3 turns grid and 3 reaction. For full particulars of the windings refer to page 353 in the June 8th issue.

Those wires which are shown dotted run under the baseboard which is raised 1 1/2 inches above the bottom edge of the panel. The photographs will help to make this point clear.

THE PARTS YOU NEED

- 1 .00015 and 1 .0001 slow-motion condenser (Polar Short-Wave Type "C")
- 1 neutralising condenser (J. B., Type 1050).
- 2 4-pin valve holders (Benjamin "Vibrolder").
- 1 valve holder serving as coil holder (Eddystone, Type 949).
- 1 .0002 fixed condenser (Dubilier, Type 670).
- 1 .002 fixed condenser (T.C.C., Type 34).
- 1 .001 fixed condenser (T.C.C., Type 34).
- 1 5,000-ohm, 1 50,000-ohm, 1 .25-meg. and 1 2-meg. resistors (Erie).
- 1 L.T. switch (Bulgin, Type S.80).
- 1 Metaplex panel, 10 x 6, and baseboard 10 x 10.
- 1 set four-pin coil formers (Eddystone or B.T.S.).
- 1 6-terminal strip and 1 2-terminal strip.
- 2 210HF valves (Cossor), or 1 HL2/K and 1 HL2 valve (Marconi or Osram).
- 2 wander plugs.
- 1 coil B.R.G. "Quikon" connecting wire flex, screws, etc.
- 1 2-volt accumulator.
- 1 100-volt H.T. battery.
- 1 4-v. grid-bias battery.

they were grasped in the hand. There was no trace of this effect when the set was put on test.

The coupling values of .002 for grid condenser and .25 megohm for grid leak would

Twelve years of ADVANCEMENT

WHEN we look upon the universal use of the short waves nowadays it seems impossible to believe that they were really "discovered" only about twelve years ago. Of course, Hertz's original experiments, right back in the very infancy of radio, were actually carried out on short waves, but, no real data about the performance of such wavelengths had then been collected.

In the early days of broadcasting the wavelength of 150 metres was regarded as a short wave, and the amateur transmitters who were hustled off their 440-metre wavelength to make room for the new broadcasting stations, took the most elaborate precautions about "getting down" to 150 metres!

Of course, it was this first move that paved the way for all the future development. The amateurs all crowded on the 150-200-metre band, and, finding it packed rather tightly, started moving downwards a little farther.

Lower and Lower.

The rest of it is well-known. After the comparative failure of Transatlantic tests on 150+200 metres, American signals on 100 metres started pouring through in an unbelievable way; these shorter waves, officially described as "of no use to anybody," had turned up trumps after all.

Thereafter, from 1923 onwards, the history is that of one long trek downwards, each successive step bringing even more spectacular results. It looks as though this year is going to see the triumphal emergence of 10 metres as a long-distance wave; and, for the first time, signals from South America are being received in this country at 8.5 metres!

Continuous and Rapid Development.

Thus you see that in twelve years of short-wave work there has hardly been a moment in which we could stand still and take stock of things. It has developed at a prodigious pace, and is still doing so, and it's difficult to see where we stand at any particular moment.

One real advancement, however, has taken place in the matter of receivers. They have not developed, like the broadcast receiver, into complicated affairs bristling with A.V.C. and double-diode triodes; they remain their old simple selves, to a certain extent, and the development has been in the matter of detail work.

It seems hard to believe that the early

150-metre receiver was almost impossible to handle because of "sharp tuning" and hand-capacity troubles; but it certainly was. I remember my first experience of handling one, and I went yooing through

fetching in more "DX" in its day than any other.

Those days of test-tube coils, de-based valves, extension handles, and the great "low-loss" craze—how exciting they were! And how silly it all seems, now that we look back at it. I suppose it is perfectly true to say that the limiting factor was valves, valves all the time!

But there is another side to the twelve years of advancement. What about the transmitters? The first short-wave broadcasting station was K D K A in Pittsburgh, who used to send us mad with joy when we found his weak little signal coming over on 80 metres or thereabouts. Nowadays, masquerading as W 8 X K, that station puts over programmes on four or five different wavelengths, and there is hardly a day in the year when one can't hear him at really good strength on one or more of them.

The First Australian Contact.

In 1924, I believe, the first contact between this country and Australia was made. Nowadays there must be a thousand listeners in this country who listen to Sydney's broadcast every Sunday afternoon and never miss a word of it.

In these few years the short waves have turned from the amateurs' playground into the indispensable property of the commercial concerns, who simply could not handle the traffic that they do without using the short wave extensively.

It is unnecessary for me to emphasise the tremendous importance of Empire Broadcasting. Some people say that it took the B.B.C. a long time to get going but after several years of semi-successful work from G 5 S W at Chelmsford, they now have a system of which they can be justly proud, and it is being extended very shortly

to be one of the most complete in the world.

Varied Uses of Ultra-Short Waves.

Other uses of short waves include the provision of space for police stations, shipping telephony, marine and aircraft beacons, and, more recently, the treatment and cure of diseases. The ultra-short waves, the youngest branch of the family, have made high-definition television possible, and it is quite impossible for anyone to estimate their importance at the present time.

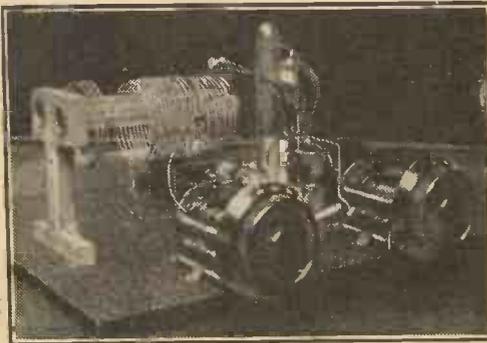
And still the downward trend continues. Who knows what use will eventually be made of "micro-waves"—those diminutive wavelets less than one metre in length?

Ever since the "discovery" of the real short waves in about 1923, development in this branch of the science has made exceedingly rapid strides. In this article, "W. L. S." reviews the trend of progress from those early days until the present time.

four or five stations all in a hairsbreadth on the dial, just as one does now on 10 metres with a big tuning condenser!

A receiver working on the 150-metre band, nowadays, handles like a rather flatly-tuned broadcast receiver, and hand-capacity is quite unknown.

And then the bother we had getting the



A PIONEER

On the left is an early receiver designed by Mr. E. J. Simmonds, which says, "W.L.S." "probably fetched in more 'DX' in its day than any other." The tuning condenser on the left has a short extension rod attached to the dial to facilitate fine tuning.

MODERN DESIGN

A modern short-wave receiver complete in its screening case. The two dials on the front of the box are for "band-setting" and "band-spreading," whilst the small knob at the side controls reaction.



things to oscillate! That, of course, was largely due to the "period" valves—the Mullard Ora, Ediswan A.R., Marconi R., and the rest of them. A modern valve will oscillate with great gusto on 2½ metres, the job being to stop it rather than start it. ¶

The photographs on this page give you some idea of the general trend in short-wave receiver design. It's a pity that the modern one is hidden away in its cabinet, but you can take it from me that the internals are perfectly clean and simple-looking.

The ancient one was a famous receiver designed by Mr. E. J. Simmonds (G 2 O D), who was a pioneer amateur transmitter, and who used to write on short waves for "P.W." That particular receiver (though it looks like a museum piece now) probably

SHORT-WAVE STATIONS OF THE WORLD

This list of short-wave stations is unique. It has not been compiled from other printed lists, but contains only the stations that have actually been heard by "W. L. S." or by readers of "P.W." who keep in touch with him week by week. The times given were correct at the time of going to press; in most cases only those at which the station has actually been heard are given, and where none is stated it simply means that no schedule of transmissions is provided by the station concerned, and which, therefore, transmits at irregular intervals

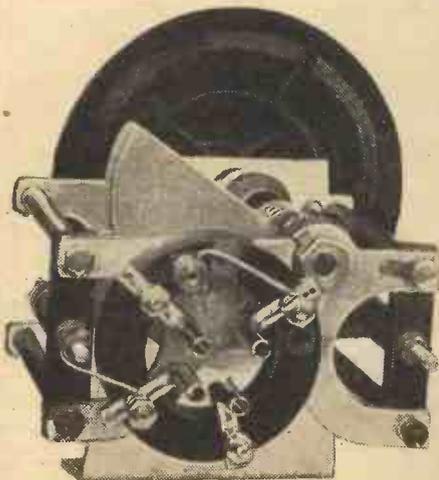
Metres	Call	Station	Time (B.S.T.)	Metres	Call	Station	Time (B.S.T.)
73	HCJB	Quito, Ecuador	1-4 a.m.	31-55	VK3ME	Melbourne	Irregular
65-22	HC2ET	Guayaquil, Ecuador	3-6 a.m.	31-55	GSB	Daventry	
51-90	OAX4D	Lima, Peru	2-3.30 a.m.	31-48	W2XAF	Schenectady, N.Y.	11.30 p.m. onwds
51-90	HI1J	San Pedro, Dominican Republic	1-4.30 a.m.	31-45	DJN	Zeesen	
				31-38	DJA	Zeesen	
51-28	YV5RMO	Maracaibo, Venezuela		31-36	VUB	Bombay	5-6.30 p.m.
				31-36	W1XK	Springfield, Mass.	Midnight-6 a.m.
				31-31	VK3LR	Lyndhurst, Australia	Weekdays, 9 a.m. -1 p.m.
50-93	TGX	Guatemala City		31-3	GSC	Daventry	1.30-4 a.m.
50-26	HVJ	Vatican City	8-10.15 p.m.	31-28	HP5J	Panama City	Sundays, 7.10 a.m. and 11- 5.30 p.m.
50-17	HIX	Santo Domingo, Dominican Republic	2-4 a.m.	31-28	VK2ME	Sydney	
50	RV59	Moscow	6.10 p.m.				
49-96	VE9DN	Montreal, Canada	4-5.30 a.m.				
49-92	ZHI	Singapore	12.30-3 a.m.	31-27	HBL	Geneva	
49-90	COC	Havana, Cuba	10 p.m.-1 a.m.	31-25	CT1AA	Lisbon, Portugal	9.30 p.m.-midn't
49-83	DJC	Zeesen, Germany		31-13	I2RO	Rome	8.30-11 p.m.
49-75	HP5B	Panama City	2-4.30 a.m.	30-4	EAQ	Madrid	11.15 p.m.-1.30 a.m.
49-60	HJ3ABI	Bogota, Colombia	2-4 a.m.				
49-59	GSA	Daventry		29-83	ZFB	Hamilton, Bermuda	
49-5	W3XAU	Philadelphia, Pa.	Midnight-5 a.m.	29-04	ORK	Brussels	7.30-10 p.m.
49-5	W8XAL	Cincinnati, Ohio		28-98	LSX	Buenos Aires	Midnight-1 a.m.
49-5	OPY	Skamlebaek, Denmark		25-73	PPQ	Rio de Janeiro	
				25-63	KIO	Kauhuku, Hawaii	
49-42	OER2	Vienna	2 p.m.-midnight	25-61	CJRX	Winnipeg	1-3 a.m.
49-4	VQ7LO	Nairobi	5-8 p.m.	25-60	HJ4ABA	Tunia, Colombia	Midnight-5 a.m.
49-34	CP5	La Paz, Bolivia	1-2 a.m.	25-60	FYA	Pontoise, France	
49-34	ZHJ	Penang, S.S.	3-5 p.m.	25-53	GSD	Daventry	
49-22	VE9GW	Bowmanville, Canada		25-49	DJD	Zeesen	
49-20	ZTJ	Johannesburg	3-10 p.m.	25-42	W1XAL	Boston, Mass.	
49-18	W3XAL	Bound Brook, N.J.	10 p.m.-midnight	25-40	I2RO	Rome	3.15-4.15 p.m.
49-15	HJ4ABL	Manizales, Colombia	11.30 p.m.-3 a.m.	25-36	W2XE	Wayne, N.J.	8 p.m.-midnight
49-1	VUC	Calcutta	3.30-5 p.m.	25-28	GSE	Daventry	
49-08	YV2RC	Caracas, Venezuela	11 p.m.-4 a.m.	25-27	W8XK	Pittsburgh, Pa.	9.30 p.m.-3 a.m.
49-02	W2XE	Wayne, N.J.	11 p.m.-4 a.m.	25-23	FYA	Pontoise, France	
48-94	LKJ1	Jeloy, Norway	5 p.m.-midnight	25-00	RNE	Moscow	
48-92	ZGE	Kuala Lumpur, F.M.S.	1-3 p.m.	24-53	CTICT	Lisbon	Thursday 8 p.m.-midnight
48-83	W8XK	Pittsburgh, Pa.	10 p.m.-6 a.m.	24-20	CT1GO	Parede, Portugal	
48-79	CO9GC	Santiago, Cuba	9.30-10.30 p.m.	23-38	CNR	Rabat, Morocco	Sunday, 1.30-3 p.m.
48-78	YV3RC	Caracas, Venezuela	10.30 p.m.-3 a.m.				
48-62	HJ3ABF	Bogota, Colombia	Midnight-5 a.m.	22-94	VP1A	Suva, Fiji Islands	6.30-7.30 a.m.
48-40	CT1GO	Parede, Portugal	12.20-1.20 a.m.	19-84	HVJ	Vatican City	4.30-5 p.m.
46-51	HJ1ABB	Barranquilla, Colombia	10.30 p.m.-4 a.m.	19-82	GSE	Daventry	
				19-72	W8XK	Pittsburgh, Pa.	2-9.30 p.m.
46-01	YV6RV	Valencia, Venezuela	11.30 p.m. onwds	19-71	PCJ	Eindhoven, Holland	
45-38	REN	Moscow	7 p.m.-midnight	19-68	FYA	Pontoise, France	
45-31	PRADO	Riobamba, Ecuador		19-64	W2XE	Wayne, N.J.	4-6 p.m.
42-70	HJ5ABC	Cali, Colombia	1-3.30 a.m.	19-63	DJQ	Zeesen	
41-8	CR7AA	Lobito, West Africa		19-56	W2XAD	Schenectady, N.Y.	8-9 p.m.
40-65	XECR	Mexico, City	Sun. midnight	17-33	W3XL	Bound Brook, N.J.	4 p.m. onwards
40-55	HJ3ABD	Bogota, Colombia	1.30-5 a.m.	16-89	DJE	Nauen, Germany	
38-47	HBP	Geneva	11.30 p.m. onwds	16-88	PHI	Huizen	1.30-4.30 p.m.
38-17	HC2JSB	Guayaquil, Ecuador		16-87	W3XAL	Bound Brook, N.J.	2-3 p.m. and 8-9 p.m.
37-33	CNR	Rabat, Morocco	Sunday evening				
35-7	HC2AT	Guayaquil, Ecuador	2 a.m.	16-86	GSG	Daventry	
34-20	ZCK	Hong Kong		13-97	GSH	Daventry	
31-8	COH	Havana, Cuba	10 p.m.-12.30 a.m.	13-93	GSJ	Daventry	
31-56	PRF5	Rio de Janeiro	11.30 p.m. onwds	13-92	W8XK	Pittsburgh, Pa.	12-2 p.m.

FINDING YOUR WAY

Much of the enjoyment of short-wave reception is lost if you are unable to identify the stations you tune in. But there is no need for this difficulty to arise if you provide yourself with a simple absorption wavemeter on the lines described by "W. L. S."

OF all the troubles that lie in wait for the short-wave novice, none is more real than that of finding his way. Short waves are like a vast uncharted ocean, compared with the neat little boating pool of ordinary medium-wave broadcast.

Just reflect, at the outset, that the medium broadcast band has a width of 1,000 kilo-



Here is a view of the absorption wavemeter described on this page. The coil is inserted in the valveholder bolted on to the tuning condenser. These two components are the only ones required, apart from three plug-in coils.

cycles (between 200 and 600 metres) and that the short waves, from 100 metres downwards, cover roughly 57,000 kilocycles, and you will begin to see that there is plenty of space in which to get lost!

Luckily for the short-wave enthusiast, he does not have to design a receiver that will permit of quick searching over the whole of this vast tract of frequencies. Stations that are likely to be interesting to him are segregated into various bands of frequencies, fairly sharply defined, and, after a while, he becomes used to the technique of scouring each of these bands at the most useful time.

Knowing Where You Are.

A short-wave receiver, nowadays, is of little value unless it is roughly calibrated. If one suddenly develops an overpowering desire to listen to Radio Bazook (or someone like that) on 43.759 metres, one has a very slender chance of finding him if one just sits down in front of a receiver covering a range of 10 to 100 metres, and knows no more about it than that!

The conventional way of covering the more useful part of the short-wave spectrum, nowadays, is to use three or four plug-in coils, each of which gives a range that makes

for reasonably easy tuning with a condenser of about .00015.

The three ranges covered by one representative set of commercial coils, for instance, are 13-26 metres, 24-50 metres and 45-96 metres. The total expanse between 13 and 96 metres includes most of the stations that the average listener wants to hear, and a receiver using three coils in this way can be quite easily calibrated.

The Absorption Wavemeter.

The two photographs on this page show a simple absorption wavemeter, the requirements for which are merely a variable condenser of about .0001 and a valveholder to take three plug-in coils. Note that the valveholder is rigidly bolted on to the condenser itself, and wired to the fixed and moving plates by short, stiff lengths of wire.

Such a device will hold its calibration in a very satisfactory way, and will be invaluable for checking up a receiver from time to time. By far the easiest way to start is to tune in a signal that can be definitely identified. This entails a bit of

dead-spot can still be noticed, and you will get a fairly accurate reading.

Then, perhaps, you will be able to log W 3 X A L on 16.87 metres, or possibly L S X on 28.98 metres. Log the dial readings, both on the receiver and on the wavemeter.

In case you wonder at the necessity for doing both, let me explain that it is quite feasible to calibrate a receiver on stations alone, without the help of a wavemeter: but that the wavemeter is invaluable as a check, and will, of course, immediately put you straight again if you rebuild the receiver, or scrap it and start with a new one.

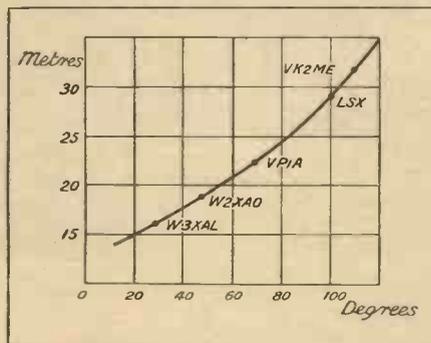
A little curve like that shown in the diagram serves to show you roughly whereabouts you are—certainly where the various wave-bands come on the dial. The wavemeter, if you make it carefully, and especially if you use a good dial and a good hair-line against which to read it, will give you more accurate readings when you pick up a brand-new station and want to see who it is.

Identifying New Stations.

It is this aspect of it that is most interesting. If you have a few stations definitely logged, and pick up another one which resolutely refuses to make any announcement, you can find his wavelength from the meter, look him up in the list of short-wave stations, and if you find a station listed dead on that particular wave, you can be reasonably certain that you've got him.

The golden rule in calibrating a receiver is this—don't choose stations that are too close together for the first few points. Take your 24-50-metre coil, for instance. Once you have definitely identified someone in the 49-metre band (say W 8 X K on 48.86 metres) don't bother about anyone else in that band. Try, instead, to get someone in the 31-metre band, and then someone on 25 metres.

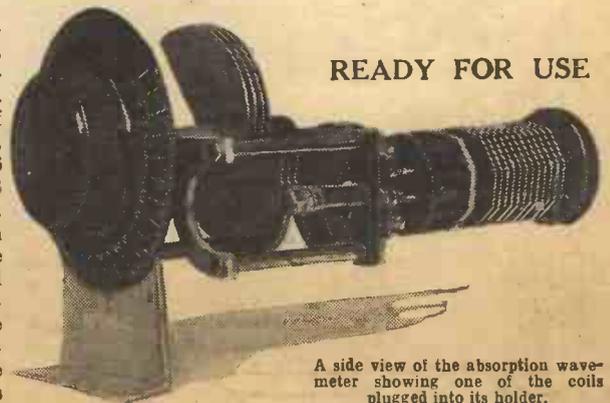
A CALIBRATION CHART



A wavemeter calibration chart is easily obtained by logging a few known stations, and provides a means of identifying unknown transmissions.

patience; for the average short-wave station, unfortunately, is not in the habit of announcing itself very frequently.

Suppose, for the sake of argument, that we listen, first, to W 2 X A D on 19.56 metres, and log him as "48 degrees" (see curve above). Insert the appropriate coil in the wavemeter, swing the condenser, with the coil held fairly near the coils of the receiver, and listen for the familiar deadspot "pop." Remove the wavemeter to the farthest point at which this



READY FOR USE

A side view of the absorption wavemeter showing one of the coils plugged into its holder.

SHORT-WAVE Activities

Dotted about all over the country are bands of enthusiasts who have formed themselves into short-wave clubs. It is here that we find the real "live wires," the amateurs to whom the hobby means so much and from whom have come many important developments in short-wave technique. If you are a beginner, you should get in touch with your nearest society right away. If you don't, you'll miss a lot!

I HAVE already remarked that the short waves are the happy hunting-ground of the home constructor. Perhaps it is not to be wondered at, therefore, that most of the radio societies in the country are taking on the new title of "Short-Wave and Television Society."

It is an undoubted fact that short-wave listeners nowadays are the real enthusiasts over radio for radio's sake. They don't mind if they can't find a programme full of first-class variety artists—they just listen to whatever they can get, and are rightly thrilled if it turns out to be something that the man-next-door can't get.

Certain writers have recently waxed derisive about all this, but do we care? The fact remains that the man who plunges into short waves often sinks so deeply that he doesn't come to the surface again for several years; all other branches of radio seem to lose their charm, and broadcast reception becomes just the means to an end. Which, in my humble opinion, is as it should be. Let the brickbats come—I'm waiting for them!

You Should Join a Club.

The first step that short-wave readers should take is to join some club or society, thereby getting into touch with other kindred spirits. The national club is, of course, the Radio Society of Great Britain, which, admittedly, looks chiefly after the interests of the amateur transmitter. But it smiles with equal geniality on the would-be amateur transmitter, and most of my readers seem to fill that bill!

Other larger bodies are the International Short-Wave Club, the Anglo-American Radio and Television Society, the International DX-ers' Alliance, the Society of Wireless Pioneers, and many others.

All these bodies arrange frequent events running the whole gamut from field days and gymkhanas to reception tests, and all, likewise, hold frequent meetings and conventionettes.

You don't get half as much pleasure out of being a "lone wolf" as you will be able to by comparing notes with others, and the social aspect of these societies and clubs is a very strong point.

Under the heading of "Short-Wave Activities," too, I must include the little tests, and stunts organized by small groups of amateurs, either officially or otherwise.

In whatever part of the country you live, for instance, you cannot be very far from

a group of ultra-short-wave enthusiasts. Two active transmitters are enough to form the nucleus of a very strong 5-metre group, the other members being content with reception only, but with a definite hope of better things to come.

Unofficial "5-metre Field Days" are being run all through the summer by such groups, and they make excellent fun combined with a real striving towards development of this absorbing wavelength.

Under the heading of "Short-Wave News," periodically, in "P.W.'s" regular short-wave section, I try to keep readers posted with details of such events as well as with meetings of the larger societies. In passing, I may as well mention that I am

"KEEN AS MUSTARD"



Some of the members of the Leicester branch of the International Short-Wave Club. They are all red-hot enthusiasts, ever eager to explore new aspects of their fascinating hobby.

only too pleased to give space and publicity to any of the activities of local groups as well.

Suppose you are a really lone hand, like one man who recently wrote and told me that he had never yet met another short-wave enthusiast nor seen a short-wave set other than his own. He had been in the game for three years, too! Your first step is to write to me and tell me so, and I will try to put you in touch with somebody within reasonable distance of you.

Competitive Tests are Useful.

Your next step may well be to arrange some competitive tests with your newly-found neighbour; you can both listen on the same waveband for perhaps an hour at a prearranged time and date, logging everything you hear and comparing logs afterwards.

Then, if one of you is badly "down," he can compare his receiver with the other, and try to find out why. It may be location, receiver, or operating ability—you'll soon find out which. Only by work of this kind can you hope to progress until you become a real short-wave expert.

Excellent though short-wave broadcast reception is, you will be missing a lot if you don't get down to it and start learning Morse. There are nearly 50,000 amateur transmitters in the world, and nine-tenths of them must use Morse only. It's all very well to condemn code work as out of date; to refer to telephony as "the only modern means of communication," and so on; but the fact remains that Morse means a simpler, lower-powered transmitter and an infinitely greater range.

Morse is Well Worth Learning.

Practise your Morse, first on a buzzer, and then "on the air," on any slow stations you can find, and you'll soon discover that it is well worth the little trouble and energy you have to expend. Later on you will be able to enter for some of the international receiving competitions. Another point worth remembering is that you never know when a knowledge of the Morse code may come in useful to you.

Even if you decide to remain a "telephony-only" enthusiast, though, you will find on the short waves quite enough activity to keep you amused for twenty-four hours each day; if you can copy code as well, you'll want more hours than that to hear everything that's going on!

Keep in touch with me through "P.W.'s" short-wave section week by week, and you will find that, by putting your shirt on the short waves you have backed a certain winner. Go right back to the beginning of this section, now, and make up your mind to "get started." That's the first and most important thing, and the rest will follow.

Sociability is the Keynote.

If you are still in the early stages, it will certainly be worth your while to start your short-wave career by joining a club—either a "local" or one of those mentioned earlier.

You will immediately find yourself in touch with others who have probably had to face your particular problems, and can tell you the quickest way of surmounting your own difficulties.

Don't be afraid that you are going to come up against something stiff and formal—sociability seems to be the keynote of most of these bodies, and at this time of year you will find the social side more prominent than the radio!

May I also appeal to the "old hands" who happen to be reading this? It is up to you, "O.H.'s," to help to start new local clubs in your own areas. You will undoubtedly find plenty of people willing to join, but just waiting for someone to give them a lead.

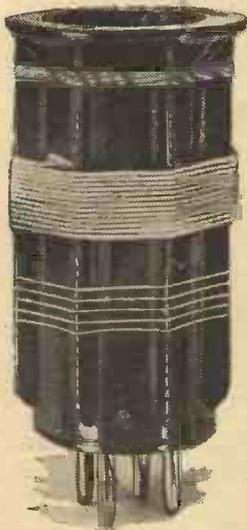
I shall be more than pleased to give all possible publicity to any such new enterprises. So come along all you short-wave enthusiasts and get together, so that you can exchange ideas and so increase your enjoyment of the hobby.

How to Make YOUR OWN COMPONENTS

The fact that the enthusiast can easily construct many of his parts is an added attraction to short-wave-work. Nothing can compare with the pleasure derived from listening to programmes picked up on a set made almost entirely by one's own hands. And think of the saving in cost, too!

SHORT-WAVE reception is one branch of radio in which the home-constructor can exercise his ingenuity and ability almost without limit. In the old days, before short-wave components of good quality were available at reasonable

prices, the average short-wave set was almost entirely home-made—variable condensers, coils,



HOME-MADE

This is an example of a three-winding coil on a four-pin former. One end of each winding is taken to a common pin and the remaining ends to the other three pins.

chokes, and even low-loss valve holders included.

The art of making our own components to-

day is in danger of becoming a lost one. This is partly due to the multitude of good components on the market, also to lack of patience and keenness on the part of the constructor himself.

One can take a kind of extra-special pride in a set, or in any piece of gear that has been almost entirely "home-brewed"; believe me when I say that the pleasure one derives from a satisfactory home-made receiver is immense.

A Three-Winding Four-Pin Coil.

Short-wave coils are the first item on the agenda, but I have already dealt, in previous issues, with the construction of the ordinary four-pin, two-winding variety. The photograph on this page may put a new idea into your minds—that of making a three-winding coil on a four-pin former.

The low-potential ends of all three coils are common, and connected to one pin; the remaining three pins take the three high-potential ends. The use of such a coil, of course, means that the reaction coil must have one end earthed, and this implies that the reaction condenser must be placed at the "live" end of the coil.

I am not very keen on this arrangement, for it means a spot of bushing if you use a metal panel, and may also mean hand-capacity effects on the reaction control unless it is mounted back in the set and given an extension-handle.

One way out, however, is to use a fixed condenser of .0001, and to control reaction with a variable resistance in series with the H.T.—a perfectly sound scheme if you choose a resistance that is silent in operation.

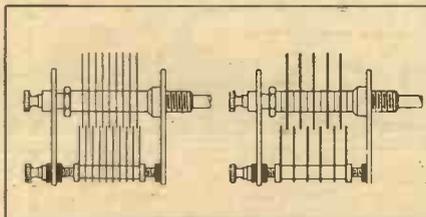
There is, of course, no disadvantage in having one end of the aerial coil "commoned" with one end of the grid coil, since the two low-potential ends would normally both go to earth.

The Electrical Arrangement.

I've already said enough about turn numbers, connections for the windings, and so on, for two-winding coils. I just want to suggest here that with the three-winding type you should arrange the grid coil in the middle, the reaction coil at the bottom, and the aerial coil at the top.

The top end of the grid coil should be the "live" one, and, of course, the bottom end of the reaction coil. The two low-potential ends, in the middle, are connected together, so that it may be regarded as one continuous coil with a tap.

CONVERTING A VARIABLE



An old variable condenser can be converted to one of the short-wave type by removing some of the plates and increasing the spacing between them.

Short-wave chokes, of course, are childishly simple to make. The little chap shown in the photograph is wound on a length of half-inch ebonite rod with about 60 turns of No. 26 D.C.C. It is a useful tip to tap the ends of the rod and insert short 4 B.A. screws for anchoring the ends of the winding.

Using Ebonite Tube.

Some people prefer sealing-wax or "Chatty," but both make rather a messy job of it. If ebonite tube is used, it is an easy matter to drill two small holes and take the wire through—an even neater method than the little screws at the ends.

Regarding sizes, 60 turns on 1/2-in. diameter make quite a good choke for all wavelengths up to about 80 metres.

Special sets require special chokes, and an ultra-short-wave choke may consist of as few as 20 turns. The single-layer variety is perfectly efficient for most purposes, although some people like to separate out the winding into sections—30 turns, gap, 20 turns, gap, 10 turns—for instance.

Next we come to variable condensers. I am not advocating a return to the days in which we used to cut our own plates out of zinc, but I do want to emphasise the fact that an old .0005 condenser from the scrapbox can be made into quite a presentable short-wave condenser by judicious "pruning."

The diagram shows a double-spaced condenser of this type. It started life as a .0005, and now has half the number of plates and twice the spacing, so that its capacity has been reduced to one-quarter of the original—.000125. This is almost an ideal value for short-wave tuning.

Removing Surplus Insulation.

If it is of a very old type, its efficiency can still further be improved by cutting away as much ebonite as possible from the supporting pieces, leaving only just enough to hold the fixed plates rigid and at the required distance from the moving.

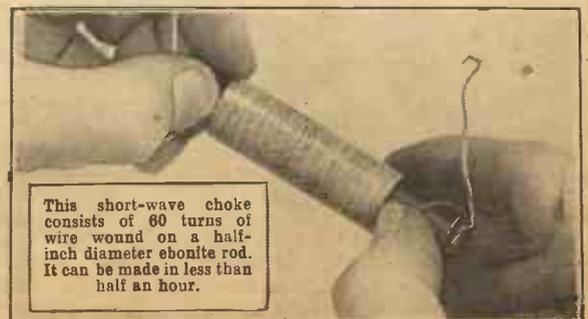
A pigtail connection, too, can be soldered on the spindle itself; it is not wise to rely too much on rubbing contacts. The only test, though, is to try the thing and see if it is noisy in action. If it isn't, you're lucky, and need not bother about pigtails.

Finally, I might as well mention that excellent air-dielectric fixed condensers can be made up from the parts of old discarded variables. Spacing and size of plates must be arranged to taste, but a suitable size for aerial coupling may be made from 1/2 plates of the usual size separated by 1/4-in. or more.

Doubtless many other ideas for home-brewing will occur to you. Go ahead with them, and you will recapture the real thrill of home-construction.

W. L. S.

H.F. CHOKES ARE EASILY WOUND



This short-wave choke consists of 60 turns of wire wound on a half-inch diameter ebonite rod. It can be made in less than half an hour.

BARRY KENT CALLING

News and Views from the "Big House"

JUNE, now free to broadcast again, is likely to appear at the mike a good deal this summer. Other starred artists for summer engagements are Queenie Leonard, Delange Clarke (American actor), and Revva Reyes, Mexican guitarist. By putting on real programmes in the early evening during the summer the B.B.C. is spending a lot more money than it did last year during the same period. This is all to the good. No one objects to extra money being spent on acceptable programmes.

Recording Van for Drama.

A special Watts recording van has been placed at the disposal of the Drama Department of the B.B.C. The quality of the recording is reported as being greatly improved. Mr. Gielgud expects to make a lot of use of the van in adding actuality to dramatic productions, where necessary or desirable.

A Sound-Proofing Problem.

"D.C.3," the dramatic control room on the fifth floor of Broadcasting House, is immediately below 6D, the big effects studio. Producers are experiencing difficulty in telling whether effects sounds are coming into D.C.3 from the loud-speaker in the room or through the floor of 6D. Experiments in special sound-proofing are being undertaken.

Book Critics.

The B.B.C. has decided to invite Mr. Desmond MacCarthy to continue to criticise general books until Christmas, after which Mr. Francis Hackett will be given another spell. Mr. Hackett is the Irish-American novelist, whose "Henry VIII" and "Francis I" had such a vogue in the "new biography."

Talks Ideas.

Among ideas being worked out for talks next autumn and winter are the following: A special series on psychology; a series on "I Have Got to Decide," and one on "Crises." There is an obvious tendency to relate the talks more definitely to the practical issues and difficulties of everyday life. The "Youth Movement" also will bulk a good deal in next season's talks, but the B.B.C. has not yet faced the problem of "setting-up exercises" in the mornings.

The Television Service.

The Television Advisory Committee will shortly issue a progress report, indicating the acceptance of the tenders for the con-

struction of the transmitters at Alexandra Palace. Both Baird and E.M.I. will be sanctioned. Although work will begin at once, there is no chance of the service starting until after Christmas.

It is likely to be February or March before the London area will be served regularly on ultra-short waves with high-definition systems. This delay, however, has not discouraged Mr. Gerald Cock, who is actively framing his plans for vigorous development the moment the signal is given.

Concert Party Relay.

During the winter months Frank A. Terry's concert party, "Pleasure on

TO BE MARRIED



A new photograph of Harry Roy and his fiancée, Princess Pearl (Miss Elizabeth Brook), daughter of the Rajah of Sarawak. The wedding is to take place on August 6th.

Parade," gave regular broadcasts from the Manchester studios. Northern listeners who enjoyed these indoor performances will be glad to hear that "Pleasure on Parade" has now moved to the seaside, and its programme will be relayed from the Floral Pavilion, New Brighton, on July 13th. The composition of the concert party is slightly different, but the character of the show and many of its members remain the same.

From Paris.

On July 19th the Band of the Garde Republicaine will give a special programme, which will be relayed from Paris. The programme will probably include such works as their brilliant transcription of Strauss' tone-poem, "Till Eulenspiegel," and a work composed for military band by Schmitt, "Dionysiaques."

Opening a New Airport.

Mr. Lindsay Everard, M.P. for the Melton division, who helped to organise the

"Looking to the Air" series of Midland broadcasts, will be one of the speakers at the opening of the Leicester Airport, which is to be relayed in the Midland programme on July 13th. The ceremony will be performed by the Marquess of Londonderry, K.G., and the Lord Mayor of Leicester will speak on behalf of the City.

The air display which follows will be described in a running commentary by E. C. Brown. For the benefit of those who are unable to listen on Saturday afternoon, a résumé of the events will be included in the evening programme.

"THE MIKADO" AND "THE NIGHTINGALE"

Our broadcasting critic reviews some recent programmes.

I DON'T remember a better theatre-relay than that of "The Mikado" from Sadler's Wells. It is frequently argued that relays from theatres are bound to be imperfect because all the cast cannot gather round a single mike, as is possible when the broadcast comes from a studio or studios.

This argument must now be shattered once and for all. Sadler's Wells has proved that the theatre stage can compete with the studio as the source whence the words and music flow. I recall a talk once given by Harold Nicolson on Sadler's Wells. If my memory serves me right, he described it as "that fine airy building." Is it because Sadler's Wells is a fine airy building that every syllable of the libretto, every click of the fans, every gurgle of the three little maids, and the hundred-and-one funny little noises that Martyn Green and Sydney Granville introduced into their lines were heard perfectly the other night?

Or was it because the microphones used have more acute receptive power and a wider range? Whatever the cause, "The Mikado" from Sadler's Wells will be remembered, if for nothing else, for its extraordinary clarity.

Besides listening to this opera, I listened also, at an absurdly late hour, to Hans Andersen's short story, or rather to a radio transcription of it—"The Nightingale." The two broadcasts had one thing strangely in common, yet with a difference. The opera has the characters of a First Lord of the Treasury, a Lord Chief Justice, a Commander-in-Chief, a Lord High Admiral, a Master of the Buckhounds, a Groom of the Backstairs, an Archbishop of Titipu, and a Lord Mayor—all rolled into one.

"The Nightingale" has a Fisherman, a Chancellor, an Executioner, a Commander of Guard, a Librarian, a Gardener, and a Royal Music Master. But these are not all rolled into one. Seven distinguished actors were engaged to play them. At what cost, I wonder? Honestly, I cannot see that such stories as "The Nightingale" are improved in the slightest by putting them into dramatic form. By a simple reading of the original story a good reader could have given the listening public just as much pleasure as this excellent cast of actors. And perhaps more.

Another point that struck me was the extremely late hour of the broadcast. "The Nightingale" is fate for a nursery public—gone to bed hours before. I cannot visualise the adult who can honestly say that he enjoyed "The Nightingale" the other night.

There were, however, some good effects produced in "The Nightingale." On the other hand, the frogs in the lake, and the hyena (to mention only two) might have been anything. Fortunately we were told what these were.

Louis Golding's talk on Boxing was beautiful—just as beautiful as he claims boxing is to him. It is unusual to hear boxing discussed from the angle of its aesthetic appeal. It is more usual, perhaps, for the question of purses, side-bets and the like to be uppermost. But Louis Golding did boxing a great service by choosing a different theme. His was "Boxing—the Sport of it—the Art of it." Boxing ought to have more fans now as a result of this talk.

Sydney Horler's thriller, "The Mystery of the Seven Cafés," strikes fresh ground. It is just the sort of item B.B.C. programmes are in need of, especially in summer, when listening is apt to play second fiddle to other pursuits. The prologue seemed to suggest that the seven episodes that are to be given

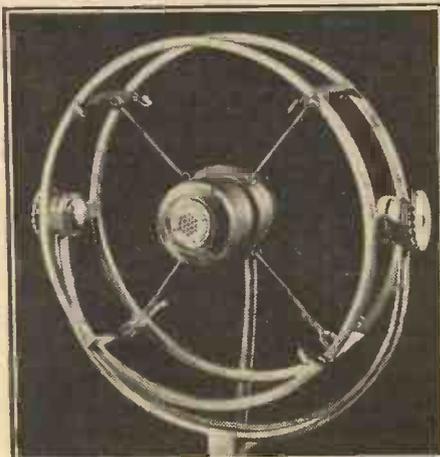
(Continued on page 464.)

Ribbon Microphones Mean Better Broadcasting

WHEN you come to think of it, we take the microphone very much for granted. We know it to be an ever attentive ear, inclined to the faintest or the loudest sounds that may impinge upon it. Yet it is a far cry from the latest ribbon type of microphone developed by the B.B.C. research engineers to the elementary carbon granule type first used in the old Marconi House days.

Of which I was vividly reminded when I called on Mr. H. L. Kirke at the Nightingale Square laboratories of the B.B.C. The Chief of Research gave me some details. I think every reader will be interested to

MOVING COIL TYPE



One of the microphones used by the B.B.C.—the E.M.I. moving coil type. Note that it is suspended on a swivel stand so that adjustments can be made to its position.

hear about microphones in general—and about the wonderfully efficient “ribbons” now coming into use at Broadcasting House.

The first thing to understand is that the early types of microphone—such as the Round carbon and Reisz—worked on the pressure principle. Meaning that their diaphragms were actuated by the pressure of the air waves impinging on them.

The Pressure Variations.

One of the first troubles noticed was the variation in pressure at different parts of the frequency range of sounds. For waves attacking the microphone frontally, so to speak, the high frequencies had twice the pressure effect of the low frequencies. Moreover, the waves coming from the sides of the microphone did not get a fair hearing.

It so happens that if the physical dimensions of the microphone are large compared with the wavelength of the impinging sounds the microphone will “listen” selectively—will pay more attention to the waves arriving parallel with its axis than

to side waves that are not. In practice this has meant that the normal microphone was more or less non-directional for low-frequency waves—that is, for those large

The B.B.C. research department has recently developed a new type of microphone which has several important advantages from the broadcasting standpoint. In this article our contributor, Mr. Alan Hunter, gives some very interesting information concerning this latest contribution of the Nightingale Square laboratories of the B.B.C.

compared with the microphone's dimensions, semi-directional for the medium frequencies and definitely directional for higher frequencies.

Mr. Kirke showed me some very interesting “polar diagrams”—graphs showing how the microphone's frequency response depends on the direction from which the sounds are coming. Below 500 cycles the diagrams are more or less circular, but above that frequency one could see how the frequency response differed for almost every direction.

Now this fundamental limitation of the ordinary type of microphone has caused quite a lot of difficulty in placing microphones for good quality and balance. Especially as, in addition to the directional effect on direct waves, there has been the added difficulty of dealing with the waves reflected from the studio walls.

Non-directional to Frequency.

Because the microphone is really like a single ear the apparent reverberation—complement of waves from reflected sources—is greater than it is to the ordinary listener blessed with two ears. The overall effect has therefore been a tendency to lose higher frequencies—and to guard against this the microphones have had to be placed very close to the performers. This in itself has been a somewhat unbalancing factor—involving all kinds of fakes to keep the balance real.

Obviously what was wanted was a type of microphone whose diaphragm was so small that it would always be much less than any audible frequencies impinging on it. That would at least be non-directional, in the sense that its frequency response would be the same no matter what direction the waves might arrive from. Such a device was offered by the ribbon microphone, which, although not new, was not a commercial proposition when the B.B.C. Research Department took it in hand.

The ribbon microphone is essentially a very light and very small strip or ribbon of aluminium, having an effective length

of from $1\frac{1}{4}$ to $1\frac{1}{2}$ in., and a thickness of only .0002 in. This is suspended between suitable pole pieces, and is so light that it can actually vibrate with the air—the air doesn't know it is there, so to speak.

Naturally, this very tiny microphone system has no directional discrimination against frequency. As a matter of fact, it is directional in an entirely different way, for it works on the velocity of the waves, not their pressure. In this it is exactly comparable with a frame aerial, for the air-wave component it responds to is analogous to the magnetic field component of a wireless wave hitting the frame.

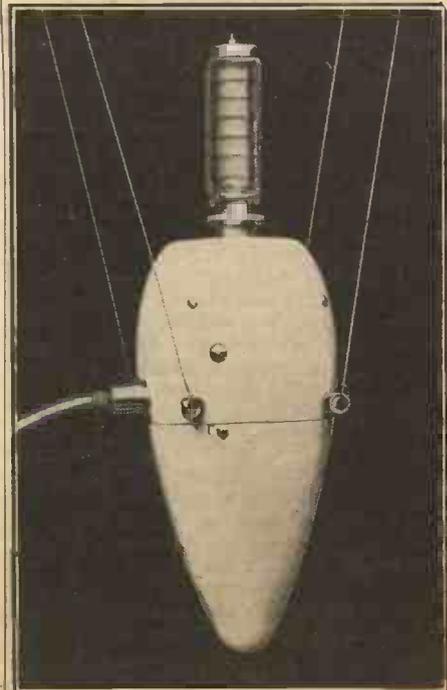
A Wide “Listening” Angle.

It will encompass all sounds within an angle of 45 degrees on each side of it, meaning that, in any given location, it “hears” all sounds coming within a total angle of 90 degrees—a pretty wide sweep, when you come to think of it. Outside this angle the ribbon simply does not hear anything—again like a frame aerial that is “dead” to waves coming from the wrong angle.

Apart from this general directional effect, which, as I shall explain later, can actually be an advantage, the sounds that are picked up by the ribbon are all equally

(Continued on next page.)

STREAMLINED



This rather unusual-looking piece of apparatus is an Edison Bell microphone with a B.B.C. streamlined amplifier.

AUTOMATIC SWITCHING FOR ELIMINATORS

A simple device which enables the mains unit to be disconnected at the same time as the L.T. battery merely by switching off the set in the usual way.

HAVING purchased an eliminator to take the place of the H.T. battery in my set, I found it rather a nuisance having to switch off the mains as well as the set. Diving down to skirting board wall-plugs or up to lamp-holders struck me as being an unnecessary evil in this mechanical and electrical age.

Furthermore, when it is forgotten an excessively high voltage may be applied across the smoothing condensers, which don't always "stand up" under the strain. The outcome of these thoughts is the relay shown in diagrammatic form and it will be found useful in several ways—it prevents the eliminator being left on with no load and makes possible the use of a remote control.

Cost Almost Nil.

The cost of construction is practically nil, a few pence for the wire, and the rest should be found in the average "junk box." The current used for the operation of the switch is the same as that used for the valves; that is, the current which heats the valve filaments works the relay "on its way."

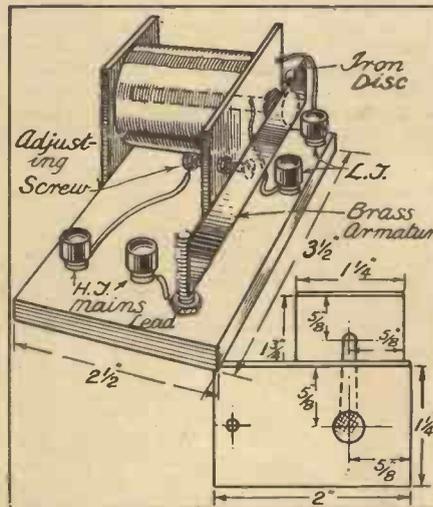
In the average three or four-valve set the voltage drop across the magnet will never exceed 1 volt and will usually be less. This, in practice, makes no difference at all to valve operation.

The construction, which is extremely simple, should be started by cutting an ordinary 4-inch wire nail in halves. The "head" is the part used and should be

fitted with two pieces of wood as shown. The larger piece is 2 in. \times 1½ in., and the smaller 1½ in. \times 1½ in. They are drilled as shown and driven on to the nail to make a tight fit.

The wire—¼ lb. No. 18 D.C.C.—should now be wound on in layers. Thread the

DISCONNECTS THE MAINS



Here are the dimensions and constructional features of the mains unit switching device. The magnet is wound with 18 gauge D.C.C. wire.

ends through holes in the larger bobbin end to hold them fast. If wound neatly, the

wire will just fill the available space, and the whole can then be mounted on the baseboard, which consists of a piece of wood—ply or otherwise—about 3½ in. \times 2½ in. Ordinary ½ panel pins will hold it firmly enough, or screws can be used if preferred.

The armature consists of a piece of thin springy brass, 2½ in. long and ¾ in. wide. At one end is soldered a disc of iron plate the same size as the nail head. This disc should not be made too heavy—ordinary tin plate cut from a cigarette tin is quite satisfactory. The support for the armature in the original was a 1½ in. \times ¼ in. bolt with its head countersunk underneath the baseboard. The armature should be soldered to it, and then adjusted so that its head or metal disc rests about ¼ in. from the nail head.

Good Pressure Contact.

The brass strip itself forms one side of the switch contact. The other side is formed by a 2 B.A. or 4 B.A. brass bolt fitted through the front magnet support. This bolt is also the switch adjustment, and must be adjusted so that the brass strip in the "off" position is about the thickness of a visiting card or a little more away from it. This small clearance ensures that when "on" the contact shall be a "pressure" one.

Four terminals complete the assembly. They should be fixed where shown, and two have the solenoid windings connected to them, while the others are joined to the adjusting screw and the armature support respectively. The switch should be placed near the eliminator and one mains lead broken and its ends joined to the terminals marked H.T.

One of the leads to the accumulator is removed from its terminal and connected to one L.T. terminal on the relay. The remaining terminal is joined to the free accumulator terminal. On switching on the set the armature will click over and connect the mains, and on switching off it will spring back and disconnect the eliminator. P. C. M.

RIBBON MICROPHONES

(Continued from previous page.)

well picked up—whether they be high or low in frequency. Because of this absence of frequency discrimination, and because it picks up less reverberant sound, it is possible to place the ribbon type of microphone very much farther away from the sound sources—the reverberation effect being much less than with normal microphones, because, of course, the direct waves are all fully acknowledged, and not lost through frequency discrimination.

Balance is Improved.

The immediate result is better balance. In the old days it was not at all unusual for the fiddles to be playing only 4 or 5 ft. from their microphone. Now they can be placed 15 to 20 ft. away without loss of effect—and therefore the sound as a whole, taking high and low frequencies, is easier to balance.

"It is by far the cheapest microphone we have so far developed," said Mr. Kirke, adding: "The great beauty of the ribbon is that the studio people all like it, because it makes balancing so much easier."

Having worked away quietly on this

special type of microphone the research engineers are satisfied they have something really good. The proof that the studio staff agrees with their verdict is the rapidity with which ribbons are being installed in different parts of Broadcasting House.

Already producers are finding special advantages for the ribbon. In shows needing more than one microphone, for instance, the ribbon's clean cut directional effect is a great help. With normal microphones there is always a difficulty when using more than one in a studio, because sounds intended for, say, the chorus microphone to some extent impinge on, say, the orchestral microphone, with a consequent blurring of the quality.

With a ribbon microphone this need not happen, for it is possible so to place it that it simply does not pick up any sounds except those intended for it. Here again the result is a cleaning up of quality—an absence of "fuzziness," as admirably instanced by the much improved relays from Covent Garden, where ribbons have been installed.

Before the coming of the ribbon they had to use two microphones, one for each half of the orchestra. Now a single ribbon placed by the conductor serves instead. The

whole orchestra comes within the 90 degrees angle of response, while all sounds—of high or low frequencies—are handled without frequency discrimination. The general cleaning up in tone has been widely noticed.

Quite Cheap To Make.

At first one of the slight disadvantages of the ribbon was the apparent need for a "pre-amplifier"—an amplifier situated near to the microphone, quite apart from the normal amplifiers. Now experiments in balancing up the amplifiers at Broadcasting House have done away with this pre-amplifier altogether, so that the ribbon is just as handy as the old carbon type.

Talk of the need for a pre-amplifier preventing the ribbon from coming into general use throughout the B.B.C. system is discountenanced by Mr. Kirke. At the same time he pointed out to me that to change over all the microphones in the whole of the B.B.C. system would be no small expense, and that is why the ribbon is such an extraordinarily promising development—for it is quite cheap to make.

Whereas a normal microphone might cost anything from £30 up to £100, the ribbon can be made for something appreciably less.

TIME FOR TESTING

BY G.V. DOWDING Associate I.E.E.

WHAT is the B.B.C. doing towards the improvement of broadcast reception? Quite a lot, but, in my opinion, not enough. It may be said that their duty to the listening public ends with the provision of good programmes broadcast via the best transmitting apparatus.

But that, after all, is only half the process. If the B.B.C. were a purely commercial organisation, it might reasonably be suggested that the other half was the concern of those who supplied and used the receiving apparatus. However, the B.B.C. is a national body enjoying a cast-iron monopoly, and therefore its responsibilities to the community are greater.

"Take It Or Leave It" Attitude.

The B.B.C. does not show up particularly well when it is compared with some other national services even in this country, let alone abroad. Of course, the "mothering" principle can be, and often is, carried to the point of irritation, but a complete disinterestedness is galling to the extreme.

One would conclude that the B.B.C. doesn't care a darn *how* its programmes are being received from the distant "take-it-or-leave-it" attitude it adopts. Perhaps it is merely lack of imagination.

The B.B.C. can rightly feel that it is doing much by providing a transmission of a quality second to none in the world. Isn't it the listener's own fault if he doesn't purchase or construct suitably efficient apparatus and thus complete an all-but-perfect radio chain?

And that is just the point. It is here where the B.B.C. lets us down with a bump. The individual listener is not in a position to know good or bad receiving apparatus when he hears it.

No doubt the lofty official reply to the criticism would be "The B.B.C. has every confidence in the radio industry to supply adequate receiving apparatus."

So have I, and I also have the knowledge that the radio industry besides including firms which conscientiously produce first-class sets includes others which manufacture gear which isn't, to say the least of it, as sound as it ought to be.

Helping The Consumer.

Now a gas company does not consider its job is done when it has ensured a regular supply of gas of consistently good quality. It goes farther, and does its best to ensure that the consumer shall have the opportunity to learn how best to use it. Therefore, it runs showrooms where can be seen all kinds of suitable stoves and other appliances and where expert advice can be obtained. There will also be demonstrations, and some gas companies even run cooking classes.

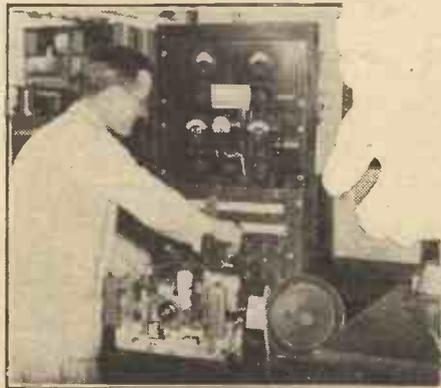
Electricity supply undertakings do the same kind of thing, although I am bound

Is the B.B.C. doing all it should in the improvement of radio reception? Do its moral obligations towards listeners end at the provision of programmes transmitted at high levels of technical efficiency? These are some of the controversial questions asked by Mr. Dowding, who also advances some suggestions for closing the present wide gap that exists between the broadcasting service and the listening public.

to admit that only a relatively few people seem to take advantage of the services of this kind which are available in most towns. But then, your local electricity engineer hasn't the opportunity of telling you through your lighting circuits how he can help you in the same way as the B.B.C. could through the ether—but doesn't.

I must admit that until fairly recently I rather took my domestic electricity supply for granted, even though the local council had built two first-class showrooms in different parts of the town. Then one day I wandered into one of them to inquire about some 200-watt lamps.

WHERE HIGH EFFICIENCY SETS ARE MADE—AND TESTED



An engineer in the H.M.V. factory testing the low-frequency characteristics of an H.M.V. set.

An extremely polite young man gave me all the information I wanted and a bit more as make-weight. He also added that if I bought my lamps at a council showroom they would always be replaced if they failed within a reasonable period—say, three months. Further, he implored me to "drop in any time" if I wanted assistance or advice concerning the electricity supply. And this, mark you, was not the showroom of a commercial undertaking but a municipal affair.

At comparatively little cost the B.B.C. should be able to run a similar service for its consumers, for that is what listeners are. Therefore, my suggestion is that in

every big town there ought to be a B.B.C. showroom and demonstration centre where listeners could hear all the latest receiving apparatus and receive advice. As to whether or not it should be possible to purchase apparatus at such centres I leave as an open question.

There certainly might be difficulties, but surely no greater ones than those encountered in a municipal electricity showroom where generally a full range of the leading proprietary electrical appliances can be examined and bought.

Personally, I think such a service should be quite free and if the cost could not be covered out of trading, then the P.M.G. might be able to disgorge a few of the hundreds of thousands of pounds per annum which he steers from the licence revenue towards the treasury.

Demonstrations Under Ideal Conditions.

Alternatively, the trading atmosphere could be entirely eliminated and the B.B.C. local centres organised more as listener-B.B.C. contact and propaganda institutions where the main items would be demonstrations of anonymous first-class receiving installations for the purpose of enabling listeners to hear reception under ideal conditions. Additionally, of course, there should be tactful and friendly B.B.C. officials to discuss all aspects of radio. All this would humanise broadcasting and establish closer relations between the B.B.C. and the listening public.

In the meantime, there is another way in which the B.B.C. could help the listener towards better reception, and which would not cost anything at all. And that is merely to broadcast on regular occasions a series of test audio frequencies. I first made this suggestion some ten years ago, and since then others have advanced similar ideas.

If the test frequencies were transmitted with a few words of simple explanation, every listener would at once be in a position to gain a very fair estimate of the quality of his set and loudspeaker. It requires no imagination to appreciate the probable extent to which the general standard of radio reception would be raised within a year or two by such a scheme.

The Question of Presentation.

Mind you, the test frequencies would want "presentation" or listeners might tend to avoid them. I wouldn't for the world have them put over by an engineer, but rather by artists like Leonard Henry, A. J. Alan, and Sir Walford Davies. At least, there could be special presentations of that nature at intervals in order to attract listeners, although the others of the weekly half-hour "Times For Testing" could be strictly scientific in order to conciliate technical aesthetes!

CATHODE-RAY CIRCUITS—No. 1

OBTAINING THE SPOT

The first of a short group of articles dealing with the practical aspects of cathode-ray television.

By K. D. ROGERS

IN recent years the cathode-ray tube has made big strides, and the coming of high-definition television has placed the tube on a pinnacle of importance that was never dreamed of quite a short time ago. And with the rapid approach of the day when the first high-definition television station in this country will be starting, it is of value to take a brief glance at the circuits and devices that have been developed to enable us to receive those transmissions.

While at the moment it is by no means certain whether cathode-ray reception will be the method universally adopted when television receivers become general pieces of household furniture, it is certain that at the beginning of this new era of television the cathode-ray tube will be well in the forefront.

Exciting the Tube.

Several articles have appeared in recent weeks in POPULAR WIRELESS on the action of the cathode-ray tube, what it is and why it does what it is intended to do, but the actual circuits that are employed with the tube have not been discussed. It is the purpose of this short series of articles on the practical aspect of cathode-ray reception to deal with the various circuits that are essential to successful operation, and this week I want to touch on the matter of

You already know that the emission from the cathode of the tube causes a stream of electrons to flow down a sort of tunnel which is biased negatively, through a hole in a positively charged anode or accelerator, and then through another anode with a hole in it. This second anode is at a higher positive potential than the first and so gives a further impetus to the electrons, which finally fly out and impinge in a neatly focused beam on to the screen, where the impact causes a spot of light.

The focusing is obtained by reason of the static and magnetic strain between the two anodes (in some tubes three anodes are used), so that though we start with a flow of electrons that are ready to spread in all directions, we end with a tightly packed mass like a beam of light that has been focused through a converging lens.

To obtain all this we need volts. And plenty of volts, too. Something like 2,600 volts are used in quite small tubes, capable of giving a television picture of about 6 inches by 4½. Larger tubes require upwards of 4,000 volts to energise them satisfactorily from the anode potential point of view.

These volts are not accompanied by any great current, nothing like the anode current even of our ordinary detector valve in a battery set being required. The electron current of the average cathode-ray tube is about 50 microamps. But the volts *must* be available and this is how they are obtained.

or petroleum-jelly-impregnated type capable of withstanding voltage up to 3,000. (We are assuming throughout this article that we are dealing with a tube that needs 2,600 volts maximum.)

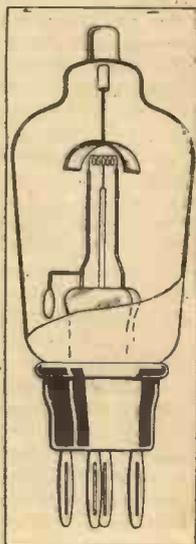
This condenser is quite enough to smooth the supply at the small current taken, which, including that by-passed by the resistance potentiometer chain, is only just over a milliamp. The circuit I have drawn incorporates a thermal delay switch in the positive lead to delay the application of H.T. to the tube until (1) it has warmed up and (2) the time base associated with it is functioning.

Tapping off the Voltages.

The potentiometer network across the H.T. consists of 1-watt resistances and volume-control type potentiometers. It is for the purpose of tapping off different voltages for the various parts of the tube. For instance, the first anode requires about 500 volts, the second anode takes the whole

HALF-WAVE RECTIFIER.

An MU2 mercury-vapour-filled rectifying valve is constructed as shown here. The anode is connected to the top boss of the valve. The filament—which is positive to the anode, of course—is connected to the usual pins in the valve base.



voltage (and is, by the way, earthed to avoid external electrical and magnetic interference), the cathode is, to the tube itself, at zero volts, and the shield (the cylinder that surrounds the cathode and acts like the grid of a valve) is biased negatively in respect of the cathode.

All this is carried out by taps on the potentiometer resistance chain. The whole maximum voltage is variable within certain limits by means of the 2-meg. "volume control" (A), the first accelerator (or anode) potential can be varied (C) (to allow focusing of the tube), the cathode is fixed, and the shield bias is variable by means of the 100,000-ohm potentiometer (B).

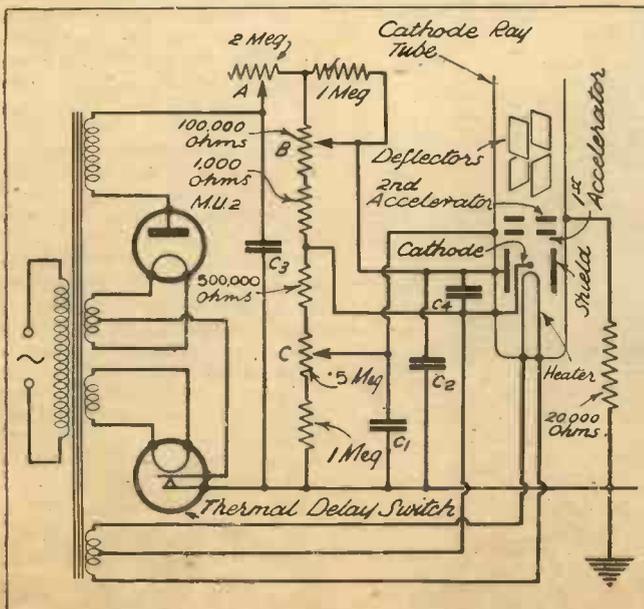
This potentiometer allows a certain amount of focusing to be carried out and limits the number of electrons, so that a well-defined spot on the screen can be obtained when the best focus point on the accelerator control is found.

The tube I have shown is of the latest indirectly-heated variety and takes a heater current of about 1.5 amps at 2 volts. A typical example of this kind of tube is the Ediswan AH.

Condensers C₁, C₂, C₃ are 1-mfd. 3,000-volt working types, and C₄ is of the 250-volt working variety. You can use any voltage rating above this; the main thing is to have a good margin of safety. For if that condenser breaks down it is all up with the tube, for the bias on the shield will be removed and the rush of electrons freed from the cathode will literally explode that electrode. The same would happen were a break in the potentiometer chain to

(Continued on page 461.)

THE SPECIAL POWER PACK



The exciter circuit used for producing the necessary voltages for the cathode-ray tube. Note that the positive is earthed, not the negative side, as is usual in radio circuits.

the excitation of the tube itself; in other words, the obtaining of the spot on the fluorescent screen at the end of the tube.

condenser is connected across the H.T. positive and H.T. negative of the power pack, the condenser being of the oil-immersed

The "LUMINOUS" Electron

A highly interesting description of how electron movement produces a light glow in gas-filled and cathode-ray tubes and also in Nature, as, for example, in that striking phenomenon known as the Northern Lights.

By J. C. JEVONS

THE true relation between light and the electron is one of the riddles of modern science. In television, for instance, how does the stream of electrons flowing through a cathode-ray tube transform itself into a luminous picture on the fluorescent screen? Or why, at the transmitting end, does the sensitive metal cathode of a photo-electric cell produce free electrons under the action of a ray of light?

We know a part—in fact, a good deal—of the answer, but not the whole of it. When we do, many of the problems which are at present holding up the full development of television will automatically solve themselves.

"A Bundle of Radiation."

The electron is the unit of electricity. It also possesses a microscopic amount of mass, but that is due to the electric charge. Actually it is all electricity—of the kind we call negative. On the other hand, the unit of light is a bundle of radiation called the photon, which has neither mass nor electric charge. It cannot, for instance, be deflected from its path by applying either a magnetic or an electrostatic field of force—unlike the electron, which is deviated by both in the cathode-ray tube.

The electron is also an electric atom—that is to say, it is the smallest known charge of electricity, just as the chemical atom is the smallest possible subdivision of an element. In exactly the same way the photon is an "atom" of light.

This is one of the most amazing discoveries of modern times. The mind can readily grasp the notion of ordinary matter being composed of concrete atoms, and it is even willing to accept the idea that an electric current can only be analysed down to a point where the electron forms the limit. But that light is likewise built up of definite "packets" of energy, which cannot be split into smaller fractions, is distinctly harder to understand. Yet so it is. Nothing that we know can subdivide the unit "packet" of light energy which we call a photon.

All-Electric Atoms.

Whenever light is converted into electricity, as it is in the photo-electric cell—or when the process is reversed and electricity is converted into light as it is in a mercury glow lamp or on the screen of the cathode-ray tube—we always find the electron and the photon at the root of the transformation. In one case a photon of light pushes its way into the atoms of the sensitive cathode of the P.E. cell, and forces out an electron. In the other, an electron invades an atom of gas—or strikes against the surface atoms of the fluorescent screen—and in doing so releases a "packet" or photon of light rays.

Of course, we are all familiar with the process in which a crowd of electrons jostle their way through a metal filament and gradually heat up the wire until it becomes visible, first as red and finally as white light. That, too, is part of the same story, but it will be more instructive to follow the action more in detail. So we will take an electron as it produces the luminous glow seen in a Neon lamp or in a Crookes tube, which was the forerunner of the modern cathode-ray tube.

A TYPICAL GLOW TUBE

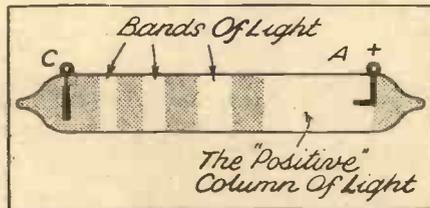
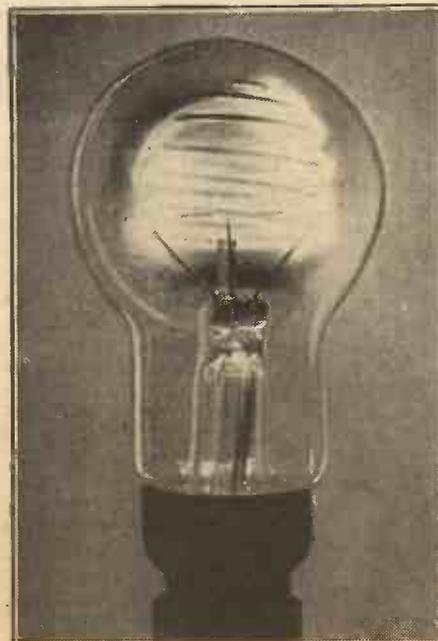


Fig. 1. A typical Crookes tube. C is the cathode and A the anode. Collisions between the electrons cause the tube to glow.

In the first place, it must be explained that the atoms of a gas—or of any other kind of matter—are not solid particles, like so many miniature cannon balls. Modern research has shown that they are all-electric in their make-up, consisting of a positive proton or nucleus, and a definite number of negative electrons. These two electric

THE NEON LAMP



The neon lamp is a practical example of an electron discharge producing a luminous effect.

particles normally attract each other with considerable force. The pull, for instance, between a positive proton and a negative electron, when four diameters apart, is roughly equal to the weight of four pounds.

Why, then, it may be asked, do they not crash into each other? They do not for just the same reason that the earth keeps its distance from the sun, in spite of the immense gravitational pull between the two. In other words, the electrons are constantly rotating in orbits around the central proton, and centrifugal force keeps them a fixed distance apart.

Slow Collisions—No Light.

We must therefore regard the gas inside a discharge tube as made up of molecules, or groups of atoms, each consisting of a tiny solar system, with the sun or proton at the centre and the electrons revolving like planets at different distances around it.

Fig. 1 shows a typical Crookes tube with the cathode at C and the anode at A, both electrodes being cold. As soon as a voltage is applied across the electrodes a drift of electrons sets in towards the positively charged anode, and a drift of positive protons towards the cathode. It should perhaps be stated that gas under reduced pressure is always partly ionised. That is to say, there are always spare electrons present, set free in the first place by the action of the ever-present cosmic rays.

As the speed of both electrons and ions increases under the pressure of the applied voltage, collisions occur and secondary ionisation takes place, so that very soon there is a generous flow of free electrons through the tube. Now, if a slowly moving electron comes into contact with a molecule of gas it does not upset the "solar system" of the atom but they bound off smoothly and elastically like a couple of billiard balls. Therefore, for some distance from the cathode, whilst the electrons are still gathering speed, there is a dark space inside the tube.

Extra Speed Causes "Damage."

Presently, however, an electron gets up sufficient speed to do damage. It strikes against one of the satellite electrons of an atom of gas and knocks it out of its proper orbit. The electron still remains within the atom as a whole, but, having acquired extra energy from the impact, it begins to spin at a higher speed and moves farther away from the centre nucleus.

This, however, upsets the steady "balance" of the atom, so that, after a very short interval, the electron jumps back again to its normal orbit and speed. In doing so it gets rid of the extra energy received from the electron by throwing it off into space as a pulse of radiation. The

(Continued on page 464.)

HOW B.B.C. OPERETTAS ARE BORN

"P.W.'s" special correspondent interviews those two highly successful partners in radio operetta—Denis Freeman and Mark Lubbock.

WHEN Toscanini was in London to conduct the B.B.C.'s London Musical Festival, a gang of the children who cluster round the entrance to Broadcasting House, hoping to get the autographs of the stars, swooped down upon a tall man with long hair and a large, black bow tie, carrying a wad of music and a conductor's baton.

"I'll give you my signature if you can tell me who I am," he retorted to their cries.

Many of the children fell off, dismayed. Then a dirty little urchin yelled:

"I know—you're Toskerny, him as 'as 'is photo outside the Queen's 'All!"

"Sorry!" answered Mark Lubbock, and strode across to St. George's Hall.

This clever young B.B.C. composer and conductor certainly looks every inch a musician, and his work since he joined the B.B.C. three years ago has proved that he is one—well above the average. Listeners know him best for his highly successful partnership with Denis Freeman, in radio operettas.

How They Met.

"It is a constant source of amazement to us how a body of listeners seem ever to follow our work and write to us about each show—the Freeman-Lubbock fan club, so to speak!" exclaimed Freeman, when I found them both together in an office at St. George's Hall. Swivelling round in his chair, he inserted a monocle in his eye, crossed his perfectly trousered legs, ran a slim hand over his well-brushed hair, and beamed at me. I glanced at his pal Lubbock. He looked as casually groomed as he must have looked one summer's evening in 1926 when he strolled into a friend's house at Chislehurst and was introduced to Denis Freeman.

"Yes," reminisced Lubbock dreamily, "I remember now, that's how it began—"

"Mark played the piano," cut in Freeman. "He played his own compositions. He played them till it was positively too dark to play any more!"

I asked Freeman what he was doing in 1926.

"In the Effects Department at Savoy Hill. Before that I had run a village theatre at my home in Sussex, had lived with artists in Paris, had been a reporter on a Hastings newspaper and one day found a body half an hour after a murder, had printed programmes for the Gate Theatre in London, and had got the bird on the stage in the West End! Then I joined the B.B.C., having become known to them as an actor in Lance Sieveking plays."

The First Production.

I turned to Lubbock.

"Me?" he smiled gently, as if it were a great trouble to have to search back through the years. "I had a musical education in Germany—I have a brother a

conductor of the Dresden Opera now. Then I entered the theatre and became a musical director—"

"The amazing and totally unbelievable thing about Mark," said the quick and debonair Freeman, "is that he comes from a real old English county family—roast beef, horses, hunt balls, you know!—and yet out of a large offspring he and his brother are the only ones who have deserted hunting for music. Now my father was writing poetry and my mother painting a picture when I was born, so no wonder I'm what I am!" And, lifting monocle from eye, he laughed politely.

"Denis remembered my playing to him that night at Chislehurst," Lubbock's voice broke in softly, like a distant stream. "And

DENIS FREEMAN



Denis Freeman, whom you see above, has been with the B.B.C. for several years and has made a name for himself in connection with radio plays and operettas. Mark Lubbock (right) is a clever musician, among his compositions being the music for the radio revues, "A Seat in Hyde Park" and "The King Can Do No Wrong."

MARK LUBBOCK



time he tells it, it has changed, so that in the end I'm in a hopeless muddle! We usually have a grand clean-up at my home. My wife plies us with tea and we annoy the neighbours by tapping out the music on the piano until four or five in the morning."

"But before that," put in Freeman, "Mark has tried it all out on his wife—it's a miracle to me how ever she manages to write novels and listen to his music at the same time!"

Both Live in Kensington.

Mrs. Lubbock is Bea Howe, the novelist, who wrote "A Fairy Leapt Upon My Knee." They live at Kensington, and so does Denis Freeman, only he is a bachelor and says he's married only to his garden and a country cottage, which he gets for 7s. 6d. a week!

"And usually," drawled Lubbock, softly, "Otto, my dachshund, dashes all round the house with my latest number in manuscript."

"Yes—yes—really it is a most extraordinary miracle how these operettas ever get to the microphone, isn't it, Mark?" Denis Freeman inserted the monocle and laughed across at Mark Lubbock.

HOW MANY VALVES?

THE classification of sets according to the valves they employ does not provide much in the way of guidance as to their performance. That is, speaking in terms of the mere numbers of valves.

What, for instance, does the term "four-valver" conjure up? A set which uses four valves, obviously. But what kind of valves, and how are they used?

The difference between two sets each using the same number of valves can be very great indeed. Let us take two cases. One four-valve set might employ a straight-forward H.F., detector, and L.F. circuit, the fourth valve being a mains rectifier.

Very Different Case.

Another set, still "only a four-valver," could employ a circuit on the lines of the one shown on page 328 in a recent "P.W." Two heptodes each doing at least the work of two ordinary valves, an H.F. pentode, a combined Driver-Class B (which is equal to three valves), a metal radio rectifier, and a metal mains rectifier.

To obtain the equivalent using ordinary valves throughout, a ten-valve circuit would be needed.

No, attempts to classify sets by mere numbers of valves must obviously fail now that there has been so much extension of the use of multi-functional valves.

It has been suggested that a fairer basis might be to take "stages" instead of valves, a "stage" for this purpose equalling one complete process of valve amplification.

But this, too, has its snags.

The only entirely satisfactory solution seems to be to classify sets on a basis of performance and that would appear to be the most logical way.

when he had written a show for broadcasting and wanted music for it he told them at Savoy Hill that I was the man who could compose it. I went along and the result was 'The King Can Do No Wrong,' with Greta Keller starring—"

"It was the first B.B.C. operetta," burst in Freeman. "There was no Theatre Orchestra then, so we augmented the Gershon Parkington Quintet."

"We worked very well together," smiled Lubbock. "So—I was taken into the B.B.C., and our operettas began to appear—'A Seat in Hyde Park,' 'His Majesty Proclaims,' 'Twelve Months and a Day'—"

"Oh—and all the others," quoth Freeman, with an all-embracing sweep of the eyeglass. "All our operettas originate from a new tune by Mark. He plays it to me; I build up a story; he composes more music—but that one tune is always the keynote of the story."

"As I compose," said Lubbock, "Denis keeps on telling me the story and every

BROADCASTING IN TURKEY

THE Turkish Government has announced its intention to construct a 150-kilo-watt station near the capital, Angora, in the near future, when Turkish programmes will attract more attention from British listeners. So let me describe the existing stations in Turkey and the types of broadcasts.

Turkey does not concern itself with "multi-studio systems," for the 5-kw. Istanbul station, which is accommodated in the main post-office in the Rue Meydancik, comprises but one studio. This is a large chamber, strikingly decorated with the colours of the Republic and with photographs of Mustapha Kemal, and by means of a heavy curtain can be divided into two studios. The control room, which is in charge of a Russian engineer, is next to this studio, and directions are given the artists through a glass panel. The transmitter, which is of French design, is at Osmanie, some fifteen miles distant, in a military zone.

The Licence Fees.

The Director, Hayrettin Bey, told me that his company was receiving the whole of the licence fees until the number of listeners reached 6,000, when the State would take a proportion. A permanent European orchestra plays four days a week, and there are several Turkish bands.

Kemal has issued an edict that the old Turkish national music is to be replaced by modern and European music, but a plebiscite showed that most listeners, while favouring dance bands, still yearned for their native compositions.

French lessons are given regularly, and there are talks on hygiene, domestic and

general topics. Important functions are relayed, and loudspeakers are erected on the minarets so that all the populace can hear. The programmes from the 7-kw. Angora station erected in 1928 are designed on similar lines.

Restricted Advertising.

The Istanbul speaker, Mesut Djémil Bey, who is also a broadcasting violoncellist, is decidedly popular. Listeners were invited to vote for a male or female announcer, and M. Bey secured seven-eighths of the votes cast. Advertising is confined mainly to cinema and gramophone-record announcements. The most popular item is that called "Karagoz," in which a solo artist converses (ostensibly) with several others, with interludes of weird "string" music.

The Istanbul transmitter has been frequently received in the United States, but, strange to say, its reception is poor in Angora. Similarly the Angora signals are not well heard in Istanbul.

C. W. L.

TELEVISION ANNOUNCER



Miss Ursula Patzschke, who announces the German high-definition television programmes.

A READER'S PRAISE

The Book of Practical Radio.

The Editor, POPULAR WIRELESS.

Dear Sir,—I beg to acknowledge receipt of "The Book of Practical Radio."

I certainly think it is one of the finest books I have read dealing with wireless subjects.

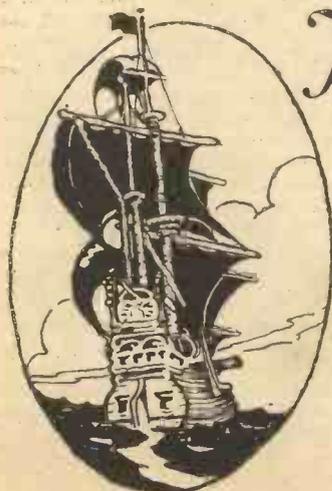
There is no doubt that "P.W." has done a great service in making available at a low cost such a mine of information that is helpful to both amateur and professional alike.

I thank you for a very fine book.

Yours faithfully,

7, Park Place,
Park Street, Derby.

W. O'BRIEN.



Here are a few of the famous authors whose masterpiece stories appear in The Argosy from month to month.—

A. T. QUILLER-COUCH
W. SOMERSET
MAUGHAM
JOHN BUCHAN
O. HENRY
W. W. JACOBS
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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 M.S.S. 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

TROUBLE IN PARADISE.

B. L. B. (Taunton).—"The finished '600' looked so good that I thought I was going to be in paradise with it, but instead of that I am in trouble! It has got the feeling of a grand set, but something is holding it back.

"For one thing, I do not get the aerial reaction as described by Mr. Scott-Taggart. And the volume control is useless, so I think the trouble is something to do with this."

It is most important to have the right type of volume control, and if by some mistake you have the wrong one the all-important effects of aerial reaction cannot be obtained.

Check up to make sure that it really is of the recommended type. And if it proves to be, examine it with a view to finding some error in wiring or other fault.

If you are quite certain that no other cause for the fault is possible, arrange to return the volume control to the supplier, for expert examination. But remember that this is the very last resort, for faulty controls are rare, while faulty wiring and operation are, alas! all too common.

H.T. VOLTAGE ON SHORT-WAVE PENTODE DETECTOR.

W. E. (Swansea).—"I want to get about 30 volts on the priming grid of a pentode, used for S.W. detector, by using a 50,000-ohms potentiometer on hand, and a resistance (or resistances) in series across H.T. The full H.T. is 100. About what value resistance do I need, and what are the connections?"

One end terminal of the potentiometer will have to be connected to earth, L.T.—, etc., the usual method being to take the lead from the terminal in question to the metallised baseboard.

The slider terminal of the potentiometer should carry the lead to the terminal on the valve. And to ensure decoupling of the grid it is advisable to connect a largish condenser (say, 1 mfd.) between this terminal and the earthed baseboard or screen.

The remaining end terminal of the potentiometer should be connected to one terminal of a 100,000-ohms fixed resistance. Its other terminal will need to be taken to the H.T.+ lead that is supplying the 100 volts to the detector's plate terminal.

Because the 100,000-ohms and the 50,000-ohms resistances are in series with one another across the 100 volts, with the 50,000-ohms at the negative end, the maximum voltage obtainable on the potentiometer's all-in position will be one-third of the total voltage, less the small drop due to the screen current of the valve passing through the 100,000 ohms.

From this voltage the control can be lowered to zero, or to any intermediate point, which is what you ask for; but remember the snag in potentiometer-tapped H.T. supply, against which we have often warned the unwary reader. The snag is that unless the potentiometer is switched off with the L.T. it will be a continual drain on the H.T. battery.

A switch that simultaneously breaks the H.T.—lead with the L.T. circuit is the best procedure, but if this is awkward to arrange an ordinary make-and-break switch in the H.T.—lead will do; or alternatively the H.T.—wander plug may be removed from the battery every time the set is switched off.

Either of these latter methods is effective, but the difficulty with both is that they have to be remembered, so the potentiometer circuit may be left on

when the set is switched off, which is a sure way of running-down the H.T. battery. The switch which is automatically operated by the L.T. control is therefore, better, since it obviates this possibility of forgetfulness.

GOES OUT OF TRIM.

E. L. (Warwick).—"Since you helped with trimming instructions I have improved the ganged tuning by quite one hundred per cent on foreigners, but I notice that it seems impossible to keep perfectly in trim over the whole waveband (medium) with the detector grid circuit section.

"If I trim it perfectly at 225 metres, and then swing up to 500 metres, I find the trimmer of that section can with advantage be in-

ONE GUINEA FOR A LETTER!

AN INVITATION FROM THE EDITOR TO "P.W." READERS

I WANT readers of "P.W." to help each other. I want them to use the columns of this paper to express their views on all and every aspect of the great hobby of radio; I want them to "swap" experiences; I want them to tell about their triumphs—and their failures—with the various sets they have built. I want, in short, to encourage an exchange of views, opinions, likes and dislikes. . . .

Send me letters for publication, in order that "P.W." can become, more than ever, the best medium for imparting all kinds of knowledge about radio.

YOU must have had, many and many a time, interesting experiences when building or operating your set. Tell other readers about your radio experiences. And, incidentally, get to know each other through the medium of "P.W."

For the best letter each week I am offering a prize of one guinea. Send your letters to the Editor, "Popular Wireless," Tallis House, Tallis Street, London, E.C.4.

created a little (more capacity), though the other trimmers remain perfectly set. Why is this?"

When a ganged set goes out of trim like this the indication is that either the coils are not properly matched, or the condenser sections are not true in the whole of their travel.

The former is unlikely where a set of good coils are concerned, but the condenser fault is easily caused by mishandling. Does that section appear to lie precisely in position when adjusted "all in"? If you can see a discrepancy a very careful readjustment to normal position may sometimes be made with advantage; but, generally speaking, it is for the makers, and not for the set-owner, who may easily do more harm than good.

RUNNING A SMALL SET FROM A BIG MAINS UNIT.

S. G. (Beckton).—"I was interested in the question raised by R. E. E. of Colchester ('P.W.' No. 676), because it may be the clue to something that has puzzled me quite a lot.

"About six months ago I bought an eliminator (H.T.) from a chap who was getting perfect results from it, but who was shifting his home to where the mains were unsuitable. We tried it on my set first, and it went fine from the moment it was connected up. So I said good-bye to batteries, and felt I had got a bargain.

"Since then I have had to get two new valves—which I never had to do in eighteen months of using batteries. And now I am inclined to think it may be because his set was a far more powerful one than mine (his was a 'five' while mine is a 'three'), and I may be getting more voltage than I thought. Would this be a possible cause of short-lived valves?"

It might easily account for the trouble you have experienced, since, if his valves were rather "greedy" ones, taking a lot of H.T., and yours are not, the voltage applied to your valves is likely to be far higher than you imagine.

It is not uncommon to find that the voltage applied to a small set from a mains unit designed for a much bigger receiver is excessive—often high enough to make the small set's valves give up the ghost earlier than they would have done with correct voltages.

You do not mention grid bias, though a sufficient increase of this would enable you to reduce the anode currents to normal, or thereabouts. Work out or measure your set's current consumption, when operating under the best estimated conditions, and compare the result with the rating of the mains unit. If there is a big discrepancy you need a "bleed" resistance, as advised for R. E. E. of Colchester, in the May 18th issue, to prevent the mains unit's voltages from being excessive.

USING LOUDSPEAKER EXTENSION LEADS AS AERIAL.

W. P. (Brighton).—"My four-valve is one of the mains-driven type, with 'Extra L.S. terminals.' So I got the builder to provide L.S. points in the various rooms when the house was built.

"The scheme answers perfectly, and if a loudspeaker is wanted in a bedroom or elsewhere, all one has to do is to take up a small one I keep for the purpose and plug it in where it is wanted.

"Usually, however, I keep in use only the loudspeaker in the set itself. I ought to explain that I also use a built-in aerial in the room in which the set is kept, the wire being concealed behind the picture rail.

"I have discovered by accident that the wires laid for the loudspeakers to the different rooms make a first-class aerial—far better than the proper one behind the picture rail. But although it gives much stronger reception there is a kind of hum and roughness about it that prevents me using it at present. How can I get over this?"

"If I use the set with the proper aerial (with or without its 'Extra-L.S.' terminals connected to the L.S. sockets in the wall) I get perfect quality and good strength.

"If I do not want extra L.S. in action, I can disconnect the proper aerial lead and take the aerial terminal wire from the set to either of the loudspeaker sockets in the wall. This gives the greatly improved strength, but there is always this roughness with it, so I have to go back to the other (aerial) socket to get good quality.

"As I do not want to disturb any of the house wiring, is there a simple way of enabling the loudspeaker wiring to serve as aerial wiring when not wanted for its proper purpose?"

We are afraid not. It is impossible to say definitely, without tests on the spot; but the probability is that the extension wiring for the loudspeakers in other rooms has been placed too close to some of the house electricity wiring, or is otherwise in an unsuitable position to act as aerial.

You cannot very well shift it; and there is no simple method whereby you can take advantage of it as an aerial and at the same time prevent it from picking up the unwanted electrical effects which are at present spoiling reception when it is used.

An expert experimenter might be able to minimise or get over the difficulty; but as far as an ordinary listener is concerned it is pretty well insuperable.

SHORT-WAVE RECEPTION FOR ALL

(Continued from page 443.)

amateur establishing contact with some expedition or other that has absolutely failed to keep in touch with the commercial station supposed to be linking up with it.

And what is there to hear on short waves? Well, in round figures I may say this: 200 broadcasting stations, 50,000 amateur transmitters, about 1,000 commercial telephony stations, many of which relay broadcast, and such oddities as ships and planes and experimental stations.

I'm not going to shout from the house-tops that short-wave reception is easy, because it isn't. But nothing that's easy is worth doing, anyway (at least, that's how I feel about things). The construction of a good set is fairly easy; the acquisition of the necessary patience to become a really first-class operator is not so easy.

But I can honestly promise you that once you take up short waves, you'll become a real radio enthusiast once more, instead of a "broadcastcatcher." Just try it and see!

OBTAINING THE SPOT

(Continued from page 456.)

occur between cathode and shield connections, or if the slider of the potentiometer B should make bad contact.

To obviate the latter I have connected a 1-meg. resistance from the slider to the negative end of the winding.

The resistance in series with the second anode or accelerator is to remove it somewhat from earth potential, as it is sometimes found that having it directly earthed results in A.C. hum, or I should say picture ripple.

Such is the ordinary exciter unit of the cathode-ray tube. It uses high voltages, and therefore must be treated with the respect and circumspection it deserves. It should contain none but the best components, the best insulating materials, the wiring should be air spaced so that no leakage or breakdown is likely, and the whole should be inserted in an earthed iron screening box, the leads to the tube being taken out through high-tension cables.

The Deflector Connections.

If it were intended that the tube should give a spot with only the circuit shown, and no time base, the deflectors would have to be connected together and to the earth point, but this would mean a stationary spot, and that is bad for the screen. It burns it. So I have left the deflectors unconnected, for they do not in practice go to the earth-line like that; they go to the time base, with which we shall be dealing in the next article.

Meanwhile, study the circuit and the brief details now given, for on an understanding of this part of the television receiver depends the power to operate the final assembly, and the understanding of the action of the rest of the circuit used for television reception.

Perhaps it will help you to realise what happens if you look upon the cathode-ray tube as an ordinary valve with its anode, cathode and grid. The fact that we do not

collect the electron stream on the anode but impinge it on the screen does not matter. It returns to the cathode eventually. We do bias the tube by its grid (or shield), and this electrode is used to modulate it in the same way as an ordinary valve is modulated by means of the incoming signals. In a valve modulation causes variation of the anode current; in the cathode-ray tube it causes variation of the brilliance of the picture on the screen.

TELEVISION SHORTS

By L. H. THOMAS.

FROM Canada comes reassuring news of progress in television. 180-line broadcasts from Montreal on a wavelength of 6 metres have been received at a distance of sixty miles, although no information is available as to the quality of the reception and definition at that range.

It is hoped that a regular service between Montreal and Ottawa can be established shortly. The distance, on my map, seems to be over 100 miles, and we will be awaiting later news with some considerable interest.

Of course, it is well known that a high-power 6-metre signal can be made to cover very long distances if the transmitter is favourably situated; but whether one can "squeeze a picture out of them" at the other end is another matter.

Good Strength Needed.

A friend of mine who has been transmitting television on the amateur 10-metre band, has been amazed to find the strength of signals necessary to produce a really good picture, even with 30-line definition. Ordinary "very strong signals" don't always fill the bill, and we have to readjust our ideas of field strength somewhat.

The 30-line programmes, by the way, have been very bright and breezy of late, and many users of disc-type kits have put them back into service after putting them aside in disgust. It's very hard to maintain enthusiasm for the 30-line broadcasts after one has seen a demonstration of "high-def.", but the simplicity of the apparatus makes one rather justful. If only we could keep something just like that, now, and receive 240 (or 405) lines on it, we should indeed be happy.

A New Concentric Cable.

An important development that concerns television enthusiasts more than they imagine is the new concentric cable that is said to be able to handle frequencies well beyond the 1-megacycle limit. If all outside television broadcasts had to rely on micro-waves, their number would be somewhat limited, and the new cable will doubtless be put to work without delay.

Incidentally, one imagines that the "O.B." side of television will not be exactly the easiest job that the B.B.C. has had to tackle. Their ordinary outside broadcasts of sound only go off so smoothly that you and I have no conception of the difficulties and complications that the O.B. men have to contend with. Add a little vision, and you've simply no idea how they'll enjoy themselves!

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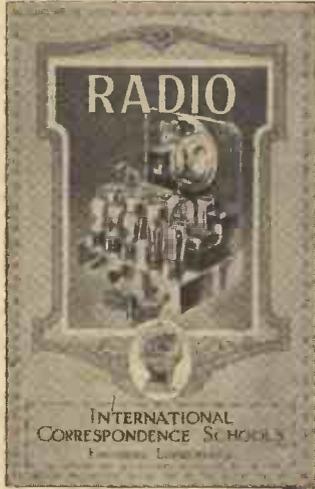
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THE "SIMPLEX" S.W. TWO

(Continued from page 446.)

to you when you first start up. Tuning is extremely sharp, and the keynote to success is—Tune Slowly. If you rush round the dials you will pass over half a dozen interesting stations without even realising that they are there.

The reaction control is no more difficult to manage than that of a broadcast receiver, and the set should go into oscillation with a gentle "slide." You will hear the characteristic "breathing" noise when the set starts oscillating, but it should be completely silent when it isn't oscillating, unless you are near the setting of a powerful station.

Excellent Slow-Motion Drive.

You will appreciate the necessity for slow movements of the tuning control when I tell you that the 31-metre broadcast band contains about 15 stations, all of which will probably come in in less than ten divisions on the dial. The condensers used in the actual set have an excellent slow-motion gearing, and if you make your own by double-spacing old condensers you must equip them with really good slow-motion dials.

With regard to the externals, all that I need say is that you will not require more than 100 volts of H.T. for headphone use. Only one H.T. positive terminal is provided, and the resistance coupling automatically arranges that the detector anode voltage shall be considerably less than this.

For the L.F. valve I suggest an "H.F." or "H.L." type, which, of course, will not require more than 1½ or 3 volts negative bias. The extra amplification obtainable with this type is well worth while, and no trouble will arise with overloading. Were this intended to be a loudspeaker set, of course, it would be desirable to use a small power valve in that position.

Note that I have not relied on the surface of the Metaplex panel or baseboard to carry the earth-return currents. There is a direct connection between the moving plates of both condensers, the L.T.— terminals on the valve holders, and the L.T.— and earth terminals on the strip at the rear. In addition, however, the L.T.— terminal on the detector valve holder is connected to the Metaplex baseboard, and the panel and baseboard are connected together by a short lead in the right-hand corner of the panel, looking from the rear.

Follow The Layout Closely.

The disposition of these earth-return leads is a very important business, and a set that suffers from hand capacity is nearly always at fault in this particular respect.

Copy the layout from the diagram as accurately as you possibly can, and I can't believe that you will experience any trouble whatever. Note the absence of a grid lead from the detector—the grid condenser itself forms the wiring from the grid terminal to the coil holder. The fixed plates of the tuning condenser, too, are connected to that same point as directly as possible.

There is not much point in giving a list of stations heard. Look at the list of short-wave stations in this issue and reflect that, with luck, you will be able to hear every one of them if you listen on the right wavelength at the right time!

You will find the 19-metre broadcast band, for instance, about half way round the dial with the smallest coil. Any evening should bring in W 2 X A D (8-9 p.m.) and W 8 X K (6 p.m. onwards) at good strength. The 49-metre band, at midnight, is packed with American stations, which should come in at 30 or 40 degrees with the largest coil.

THE LINK BETWEEN

By G. T. KELSEY.

THOSE readers of "P.W." who recall the success which attended Mullard's entry into the set market last year with the "M.B.3" receiver will learn with interest that this enterprising firm this year is to launch a complete range.

Great secrecy surrounds their activities at the moment, and I cannot yet reveal any details of the sets which are to be introduced. I understand, however, that the range is to be released some time this month, and, as a general rule, when the makers of valves take up the manufacture of sets, it augurs of something really good. After all, if the valve makers with their wide knowledge of vacuum tube performances are not qualified to design first-class sets, who is?

I shall be interested to learn more of this latest Mullard effort, and shall not hesitate to pass on the details as and when they are available. In the meantime—wait for it!

Get Mains-Minded.

I believe it to be a fact that a number of listeners whose premises are equipped with electric mains supply still prefer to stick to their battery sets. Well, I can forgive them for that. Perhaps in some respects they know a thing or two!

Perhaps, on the other hand, they don't. Anyway, that's a moot point, and I do not propose to enter into an argument on the subject. But I cannot for the life of me understand why battery-set users with mains on tap use batteries! That there are such people is evident from the correspondence which reaches me every week.

What's the matter with a good power unit? As far as I can see, there is everything in favour, and nothing against the idea unless—I wonder if it is the old story of initial outlay?

It is because I am convinced that this is the main objection that I want to call attention to the fact that the finest power units available can now be obtained on hire purchase terms.

For instance, the Ekco K 10/20, which is suitable for all ordinary types of sets and which is equipped with an accumulator charger, can be obtained for a deposit of 5s. followed by 11 monthly payments of 5s. Could anything be more reasonable than that? Why, it would cost you nearly as much over the same period for H.T. renewals and accumulator charging.

As for reliability, well, it is a significant fact that Ekco, who were the pioneers of British power units, are to-day still the leaders in this field, and it is an old saying that there is nothing that succeeds like success.

So now, you battery set-ites with mains on tap, what about it?

That Latest G.E.C. Set.

You will probably be inclined to laugh when I tell you that I am so enamoured with the specification of the new G.E.C. battery set that I am almost sorry that my home is an all-electric establishment! I have tried to analyse my psychology and can only arrive at the conclusion that my supposedly Sassenach ancestors must have crossed the border at some period of the family history.

And yet I don't know. I don't think that one needs to be honoured with a streak of Scotch blood to appreciate the lowness of cost of this new G.E.C. top-liner. After all, a first-class battery set by one of the country's leading manufacturers must appeal to all as a bargain at only £7 19s. 6d. And that includes the necessary batteries!

The set is a three-valver with variable- μ screened grid H.F. stage, screened pentode detector and parallel-fed auto-transformer-coupled pentode output stage. Two tuned circuits are employed, and the incorporation of a special constant reaction circuit makes the set particularly easy to handle.

Volume control is effected by varying the bias on the variable- μ H.F. valve, and by the use of an automatic bias circuit the grid-bias battery is dispensed with.

The automatic-bias circuit, incidentally, is rather ingenious, for it compensates for the lowering of the H.T. battery voltage during its life, thus maintaining consistently good quality of reproduction.

If any of you readers are looking for a remarkable battery set at a "give-away" price, take my tip and obtain full details of this latest G.E.C. production before deciding anything.

TECHNICAL JOTTINGS

Some Varied Notes of Interest to all Readers.

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

The High-Frequency Pentode.

THE high-frequency pentode represents a very great advance in H.F. amplification and is really quite a remarkable achievement. It is the natural successor, as it were, to the H.F. screened-grid valve, which was itself hailed as a very great discovery not so long ago. The screened-grid valve gives a considerable stage gain, and was undoubtedly very much better than the types of H.F. amplifier which immediately preceded it.

The S.G. valve has, however, certain drawbacks, and one of them is that the circuit has to be very carefully adjusted in order to keep it stable and to prevent distortion.

frequencies selectively and therefore "even things out."

But bear in mind that it does this by subtraction and not by addition. Nevertheless, tone control, when properly applied, may make a very noticeable difference to the quality of the reproduction, and it can be utilised very effectively to suit individual tastes. As I have remarked before, the type of reproduction which pleases one individual will not necessarily please another, and therefore it is obvious that listeners do not judge merely by faithfulness of the reproduction to the original.

Insulating the Wiring.

When wiring up a receiver you may use busbar, or some people prefer round wire covered with insulating sleeving. Some people like naked busbar, or whatever the conductor may be, but there is a good deal to be said for having the wiring insulated. If two adjacent conductors happen to come into contact, or if you happen to be poking about in the "works" — you shouldn't be, but people so often do — there is always the danger of a short-circuit, with possibly disastrous results to the H.T. battery or to a valve.

Many people slip on spaghetti sleeving, but this is often a bit awkward as it needs a good deal of care to get the lengths of sleeving exactly right and also it doesn't help you very much when you come to the soldered junctions: in fact the junctions are often very awkward to negotiate.

"Thick and Clear."

A little dodge which I have myself used with success—it is not particularly ingenious and certainly not original—is to paint over the various connecting wires with thick cellulose varnish. I generally use the clear variety—"clear but thick," so to speak (it's cellulose solution, not soup we are talking about), but this has the little drawback that it is not easy to see at a glance which conductors you have painted and which not. If you prefer to use coloured cellulose varnish, of which black is the most obvious colour, this enables you to see immediately which parts have been done and which have not. The varnish can be very easily applied by means of a small artist's paint brush and, if thick enough and not applied too lavishly, it will surround the wire without dripping. It is, of course, also very easy to insulate the junctions in the same way. The varnish completely dries off in an hour or two, leaving a thin coating of celluloid around the conductor.

Very Effective.

You may perhaps think that the coating is too thin to be effective, but I can assure you (from actual tests which I have been making lately in another connection altogether) that an extremely thin covering of celluloid applied in this way acts as a

(Continued on next page.)

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A curious point in regard to the screened-grid valve is that it came into prominence at a time when coils were not nearly so efficient as they are to-day. Hardly had the screened-grid valve made its appearance and given us excellent results with the type of coils then available than somebody went and discovered coils of very much higher efficiency, so that the screened-grid valve was robbed to a certain extent of the credit which it could otherwise have gained.

The high-frequency pentode valve, however, can be said to take the place of the screened-grid valve in most modern sets, and in conjunction with modern coils it gives very much better amplification.

Tone Control.

Many people think that if a tone-control device is fitted to a set it will actually improve the tone in the sense of making up any parts which are lacking. In practice it achieves this object rather by inference. What I mean is that if a certain part is lacking—for instance, the upper frequencies (which is most usually the case)—then the lower frequencies become by comparison more prominent: what the usual tone control does is to suppress the lower

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TECHNICAL JOTTINGS

(Continued from previous page.)

perfect insulator for a voltage many times greater than that likely to be met with in a radio set.

If at any time you want to unsolder or resolder the joint, when the conductors have been varnished in this way, the best thing is to peel off as much of the celluloid as possible in the immediate vicinity of the joint by means of a penknife, and then to remove the rest by a tiny wad of cotton-wool held in tweezers and moistened with amyl-acetate or acetone.

Pentode Output.

The output pentode valve is so convenient, in view of its very large stage-gain and in view of the fact that it consequently enables us to make an efficient set with the minimum number of valves, that there is perhaps a danger of the ordinary three-electrode power output valve falling into disuse. It is not so long ago that we looked upon the well tried three-electrode power valve for output purposes as the last word. But then the great discovery of the output pentode came along.

I think we ought to be careful here. The output pentode after all is not really intended to take the place of a generous power valve, or even, say, a couple of stages of L.F. amplification, finishing with a power valve. The pentode is more for the purpose of giving us a certain output with the minimum of stages; that is, of course, due to the high ratio of output to input. The output pentode is for this reason an extraordinarily useful and valuable component and the simplicity and compactness of the popular three-valve type of receiver to-day owes a great deal to it.

Compared With Power Valves.

But without minimising in any way the immense value of the modern output pentode valve I think it is true to say that, if compactness or the number of valves is not of great consideration, you will often get better results by going to, say, a couple of stages of low-frequency amplification, using triode valves, and so spreading the stage-gain out a bit.

The output pentode valve will work excellently if it is not pushed too hard, but, unfortunately, it often is pushed too hard. If you *must* go in for large volume output, and conditions are really unfair to the pentode, it is far better to go over to a couple of stages of triode L.F. amplification, and this will give you better quality with the volume you want.

Home Construction.

I do not think there is any doubt that home construction is not so widespread as it was a few years ago. Those of you who have been radio fans for some years past will remember well enough that in the early days of broadcasting home construction assumed almost the proportions of a national epidemic. It formed the one topic of conversation in suburban trains, at the lunch hour, and even within the sacred precincts of the board-room. Everybody was mad on home construction in those days, and even golf took second place.

"The Lazy Course."

Since then the set manufacturers have so greatly improved their products, and prices have become so much more popularised, that there has been a great and increasing tendency for listeners to take the lazy course and buy a ready-made set. I dare say it could be argued now that a set could be bought more cheaply than it could be made, but, on the other hand, I for one am firmly of the belief that home construction of radio sets (and television sets, too, very shortly) will continue to be a popular hobby with a large number of the people, if for no other reason than that we have the younger element coming along year by year, full of technical enthusiasm. Wireless will always, I think, appeal to the schoolboy, and the latter is getting more and more technical-minded as time goes on.

Perhaps one of the most definite signs of the decline in home construction is the fact that a number of manufacturers dealing in components for home construction has considerably decreased during the past three or four years. But this is not to say that the manufacturer of components for home use has died out, or anything like it. In point of fact, those manufacturers who are still in the component business are doing an excellent trade, and I think the right view is that the trade has, as it were, shaken itself out and has become more "rationalised."

Making Television Sets.

At any rate, "P.W." knows from actual experience that whenever set designs with blueprints are published there is always a very gratifying response, and it would not be any use anyone attempting to convince the staff of this journal that there was the slightest likelihood of home construction dying out.

I mentioned television a moment ago; I think that when the new B.B.C. television service gets going we shall see a wave of home construction of television sets quite comparable to the home construction of radio sets which we witnessed not so long ago. Perhaps then we shall also see a great increase in the manufacture and supply of components for home use with television sets.

Quality in Reproduction.

We hear a good deal about preserving the upper audio-frequencies or "top" for the purpose of keeping up the quality of reproduction; a set in which this is specially arranged for is sometimes given the unofficial description of a "high-fidelity" set; this term, by the way, is very much in use in the United States.

Background Troubles.

At first sight you might think that the introduction of a so-called high-fidelity set meant that the ordinary set was lacking or inferior in some way. This bringing in of the upper register is all very well in its way, but is not without attendant drawbacks. The principal difficulty about it is that it is very apt, especially on distant stations where there is narrow separation, to bring in all kinds of heterodyning and "background."

For local stations, where the volume is large and the danger of interference is consequently relatively small, the high-fidelity idea often works out all right. I

think, if you do use a set of this kind, it is a good plan to have some kind of switch so that you can cut out the so-called high-fidelity business when listening to distant stations, where the separation is so small that you are very liable to get interference between one and another.

THE "LUMINOUS" ELECTRON

(Continued from page 457.)

energy so ejected is a photon of light and is, of course, luminous.

This explains the first glowing band of light formed inside the tube. It is followed by a dark band, where the stream is recovering from the effects of the first set of collisions, and is gathering up fresh speed to make a new attack on the next layer of gas atoms. In some cases the action is repeated several times, to form a series of alternate dark zones and glowing bands of light. Finally, the increasing pull of the anode voltage becomes sufficient to maintain a continuous glow, along what is known as the "positive" column of light.

The Aurora Borealis.

Here is the mechanism of the luminous effects seen whenever high-speed electrons pass through a gas-filled tube. It also accounts for the glow sometimes produced in the "soft" type of valve—and even explains the striking natural phenomenon known as the Northern Lights, or the Aurora Borealis.

Finally, it is the source of the fluorescent light which comes from the screen of a cathode-ray tube. Only a few substances possess the particular atomic structure which is able to produce fluorescent light under the action of free electrons, though nearly all substances do so under the action of X-rays.

"THE MIKADO" AND "THE NIGHTINGALE"

(Continued from page 452.)

fortnightly will be eagerly awaited. If the promise that further excitement to be continued in our next is stressed, there should be no doubt about this.

I am all in favour of old musical-comedy broadcasts, not for their stories or their comedy, but solely for their typically English music. Broadcasts like "The Geisha" are refreshingly sweet to listeners who dislike the foreign rhythms that have now become national by adoption.

Now for a few pars on a recent Music Hall. Collinson and Dean go all historical. The St. Georgeites go hysterical over them. More from habit, I fancy, than for any real cleverness this time. Rehash stories of Bruce and the spider, and Sir Walter Raleigh. I have heard them in better vein. Certainly I have seen them so. Television would make even a better radio turn of them.

The Harmony Kings introduce new love songs that fairly tug at the heart-strings. A noisy, caterwauling midnight howler number brings down the house, and my loudspeaker, nearly.

Beryl Orde goes all American, but relief comes when she impersonates the Buggins Family and the Western Brothers. Variety was sadly wanting in this turn.

Stainless Stephen has, as usual, a lot of new stuff, the best of his jokes being at the expense of Henry Hall who, he said, has so often been on the air that now he thinks he can walk on it.

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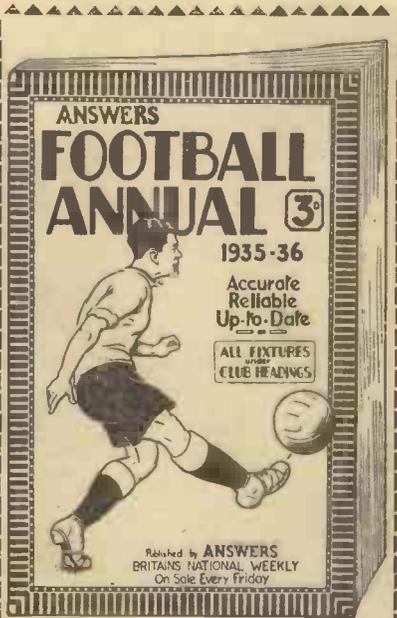
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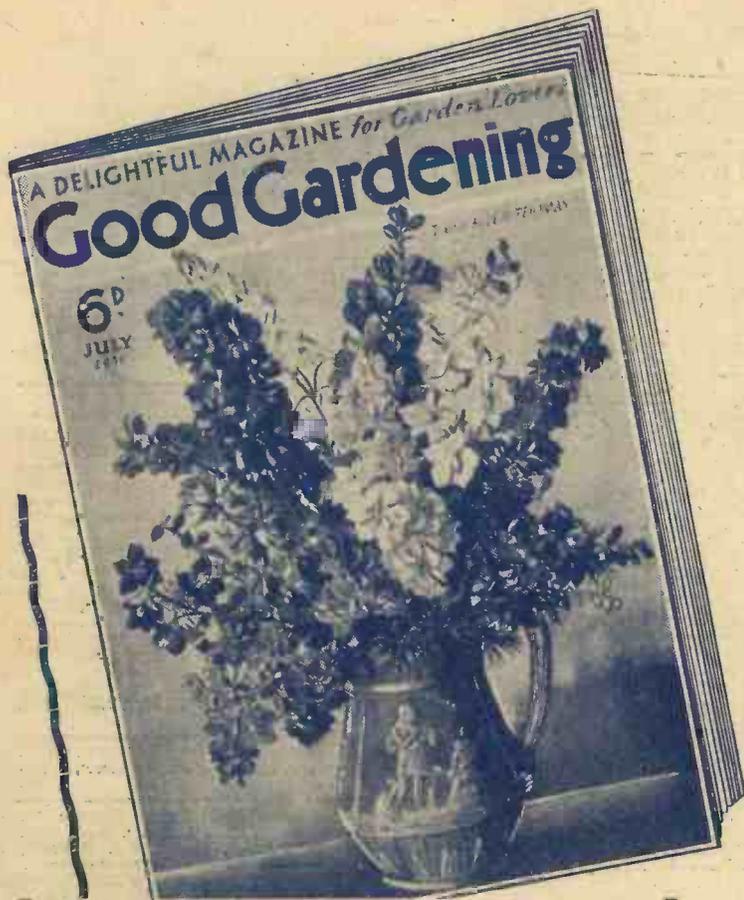
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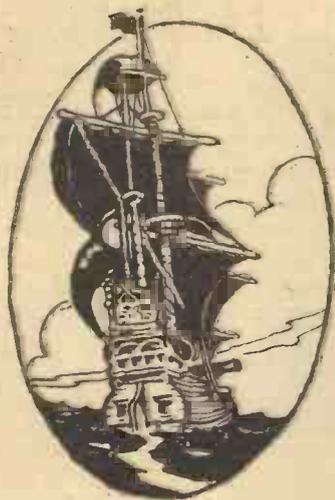
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The studio adventures of C. Denier Warren, John Rorke, Will Hay, Effie Atherton, Philip Wade, Claude Hulbert and Enid Trevor.



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KATHERINE MANSFIELD

wrote "The Tiredness of Rosabel," which also appears in the August ARGOSY, when she was only nineteen. This brilliant study of a young milliner's assistant reveals one of the world's finest story writers at her best.

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A NEW ONE
LOCAL DISHES
ROYAL GREETINGS
"DX" NEWS

RADIO NOTES & NEWS

THE "S.M."
PRISON RADIO
MY GARDEN
IN U.S.A.

New Brooms in Far East.

THE Manchuria Telephone and Telegraph Company—a semi-Government corporation under the management of Japan and Manchukuo—has taken over from the previous administrations the broadcasting stations at Harbin, Dairen, Hsinking and Mukden, and is gingering them up no end, by all accounts.

Hsinking, which has been promised an entirely new transmitter having a power of one hundred kilowatts, is expecting its new programmes on the air by November. It will be by far the most powerful station in that part of the world, and if somebody tells you it has absolutely no political significance you should smile a bland and Oriental smile and murmur "Yes? No? Me savvee, all-a-same."

Santa Marta.

WITH all this increased interest in short waves I gladly snatch the news of a new station from under the very nose of W. L. S. & Co. I don't think my industrious colleagues who specialise in short waves will have recorded Santa Marta yet—he's quite a newcomer on 40.99 metres. The station is situated in Colombia, S. America, about 50 miles east of HJ1ABB, Barranquilla.

I got wind of Santa Marta from a roving correspondent who kindly took down his speech on the spot, as it sounded to English ears, and sends the following description of the announcement: "Atchay-hota-une-ah-bay-ah, aqui en Santa Marta."

The call-sign is HJ1ABA, and the wavelength, announced in Spanish, sounds like "Sayce-mills-sayce kilo-see-los" (6006 kilocycles).

South Coast Amateurs.

SOUTH COAST listeners are asked to give ear to Hastings—"1066 and all that"—on Sunday evenings at 6.30, 7 and 7.30. At those times special modulation experiments will be tried from G5BS, on 160 metres, and the Hastings and St. Leonards Radio Society would like to know how they are received.

A recent 5-metro field-day proved disappointing, but work is proceeding at the society's new headquarters, and it is hoped to start regular test schedules soon, from G6HH, on various wavelengths.

"Beetonic" Art.

THE success of Mr. Cecil Sharpe in capturing and making permanent the old traditional songs has inspired Mrs. Arthur Webb to do a far, far better thing. She has gone out into the highways and byways and compelled the expert housewives and cooks to describe their wonderful local dishes for the benefit of listeners to the morning talks on cookery.

ARE YOU INTERESTED IN—

- Short Waves? - - - See page 475
- Television? - - - See page 479
- B.B.C. Happenings? - - See page 482
- Gramophone Records? - See page 483

This smacks of genius, for whereas a gay and sprightly tune makes glad only the heart of man, a well-cooked Hog Pudding or a Figgy Squab rejuvenates and reconditions him. To lift the heart is good, I grant you. But to make the mouth water—that transcends mere anatomy, and becomes Art.

Pilotless 'Planes.

THE fact that for many months the R.A.F. has been using a type of radio-controlled aeroplane for target practice caused a great stir when revealed to the public in connection with the R.A.F.

HEARD OVER THE AIR



MANTOVANI, the popular band leader and radio artist, tuning in a programme on his Cosor mains receiver.

Display at Hendon. The aircraft of this type have been named "Queen Bees," and when in the air they contain nothing but the engine, the fuel, and the controlling wireless mechanism.

The range over which they can be wirelessly controlled from the ground is about ten miles, in which area they can be made to loop, spin or roll just as though a live pilot were on board.

Over the sea machines of this type have been equally successful, and though officially styled as targets, it is obvious that such aircraft are capable of other uses.

The Prince and Wireless.

THE interest which the Prince of Wales takes in radio is reflected in novel form on his birthday, when greetings by wireless from all over the world are handed to him.

All the messages are handled by amateurs in the different countries, and radio is the sole means of communication. For example, when a Bradford amateur, G6KU, picked up a message from VS1AJ, in Malaya, he did not post it from Bradford, but called up the president of the Radio Society of Great Britain on short waves. Only in this all-the-way-by-wireless fashion is a greeting qualified to reach the Prince.

The "Pocket" Policy.

EVERYBODY knows how the Germans, being restricted to build only very small battleships, packed their little vessels so full of concentrated destructive power that much bigger ships might well hesitate to try conclusions with the pocket battleship.

Are they doing ditto with radio? Following the news that Warsaw may have a 200-kilowatt station, it is said that the new Deutschlandsender, reconstructed to a power of 150 kilowatts, is going to sound quite equal to a 200-kilowatt when its hotted-up aerial system is complete!

Warsaw may not approve of this, but it certainly brings grist to the "DX" mill.

Vatican Radio Extension.

CARDINAL SINCERO, secretary of the Oriental Congregation, recently inaugurated from the Vatican a connection with Beirut, and sent a message of greeting to the patriarchs of the East.

(Continued on next page.)

ITALIAN STATIONS ARE RAISING THEIR POWERS

From Beirut communication will be made with Syria, Palestine, Transjordan, the Persian Gulf, Iraq, and the Philippine Islands. As the existing wireless services are very extensive, and are supplemented by ultra-short-wave telephony, it seems that the Vatican City radio experiment has proved triumphantly successful.

Park for Young Hopeful.

VISITORS to London who complicate life's little problems by tagging a Growing Boy round with them will thank me for reminding them of the Science Museum, South Kensington. Wonderful place, the S.M., S.K. Deliver a boy there in the morning, with a packet of sandwiches, and call for him after tea. You'll find he has had the day of his life, and will want to go back to the models to-morrow.

The radio side of the museum is an entertainment in itself.

Incidentally, if you don't wish to leave your young friend alone there's no need to fear boredom—the last time I went to South Ken. I felt quite snooty when they turned me out.

Here and There.

HASTINGS has commemorated the early television experiments of John L. Baird by setting up a tablet recording them.

Richmond, Va., has surprised the other American stations by coming out with an entirely new type of 320-ft. mast. Like those used in Germany, it is all wood—a surprising break-away from American practice, and one which is being watched there with great interest.

Belgian Prison Experiment.

IN this country gentlemen whose spare time is arranged several years in advance by bewigged members of the judiciary do not, in general, enjoy radio in jug. But in Belgium some philanthropic souls have endowed the Louvain Penitentiary with wireless in every cell.

We all know that the Brussels programmes are commendably snappy, in the main; and it will be interesting to learn what the Doing-Timers think of this innovation. Will the Belgian version of "Gum-Shoe Dick," for example, be acceptable as amusing business, or will it savour too much of successful police work?

Joking apart, isn't it time that somebody investigated the effect of radio in British prisons?



Society Note.

IRISH readers of "P.W." may be glad to know that the Irish representative of the Ladies' Section of the Anglo-American Radio and Television Society is Miss Mae Mack, of 110, Rock Road, Booterstown, co. Dublin, Irish Free State. Miss Mack will be pleased to enrol any members of the fair sex in Ireland who wish to join the society.

The men's section of the society, very much alive, is organising a picnic, with boat races and other high falutin, at Ruislip, on August 11th. After that several dances are being held, and particulars of all these goings on can be obtained from the Hon. Sec., Kingsthorpe, Willowbank, Uxbridge.

THE CEREMONY OF THE KEYS

In the early years of broadcasting, an officer of the Grenadier Guards, then on the staff of the B.B.C., suggested that the Ceremony of the Keys would make an impressive outside broadcast. This was in the days before outside broadcasts had advanced, by experiment and experience, to their present state of perfection. Later, when the Ceremony of the Keys was first introduced into the programmes, it captured the imagination of listeners as few other outside broadcasts had then done. Nowadays this ceremony is an annual broadcast event and it has even got as far as the film screen.

On July 23 listeners will again hear this historic ceremony, which will be carried out by the Chief Warden of the Tower in conjunction with the 3rd Battalion Coldstream Guards. The relay is by kind permission of the Governor of the Tower of London.

The Ceremony opens with the Chief Warden meeting his escort at the Bloody Tower. The Chief Warden and escort then proceed to the Visitors' Entrance gate on Tower Hill, the sentries en route presenting arms. The Visitors' Entrance gate is locked, and the sentries then return through the Middle and Byward Towers, locking each in turn. On reaching the Bloody Tower, they are challenged with the historic words, "Halt! Who goes there?" "The Keys." "Whose keys?" "King George's Keys."

They then proceed to the Main Guard. The Main Guard salutes the Keys by presenting arms, and the Chief Warden, raising his hat, calls out, "God Preserve King George." The Guard answers "Amen." Ten o'clock booms from the Tower clock and the relay finishes with that heart-stirring call, the Last Post. The crunch of marching feet, the military orders, and the hollow sound of the locks being turned give this broadcast an atmosphere of vivid actuality.

Italian Advances.

RECENT comment on the reliability of the Rome station has brought me many references to Italian radio, and one letter from Rome itself. From this I learn that the new Italian beam services to the Far East and North and South America are doing well, especially the 49.3 metres transmission to North America.

Other interesting items of developments in Italy are that in addition to Rome's increase from 50 to 120 kilowatts, the second Rome station will also use a 120-kw. transmitter; that Bolzano is to increase from 1 to 10 kw.; and that Bologna's new station is to be of the same power (50 kw.) as our own Regionals.

The German Radio Trial.

HIS many friends in this country will be interested to know that Dr. Hans Bredow, formerly Reich Wireless Commissioner, is appealing against the sentence recently passed on him in the "Radio Trial."

Dr. Bredow, whose name will be familiar to many readers of this journal, was found guilty on four charges, and sentenced to

six months' imprisonment and fines totalling about £400. But both the imprisonment and fines were considered discharged during his period in custody under remand.

The trial caused a big sensation in Germany last November, but all the accused are now free. I hear that Dr. Bredow is accepting an important post in America with the Lepel High-Frequency Corporation.

Garden of Peace.

WITH the best intentions, E. L., of Bexhill, inserts in a letter chiefly devoted to praise of the Modernised Magic a query about my garden's progress. And "I would that I could utter the thoughts that arise in me."

That late frost was a body-blow, indeed, and since then I have been afflicted with greenfly, who seem to thrive on insecticides, with ants, feline excavators, and lawn-mower stoppage.

On top of all that a new neighbour decided to erect an aerial mast. It rose to noble heights, wavered, and then fell in a south-west-by-south direction, plumb across my plums—bisecting Victoria, and decapitating Monarch. (And so to bed, right vext that I did swear so before a new acquaintance.)

Dutch Television.

THOSE who have heard that Holland was busily working out something good in television will be interested in Dutch newspaper reports on the subject.

These are to the effect that although experimental work has been going on for years, there is little prospect of a public service in the near future. The difficulty is not technical, they say, but very few burghers could be converted from their unwillingness to pay for it!

On The Spot.

THE latest idea for a novel wireless alarm comes from Washington. A radio firm there has applied to the Federal Communications Commission for a licence in connection with a miniature transmitter that can be inconspicuously installed below a counter.

When a bandit enters and "pulls a gat" on the cashier, that apparently scared official pushes over a pile of coins, under which the wireless alarm is situated. The removal of the coins actuates an unseen switch and sends out a radio call to all police cars, giving details of the whereabouts of the robbery. So before the gangster leaves the building the always-cruising police cars are making for the spot, with the express intention of putting the raider on it!

ARIEL.



BEFORE *the* BROADCAST

HOW many listeners realise what an enormous amount of work has to be put into every "show" that is broadcast from the B.B.C.? Before the broadcast, which may easily be for one night only, or at most for two nights, many rehearsals are necessary—in spite of the obvious fact that, with scripts before them, the artists do not have to be as word perfect as on the ordinary stage.

Come with me to St. George's Hall, where the final rehearsal of "The Geisha" is just beginning under the direction of Gordon McConnell, one of the B.B.C.'s leading producers.

On the Carpet.

Stanford Robinson is sitting up in his high grey chair, following the score laid out before him on a wide and brightly illuminated lectern. Sleek, black-haired, suave, he wields the baton that the Theatre Orchestra responds to as one man.

And there they sit before him on the stage once devoted to another kind of magic, carefully dispositioned on a "floor map" plotted out after many experiments to gain just the right balance for the microphones. Each member of the orchestra knows his or her place—and keeps to it for all the shows in which this combination is needed.

Strings in the front, wind instruments behind them, brass and drums on the right. All carefully placed to placate the stern demands of the microphone.

To Stanford Robinson's left we see a curious green carpet, with numbered black squares marked out on it. Also red lines running out fan-shape from the focal point that is the microphone suspension position.

What part does all this play in the production just getting into its stride? A very important part, as we shall see. Note how the stars of the show keep advancing towards the microphone—how they take care to glance downwards to see that they are standing on the right square.

See, too, how that brave little portable rail prevents each of them, in moments of excitement or dramatic intensity, from advancing too closely to the microphone.

The Control Room.

It is a ribbon microphone they are singing and speaking into. One of the very latest types, specially developed by B.B.C. Research for the express purpose of making productions of this kind easier to balance.

The ribbon is directional, in the sense that it will pick up all sounds equally well coming within an angle of 90 degrees, while ignoring entirely any sounds outside that angle. The red lines on the green carpet keep the performers within the ribbon's orbit of response.

The rail keeps them from "blasting" into the microphone. The squares help to centre their efforts, to maintain a level

In this issue we are presenting to our readers interesting articles on aspects of British broadcasting, giving some entertaining sidelights from the artists' point of view. This is the first of these outstanding articles all of which have been specially prepared for "Popular Wireless" by

ALAN HUNTER

attack on the microphone—a great help, this, to the control man, whom we shall meet in a moment.

Beyond the green carpet, with its ever-changing procession of stars, we see the chorus. Their microphone is suspended behind the artists' microphone just mentioned—it is another ribbon, arranged at the same angle. The chorus, waving its sea of scripts, watches and follows its cues from Stanford Robinson.

We thread our way across the stage to a sort of fire-escape contraption—the stairs leading up to the control room. It is inside this little room that we discover the nerve centre of the whole production—and the producer himself, in this case Gordon McConnell.

is sitting on the floor, following the script he has materialised from the original stage version of "The Geisha"—listening intently to every sound coming from the near-by loudspeaker. Which is, of course, reproducing what the "mikes" are picking up in the theatre below.

Rex Howarth is at the control panel, working the "fades" for the various microphones, making notes as he does so on his copy of the script.

On his left is a secretary taking down the producer's last-minute instructions, as well as keeping her eye on a large stop-watch—for the show must run to time, like everything in broadcasting.

Mixing the "Mikes"

Way behind the observation window a youthful engineer tends the gramophone turntables; he, too, has a script before him, to show him when to start up the appropriate effects record—or it may be a short recording of commentary.

All this production team is intent on one thing—the effect coming from the loudspeaker. McConnell is trying to put himself in the listener's place—criticising every single line that detracts in his expert view from the aural effect.

BEHIND THE RAIL AT ST. GEORGE'S HALL



In a recent successful musical play broadcast from St. George's Hall, Evelyn Laye and a large cast of famous artists took part. Here you see them standing behind the portable rail, with Stanford Robinson on the extreme right.

An animated scene. From our vantage point we have a view of the whole of the cast below—of the orchestra, of the chorus, of the stars on their green carpet, of the conductor in his high chair—having now taken off his coat as he warms up to the job—and of the three main microphones devoted to the picking up of the various sections of the show.

Inside the control room, now. McConnell

There is a constant interchange of comments between the producer and the man at the control panel. Both seem to be working as a team, with the girl taking a more than casual interest in the progress of the show—and the youngster eager to start up his records just at the right moment for the control man to fade in the effects.

Let us look for a moment at the various

(Continued on next page.)

BEFORE THE BROADCAST

(Continued from previous page.)

knobs under Rex Howarth's expert control. He has two panels, but most of his work seems to be concentrated on the right-hand one—with its four large black control knobs marked, from left to right: "Orchestra," "Main," "Chorus" and "Echo."

Every now and then, it is true, he deserts his main panel—or rather leaves it set up as he wants it—and twiddles one of the knobs on the left-hand panel, which has three usable controls marked: "Gram," "Studio" and "Standby Mike."

On the correct mixing of the microphone outputs under his control depends the final listener effect. It sounds easy, perhaps, to bring up the orchestral microphone control when the orchestra is playing, or to increase the main microphone output when necessary—but only a very short observation of Rex at work will be necessary to convince you that this is a job calling for large reserves of finesse—not to mention a quite extraordinary flair for dexterous hand movements.

Good Humour, But Concentration.

And so we watch the show progressing. Who's that pretty blonde edging her way on to a precious square of the green carpet? That's Anne Ziegler, a hard worker and, so they say, a star with a big future at the microphone.

Everyone seems to be in a good humour, laughing at the quips and jests, and yet withal keeping a concentrated attention on the sequences. And all the time McConnell quietly goes on giving the girl odd instructions to be passed on to the artists before the broadcast. Every now and then he dashes downstairs, perhaps to draw Anne Ziegler gently back a little from the microphone, or to confer with one of the waiting stars.

"A Little Nearer."

Meanwhile, the control man dare not leave his post; nor is there any need for him to do so. He wants the chorus a little nearer, does he? Very well, he just presses a switch button and speaks into a microphone suspended above his controls: "A little nearer, ladies, please!"

And they move a little nearer, for downstairs just behind them is a loudspeaker which they can all hear quite plainly when the control man sees fit to speak into his microphone.

What is happening now? The whole cast seems to be in a state of suspended animation. Nobody is doing anything, and yet from the loudspeaker in the control-room the well-known voice of one of the announcers is giving a short commentary on the progress of the plot.

It is not the announcer himself, but a

recording, which we can see turning away under the eager eye of the young engineer. How that boy loves his turntables!

Just as the announcer's "bottled" voice ceases, the control man leans over to the knob marked "Gram" and, when the record is actually over, he presses a switch and a bright little green light shines out its warning above the microphone in the theatre below. This is the signal the cast has been waiting for and, without more ado, they go ahead with their "real life" contributions.

One of the senior engineers arrives on the scene. He is interested in the ribbon microphones at work below. And no wonder! These microphones are proving a tremendous asset to the producers of the Big House.

The New Mikes Are Much Better.

McConnel tells me that they suit his sort of technique admirably. He believes in "one-studio" shows wherever possible. The ribbon makes this idea more practicable than any other kind of microphone ever did.

Due to its peculiar directional effect, the ribbon will pick up only the sound source that is required, and not part of another microphone's sounds, as with the usual type of instrument. The chorus "mike," for example, will not respond to any of the sounds made by the orchestra. No special screening between "mikes" is therefore necessary now, and each "mike" produces its own clean-cut output, which, of course, the control man merges from one to the other at will.

What is more, as McConnell reminded me,

THE "FLOOR MAP" AT ST. GEORGE'S HALL



Before the broadcast the artists are placed on their most suitable carpet squares to achieve the best effect—and woe betide them if they dare to move from their numbers!

it is possible to place artists and instruments farther away from ribbon "mikes" than from other types without losing any of the quality. This means that a better balance can be obtained, as was very strikingly demonstrated by the incisively clear diction of the chorus.

The show is drawing to an end. The girl with the stop-watch is becoming mightily keen. As the last crescendo of chorus and orchestra dies away, she presses the button. "Call it seventy-three minutes," I hear her say to the producer, who smiles with

satisfaction; for the show is timed to take exactly seventy-five minutes.

Magically, the whole crowd of principals, chorus and orchestra disperses, leaving only the producer and a few members of his staff to attend the "inquest" on the last rehearsal before the broadcast.

How desolate the somewhat shabby old hall looks now! And yet, if I may judge by remarks of the engineers, this same old hall of magic is one of the best broadcasting studios in the B.B.C. system. Besides, listeners don't care what the hall looks like; it is what they hear that matters.

So I left McConnell looking over his notes. He was leaving nothing to chance—before the broadcast.

DURING THE SHOW

Would you like to see a Broadcast performance?

VERY few listeners living in or around London imagine they will ever get a much coveted seat in a B.B.C. broadcast show—studio or St. George's Hall, for variety or any other type of light entertainment.

Yet if you make it snappy you have just as good a chance as the next man.

Only a Limited Number.

The lists were closed last August, it is true, because at that time applications for free seats in these studio and theatre shows were far exceeding the accommodation. After all, there is only a limited number of seats—and the number of audience shows is also quite small.

Last year, music-hall shows were not nearly so frequently broadcast as now—and it is perhaps in the music hall more than in any other kind of radio entertainment that the audience most definitely fills a niche.

So send in your application now. There's no time to lose. By August last year 3,000 people applied—and they closed the lists.

Write At Once To B.B.C.

Send your card or letter direct to the B.B.C., Portland Place, W.1, and very shortly you will receive a polite acknowledgment, telling you—unless the lists close meanwhile—that your name has been put down for a ticket in due course. It may be some months before anything further happens—but by the time the ticket does come along no doubt you will have forgotten all about the matter, and thus be very pleasantly surprised.

There is no fee for entrance to a broadcast show. Only the B.B.C., in its always tactful way, provides a box for the Week's Good Cause in the vestibule of the hall. You can add a coin to the collection if you feel so disposed—but there is no compulsion.

The B.B.C. will see you get a comfortable seat, and all they ask in return is that, during the turns and announcements, you keep silent.

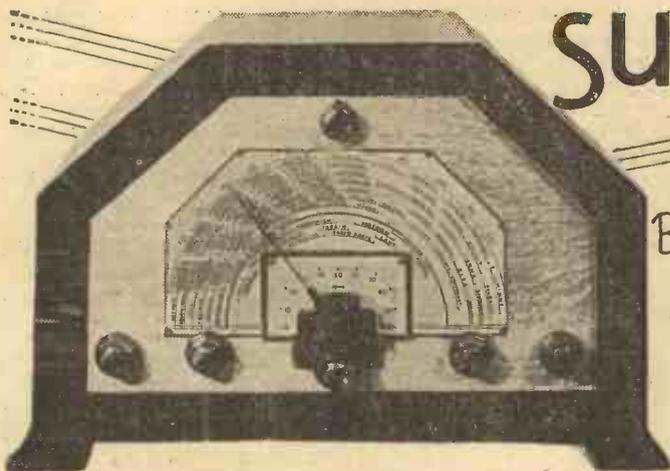
Never forget that in a B.B.C. show you are part of it. In this sense you take on a special importance, for your applause—only to be given if you really mean it!—is part of the broadcast, intended to entertain listeners just as much as the artistes themselves.

A. H.

SUMMING-UP

The 600

By John Scott-Taggart M.I.E.E., F.Inst.P., Fel.I.R.E.



Mr. Scott-Taggart analyses his S.T. 600 and feels that although the performance of the set is without a rival, it is a little ambitious for the average listener. But there is another side to the question, and here are a few letters from readers who have obtained wonderful results with this receiver. Note that all types of constructor are represented. There is a young man of 17½ years, "an old lady" as she calls herself, and an amateur constructor 75 years old!

AS each radio season draws to a close I am given the rôle of coroner—to hold an annual inquest on the leading design of the previous year.

This funereal note hardly conveys the object of this article. I come to praise the 600, not to bury it. But as I am at work on the big set for the forthcoming season, I am glad to have the opportunity of winding-up the debate on a set which will gladden the hearts of many an owner for several years to come.

Debate? Of course. The buzz of argument, the cry of disillusionment, the groan of the cynic inevitably fill the air after such a set as the S.T. 600 is launched. It is for me to analyse and probe this miscellany of noises and see how far they are justified.

Price and Performance.

This has to be done partly to help those in trouble, but also so that I can learn what to avoid in the future. It may seem a simple matter to put forth a design for the home-constructor, but the number of deflated failures and the survival of only one or two designs a year prove that it is an extremely difficult task.

The first technical problem is to combine reasonable price with high performance. Here the greatest difficulty is presented by the selectivity problem.

The next question is that of "reproducibility," i.e., to what extent the public will get the same results as the designer. This calls for a long experience of the average constructor—and the average manufacturer.

From a performance point of view the S.T. 600 is astounding. As far as I am concerned the set is finished. I am looking ahead and drawing up new plans. I have no motive in belauding a last year's model. My views at this stage are not coloured by enthusiasm: they are the cold estimate of a set's worth. And I say without hesitation that the 600 touched a new high level in battery-set performance. In many directions it is not likely to be beaten for at least two more years.

Was It Too Good?

I still have the original set and use it as a standard for a variety of purposes. Its sensitivity is remarkable. It will get practically everything on practically nothing. But was it too good? This may seem a crazy question, but it is one that has persisted in haunting me. Though I hate to say it, I think that, on the whole, the S.T. 600 erred on the ambitious side.

LOGGED 58 STATIONS.

Dear Sir,—I feel I must write to you thanking you for the wonderful set, the S.T. 600, which I have had the pleasure to build. I have followed your instructions as regards components from start to finish. I am more than pleased the way I receive the stations. I have logged about 58 stations all together, and there are still more to come, and all received at full loudspeaker strength.

What pleased me most was the way I could disappear North Regional and receive Cologne, and also get without North National and receive Copenhagen. I must mention that North National is now on its new wavelength. I can honestly say it is the best set I have ever had, including the good old friend the S.T. 400, which I have now sold to a friend. Wishing you every success.

M. W. FAULKNER.

16, Frank Street, Failssworth, near Manchester.

CHILD'S PLAY TO BUILD

Dear Sir,—I built your S.T. 600 last week. It is now correctly ganged, and I am in every way satisfied with it. I am only 17½ years of age, but I have been interested in wireless since 1927, when I built my first crystal set—the "600" is somewhat of an advance, I can assure you! My previous set was the original S.T. 300, which put to shame most battery "fours," but was a bit of a teaser to work until I got used to it. The "600" is absolute child's play to build—anyone with a screw-driver, bradawl and pair of pliers could build it straight off. I have tested it out thoroughly, and as far as I can see any station worth receiving can be heard, and once found can always be found, thanks to the dial, which is a great success.

I have not yet used the Extractor very much, although it is necessary to do so to receive Deutschlandsender clear of Droitwich.

The quality is excellent—although except on Droitwich I keep the "tone" right round to cut off sideband splash, which it does very effectively.

It's useless to say how many stations are received, as, if Mars is ever heard, it'll be on an S.T. 600!

On a length of "aerial" of 2½ ft., in daylight 12.30 (noon), it received eight or ten stations at fair strength. The addition of an earth improved stability. My aerial is 100 feet long—30 feet up.

I thank you for giving me so much pleasure in your designs—the first lasted me two years, and the "600" is going to outshine this unless you do the impossible.

T. N. DIGBY ROBERTS.

2, Somerset Place, Queen's Road, Guernsey, C.I.

It was, for example, the first S.T. "boom" set to have ganged tuning. Reluctantly, I have come to the conclusion that the constructor cannot be guaranteed to make a success of a ganged set.

Very frequently the builder himself cannot be trusted to operate the set properly. I fondly imagined that with one knob to tune he would be incapable of error. Yet in the case of numerous sets I have seen the only fault has been that the rear trimmer has been wrongly set. This throws out the ganging, reduces signal strength and increases interference.

The Break-Through Trouble.

Even more serious was the mysterious complaint of break-through on the long waveband: the symptom was the interference caused by a B.B.C. medium-wave regional. I went to great lengths—the length of England in several cases—to trace the causes of this. It was invariably due to improper operation of the set or incorrect ganging which in most cases was due to the operator and in some cases to defectively-matched components.

To avoid such break-through on an exceptionally sensitive set the volume control must be reduced and anode reaction increased. Ganging must also be accurate, because if it is not, the desired long-wave signal will be greatly weakened while the jamming medium-wave station will not be affected.

If, say, a 480-metre signal is breaking through into two tuned circuits each tuned more or less to 1,200 metres, it is not going to worry because the two circuits are a little out of gang; the difference between 480 and 1,200 is already so great that misganging, though destructive of a 1,200-metre signal, would not affect the loudness of break-through.

Obtaining The Required Selectivity.

Now, selectivity on a straight set is largely a question of boosting the desired signal, and then reducing the interference to below audibility by cutting down both signal and interference. In practice, we cut down everything and then bring up the desired station by reaction, leaving the interfering station inaudible. This simple process cannot be carried out unless the circuits are ganged properly.

Several constructors, of course, departed from my specification of components. By doing this, they became their own designers,

(Continued on next page.)

SUMMING UP THE 600

(Continued from previous page.)

and must accept any consequences. The percentage is about fifteen—quite enough in the case of a popular set to provide a festering leaven, to give a bad name to a set, a periodical, and even to the designer himself. Although I implore constructors to keep to my components and valves or else to leave the set alone, my warnings are ignored. Funny, isn't it? In order to save a shilling or two the whole cost of the receiver is put in jeopardy or the set in the dustbin.

Apparatus of Tried Merit.

These matters affect design. It behoves us to use apparatus only of tried merit, and to avoid new products. This is a disadvantage in some ways, but an insurance in others. At any rate, "fool-proof-ness" is going to be a guiding principle in future. Sheer performance alone may be a dazzling jewel in a designer's crown, but certainty of results in every case is a more satisfactory achievement.

In making these rather sweeping statements I am anxious to clear the decks. Actually there are many firms who use every endeavour to turn out thoroughly

tested products, just as there are thousands of conscientious and skilled constructors. But I am more annoyed when I hear of a reader who has been let down than I am elated at receiving a letter full of praise. I lose my temper far more easily than my head.

In concluding my inquest, I have no wish to hush up the serious delay experienced by most constructors in obtaining—or not obtaining—valves and components. The publishers of this periodical found it

necessary to print 286,000 copies of the S.T.600 issue—the number rises on every year's "boom" set of mine—and the S.T.600 easily headed the list of last year's sets.

But apparently success does not breed success, merely delay. Quite a number of readers sent me angry letters saying they would build another designer's set. But I knew they would be no better off, because the drastic shortage of components and valves in the S.T.600 made it impossible to assemble a complete list of components for any other design!

The Question of Delay.

However, this is a matter of trade organisation, and you may be absolutely certain that this journal and myself will do all that we can to ensure a quick delivery of apparatus next time.

It is my consistent practice to be quite frank over my own designs. But I am in the pulpit, and not in the dock! The 600 is a first-class set of which I am proud; and there have been hundreds of letters to prove its worth.

There have been some troubles, but they have taught us things and my goal of 100 per cent trouble-free construction is brought the nearer.

J. S.-T.

THE SET ON TEST



Mr. Scott-Taggart making some measurements on the original battery S.T.600.

UNCANNY SELECTIVITY.

Dear Sir,—I wish to convey my sincere appreciation for giving me the opportunity to test in my home your new creation S.T.600, A.C. version.

It would be really ungrateful if I did not send you a few lines to thank you for lending me such a wonderful set and let you know my experience with it in the Morden district.

I did not trouble to count the number of stations received, but after a few moments I have heard many well known to me and many more never listened to before with my present S.T.500. Volume was enormous, of course, and quality quite typical of all S.T. sets; but what really surprised me was the uncanny selectivity obtained with the "Extractor," which, when adjusted, can and will separate, or, better still, eliminate any unwanted station, no matter how near or powerful.

Needless to say that after my experience with the "600," my wonderful "500" has been sentenced to be dismantled shortly. I would recommend anyone to build this new magnificent set.

Thanking you once again for your great kindness in lending me your set to try.

J. ESPINOSA.

20, Maycross Avenue, Morden, Surrey.

75-YEARS-OLD ENTHUSIAST.

Dear Sir,—I am writing to thank you for your new set, S.T.600, which I have just completed. I think it is wonderful; the tone and reception are magnificent. I have built both your sets, S.T.300 and S.T.400, but this beats both previous sets.

It may interest you to know that my age is 75, but my age does not tire me from building your sets. I again wish to thank you for the pleasure you have given me.

WILLIAM LIVER.

40, High Street,
Preston, Lancs.

PERFECT RESULTS.

Dear Sir,—I must write you about my S.T.600 A.C. No doubt you remember I condemned the set as I got such poor results. I found out, however, that the dealer had given me a wrong component. After replacing same I got perfect results. Oh, boy, what a set!

I had been working a six-valve battery set before, but this three-valve has put it in the shade. Volume on foreign stations came through at amazing power, and yet a slight move of the condenser knob and they were gone. Quality is the best I have heard, and not a bit of hum could I hear.

The Extractor does its work well; forget it, and you wonder where the local station is gone. Can anybody want more? One or two friends were interested in my building it, and when I told them the poor results I was getting, they said the reports were too good to be true, but after they had heard it they changed their minds and admit it is the goods.

Thank you for the best set I have ever had, and I have had a few this last ten years.

GEO. KEATES.

43, Dalmeny Street, Edinburgh, 6.

AN OUTSTANDING SUCCESS.

Dear Sir,—I trust you will pardon me for occupying your valuable time, but I cannot help thanking you for giving to the constructor a set which after construction is worthy of preference over any other and is an outstanding success.

We have had great difficulty in obtaining the coils for the S.T.600, but they are coming along more freely now. This delay from the manufacturers speaks for itself, as there must be a very heavy demand.

I have demonstrated the set to scores, and each has praised it.

T. W. AVERILL.

48, John Street, Neyland, Pembrokeshire.

VERY SENSITIVE.

Dear Sir,—I feel you would like to know about the results obtained on the S.T.600. I built the A.C. S.T.600, and may say I am perfectly satisfied. I have built my own power pack, comprising 350-350 volts 120 milliamp. transformer feeding two Rola matched speakers F7 and F6, 2,000 ohm field, and a Heayheard choke all in parallel, and the background is very quiet.

I have built all sorts of sets, my last set being a superhet, and after three controls I was a bit dubious about the 600's array of knobs, but after trying the set out find they all serve a good purpose. The set is very good, very sensitive and selective, and I shall have no hesitation in recommending it.

Also, I shall be delighted to let anyone look over the set and try it for themselves. Wishing the paper every success.

T. DOHERTY.

39, Conway Grove,
Horehills Road, Leeds 8.

SELECTIVITY AMAZING.

Dear Sir,—May I take this opportunity of writing to thank you for producing such a masterpiece as the S.T.600. I have built the set up as a radiogram and have had it in operation for three weeks now.

I am not going to trouble you with a list of stations that I have received; suffice it for me to say that every one of the stations included on the Spot-on dial is within the receiving range of the set. Selectivity is amazing, as is also the tone.

As a family receiving set it can be fool-proof, and for the real enthusiast—well, what could one wish for more?

H. BRITT.

Bridge House,
Saxilby, Lincoln.

"HUNDREDS OF LETTERS TO PROVE ITS WORTH"

AN "OLD LADY'S" S.T.600 SUCCESS.

Dear Sir,—It is perhaps just possible that you may remember an old lady writing to tell you she was building the S.T.600.

Well, I finished it this week, and connected it up this afternoon, and you may imagine my joy when on turning the switch the receiver "spoke."

Of course, it is rather like a new car—the controls are unfamiliar, and I am afraid I have sent many undesirable noises into the ether this afternoon, but I have also found various stations, and I am delighted with the tone and selectivity. The Extractor is wonderful. To be able to get stations without a background in these days seems like a magical performance.

Now I must "get down to it" and study your book and your articles until I have achieved full mastery of this very wonderful set.

I cannot understand the people who buy commercial receivers. There is no fun in them, no interest, no excitement. I am not very keen on "listening-in," except to the news, and a little good music, when they have it. But "wireless" is a perpetual source of interest, and I thank you many times for the S.T.600.

(Mrs.) AMY MONTAGUE.
Penton, Crediton, N. Devon.

MADE ALL S.-T.'s SETS.

Dear Sir,—I have taken all this time to make the S.T.600, but I have obtained the first-named components. I did not hurry in putting them together, for I had my S.T.500 (incidentally, I have made all your sets). Now I have the S.T.600—boy, I have a veritable radio library! I go into my room and select whatever book (station) I require.

T. A. CHAMBERS.
"Camley Corner," Oakington Avenue,
Wembley Park.

WELL SATISFIED

Dear Sir,—As a builder of your S.T.300 and "400," and now the "600," I must say the "600" beats the "400" easily.

I can get quite a lot of foreign stations on earth wire only, and can cut the local out by two degrees.

My wife, who did not get on very well with the other sets, fetches in the foreign stations easily on the "600."

I obtained my specified kit and valves quite easily.
B. BOOTH.
25, Lealand Road, Tottenham, N.15.

"THANK YOU!"

Dear Sir,—This letter is going to be just one long "Thank you!" I have recently completed my "600," a universal version using Ostar valves, and I am thoroughly satisfied with it in every way, more than satisfied.

The valves seem all right—hum is completely absent on D.C. mains, positive earth, and the reactions are smooth. But the circuit, your part, is the great part.

"Tone is Really Fine."

Quality.—The great joy of an S.T. set is being able to receive the locals in an unselective way and make the most of the quality available. The tone on this set, using an energised Magnavox and a Blue Spot 100U in parallel is really fine, absolutely natural and free from boom. (100U can be cut out when necessary,

at really useful strength, with the locals working.

Tuning is a most enjoyable process now, once having got used to the unexpectedly large effect of the front trimmer (he is a vital little knob, that one), also having learnt to use the "volume control" knob as a selectivity and not a volume control. It is really a huge improvement over the "500," the controls leaving the main tuning unaffected.

The dial is the crowning joy of a joyous set. Straight to the station every time. It is the only tuning dial worth anything at all, compare it with any other type you like. The family bless the single-knob tuner and the dial when they merely wish to change from one local to the other.

When first I opened the special "600" issue of "P.W." I was terribly dis-

appointed not to see two H.F. valves and a 3-gang condenser! Please don't laugh at me. But I was soon convinced by your explanations, and now I know. I have so far nothing the least little bit wrong to report, nor do I expect to have. The set has a J.B. condenser, Colvern coils, and a station name dial. The pointer comes over the names quite nicely. The trim-

ming seems all right, and there is no break-through on the long waves at all, not even at the very bottom, which is curious but pleasant.

So may I please thank you most heartily for giving us constructors free access to your endless

flow of ideas-in-a-practical-form. I don't know what we'd do without you. Commercial radio leaves me cold, and other designers' sets are just flat imitation of commercial sets. Your sets are so utterly and satisfyingly different. It is grand on an S.T. set adjusting the knobs to suit every condition as it arises.

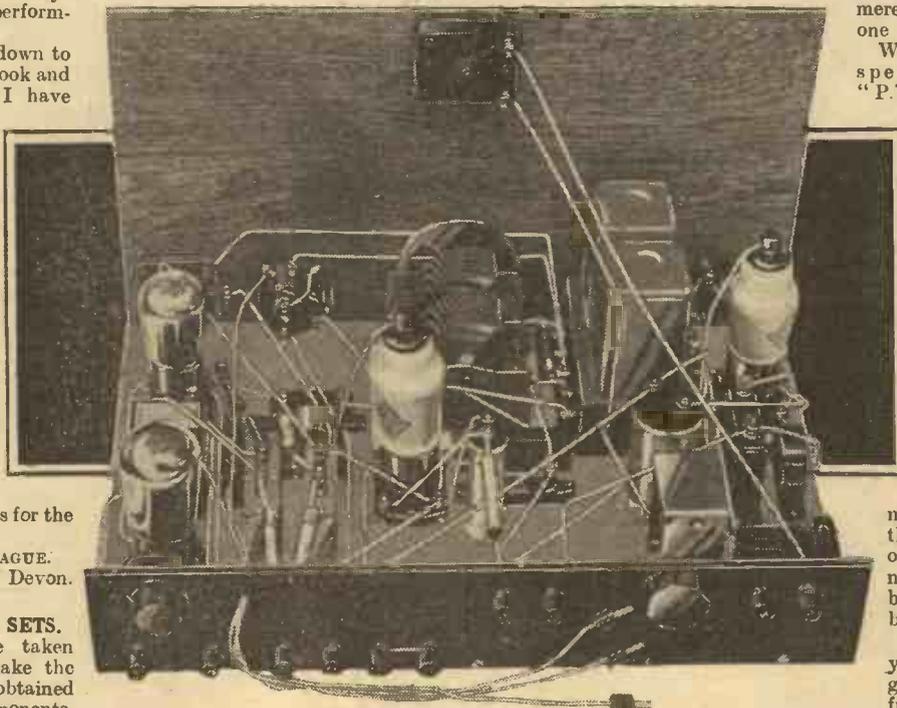
Clear Wording and Wide Field.

Your descriptive articles are so attractive, too, explaining all the details and reasons, and giving the amateur such painstaking instructions as to operation etc., making him feel that you really want his particular set to be a success. (My newsagent, an ardent S.T.400 man, just about to convert to I.S., says: "S.T. is the only one who gets my interest," and them's exactly my sentiments, too.)

Very many thanks also for "The Book of Practical Radio." Its so clear wording and the wide field it covers have already been useful, both in regard to controlling the "600" and in practical wireless details in general. Thanks, too, for the Manual; your gift for clear explanation is exceptional. So few electrical engineers come anywhere near making themselves clear to their mechanical listeners or readers.

(Continued on page 485.)

THE WORLD-FAMOUS S.T.600 RECEIVER



Thousands of readers who have built the "600," or have seen it, will be familiar with the view shown in this photograph of the back of the famous receiver.

for foreigners.) It is so very jolly, operating the knobs, and along comes the excellent quality, the transmission doing its best, the output stage doing its best, neither of them restricted by fixed selectivity.

Sensitivity is grand, just grand. After dark, fifty-five stations are always available for good entertainment. Some, of course, are enormously strong. Aerial reaction is to the fore again. I still have only the little attic aerial. Background noises are surprisingly low, so different from the general run of commercial supers. There is no increase of valve noise, etc., when the sensitivity of the set is pushed up. All the B.B.C. stations, also Poste Parisien, etc., and several long-wavers come in well by daylight.

"Extractor So Simple to Use."

Selectivity is unbelievable for only two tuned circuits. Poste Parisien-Breslau and other similar combinations present no problem at all; it's quite wonderful. And the Extractor, oh boy! so simple to use, and lo! Sottens, Cologne, Copenhagen, Hörby, even Turin, and Deutschlandsender are all available

"IT'S HARD TO BE FUNNY"

Eric Maschwitz, the B.B.C.'s Director of Light Entertainment, suggests in this exclusive interview that it is only hard to be funny on the radio when the special technique of the microphone is neglected. He places more faith in special acts, he says, than in individual entertainers.

HOW often do you really laugh uproariously when listening to any broadcast programme? That question is hardly necessary—for one could count on the fingers of one hand the number of times one's sides have been genuinely split.

If it is true that it is difficult to laugh at the loudspeaker, it is even more true that it is difficult to make people laugh from the microphone end of the chain.

And that is why I went along to see Eric Maschwitz. As Director of Light Entertainment he ought to know something—in fact, all there is to know—about the true ingredients of laughter. Himself a joyous soul, he has to deal with every conceivable type of public entertainer—from the low comedian upwards.

Different Needs of Radio and Stage.

"Is there such a thing as a *real* radio comedian?" he said, repeating my first question. "I doubt it. The radio and the stage needs are so different. We do our best to make the most of stage acts by providing them with their accustomed environment—the stage at St. George's Hall and an audience who can laugh at their gags.

"The average comedian really works at the audience, you know. His humour consists of gags which are not finished when he makes them—only when the audience gives him a laugh. Only then can he go on with the next gag.

"Radio humour is quite different. It does not consist of a series of gags, usually. Instead, the artist strives to build up a character. Not gag making, but *character*

building—that is the essence of radio humour—as practised by some of our most successful turns, anyway.

"Examples come readily enough to mind. Gillie Potter, John Tilley, Mabel Constanduros, Alexander and Mose—all character studies. And all tremendously successful because they don't depend for their act on any answering laughs."

Well, there you have the whole kernel of the matter, I think. And I believe absolutely that Mr. Maschwitz is dead right. One has only to study America—the land of gag writers!—to see the truth of his dictum.

Over there they have the vast advantage that they can afford to engage artists for whole-time effort on the radio. As a result they are able to command the full talents of masters of character portrayal. Artists are billed to appear in these characters at the same time every evening, or, at least, at well-established times during the course of the week.

"When the character becomes almost a household figure," explained Mr. Maschwitz, "there is no need for side-splitting gags. The artists can be whimsical, they can be crazy, they can be absurd.

"Contrast this freedom of expression

with some of the turns over here, where they are expected to fill an eight-minute act with an entirely fresh lot of material. It is *much* harder, of course.

"Why can't we build up similar acts? We could—if we could afford to pay for them! But obviously, it is not possible to pay an artist anything like the huge sums available in American radio for whole-time contracts on the air.

"We must take our artists very largely as we can get them—from the music-hall, the theatre, the concert party. Or, if we do make an artist's name over the air, we cannot expect him to refuse contracts elsewhere—he has to live, and can't live entirely on what he gets from us.

"Comedy writers are very limited. All the best of them are of necessity tied up with theatre interests. People like Billy Bennett and Max Miller can always command high figures—because they are so good. Incidentally, when they do come on the air they are also good, because their lines are inherently good stuff."

Finding New Material.

One begins to see what Mr. Maschwitz is up against. I wanted to know how he ever managed to find new material, if it were so scarce.

"Oh, there are many ways of finding new acts," he replied. "We send our representatives to nearly every music-hall show. We hold innumerable auditions. We investigate recommendations from all quarters, to see if the material is suitable for the microphone.

"But I think you are placing rather too much emphasis on the value of radio humour. Indeed, variety as a whole is probably not nearly as popular as some people seem to imagine."

Once again I found myself rather agreeing. For one thing, a variety show—by its very nature—cannot please all its listeners all the time, and there is an inevitable irritation created by the turns that do not happen to appeal—an irritation likely to stick in the mind much more than the odd turns that do appeal.

Essentially Radio Acts.

"In any case, as there is not an unlimited amount of variety we have had to think out essentially radio acts—"Cafe Colette," "The Red Sarafan," "In Town To-night," and so on. Altogether we have something like thirty of these special acts running now—all essentially of the stuff of radio, the scripts being written here at the B.B.C. specially to suit the needs of the microphone.

"Scripts for comedians? H'm, the trouble is always to get comedians to accept them! Few of them really take this microphone technique seriously. Not that I can blame them—radio is, after all, only a sideline for the majority.

"I should say that there is not more than a dozen artists making a whole-time living out of radio in this country. It is

(Continued on page 485.)

GILLIE POTTER



An entertainer with an essentially radio type of art.

STARS OF "BITTER SWEET" DISCUSS THEIR PARTS



These are the leading personalities who took part in this musical comedy. From left to right they are Betty Huntley-Wright, Eric Maschwitz, Evelyn Laye, Stanford Robinson and Serge Abranovic.

The New Radio Organs

By G.V. Dowding Associate I.E.E.

DURING the next few years "electronic music" is going to develop to a very considerable extent if present activities and indications are anything to go by.

Already quite a few broadcasting stations on the Continent and in America have installed electronic organs, and some of the biggest organ builders in the world are actively engaged in developing instruments—Messrs. Crompton, for example.

And when you come to think of it, all this is logical progress. The science of building pleasant sounds has a history of steady advancement. There is no reason to suppose our descendants will be any more satisfied with the pianos and organs of to-day than we would be with the harpsichords and clavichords of our ancestors.

What May Have Happened.

Here is another thought. During previous centuries everything that has been capable of producing a nice sound as against mere noise has been recruited to musical purposes. Some may say that many mere noise producers, too, have been brought in!

One can picture the kind of thing that happened. George Caveman, sitting on a boulder, idly plucks the string of his bow. Twang! Twang! The man who lived in the cave next door was also there and happened to do likewise. Their bow strings being of different lengths, different notes were emitted. Ping! Pung!

Hence the harp, and a whole horde of other such things.

Similarly, ten years ago a new sound having musical possibilities began to be widely heard. The plaintive wails and squeaks of the radio oscillator. Hence, the Theremin. But progress moves fast these days and already the Theremin and other such instruments which produce single notes have been followed by highly developed contrivances capable of wonderful effects.

The "Valvonium."

Perhaps some of you will remember that little "Valvonium" which I described in "P.W." some time ago. This made use of a single valve oscillating at a low frequency. The frequency could be changed by altering condenser capacities by means of keys, and in this way some two octaves could be covered in flute-like notes.

Since then there have been

several organs built on a large scale using the same principle. One of these used about one hundred separate oscillating valve circuits so that full chords could be played.

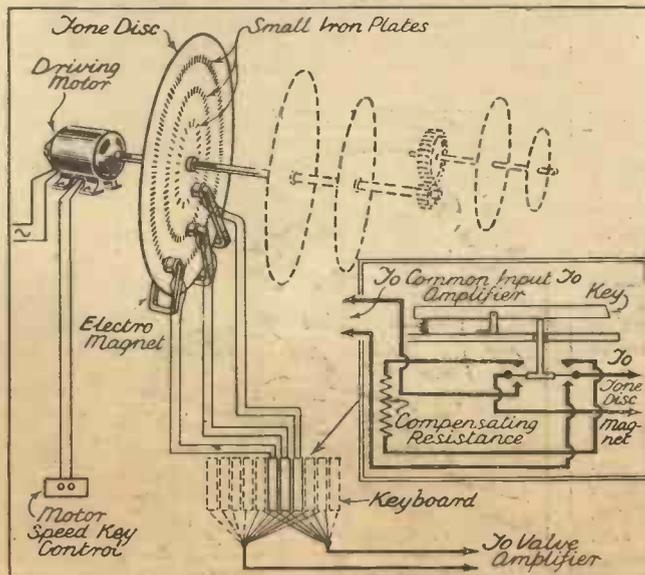
All over the world strange and wonderful new musical instruments are being developed especially for broadcasting. In this article some of them are described and details are given by our Technical Editor of a scheme he himself has originated.

But even that is as nothing compared with what is now being done. In America they have designed an affair which is capable of producing about twenty-five thousand pure audio frequencies which can be combined in an almost endless number of different ways.

A note, for instance, the "middle C," can have all kinds of harmonic structures built up on it so that it sounds like an organ note, a violin note, the note of a brass instrument, or in fact like any existing musical instrument or human voice, or things not yet heard by the human ear.

And that can be done with any one of the notes singly or simultaneously with any number of the others.

AN INGENUOUS SCHEME



The various notes are developed by means of rotating discs having iron plates on them which pass through the poles of electro-magnets. The inset diagram shows how the operation of the playing keys cuts out compensating resistances when the "pick-up" outputs are switched over to the amplifier.

Mind you, I think it is rather unnecessary to have such versatility in a single instrument. As you all probably know, some of the big cinema organs have dozens of "stops" allowing them to be played to sound like trumpets, clarinets, violins, pianos, etc., but how often do you hear them played over more than a small proportion of their scope?

However, the fact remains that it is possible by purely electrical means to produce wide ranges of pleasant noises with apparatus much less expensive than ordinary organs of similar potentialities. And these noises are produced in a manner ideal for broadcasting.

No Studio Problems.

There are no studio problems. Acoustics do not have to be considered at all. Instead of the noises first being emitted into a specially arranged studio with carefully placed microphones, all you have to do is to connect the electrical output of the instrument straight on to the transmitting plant, just as you would a microphone or gramophone pick-up.

There is plenty of scope for invention in this new field of music production. Within a few years someone somewhere is going to think of something quite small and cheap which will produce marvellous tones by electrical means. You see, the output from the actual instrument can be quite small.

You haven't got to shift great chunks of the atmosphere with it. Ordinary amplifiers can develop the necessary volume if the music is required to be heard direct. And the ordinary amplifiers used in any broadcasting system would serve the same purpose if the music is to be sent through the ether via radio waves.

Using Photo-Electric Cells.

Oscillating valve circuits are the most obvious way to produce different frequencies, but there are other means. There is the photo-electric cell to consider. In one system numbers of discs with holes pierced in them are rotated between a light source and a bank of photo-electric cells.

The speed of the discs and the number of holes in them regulate the interruptions in the light which reaches the cell, and therefore produce a pulsating electric current which can be controlled as to its frequency very simply.

(Continued on page 436.)

CONNECTIONS IN D.C. MAINS RECEIVERS

Some notes on the correct arrangement of the heaters and cathode wiring.

THE valve connections in D.C. sets can appear somewhat confusing to those who have not quite got the "hang" of the subject of currents and potentials. An instance of this came to the writer's notice recently, where an experimental hook-up failed to give any results whatsoever owing to a simple misplacing of a cathode connection.

Consider, first, the arrangement as shown in Fig. 1a. The valve filaments (or heaters) are all connected in series, and an external resistance R is inserted in the positive main to drop the voltage to a suitable value. The H.T. supply is also taken off the positive through a fuse, and the usual smoothing circuit consisting of the chokes and condensers L, C.

Losing H.T. Voltage.

A possible mistake would be to tap this H.T. lead off the filament side of R, whereas, as shown, it has to be taken off the mains side. This gives the full mains voltage for H.T., which can afterwards be dropped by suitable anode resistances, while if the first connection were adopted we should have a very low value of H.T. owing to the large "drop" in R.

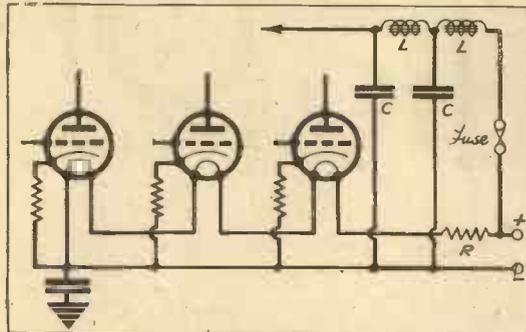


Fig. 1a, above, shows the connections required when the heater voltage-dropping resistance is in the positive mains lead, while Fig. 1b, to the right, shows this resistance in the negative lead.

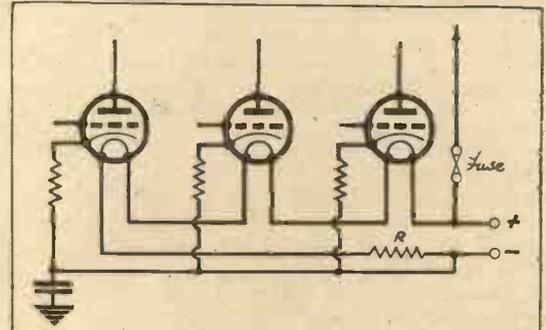
regarded as the "earth" side inside the set, although it must never be actually connected to earth except through a condenser as indicated. For it must be appreciated that the negative will be the live main in many cases, so that everything connected to it directly will be at a high potential to earth.

Now, suppose the dropping resistance were placed in the negative lead. Which are we now to take as our "earth," or "return," circuit? An easy error would be to retain the cathode connections shown in Fig. 1a. But a little consideration shows that the cathodes would thus be at practically the same potential as the anodes—i.e. not enough anode current would flow, although a voltmeter between negative main and plates would show full voltage.

The Detector Position.

The remedy here is simply to take a new cathode return lead from the mains side of R, the reasoning being the same as before. Finally, remember that the detector should usually be at the negative end of the heater chain. H. R.

CATHODE "RETURNS"



THE IMPORTANCE OF GOOD CONTACT

Simple points, which nevertheless can affect results considerably, are dealt with in this article.

ALL experts will confirm that the importance of good contact at all points of connection, in wireless or electrical circuits, cannot be over-estimated.

In wireless a big percentage of reception troubles are ultimately traceable to faulty connections at some points of contact in the circuits, battery or mains type. A faulty connection is likely to be made when wiring up a set at one of the many points where an ordinary single-strand wire or flex is connected under a screw head or terminal nut, say on a valve holder, transformer or other component fitted with a similar arrangement for connection.

However simple this particular operation may seem to the constructor, beginner or experienced, there is a right way and a wrong way of making this connection.

Positive Contact.

Before dealing with this type of connection it might be pointed out that leading manufacturers of various connectors, plugs, sockets, jacks, valve-holder sockets, etc., make good contact the basis of their design.

Whenever a single wire, or wires, is connected under a terminal, or a flexible cord is attached to any type of accessory, it is essential that the electrical contact be as

good as possible, and that the contact be as tight as possible, on adequate and clean surfaces.

The scientific reason for this is that there is no such thing in nature as a Euclidean plane surface, and when two surfaces are put in contact they will, unless of elastic material and pressed together, touch only at a few isolated points.

Current Density.

When making electrical connections we overcome this as far as possible by forcing the parts together with a screw or nut, or by means of spring contact. A slack connection means that the parts are in contact only over a small area. The

current density across actual contact will, therefore, be high, and if the connection is in a portion of the wiring carrying much current, it will get very hot. Also, if there is a thin air film between the two surfaces which are supposed to be making contact, persistent arcing may occur, causing an unsteady current and burning of the contacts or wire.

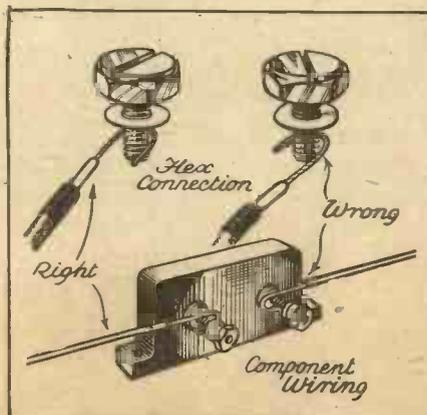
Flex Connection.

When attaching flexible cords the flex should be prepared thus: Remove the outer covering of braid, silk or cotton for about 1½ inches. The copper should be entirely stripped for about ¼ inch, leaving nearly an inch of bare rubber exposed. The bare copper should be twisted up tightly, taking care that no loose strands are left free, and then doubled over on itself. Whipping up the frayed end of the outer covering with strong thread makes a neat job and prevents further fraying. When connecting the end of the flex to a screw or terminal, if a small washer is placed first under the screw head or terminal nut a better connection is made and also prevents the wire from being dragged by the screw as it is tightened up.

The loop in the end of the wire should be as illustrated, so arranged that the action of tightening up the screw or nut tends to close the loop and not open it.

The method of arranging the loop, of course, applies to other wires, especially to the tinned single-strand wire used so extensively in set wiring. L. A. H.

CORRECT METHODS



Whether wires fit under screw heads or ordinary terminals, there is a right and a wrong way of twisting them round the shank so that the wire will not be squeezed out in the tightening up process. The correct and incorrect methods are illustrated in this diagram.

NEXT WEEK
WHAT YOU WILL SEE AT
RADIOLYMPIA.

ON THE SHORT WAVES



The Detector Circuit

After emphasizing the importance of the detector circuit on the short-wave set, W. L. S. gives details of the scheme which he finds always gives him the best results.

PLEASE don't get bored with these little talks about the detector circuit. I know I'm always harping on the subject, but for short-wave work it is quite impossible to hit on a more vital one.

On any wavelengths, in a sense, and on short waves in particular, the detector seems to do all the important work. We can design beautiful H.F. stages and simply marvellous L.F. amplifiers, but without a rattling good detector they're just a waste of time.

A Vital Part of the Set.

Just reflect, also, that the detector is the only part of the circuit that is the slightest use to us on its own. A good single-valver makes a really excellent short-wave set that will receive every station in the Call-Book (sardonic laughter from the sceptics). All right, sceptics—I said a good one, and you probably don't know what that is.

Just let me rub in, once more, the fact that a short-wave set with a detector that is faulty in any way is like a beautiful car with two of the plugs removed. It will get along somehow, but that's all you can say for it.

The circuit on this page shows a conventional series-fed detector. I have used this same arrangement in all my recent sets—the "B.C.L. Two," the "Simplex" described last week, and many others that haven't been described in print.

Why should I change to anything else? I know this circuit, and I know it works. I could be frightfully clever and use one that looked all wrong when it was drawn out, but no one would be any better off for that (except, possibly, the draughtsman)!

Important Points to Remember.

Let's stick to this good old circuit and talk about it some more. The grid coil, tuned by C_1 , is the most important part of it. Signals coming down the aerial are handed on to this tuned circuit, and at whatever frequency to which it is tuned its job is to offer the highest possible impedance to those signals, handing them on to the detector grid.

Changes in grid voltage imply corresponding changes in anode current, their amplitude depending upon the slope of the valve in use. The reaction coil, wired in series

with the anode circuit, therefore carries a kind of image of what is already going on in the grid coil, and if some of this can be fed back once more into the grid circuit, we can produce a "build-up" that is only limited by the point at which the valve goes into oscillation.

This feed-back has got to be controlled with the utmost delicacy, and we use a variable condenser C_2 for this purpose, since it allows us to use fixed coupling between the two coils.

Note that our H.F. choke and 'phones are hitched on to the reaction coil not at the anode end, but at the other end. The only disadvantage of attaching the choke to the anode end is that it then needs to be a really good, low-capacity choke. In the "series-feed" position (as shown) all that it has to do is to ensure that there isn't enough H.F. leaking away through the 'phone cords to keep the valve in a perpetual state of oscillation, independent of C_2 .

always drumming this in, but, after all, I have newcomers among my readers every week, and I must, in a way, keep going back and covering the ground again.

The next point in order of importance is that the filament end of the grid coil and the H.T. end of the reaction coil should be next to each other. Some people seem to delight in wiring up their coils in an exactly opposite way, so that the plate and grid connections to them are adjacent. This gives an unnecessarily high plate-grid capacity, and almost invariably plays havoc with the reaction control.

The Grid Return.

Think of the two coils as one continuous one, split in the middle to have the H.T. applied across the gap, and you will see the circuit as it should be. The little layout in Fig. 2 shows how both the foregoing points may be settled.

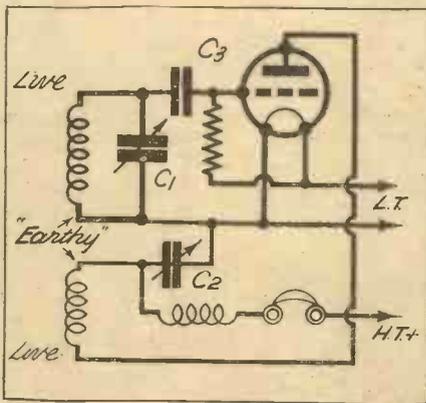
I have shown the coils "out in the clear" to emphasise the correct connections. Actually you will probably use some type of four-pin coil plugging into a valve holder, and an even more compact layout may be made of it.

There used to be a craze for returning the grid-leak to a potentiometer connected across the L.T. supply. Nowadays I invariably take it straight down to the positive leg of the filament. This gives a very smooth control with the modern 2-volt "H.L." type valve. Grid-leaks, incidentally, are much quieter than they used to be, but it's still worth while trying several if you can.

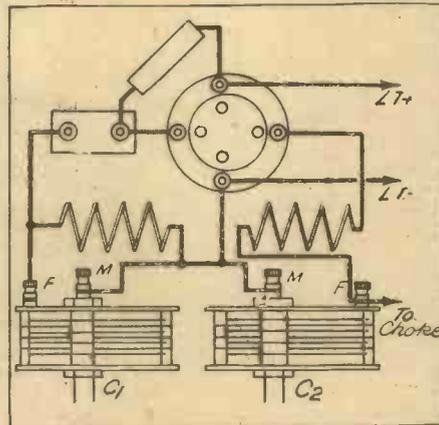
The Values.

Out of half a dozen you will generally find one that gives you perceptibly less background hiss than the others. Stick to it and treasure it! The conventional value of 2 megohms isn't far wrong, but you will sometimes find that your particular valve gets on better with 4 or 5 megohms. The grid condenser may be anything between .0001 and .0003—I can never notice any difference.

Other mechanical considerations include the fact that it is well worth your while to mount the detector valve holder and the grid condenser up in the air. Little ebonite spacers about $\frac{3}{8}$ in. long are admirable.



AN IDEAL DETECTOR



The circuit above, and practical layout to the right, show the well-tried detector arrangement which W. L. S. strongly recommends.

Now there are some practical requirements for this circuit, if we are to get it going really well. First, the grid coil must be wired directly across C_1 . The leads joining the coil to the condenser form part of the tuned circuit, and if they are long they will add quite an amount of inductance and resistance to the circuit.

The mere fact of being long—so long as they are direct—doesn't matter enormously. It is when they pay calls on the way, to have a look at other components, that the trouble starts. I know I am

ON THE SHORT WAVES—Page 2.

Points from the POST-BAG

I USED to mention the receipt of frequent letters and batches of news from A. W., of Cape Town, and was wondering why these welcome additions to the post-bag had stopped abruptly. At last comes a letter from A. W., telling me that he has been ill for many months, *sans* receiver and *sans* news. Tough luck, A. W., but I'm jolly glad to hear that you're back again. I'm glad, too, to hear that "P.W." kept you going and contributed to your recovery.

Short-wave news from the Cape Town "Argus" radio section includes a note to the effect that W 2 X A F is undoubtedly the best American station on the air. They also mention a new Canadian station, V E 9 A S, who is on the air on 46.69 metres and wants reports. These should be sent to the Engineering Department, University of New Brunswick, Fredericton, N.B.

"H.A.C." Users Write.

W. K. (Glasgow) has gone back a few years and has just built the "H.A.C. Three-Valver." I almost forget what the circuit was, and have had to look it up! He complains of very bad reaction control, and mentions in the same breath that the reaction condenser included in his kit was not the one recommended in the article. That's point No. 1, W. K.! If changing that doesn't put things right, I think your detector valve must be to blame. Try reducing the detector voltage considerably; if that doesn't work, change the valve.

A voluminous log arrives from H. A. M. (Margate). He, by the way, is another "H.A.C." user, and he remarks that a thorough clean-up of the variable condensers with a pipe-cleaner, followed by the installation of a new air-dielectric reaction condenser, has made a brand-new set of it.

R. D. E. (Standon) doesn't agree with me that W 5's are the hardest Americans to receive. He finds the W 6's far more difficult, but he is referring to telephony stations only. I was thinking chiefly about the C.W. people, and whereas it is quite an event to hear a "5," the "6's" come roaring through in the early mornings in their hundreds.

R. D. E.'s record must surely be unique—595 verifications from 57 countries, all using telephony and all on loudspeaker! Does anyone want to say he can beat that?

The Pentode Detector.

A. F. McF. (Manchester) thinks my suggested layout for an amateur station was rather too ambitious for a beginner. As a matter of fact I entirely agree, and it wasn't meant as a hint that a beginner should possess everything shown in the photograph he refers to (May 11th, page 249). It showed a representative station

using 50 or 100 watts and capable of world-wide work.

A. F. McF. sends a photograph of his own station, which is simplicity itself and is used for R. N.-W. A. R. work. Unfortunately, it isn't quite sharp enough for reproduction.

G. W. G. (Ipswich), who is becoming quite a regular visitor to these notes, describes his new receiver. He is now using tuned H.F., triode detector, and S.G. L.F. Even on 16 metres he assures me that he gets some gain from the H.F. stage. In a stop-press bulletin he tells me that he has just invested in a power-pentode, which he has put in the detector stage. No more triodes for him! He's got to go out again and buy a volume control now.

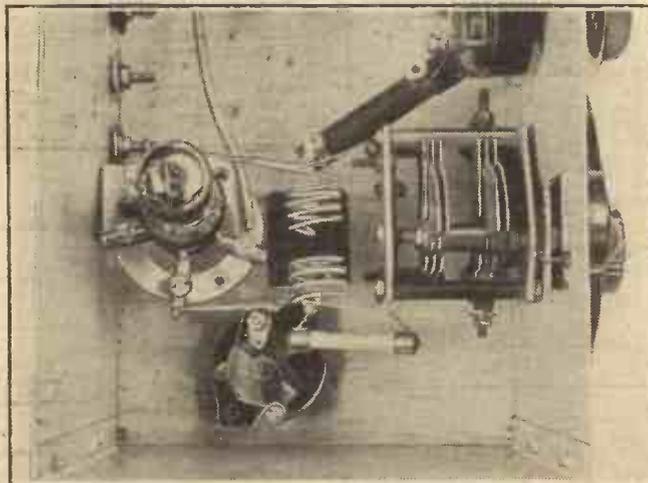
The Seven-Day Peak.

W. K. C. (Hucknall, Notts) has sent in a three-months' log on W 3 X A U (49.5 metres). Once more that remarkable 6-7 day peak is in evidence; in fact, it seems to be more marked in readers' logs on the 49-metre stations than on the 31- and 19-metre bands.

Another interesting thing that shows up is that signal strength appears to be very low on the night of a full moon, but up to R8-9 again within two or three days. W. K. C. is very keen on obtaining some reliable information regarding the phases of the moon and their effect upon short-wave reception.

Will any other reader interested in the subject please get into touch with him? "Mr. W. K. Chaplin, 9, Station Terrace, Hucknall, Notts," will find him.

A TUNED CIRCUIT FOR 5 METRES



This photograph shows the tuned circuit of a 5-metre receiver. Although this uses a different circuit from that shown on the preceding page, the same principles in wiring have been observed with regard to the coils.

C. J. P. (Cranwell) proceeds to bust up the "quasi-optical" theory of ultra-short-wave propagation with a few well-chosen remarks. I don't agree, however, with his substitute for it, which involves a belief in reflected waves going up and coming down at steep angles. I really believe that all our present short-distance 5-metre work is being done on ground waves.

The reflected ray may be coming down somewhere—probably in the Antipodes—at certain suitable times. Ten metres has awakened once more, and contacts between this country and South America have been established on low power this year.



INTERESTING broadcasts in the Empire programmes during the next few weeks will include the Ceremony of the Keys (July 23rd and 24th), the running commentary on the King's Prize at Bisley (July 20th and 21st), Tidworth Tattoo (August 3rd, 4th and 5th), and the Keswick Convention Diamond Jubilee Service (July 28th).

Listeners on short waves who never bother to listen to our own Empire Transmissions are missing quite a lot, even if they live in this country. Many excellent programmes which are radiated to the Empire are not mere relays or recordings of the ordinary British programmes, but contain original matter.

Empire Listeners Praise Programmes.

Letters from overseas readers are becoming very numerous nowadays, and it brings a glow of satisfaction to read their complimentary remarks about the service they are getting from the B.B.C. The usual tenor of the letters is "They may not put out such a strong transmission as Germany and America, but there is simply no comparison when it comes to programme interest."

Mr. Leslie W. Orton, of the Anglo-American Radio and Television Society, tells me that the social side of the society is being considerably extended this summer. Dramatic, hiking, cycling and ciné clubs are being organised, and arrangements are being made so that any members who show real talent in one direction or another will have an opportunity to broadcast in the society's concerts from Continental stations.

Swedish Contact Wanted.

Readers are also asked to note that the London offices of the society are now at 89-91, Wardour Street, and that Mr. Malcolm Barr is the new executive secretary. Persons wishing to join, however, should write to Mr. Orton at "Kings-thorpe," Willowbank, Uxbridge.

I have a letter on my desk from Mr. Oscar Bylund, Roslagsgatan 7, Stockholm, Sweden, asking me to put him in touch with any radio amateur in this country who would like to correspond with him on short-wave and general radio subjects. Mr. Bylund, I may mention, writes in perfect English, so that readers need not be afraid of their ignorance of the Swedish language! Will somebody please start the ball rolling? Thanks.

The regular schedule from Bombay, V U B, on 31.36 metres, is as follows: Wednesday and Saturday, 5.30-6.30 p.m., and irregularly on Sundays. Readers who complain that Bombay is "never there" will now know when to look for him.

MY MOST EXCITING

Microphone Moment

EVERY moment at the "Big House" is exciting, really.

The rush and tear of rehearsals, the ever coming and going of artists, the voracious microphone for ever eating up talent, programmes day and night: here are surely the essential ingredients of excitement?

That is the general, all-pervading atmosphere. Excitement that can be felt immediately one enters the "tower" of the Big House—the sacred precincts of real broadcasting. But in the Artists' Foyer and in the famous Green Room you will hear tales of extra excitement—of thrilling episodes the outside world seldom hears about.

In Armour.

C. Denier Warren, the well-known author of the gags in the "White Coons" shows, not to forget the equally popular "Kentucky Minstrels," tells me of one of his most amusing—and quite the most exciting—moments at the Big House.

"While I was rehearsing my part in the Alhambra season's 'Henry the Fifth' I had to put over one of those Kentucky shows. By the time the broadcast was due I was actually playing a fifteenth-century soldier at the theatre—dressed in heavy armour from head to foot.

No Time To Change.

"You know the way these things happen. There was just time to sprint in a taxi from the theatre to Broadcasting House—but no time to change my rig-out.

"It was a question of working the two shows to minutes. I daren't risk wasting time changing, so I had to turn up for the Kentucky boys complete in my armour.

"Every time I moved—if I forgot myself for a moment—it sounded like a visit from the dustman! But that was not the worst of it. Just as I was saying something about 'Massa Johnson,' my

Although the organisation at Broadcasting House and other B.B.C. centres usually runs like a well-oiled machine there ARE unexpectedly exciting moments—as the galaxy of radio artists interviewed below vividly testifies. But listeners seldom suspect anything has gone wrong!

helmet thing fell down over my mouth—and for a moment or two no one could move the wretched clamp.

"There was I muttering Minstrel patter through my metal face-trap—much to the amusement of the 'boys.' We got it

open at last—but meanwhile I can tell you it was exciting!"

Harry Hemsley, whose child imitations are so perfectly

I was glad when my exciting moment was over.

"It just shows how little people realise what happens at these moments. Do you know, that particular show went over extremely well—it was highly commended afterwards!"

John Rorke, whose popularity with listeners increases with the years, tells of some real excitement when he was up at the Midland Regional some years ago.

Due To A Flood.

"My most exciting moment? Well, every moment of broadcasting is that, you know! But I think it would be hard to beat the experience I had when the Thames Embankment flooded

and washed out the 'S.B.' cables to the Midlands.

"Charles Brewer was up there at the time, I remember, and at a moment's notice all those of us who were still in the studios had to get down to supplying listeners with an extemporary programme—from about ten o'clock until midnight.

Listeners Heard.

"At first we simply didn't believe it when the engineers said the cables had broken down—we suspected just another gag. But when we realised the real situation we all joined forces—and produced what was afterwards voted a very successful programme!

"I made a bit of a *faux pas* when it began.

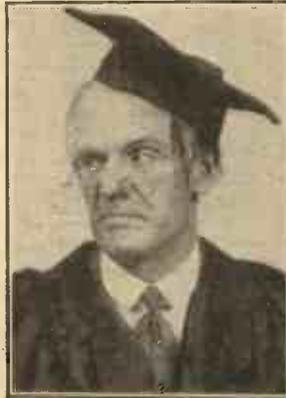
Thinking the mike was 'dead' at that moment I shouted: 'Now we shall all get double fees!' But the 'mike' was alive—and listeners heard this pious hope!

(Continued on next page.)



FOUR FAVOURITE RADIO STARS

C. Denier Warren (left), of "White Coons" and "Kentucky Minstrels" fame, had a "moment" with a helmet!



Will Hay (to the right above), the famous school-master comedian, says his most exciting moment was his first—at Marconi House.

John Rorke (to the left below), a popular broadcaster, had a most exciting moment at Midland Regional—when the S.B. lines failed!



Harry Hemsley (right), child impersonator, had his exciting moment when he found himself with the wrong script in his hand

done over the air that many listeners imagine he must have a gang of real children in the studio with him, also can recall an exciting moment.

"It was in one of the variety shows

not long ago," he said, "and I was standing nonchalantly at the 'mike' ready to do my stuff, when, idly glancing down at the papers in my hand, I realised I had the wrong manuscript with me!



"I made a bit of a *faux pas* when it began.

Thinking the mike was 'dead' at that moment I shouted: 'Now we shall all get double fees!' But the 'mike' was alive—and listeners heard this pious hope!

(Continued on next page.)

MY MOST EXCITING MICROPHONE MOMENT

(Continued from previous page.)

"Sketches, low comedy, songs and everything, we did. It might have been an awful flop—but Charles Brewer produced us wonderfully well considering it was all done on the spur of the moment."

Will Hay, the schoolmaster comedian, got exceedingly reminiscent when I tackled him on his most exciting broadcasting moment.

"Oh, the first, without doubt! Incidentally, I must have been one of the very first to broadcast any funny stuff from Marconi House. I distinctly remember the date—it was in July, 1922.

In the Early Days.

"At that time we were rehearsing a show called 'Listening-in' at the Apollo—and I and the 'class' trooped over one fine afternoon to Marconi House. In those days you had to hold the microphone in your hand. You can imagine—or perhaps you can't—what it was like with three chaps all trying to grab the wretched thing and speak into it.

"Most of the time we seemed to be pushing each other out of the way—you had to put your face pretty close to the microphone, otherwise your voice would not be picked up at all!

"It was, certainly exciting—because, you see, it was so very new and strange. And, anyway, it was in the afternoon, so it did not matter very much if a few odd

CLAUDE AND ENID BY THE SEA



Claude Hulbert and Enid Trevor are always having exciting moments, of course. Here is one of them—a holiday incident at Felpham, near Bognor Regis.

sentences were missed when one of us forgot to push his face closer!

"Come to think of it, there weren't many licences in those days. It is just possible that no one heard the programme at all!"

That, of course, is just Will Hay's modesty. Did you know, by the way, that he is a very keen amateur astronomer?

He tells me his new book, "Through My Telescope," is now out. If I buy a copy he will autograph it. My stars!

Effie Atherton, who has been doing good work lately at the Big House, goes back to an "Air Do Wells" show for her most exciting moment. "My one horror in life," she says, "is mice!"

And then her pet horror came literally to life while she was actually broadcasting in one of the smaller studios in the Big House. Brian Michie, the blond giant of a producer, was getting the "Air Do Wells" well under way when there was a scream from Effie.

"I simply couldn't help it," she explained to me.

"There was a mouse—actually a mouse—slowly running along one of those overhead microphone leads.

"But that wasn't the worst of it," she went on.

"It ran into my hat—it was perfectly horrible! Two of the men in the show tried to kill it. I felt absolutely sick.

"He's Dead."

"The final straw was still to come, though. When the thing had been killed one of the men actually held it up to show it to me—as though I was not terrified enough!

"How on earth we managed to get through that show I don't know to this day. Excitement of that kind is not my idea of pleasure—and now I'm more terrified than ever of mice!"

Enid Trevor and Claude Hulbert have had their moments, too. I was talking to Enid about excitement and she recalled the time when she had to do a scene in the Effects studio at the top of the building and then rush down as quickly as possible to Studio B A in the basement.

"All Stations."

"I had only just time to make it," she said, "so I rushed into the lift at the top of the building. And, do you know, the wretched thing stopped at every single floor all the way down! Talk about moments that seem like a lifetime—that seemed like an eternity!

"Claude had a narrow squeak when he was in the 'Two Pairs' act not long ago. We called for Paul England on the way to the

Big House from our own house and everything was perfectly all right until we got as far as Big Ben—when, to our horror, we saw that we had only eight minutes to go before we were due on the air!

"Meanwhile in the studio they were not worrying, for we never miss our cue. But you can tell how fine we cut it that

time, because as we rushed through the studio door the band was just beginning to play our music!

"Needless to say, that was before the thirty-mile-an-hour limit came into force—I doubt if we should have done it otherwise!"

Philip Wade, the well-known playwright and actor on the radio, told me—during a five-minute break in rehearsing his latest play at the Big House—that disasters simply don't happen at the studios; not when he's around, anyway!

A POPULAR PLAYWRIGHT



Philip Wade, the radio playwright, confesses that exciting moments just don't happen to him—although he is always excited to hear his plays come to life.

Living Characters.

"Perhaps the most exciting moment for any radio playwright is when you hear your characters slowly coming to life through the loudspeaker. That certainly is exciting. But everything works so smoothly that normally there is no chance of breath-taking accidents causing any excitement.

"After eight rehearsals you know exactly where you are with a radio play—and it is most unusual for anything exciting to happen then—although I am always excited when listening in the control room to my plays being

actually broadcast."

A. H.

FROM AN ENTHUSIASTIC SHORT-WAVE LISTENER

Dear Sir,—Having possessed an ordinary radio receiver for the past ten years, I thought I would have a go at short-wave reception. Two of my pals having possessed receivers of their own for the past two years, I thought I would try it, too; so raking out about two and a half years' "P.W.'s" I came across, after a long search, a three-valve S.W. receiver, designed by you and published in "P.W." May 6th, 1933; this set was the famous H.A.C.

I finished building this set on the 23rd December last. At first I could not make much out of it, but being patient I tried and tried. After a short time my number of stations began to increase by leaps and bounds. This set is a real "Hot Dog" set.

My two pals have got 84 and 70 stations respectively on 2-valvers in two years, which I thought, before I built mine, was wonderful. Well, I have gone one better, having picked up 61 stations in less than two months, plus "tons of hams" and commercials. So by the time I have had my set two years I should be able to pass the hundred mark, I think.

Some of my best bags have been, I think, H J, A B B, H J 3, A B H, Y V 5 R M O, V K 3 L R, H J 4 A B E, the new station at Havana, C O H, and last and not least, V-K 2 M E, whose programme I listen to every Sunday afternoon.

I am situated about 450 ft. up and use an 80-ft. outdoor aerial. If I go on getting stations like I am at present I believe I shall get reception from Mars and other planets.

This S.W. "bug" is very dangerous. I predict that in less than ten years everybody will possess a S.W. receiver.

I myself would not go back to ordinary wireless for anything, though, of course, I like to have a change occasionally; though to listen night after night to ordinary locals is the most monotonous thing I can think of.

Wishing you all the best in the future, and go on helping "DX" enthusiasts as you have done and still continue to do.

Yours faithfully,

L. C. B. BLANCHARD.

122, St. Andrew's Road,
Coulson, Surrey.

TELEVISION

SOME little time back I gave a brief description of my idea of what the first complete receivers for high-definition television might be like. In the May 18th issue there was reproduced a sketch of such a receiver, with a cathode-ray tube mounted vertically and a mirror in the lid arranged at an angle of 45 degrees.

A long letter from a reader was received a few days ago, telling me, in the most polite strain conceivable, that I am all wrong with my ideas. So persuasive, in fact, is the gentleman concerned that I am beginning to feel that way myself!

Too Much Radiogram Influence.

The main point that he brings up is that there is "too much radiogram influence behind the design." He then proceeds to explain that, to a hyper-critical person, even the talkies are most unsatisfactory, because they fail to produce a perfect illusion. Just stop and think for a bit, and you can always tell that the sound is coming from a source that is not quite level with the mouth of a speaker or a singer.

How much worse this may be with television remains to be seen, but this reader seems to think that the loudspeaker at the bottom of the set will fail completely to give realistic synchronisation with the picture at the top.

Personally, I think he is being a little over-critical; but, in fairness to him, I am reproducing a sketch of his own scheme for actually projecting the sound from the same level as that on which one sees the picture.

I think he is right when he says that the ideal we have to aim at is that of a "speaking image." Whether some similar lay-out to that shown will be adopted remains to be seen.

Very Few Controls.

Regarding the controls themselves, it seems that we may hope for such perfection of initial adjustment that several of them can be tucked away at the side or even the rear of the set. My own experience of time-base circuits, unfortunately, does not justify such optimism, but a leading manufacturer has assured me that it will be quite a simple matter to design circuits that will "stay put" for indefinite periods.

This will mean that the only controls that must be "to hand" are tuning, volume and brilliance, the "speed" and "sweep" controls being placed in a less accessible position to discourage unnecessary twiddling.

After all, it is obvious that television receivers *must* come to this. Probably most of the commercially-built, expensive receivers will find their way into the hands of unskilled operators, and a multiplicity of controls will be fatal. Compare the radio receiver of to-day with that of

SOME FURTHER REMARKS ON THE DESIGN OF TELEVISION RECEIVERS

By L. H. THOMAS

1925, and then reflect upon their respective performances and specifications! To-day's is enormously more complicated, and yet the number of controls is probably a third or a quarter of what it used to be.

Listeners and "viewers" in Berlin have an average of five hours daily television for their amusement. Transmissions are radiated both by the broadcasting company and by the post-office, vision being on 6.8 metres and sound on 7.1 metres. Germany claims to be the first in the field with a regular transmission which is actually used for the purpose of entertainment.

In the U.S.A. transmissions from the Empire State Building have been carried out intermittently for some time, but I imagine that they are mostly experimental. The same building has also been used for the tests of the new Armstrong system of

intermediate-frequency circuits for the television receiver. The necessary bandwidth may be assumed, for the sake of argument, to be about 2 megacycles, and all sorts of arrangements are waiting to be tried out.

It is unfortunate, but nevertheless a fact, that the apparatus required for accurate measurements of the I.F. characteristics is somewhat beyond the reach of the amateur constructor. He can, however, build himself a valve voltmeter at very little expense, and the only other gear required is a simple valve oscillator that has a fairly wide tuning range in the neighbourhood of 6 to 8 megacycles—50 to 37.5 metres.

Injecting the Oscillations.

The output from this oscillator is "injected" into the I.F. circuits by means of a simple link coupling—two one-turn coils joined with twin flex, one coupled to the oscillator and the other to the windings of the first I.F. transformer, will do the job quite effectively.

This is hardly the place to describe the construction of a valve voltmeter, but anyone understanding the principle of rectification can hardly be at a loss to rig one up for himself. An old 4-volt receiving valve of the P.M.4 or P.M.4D.X. type is admirably suited to the job, with a 0.5 milliammeter in the anode circuit and a means of adjusting the grid bias to give an accurate zero setting.

Of the various types of I.F. circuits I could say quite a lot. Some favour the band-pass scheme, keeping the separate stages fairly sharp; others superimpose a number of flat resonance curves on each other, and a third school is trying to do the whole thing with one flat but "beefy" stage.

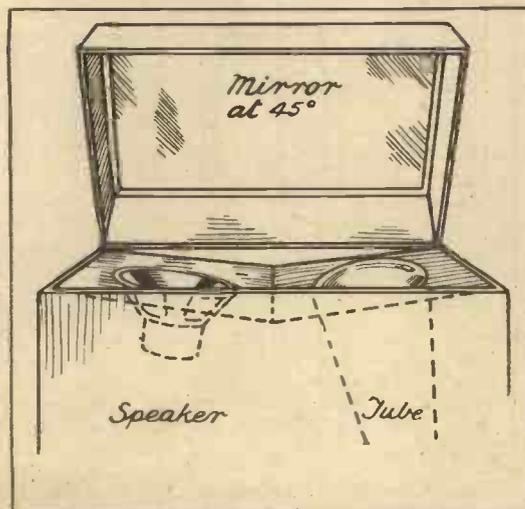
Efficient Screening Essential.

Two things seem to be essential, whichever scheme is used—H.F. pentodes, to give the necessary gain, and very complete screening as a result of that gain! If the whole receiver is built up on the "unit" principle, with the I.F. amplifier, on a metal chassis, as one self-contained unit, the problem seems reasonably straightforward.

Certain people with quite a lot of ultra-short wave experience are still of the opinion that the superhet is not necessarily the only way out. When we produce a valve that is equivalent to the new Acorn pentode available in the U.S.A., H.F. amplification on these high frequencies will not be a difficult matter at all.

Whether the band-pass circuits are going to be easier to handle at signal frequencies than at the intermediate frequencies of a superhet remains to be seen. The commercial receiver, however, will almost certainly standardise the superhet.

A READER'S SUGGESTION



The idea behind this arrangement is to make the sound appear to come from the same point as the picture by reflecting both sound and vision from the mirror.

eliminating static and electrical noises. Can it be possible that the famous scientist has some television developments up his sleeve as well?

(Since writing the above paragraphs, a message has reached me to the effect that a regular transmission has been put into service in Italy as well!)

Probably the most interesting field for private experimental work at present is that concerned with the design of the

SURPRISES OF A VISIT TO DAVENTRY

Since the coming of Droitwich, Daventry has been almost forgotten by listeners at home, but a tremendous amount of work and research is going on there, as explained in this article.

By A SPECIAL CORRESPONDENT.

SINCE the old Daventry National and Midland Regional transmitters at Daventry were closed down, and transferred in spirit to Droitwich, the famous station on the "Dane Tree" hill outside this little Northamptonshire town has almost faded out of the ken of most listeners in Great Britain, though as the centre of the B.B.C.'s Empire broadcasting service it is in direct touch with thousands of Britishers exiled abroad. But when I paid a visit to Daventry the other day I found many things of great interest to home listeners, as well as to those in the Empire.

My visit was one of surprises.

The Old 5 X X Transmitter.

First of all, I was curious to see what has happened to the famous and venerable "5 X X" transmitter, Daventry National, since Droitwich took over. Inside the old transmitter building I found that hardly anything has been dismantled. The transmitting valves have been removed, and a few odd bits of wire, etc., but I suppose it would not take more than a few hours to put "5 X X" back on the air.

I asked what were the B.B.C.'s intentions, but, apart from saying they had received no instructions from London to dismantle it, the Daventry engineers would tell me no more.

When I returned to Town I asked B.B.C. Headquarters what they propose to do with this old transmitter. They replied rather mysteriously that they had no information to give.

Why? I wonder why? Is "5 X X" kept as a stand-by in case of serious breakdown at Droitwich? Or has it simply been forgotten by Headquarters? Or is it retained by Government request in case of what is known as a National Emergency?

Signs of Government Influence.

I ask the last question because there are other signs of Government influence at Daventry. This was my second surprise. In the same building, under the same roof as the silent "5 X X" apparatus, I noticed another transmitter, of modern design.

This, I discovered, is actually an Air Ministry transmitter, but is kept in order by B.B.C. engineers. It transmits weather reports for aircraft by telephony on about 1,180 metres, with a power of two kilowatts. The reports come by landline from the Air Ministry in London.

The single-wire aerial for this transmitter is hung to one of the old 500 ft. "5 X X" masts. It is almost lost in the bewildering array of Empire station aerials, of which more anon.

Walking over to the building which used to house the Midland Regional transmitter, I found that this has been dismantled. Some of the bits have been used, along with parts of the old G 5 S W short-wave trans-

mitter which were brought from Chelmsford, to knock together a short-wave transmitter which is now working on 25.53 metres, with the call-sign G S D and 15 kilowatts power.

This was the next surprise. It is not generally known that the B.B.C. has this third short-wave transmitter at Daventry, in addition to the two original Empire short-wave transmitters, but I found that it is working regularly and is intended primarily to serve South Africa.

Then I went along to the Empire station proper, the building in which the two 10 to 20 kilowatt short-wavers were installed when the B.B.C. started its Empire programmes. Here I found everything much as it was when I attended the inaugural ceremony of the Empire service three years ago.

The aerial systems are completely transformed, however. All the original "beam" aerials, with their reflectors, have been scrapped.

Experiments with various new kinds of aerials are still going on. An experimental

like the Eiffel Tower, and weigh 100 tons each. The masts are insulated from earth.

I saw no signs at Daventry of the two new Empire transmitters which are to be installed. These, the B.B.C. has announced, will have a power of some 50 kilowatts each, and when they come into operation the two original Empire transmitters will be combined to form a single set of about the same power.

New inventions of absorbing interest are continually being tried out by the B.B.C. at Daventry, and one which caught my attention is a new feeder system, for connecting the transmitters to the aerials. The idea is that, instead of using exposed wire supported on poles some 10 ft. high for this purpose, as hitherto, the feeder consists of a copper tube $\frac{3}{4}$ -in. in diameter enclosed inside a 4-in. copper pipe.

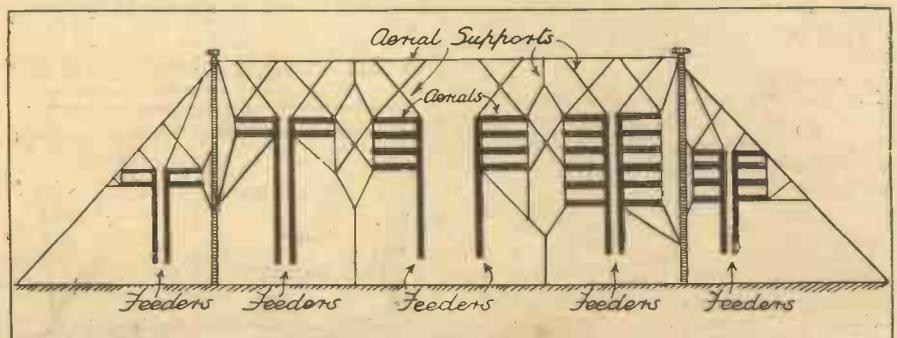
An Improved Feeder System.

These pipes run along about 2 ft. above the ground and look like sets of small drain-pipes. The inside copper rod is insulated by porcelain supports from the outer covering.

Only a little of the new type of feeder is yet in use, as it is very expensive. But it is claimed to give much improved results.

Another surprising thing I discovered is that the Empire transmitters are now arranged so that they deliberately boost up the top frequencies. This is because the average short-wave listener uses his set with the reaction turned well up, so cutting the top. The accentuation of top by the B.B.C. makes for better intelligibility.

THE NEW SHORT-WAVE AERIAL SCHEME



The short-wave aerial systems at Daventry have been completely transformed. All the original "beam" aerials, with their reflectors, have been scrapped, and horizontal di-pole aerials as shown in the above diagram have been substituted.

transmission to Canada, additional to the regular Empire programme service, is being carried out in the early morning two or three times a week to test new aerial designs.

Di-Pole Arrangements Favoured.

The aerials at present favoured for the regular programmes are all horizontal aerials of the di-pole type, varying in length from double-wave to $\frac{1}{2}$ and $\frac{1}{4}$ wave. They are slung up in stacks, sometimes two in a stack, sometimes four or six, as shown in the diagram.

Five complete aerials only are shown. Altogether there are 20 such aerials. I noticed that all the insulators are glass. Some of the aerials are slung between the old "5 X X" masts, which are 500 ft. high; some between two new self-supporting masts, 350 ft. high, which are shaped

I left Daventry feeling that a lot of very valuable work is going on there very quietly. The engineers are as keen as mustard about their job—and incidentally it takes a staff of 26 engineers working by shifts to keep the transmitters going 21 hours per day. And the total staff of the station is 40. That was perhaps the biggest surprise of all!

DON'T MISS

The Special Servicing Articles

IN NEXT WEEK'S

POPULAR WIRELESS

A NAVAL OCCASION

On July 16th the King will review his Fleets, which will be assembled in full might at Spithead. A highly interesting description of the arrangements made by the B.B.C. for relaying the proceedings is given below

By Our Special Correspondent



AS part of the B.B.C.'s sustained effort to represent the spirit of Jubilee, we shall hear the King review his navy arrayed in its impressive might at Spithead on July 16th.

What we shall actually hear will be a composite sound-picture of gunfire, ships' bands and cheering. How this will be made possible was recently explained to me by an engineer of the B.B.C.'s Outside Broadcast department.

For the first time in "O.B." history the commentary on this essentially "naval occasion" will be broadcast from a battleship, H.M.S. "Royal Sovereign." The commentators will be naval men, Commander Stride, R.N., and Lt.-Commander R. Woodroffe, R.N. Some listeners may have heard Commander Stride when the "Strathmore" was launched.

An Excellent View.

The "Royal Sovereign" will be anchored about one and a half miles out, almost opposite Southsea Castle. Four or more microphones—probably of the familiar Reisz or moving-coil types—will be strategically placed to pick up not only the general noises incidental to the review, but also the commentators' remarks.

The commentators themselves could hardly have a better vantage point, for they will be perched in the foretop, as it is called, a roomy location some 80 to 100 ft. up. From that point they will be able to see in all directions, an uninterrupted view of the scene that will no doubt be communicated to listeners in the form of graphic descriptions.

Short Waves Again.

Commentary and background noises picked up by the "mikes" on "Royal Sovereign"—how will they be conveyed to Broadcasting House? By the use of that hardy annual of "O.B." technique, the portable transmitter designed for the Boat Race commentary.

A receiving point will be set up on the shore to pick up the signals from this short-wave transmitter, which will then be passed on to the usual land line, and so up to the control room at Broadcasting House, London.

The "O.B." men do not look upon this particular job as very onerous, for they are

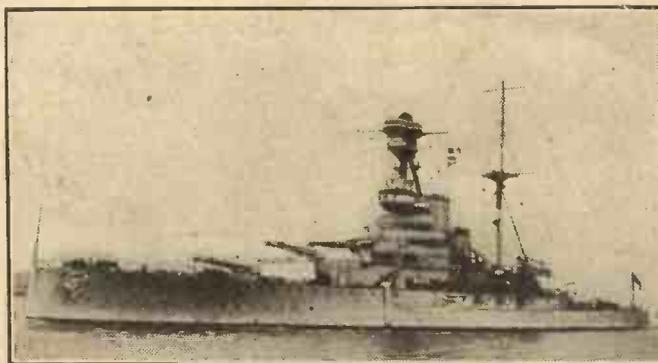
still sighing with relief at the success of their recent St. Paul's Cathedral hook-up—which they look upon as the biggest thing ever tackled. As they point out, the ship will be stationary, not moving as the launch "Magician" is during the Boat Race.

There will be the further advantage that an efficient aerial—possibly of the half-wave type—will be possible on "Royal Sovereign," whereas on the launch "Magician" a 10-ft. high aerial is the limit owing to bridges.

As the portable transmitter will play such an important part in the coming commentary, perhaps you would like to be reminded of some of its features? It is a very modern outfit, comprising a crystal controlled drive, an intermediate high-frequency amplifier, modulator stages and modulated amplifier.

High power modulation is effected, and with 25 watts delivered into the aerial a satisfactory signal to noise ratio is obtained over the relatively short distance of communication—in this case only a mile or so. The transmitter is capable of 80 per

H.M.S. "ROYAL SOVEREIGN"



The commentary will be given from H.M.S. "Royal Sovereign," which you see above. Several microphones will be used for picking up the cheering and sounds of gunfire.

cent modulation, showing what is practically a flat frequency characteristic up to 7,000 cycles.

In spite of the obvious efficiency of the apparatus the whole transmitter, which is contained in an aluminium box having four compartments, weighs just under 100 pounds. It is completely waterproof, and will stand any amount of knocking about. Indeed, an engineer proudly says that the transmitter can be dropped several inches

while it is working without any noticeable effect on signals.

Power for the transmitter is not such a problem as one might at first imagine. The high tension is obtained in the first place from a 24-volt accumulator supply, which works a rotary transformer giving 1,000 volts at 200 milliamperes. The filament supply is obtained from a 6-volt accumulator—the total current being 10 amperes.

In case of accidents all this power equipment is duplicated. When fully charged the batteries on board can provide for six hours' continuous broadcasting. Actually the Spithead commentary will not occupy a great deal of transmission time, although excerpts will necessarily be spread over a period of two hours or more as the successive "high lights" of the review occur.

Special Admiralty Sets.

Transmission from "Royal Sovereign" to the shore engineers at Southsea Castle is, of course, a one-way affair. In order that there may be constant communication between the ship and shore men the Admiralty is supplying two very small wireless transmitters, particulars of which the B.B.C. engineers themselves were in the dark about when I saw them.

These transmitters will be the products of the Signals School, and will no doubt carry out their function of maintaining speech between the vital control points. The B.B.C. is working very closely with the Admiralty over the whole job, so that technically listeners need not fear any hitch.

Making Sure.

As a matter of fact, the B.B.C. brigade will go down to Southsea four days before the actual broadcast, just to make sure everything is in good order. They are especially anxious to note the effect of the large masses of

metal represented by the surrounding battleships on the transmission of their short-wave signals.

Some idea of the assembly of ships for this review may add to the interest in "dating" your set for this commentary. The British Navy consists not merely of battleships but of the personnel and craft of our essentially sea-going nation. Cruisers, aircraft carriers, destroyers, sloops,

(Continued on page 486.)

BARRY KENT CALLING

News and Views from the "Big House"

THERE is much discussion among the staff at Broadcasting House concerning a *questionnaire* that has recently come round from the Director of Administration. Exact information is being sought about those members of the staff who are either Territorials or Reservists, or who are under any other military obligation to the State. Apparently the idea is to encourage all the members of the B.B.C. staff of military age to take up active training of one kind or another.

Mr. Stanton Jefferies Leaves.

The resignation of Mr. Stanton Jefferies means the departure from broadcasting of one of the real pioneers. Mr. Jefferies was one of the half-dozen original members of staff taken on by Sir John Reith. He was actually broadcasting before the B.B.C. was formed. Mr. Jefferies knows more about "balance and control" than anyone else in the world.

General Election Broadcasts.

With a General Election not far away, the B.B.C. is thinking about plans for broadcast election addresses. On previous occasions the various party managers and whips have managed to agree among themselves as to the disposition of available time, and it is hoped to secure the same result this time.

When the B.B.C. Listens.

It seems a curious state of affairs, but it is true that there is not much systematic listening by members of the staff of the B.B.C. An attempt is being made to put this right by organising special listening parties to particular programmes of an experimental or novel character. Heads of departments will nominate individuals who will listen during office hours, counting it as part of their normal work. After each spell of listening there will be a discussion and a record of impressions and criticisms. The idea owes its origin to the fertile mind of Miss Mary Somerville, the Director of School Talks.

Marriage Through the Ages.

The Variety Department of the B.B.C. is considering a suggestion from a listener for a feature programme on marriage proposals through the ages. This has considerable dramatic and humorous possibilities.

The "Vicar of Mirth."

The "Vicar of Mirth," who has been off the air for some time, is likely to do a "come-back" before long. He was given a new audition recently, and among those sitting in judgment was the Rev. Iremonger,

Religion Director of the B.B.C. Mr. Iremonger was not wholly satisfied, so some revisions are being made. The "Vicar of Mirth" was one of the most popular radio turns of the early days.

Artists' Rehearsals.

The B.B.C. has been a good deal exercised of late because of the increasing number of occasions on which artists have excused themselves from rehearsals at the last minute. A new rule is to be applied under which, if artists do not attend the rehearsals specified in their contracts, they will be asked to relinquish their parts.

Television Prospects

Lord Selsdon's advisory committee on television has just reached some important

ONE OF THE BUGGINS



Mabel Constanduros, one of the most popular of our broadcasters, in a Buggins sketch.

new conclusions, the effect of which will be to guarantee the beginning of a service of high definition television in the London area during January of 1936. It was previously the expectation to delay the beginning until March, but the whole programme of development has been so speeded up by Lord Selsdon that three months have been saved.

Sir Thomas Beecham and the B.B.C.

Sir Thomas Beecham is not going to let up on the B.B.C. He gave very strong evidence to the Ullswater Committee, and he is pursuing the subject in other directions. Sir Thomas thinks that the whole music policy of the B.B.C. needs overhauling;

he wants more money spent on artists and musicians, and he wants less competition from the B.B.C. in public performance.

B.B.C. and Listeners' Organisations.

The B.B.C. will have nothing to do, for the time being at all events, with the various new societies of listeners that are being set up. This is a new policy, the effect of which should be to throw the organisations together in a common effort to secure recognition.

"A GREAT ARTIST"

Says our Broadcasting critic concerning Greta Keller.

I HAVE nothing but admiration for the stage artist who does not depend on an elaborate setting for the success of his or her turn. One could mention the names of several clever people who can do this. I was reminded of these people when Greta Keller gave us that delightful 15 minutes the other evening. She had nothing but her own self to aid her. She sang a series of songs in her own inimitable way, which were all-sufficient in themselves to hold our attention. Though not altogether a lover of her type of singing, I am bound to confess she persuaded me into believing that she is a great artist. Her finish and polish are wonderful. I thought her German songs were delightful.

Johann Strauss in Covent Garden was just ideal fare for a warm summer evening. Interpolated between a number of famous Strauss waltzes was a brief conversation carried on by the occupants of the Royal box at an imaginary opera concert. These conversations were teeming with information not only about Strauss, but also about contemporary composers. I liked especially the expression of the verdict of public opinion on these composers, and the comparative merits of Beethoven, Mozart and Strauss, which were discussed with an air of authority, that carried conviction. There was a very pretty story about Strauss. Subject matter which might be regarded as dry-as-dust in a book on our great composers was dished up in the pleasantest of ways, making the hour as instructive as enjoyable.

A Fine Running Commentary.

The Petersen-Neusel commentary by Lionel Secombe was one of those events that make listeners forget all about the staleness of listening. This applies equally to the several other commentaries and accounts that are at present in season. If I were in control at Broadcasting House I should arrange for stacks more of these relays. It would kill summer grouching outright, I feel sure. It is all wrong to foist winter entertainment on folk in summer mood.

By Thursday night of the week I am dealing with there had been nothing on the air to make anyone even smile. There had been attempts which it would be very charitable of me to call feeble. What do you think of this as a specimen of a joke? And this was the best one perpetrated so far. "What goes 99-bank; 99-bank; 99-bank?" The answer: "A centipede with a wooden leg." Ye gods and little fishes! What are our joke-factories doing? Are they closed, too? Confound the depression!

But nil desperandum. I tuned in for the Thursday night Music Hall, with hope running high. The law of averages and all that was in my mind. The bill kicked off with the Two Leslies. The spell was immediately broken, and I laughed more in the next ninety minutes than I had done for days. I should say this was the funniest Music Hall bill on record. Olympia is in the offing, I know. The Two Leslies always invite listeners to laugh with them. Their songs are their best feature. They had a couple of peaches this time: "He was a Real Dirty Dog, but so 'andsome," and "Meet Me on the Dustbin." Listeners who were unfortunate enough to miss them must agree as to the possibilities of songs with titles like these. The golf stories weren't quite so good. One was in the "oldest member" category.

Greta Keller appeared for the second time in one week. She sang, among others, her own favourite song.

But to get back to jokes and laughter. Will Fyffe did an old act, but his jokes came up as fresh as ever. A great comedian is Will Fyffe. You know, I always think that Will Fyffe would sing Harry Lauder songs as well as the great comedian himself. There is more than a suspicion of Lauder in Fyffe. His patter is infinitely better, of course. Every sentence produces a laugh. What about one of those rulings of Pompey he nearly married? Or the night out he had in New York, when his American friend spent

(Continued on page 485.)



THIS week I want specially to call your attention to the coming among us in person of "The Street Singer," Arthur Tracy, whose Decca records have for so long been among the regular best-sellers, and who has been seen several times over here on the cinematograph screen.

He is to appear for a fortnight at the Palladium, London, commencing on July 15th, and then will go on tour round the country. We shall probably hear him on the air, too.

Arthur Tracy really earned his name as "The Street Singer," for at the age of ten he started singing in the streets and back yards of Philadelphia, where he was born, to earn odd pennies. With these pennies he bought music, for as a child he simply had to sing even if he taught himself, as he did for some years.

"Sings in Ten Different Languages."

His voice is unusual, and he calls it a "bari-tenor" on account of its peculiarly wide range. He is specially fond of singing ballads and folk songs in foreign tongues, and has such a way of picking up languages wherever he goes that he now sings in ten different languages, including Japanese.

Once he nearly lost his voice, for when his parents found that he was determined to sing they scraped enough money together to send him to a teacher, who, finding that his voice was already well developed tried to force it further, with the result that at the fourth lesson it suddenly "snapped."

For seven months Tracy could not speak above a whisper, and specialists said that he would never sing again. But rest and care eventually brought his voice back, with the power and quality that we know so well. Here's welcome to one of America's and England's radio, film and gramophone favourites.

And, talking about radio and gramophone favourites, let me put right a little matter that I slipped up on last time. I reviewed a Parlophone record of Pat Hyde and Her Swing Music, singing and playing *Seeing is Believing* and *My Dance*, and find I was quite wrong in my assumption of Pat's identity.

Her mother told me so in a charming chat we had, and gave me the news that Pat and she used to do a double act on the stage. Pat is a most accomplished instrumentalist as well as vocalist. Her voice you have already heard on the radio and Parlophone records. She should go a very long way, for she is only eighteen, and well on the way to stardom now.

The competition among gramophone companies for star artistes is one that always fills me with interest, and not a little amazement. I suppose it is really worth while for B Company to find some similar star because A has got hold of what it considers, say, a boy prodigy, or for D to search the world for an "antidote" to C's latest crooner.

But, against all this galaxy of talent surely one must balance the complete befogging of the public and the expense! If A comes out with a shout about some outstanding find in the world of pianists, and immediately after B, C and D also come out with shouts concerning similar finds, surely the public is liable to lose confidence in the statements made, and interest in the actual records.

Duplication.

It seems to me that the gramophone industry is being rushed off its feet by almost blind devotion to the god "Competition," and that the result is to be the even worse clattering up of the record lists with such superfluity of recorded items that the public cannot hope to choose wisely, and in the end will realise that the true choice of a record demands the listening to some dozen or more of the same items played or sung in varying shades of difference by "outstanding artistes."

Such a task is not beyond the capabilities of the average man to carry out, his discrimination is probably very good, but has he the time or the

inclination to wade through the lists of the various companies and then to go into one of the dealers' little silence cabinets and to spend an hour or two picking out the record that he likes best?

And the results of all this racing for publicity stories, and scrambling for novelties and new "finds" must inevitably be that the cost of the records to the gramophone companies will increase.

The man in the street is not going to waste a lot of his time listening to various renderings of the same subject; he will either pick out a number because he likes the number itself, more or less regardless of who is playing or singing it, or he will take the advice and recommendation of a friend and call that it.

The result as regards the gramophone companies must inevitably be less records sold of any particular item by any particular artiste, though the number of the total records sold may possibly slightly increase. (This increase I,

"THE STREET SINGER"



Arthur Tracy, better known as "The Street Singer," through his Decca records and the films. He is starting a music-hall tour of this country on July 15th.

personally, doubt.) But this must mean less profit per record, owing to the greater cost of recording, and the making of the masters and matrices.

Personally, I find that the increasing rapidity with which new stars are making their appearances, complete with full ballyhoo, is most befogging, especially as the difficulty of telling one star from

(Continued on page 487.)

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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 N.S. 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 appliances 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

CHECKING THE ACTION OF A.V.C.

J. C. S. (Bishops Stortford, Herts).—"Is it possible to check whether an A.V.C. circuit is working properly?"

Yes, but that word "properly" can be interpreted in so many ways that we are not quite sure of your meaning.

The simplest test for the working of A.V.C. is a comparison of the controlled set with one that is not so controlled. Suppose, for example, that a neighbour's set can be used for comparison, or that you can get on to a friend by phone to compare your results at any given time by his. If you both agree to tune in a distant station, and he finds that it keeps fading right out, whereas on your set it is constant, you can be assured that your A.V.C. is working.

Alternatively, you can check the action by means of a milliammeter. Insert the instrument in the anode circuit of the controlled valve; or, if several valves are controlled, insert the milliammeter in the common H.T. supply to these valves. If the A.V.C. is working properly on distant stations you will find that although the programmes are reasonably steady there are wide variations in the anode current, corresponding to the fading.

An even more convincing test is to place a finger on the grid terminal of the first valve holder, which normally would throw out the tuning and alter programme strength. On a set with A.V.C. there would be an attempt at automatic compensation, and the anode current shown by the milliammeter readings will consequently vary immediately the finger is placed on or taken off the terminal. But normally there is no need to test for A.V.C. operation, for fading will become troublesome if it is not working.

FILTERING H.F. DISTURBANCES FROM THE MAINS.

G. E. (Leeds).—"Being convinced that the disturbance comes in from the D.C. mains I am going to try inserting a pair of H.F. chokes, one in each main; in conjunction with these will be two 1-mfd. condensers, as recommended by the post office engineers.

"The condensers will be joined together and earthed at the centre-point, but where should I put the wires from the other ends of these condensers? To the sides of the chokes which are towards the street (mains entry), or to the side which are towards the house wiring and set?"

"Next to each condenser I have got a fuse mounted, so I do not suppose it would matter if I tried out both ways, but I would rather have it right to start with, if possible."

Usually the condenser connections to the pair of chokes are better made on that side which is connected to the house wiring.

But the condenser leads of such a filter should be treated as a pair, going either to one pair of the choke terminals, or else going to the other pair of choke terminals—not one condenser lead to the set side of its choke, and the other condenser lead to the mains-switch side of the other choke.

FITTING A "HUM-SILENCER."

A. G. (Driffield).—"My set is an all-mains four-valver, 1933 vintage, and the only

possible fault anybody could find with it is that there is just a slight suggestion of hum. Not enough to spoil reception, but quite plainly heard when the set is otherwise silent, as in an interval before the announcer speaks.

"A visitor who heard the set working has aroused my curiosity by telling me that on his all-mains set he has a hum-silencer fitted on the back. He described it as follows:

"At the back of the cabinet, near the mains plug lead, there is a half-inch hole in the woodwork, through which a screwdriver can be inserted. Behind this opening there is a slotted control fitted, and this governs the amount of hum heard.

ONE GUINEA FOR A LETTER!

AN INVITATION FROM THE EDITOR TO "P.W." READERS

I WANT readers of "P.W." to help each other. I want them to use the columns of this paper to express their views on all and every aspect of the great hobby of radio; I want them to "swap" experiences; I want them to tell about their triumphs—and their failures—with the various sets they have built. I want, in short, to encourage an exchange of views, opinions, likes and dislikes. . . .

Send me letters for publication, in order that "P.W." can become, more than ever, the best medium for imparting all kinds of knowledge about radio.

YOU must have had, many and many a time, interesting experiences when building or operating your set. Tell other readers about your radio experiences. And, incidentally, get to know each other through the medium of "P.W."

For the best letter each week I am offering a prize of one guinea. Send your letters to the Editor, "Popular Wireless," Tallis House, Tallis Street, London, E.C.4.

"When the set was first switched on the hum was loud, but it was removed entirely by slowly turning a screwdriver in this slot, and the set has never given trouble since. If, however, the adjustment is altered the hum reappears, and the hum-silencer has to be readjusted again to make it go away.

"Would it be possible for me to have a hum-silencer of this kind fitted to my set? Although I could not carry out the work myself, knowing nothing of wireless, I could probably get it done if I knew how the hum-silencer works. But nobody else seems to have heard of them."

We cannot say definitely from your description, but the facts given about the "hum-silencer" are all consistent with this being a low-resistance potentiometer, used instead of a centre-tap on the mains transformer.

If you examine the inside of your set you will probably find that the lead from the mains plug goes to a power transformer on which you will find

various voltage-figures marked. Some of these will be high voltages, but in addition there will probably be three terminals in close juxtaposition marked with low figures, such as 2 or 4, or the three terminals may be marked respectively 2-0-2.

These are the terminals of the usual "L.T." windings, and three terminals are necessary, instead of two, because the "earthing" of the screens, chassis, etc., of a mains set is not capable of being taken (as in a battery set) to "L.T.," but must instead be connected to a centre-point on the "L.T." winding of the input transformer. (This is usually, or very often, marked "0," and is nearly always placed between the other two "L.T." terminals on the transformer.)

If, however, the terminal marked "0" is not the electrical centre of the L.T. winding, as it should be, there may be a slight hum such as you experience. And this can often be removed, exactly as you describe, by fitting a low-resistance potentiometer to the transformer's "L.T." terminals.

A suitable potentiometer for the mains tapping costs very little, and has a resistance of only 30 ohms, or thereabouts. To install it is very easy.

Its outer terminals go to the respective "outers" of the "L.T." winding on the transformer, in addition to the wires already going there. Then the wire which goes to the centre (0) terminal on the transformer is removed from that point and taken instead to the centre terminal of the new potentiometer, leaving the "0" terminal on the transformer vacant.

IS AN OUTDOOR AERIAL WORTH WHILE?

W. A. (Redditch).—"There seems to be a great diversity of opinion about outdoor and indoor aerials—what are the facts?"

"Is it true that the modern set is so much better than those of a few years ago that the aerial to which it is attached makes very little difference? Would I have a better selection of foreign programmes on my own set, which is an S.G., detector and pentode, if I changed from the present indoor aerial system to one of the outdoor type?"

"On the one hand I am told that the better pick-up of an outdoor aerial must inevitably give any set a greater range; while, on the other hand, it is said that a set which is sufficiently powerful to need H.F. volume control doesn't need a big input such as the outdoor aerial would provide. Which is the right view?"

"I am sure there must be many, like myself, who use indoor aerials because they are convenient and inconspicuous, and who would like to try the outdoor kind, if better range could be obtained.

"Assuming a 1934 or later set, what would be the effect of outdoor as compared with indoor aerial?"

How to Make a Decision.

The effect of fitting an outdoor aerial, in place of one of the indoor type, is the same now as it has always been: provided that both types are of average dimensions and efficiency the greater length of the outdoor aerial, its superior height, and its freedom from screening by walls, etc., will invariably result in greater voltages being developed in it by distant stations than can be developed by the same stations in the (smaller) indoor type of aerial.

Thus, it is true that "the better pick-up of an outdoor aerial must inevitably give any set a greater range."

If we take the outdoor aerial's superiority for granted, the only point to be decided is whether that superiority can be usefully applied in any particular instance. A good case in point is where a powerful set is employed with indoor aerial, the magnification of the set being so great that usually the volume control has to be employed, even on foreign stations, to prevent overloading. With such a set there would be no real benefit in changing to an outdoor aerial, for the obvious reason that with an inferior aerial input the H.F. input to the detector is already capable of loading the set to capacity.

And this instance gives a practical clue as to how it may be decided whether or not an outdoor aerial would be beneficial. The answer lies in the degree to which H.F. volume control is necessary.

If your volume control is brought into use only for the local station; if you frequently turn the volume control to maximum sensitivity, and still fail to get enough volume for your requirements; if, in short, you do not get sufficient H.F. input for the majority of your listening, an outdoor aerial would be advantageous.

If, on the other hand, your H.F. volume control has normally to be kept "toned down" for other than the nearer stations, and if the input volume control is seldom, if ever, used at its position of maximum sensitivity, the indoor aerial is all you need.

"DOUBLE RECEPTION"

An Ingenious Short-Wave System
By "Supervisor."

A FEW years back the comparatively old cable systems of this country joined forces with the increasingly successful wireless competitor. Improved methods of telegraphic communication were thereby provided, because to most places abroad there were now available the alternative channels of siphon-recorder reception on cable circuits, and undulator reception on wireless circuits.

Engineering developments, however, now provide siphon-recorder and undulator reception from the same short-wave wireless circuit. The two methods differ by the former giving dots and dashes of equal length on opposite sides of a centre line, while the latter gives dashes longer than dots: both use a wavy incline of Morse.

Avoiding Failure.

At the receiving end, the signals come in on both the recorder and undulator sets of apparatus. The operator uses his discretion which copy he uses, but if a failure occurs on the "tape" he is reading, then the other is available to use as well or instead. A failure may be due either to the line (variable signals, for instance), or to mechanical trouble in his apparatus.

Either system can be used with an automatic printing device, so that printed copies are delivered.

Should the printer fail, the Morse record of either tape can be typed up. In this case the operator types the message while the signals are being drawn past his typewriter on a specially constructed stand.

One of the first circuits this was successfully operated on was the Cape Town to London Short-Wave Wireless System, but it is now used on other long-distance services.

IT'S HARD TO BE FUNNY

(Continued from page 472.)

nothing more than pin money for many artists. They appear before the microphone either as an extra, or because they want publicity, or simply because they think it is the thing to be on the radio sometimes. Very few because it is their whole life's work.

"It is all a question of the financial side of the production. Do you realise that so-called light entertainment is the most expensive of all forms of entertainment? Because it is light most people think it is lightly come by, and lightly paid for. This is quite contrary to the true conditions.

"We Try to Entertain."

"Artists of the calibre of Maurice Chevalier and Eddie Cantor cost a terrific amount of money—because they have something original if not unique to sell. It is so different with, say, musicians, who are paid to interpret other people's works. Except for a few outstanding exceptions, it is true to say that the light entertainer

gets a lot more for his work than the serious artist gets.

"You suggest that it is not easy to be funny. No, that's true. But I would suggest that we need not worry unduly over this fact. For I have long since come to the conclusion that the type of radio humour so difficult to come by is not what the radio public wants.

"The special acts, such as those I have just mentioned, bring in far more letters of appreciation than the straightforward variety shows with comedians in them.

"It may be hard to be funny. But, given the right approach, it is not difficult to entertain. And that is what we are trying to do." A. H.

"A GREAT ARTIST"

(Continued from page 482.)

£4 odd, his English friend £3, while he himself spent a very good evening.

And we mustn't forget Norah What's-her-name and Gwen — Well—you know who! Here was more fun. Old songs dished up but brought up to date. I loved that Alfonso song of theirs. A few lines of it are still running through my mind, like the proverbial Die Lorelei. "I met him one day in Madrigger—He said he'd a million quidder—I hope some day to be his widdier." There were yards of this sort of stuff which highbrows might object to. But I like it.

I would like the Mills Brothers and similar turns better if they had better words set to their tunes. Nothing's wrong with the latter, or their harmonies.

Noah Beery was quite as I expected him to be. I wasn't thrilled, perhaps, because I wasn't in the mood for "The Song of the Whip."

Billy Cotton maintained the high standard of the bill, and his own. I found his band entirely to my liking, till they began the noisy, bellowing stuff which is my *bête noire* where dance music is concerned.

When Will Hay and Co. were announced I couldn't believe my own ears. Again an old act was presented. It didn't matter. Any of Will Hay's acts will stand repetition. This particular schoolroom scene is a gem.

C. B.

SUMMING UP THE 600

(Letters continued from page 471.)

My father is at present very happily ploughing through the Manual, "getting to know something about wireless at last," he says. It's the first book to meet his (and my) need, a book which gives principles plainly, clearly and readably, and without assuming that the reader knows it all first.

A Heartfelt Thank You.

Reverting to your articles in "P.W." I read every word over and over again (1) in delightful anticipation before building; (2) for advice and encouragement while building; (3) for advice re controlling the set when built; (4) when all is going strong I re-read the whole lot, and get the thrill of everything having come true!

One last heartfelt "Thank you" and I will stop. Please take seriously my enthusiasm for S.T. and all his works, for every word is genuinely meant. After all, from all points of view the "600" is entirely outstanding.

LAWRENCE LINDSAY, A.M.I.Me ch.E.

47, Queen's Road, Bradford.

A MAGNIFICENT RECEIVER.

Dear Sir,—Having built the S.T.600 with great success, I think a few words are due to you for a magnificent receiver. It is all you say and more. Situated as I am, some twelve

miles from Daventry, I find no difficulty whatever in cutting out Midland Regional to get adjacent stations.

With the Wearite Main Coil Assembly and Formo Ganged Condenser, I was troubled somewhat from break-through from Midland Regional on the long waves, but when the set was trimmed properly break-through was negligible. Indeed, Oslo and Luxembourg came through without a trace of interference.

Using Anode Bend.

At present I am using anode-bend rectification, which no doubt doubles selectivity, reaction being much smoother. Probably there are hundreds of "P.W." readers who have built the S.T.600 without getting the results they should do. My advice to them is that they should have got the parts as specified, and not send letters of abuse when a few moments' reflection would have obtained for them the splendid results I am getting. When once the set is trimmed properly one cannot help obtaining station after station at full loudspeaker strength.

The "Spot-On-Dial" is indeed a boon, stations come through to name on both wavelengths. Of the Extractor I must say it silences the local, and once set I never touch it; a little anode reaction and aerial reaction bring it back at full loudspeaker strength.

It is indeed a winner, as all S.T. sets are, and in closing I thank you for giving me the opportunity for building a magnificent receiver.

WM. J. LINAKER.

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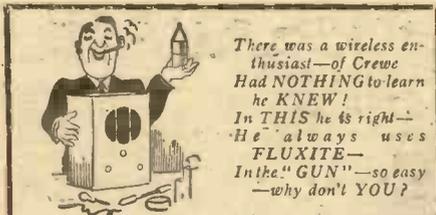
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THE NEW RADIO ORGANS

(Continued from page 473.)

In another system endless lengths of film with sound tracks representing various frequencies are passed between the light and the photo-electric cell. One ingenious inventor suggested that the natural notes of the various musical instruments should be recorded on film and employed in an electronic organ.

Some few months ago I, myself, was playing about with what I still consider to be a promising scheme. The accompanying sketch shows the idea fairly clearly. There are a number of discs, and on each one rows of small iron plates are fixed. As the disc rotates these discs pass between the poles of small permanent magnets.

A fluctuating current is developed in the windings of each magnet, and the frequency of fluctuation will depend upon the number of iron plates passing each second.

Gliding Tones are Possible.

The required number of discs can all be geared together. Twelve discs having ten "pickups" on each give you 120 notes. The output from each pickup goes to one key on the keyboard. The key is really a two-way switch. When it is depressed it connects the output to the main output terminals of the outfit. When it is released it switches over to a compensating resistance.

Gliding tones are possible by means of the control of the driving motor. Depress one key and the motor slows down, depress the other and it speeds up.

There was no attempt on my part to provide for varying harmonic structures for each note, and I am describing the scheme only to give you an idea as to what can be done to develop notes in other ways than with oscillating valve circuits.

I believe someone will ultimately discover a method which will enable a thousand and one tones to be produced from a device little larger than an H.T. battery. And if that someone happens to be a reader of "P.W." I hope he will first describe his invention in the columns of this paper!

THE LINK BETWEEN

By G. T. KELSEY.

I HAVE never been to the United States. It's one of those places that I have always wanted to go to if only for the purpose of making a comparison between their broadcasting conditions and our own. But if ever I do succeed in getting across the Atlantic I have an idea that I am going to be disappointed.

At least, that is the impression I formed when chatting the other day to one of my trade friends who has just returned from skyscraper land. And apparently, much as he enjoyed his visit, he is firmly of the opinion that they have little to teach us in radio matters.

To be honest, that was rather what I thought must be the case, but so much "ballyhoo" seems to get round about the advantages of this, that and the other in the States that—well, I wasn't quite certain what to believe. In any case, I suppose it doesn't really matter "two hoots" whether they are ahead or not, except that there is something confidence-promoting in the knowledge that our own manufacturers are on top of the world. Well, apparently they are!

My informant—no less a person than Mr. Richard Arbib, the enterprising Press Manager of "His Master's Voice," upon whose judgment I am content to rely implicitly—tells me that although there are few American sets produced these days which are not

of the all-wave variety, quality of reproduction as we know it in this country just doesn't exist in all but a few makes. I am afraid that state of affairs would not suit me for very long.

Then, too, there is the question—and a very controversial one it is—of sponsored programmes. I usually find that the system is praised to the skies by the "pseudo-authorities" who have never even heard the States, let alone been there, and deprecated by those with first-hand experience.

I must confess that until now I have had a fairly open mind on the subject, but after what Mr. Arbib has told me, I should imagine that it must be a terrible system taken on the whole. We may not always agree with the policies of our own broadcasting authorities, but at any rate our standard of programmes is second to none, and we really have a lot to be thankful for.

As for television, I gather that whereas certain American firms are "playing about with it," they make it abundantly clear that their activities are essentially experimental, and the likelihood in the near future of an established service of television programmes materialising is about as remote as the moon. So it seems that in the late autumn we shall once again be "showing them a thing or two."

In the meantime our own manufacturers would perhaps be well advised to give their serious attention to the question of all-wave designs, for that appears to be one of the very few aspects of radio in which America is ahead of us. It should, in fairness, be pointed out that they have a tremendous advantage in connection with short-wave listening times, for they are able to receive the pick of our evening programmes during their afternoon, whereas if we want to hear their evening programmes we have to listen in the small hours of the morning. But the main thing to remember is that the listening interest in short waves does not end with the programmes from the States.

Well, I feel that I am indebted to Mr. Arbib for this first-hand information, and I pass it on to "P.W." readers because it does definitely remove any doubts which may exist as to the supremacy of British radio. There is nothing in the world to equal it, and when your turn comes to visit the "Show" this year, you would do well to remember this fact.

Service from the Valve-makers.

The above timely pat on the back for British radio enterprise prompts me to call attention to another important matter in which our own manufacturers excel. I refer to the question of service to the customer.

Did you know, for instance, that by writing to the Marconiphone Company you can obtain free of charge specially prepared details of quite a number of the latest Marconi valves? I have seen some of these informative sheets, and they seem to me to be invaluable to the constructor.

Not only are the fullest details given concerning the valves, but in addition most useful circuit data and advice as to the way in which they can best be employed.

I strongly advise you to keep an eye on the Marconi valve advertisements, which appear frequently in "P.W.," for it is in these announcements that information is given as to where to write when special details are available.

A NAVAL OCCASION

(Continued from page 481.)

marines, convoy ships, torpedo boats, trawlers, and in fact representative craft of every type will assemble themselves at Spithead for the July 16th review.

His Majesty the King will steam out of Portsmouth Harbour in the "Victoria and Albert" to meet not only the Home and Atlantic fleets, but also the Mediterranean fleet. As the King's yacht approaches the lines formed by more than 160 men-of-war he will be greeted by the Royal Salute—fired from all the ships' guns, and played by all the ships' bands. This colourful medley of sound will be part of the broadcast, of course.

Thrilling Moments to be Broadcast.

As the Royal yacht proceeds down the lines the crews, standing to attention, will "dress ship," and a tremendous cheering will be heard, together with the ships' bands doing the King musical honours.

It is estimated that the review will take over two hours, but the naval commentators are expected to broadcast only the outstandingly thrilling moments. At the conclusion of the review the Fleet's air arm

(Continued on next page.)

A NAVAL OCCASION

(Continued from previous page.)

will fly past and at night all the ships will be illuminated, a searchlight display adding to the splendour of the whole affair between 10 p.m. and midnight. And then, next morning, the King will lead the Fleet out to sea for service exercises south of the Isle of Wight.

Altogether a naval occasion worthy of the King's Jubilee. It should be well worth while even from the listening point of view—or rather hearing. As the commentary is almost certain to be picked up in many foreign countries, as well as being sent to the whole of the Empire, it will serve as a reminder that the British Navy is still a mighty force to be reckoned with—that, indeed, Britannia still rules the waves!

ROUND THE RECORDS

(Continued from page 483.)

another, except in some very minor voice inflexion or method of playing, is increasing twice as fast as the numbers of stars.

More especially is the increase to be noted among the dance bands and the crooners and light vocalists. Some are very good, and some, well, not so good. But we do not need all the variety that is almost slung at us. I do not want the latest dance hit played by fifteen or sixteen different bands and sung by some fifteen or twenty different crooners or near-crooners. And I am sure you do not either. I want one record of it by a good band, and I am not going to wade through a maze of good, medium and indifferent to find it.

It is different in the case of the latest Columbia announcement concerning the new Italian tenor, Carlo Buti. He is certainly a great discovery, and Columbia intend to star him as their leading tenor. So we have Gigli on H.M.V. and Buti on Columbia. That is all to the good, but I hope the other recording companies will not take it as a signal for a spate of tenors.

The first record of Buti is DB1542 and is of *On a Balcony in Naples and Sorrento*. Both are sung in Italian and there is no gainsaying the qualities of voice and expression.

And on the subject of tenors you may remember that I wrote a few weeks ago about Master Denis Gonet, who records for Regal Zonophone. He has made another record (his first was the famous "On With the Motley") on MR1705, and sings *Ah! Sweet Mystery of Life* and *If I am Dreaming*, from "The Du Barry."

He has a most unusual voice, of course, and you should certainly hear him. Specialists have examined the boy, who is only thirteen years old, and they declare that his voice is not a freak but a genuine tenor. Gonet has never sung soprano or alto, and his voice has remained unimpaired from the day he began to use it professionally; there seems no likelihood of its changing or "breaking."

Gonet was born of British parents in India, and came to London for his education. He knows many of the Italian opera scores off by heart and recently, it is said, Gigli, the famous tenor, averred that he had never heard such a voice in any boy before.

Some Items You Should Hear.

Here are some more records you should certainly hear; many of them you will want to buy. I will give quite brief details, and suggest you ask your dealer to run them through for you next time you go to the gramophone shop.

Decca F5543, of special interest to film fans of Bebe Daniels, Skeet Gallagher and Ben Lyon. One side holds the three in *Hollywood Holiday* and the other Bebe alone, singing *Dream Shadows*.

Decca K755, John Watt's *Songs from the Films*; another Silly Symphony record from the famous compe's versions of Walt Disney's cartoons.

Decca O2026, Winifred Shaw sings *Lullaby of Broadway*. She is one of the new artists to be recorded on Brunswick and Decca this month.

Regal Zono MR1691, The Commodore Orchestra playing *The Musical Clock of Madame de Pompadour* and *The Golden Musical Box*.

Regal Zono MR1692, Reginald King and his orchestra melodiously playing *Alice Blue Gown* and *If You Could Care*.

Columbia DB1550-51; Layton and Johnstone are ending their partnership after fourteen years, but there are still some of their recordings to be released. Here are two, among which is the fascinating *Little White Gardenia*, sung by Turner Layton.

K. D. R.

DESIGNING A SET

Practical Jottings on varied subjects.

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

I KNOW that a large number of readers of "P.W." have made up sets from designs published in this journal from time to time, but I do not know how many of you have ever designed sets entirely for yourselves. At any rate, those of you who have will agree that one of the first things to be decided, before embarking upon a set design, is the type of output valve which it is intended to use.

The output valve in turn depends upon what sort of loudspeaker you expect to employ and what kind of volume you require. As a rule, the output valve will be a pentode, or a three-electrode or medium-power valve, and both of these types of valves can be obtained for battery operation or for use with A.C. mains.

The Output Valve.

If you are going to use a three-electrode output valve you can look for low anode impedance, and, as a rule, a somewhat low amplification factor, which means a rather large grid voltage. Sometimes you will find, when using three-electrode output valves, if you are limited to, say, 150 volts, or perhaps 200 volts, the output will not be sufficient, and you may have to use a pair of valves in parallel or alternatively in push-pull arrangement. But if you can use a higher voltage—say 350—you can generally get an output triode, which will give you all the power output you want in a single output valve instead of a pair.

H.F. Oscillations.

With these large modern valves for the output stage you want to be very careful to avoid high-frequency oscillations being set up. These are due to the high mutual conductance of the valves, and the oscillation is generally started by some sudden increase in the input to the grid, such as may be brought about by a momentarily extra strong signal.

This results in distortion, and the increase in the anode current may even be serious enough to damage the valve. To prevent this danger you can include a resistance of 100 ohms in the anode circuit, in the vicinity of the anode terminal of the valve. This resistance must not introduce any appreciable capacity, and it must be able to carry the anode current easily. On the question of capacity, remember that the resistance may be comparatively free of capacity in itself, but capacity may be set up owing to the component being wrongly placed in relation to adjacent components, screens, and so on.

Using a Pick-up.

Everybody knows that when a pick-up is inserted into a radio receiving circuit it generally makes use of the detector valve, which then becomes the first low-frequency amplifier. But it is not always so generally realised that the circuit may act quite differently when used with the pick-up

(Continued on next page.)

APPEARANCE

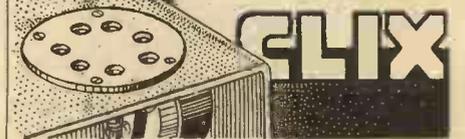


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DESIGNING A SET

(Continued from previous page.)

from what it does when carrying the output of the high-frequency part of the set. Sometimes you will find that it works perfectly well as a radio set, but it does not work nearly so well when the pick-up is used. There are a number of reasons for this, the chief one being that which I have already indicated, namely, that the detector is acting in an entirely different way when the pick-up is connected from what it does when handling a mixture of radio and audio-frequencies. When used with the pick-up it acts purely as an amplifier, but when used as the detector in the radio circuit it acts partly as an amplifier and partly as a rectifier.

Decoupling Resistances.

It is for this reason that you almost always have to apply a certain amount of negative bias to the valve when it is used with a pick-up. On top of this, it is generally a good thing to increase the anode voltage, at any rate in the case of a battery-operated set. Two anode decoupling resistances may be used, one of these being short-circuited when the pick-up is brought into circuit. As to the value of these resistances, one of them may be, say, 5,000 ohms, whilst the other will be the difference between this 5,000 ohms and the total decoupling resistance which is necessary for the proper operation of the set. If, for instance, the latter is 30,000 ohms, then the second decoupling resistance will be 25,000 ohms.

Valve Curves.

Readers often ask me what is meant by a dynamic valve characteristic curve. Most readers nowadays seem to have a pretty good idea of the ordinary characteristic curves of the valve, these being static curves, but dynamic curves seem to cause them a certain amount of uneasiness. The word "static," as you no doubt know, means something stationary or still, whilst "dynamic" means something in motion. The static characteristics of a valve are, therefore, those which are obtained with steady voltages and currents; whilst dynamic curves will be those obtained under operating conditions or, at any rate, when the voltages are varying. You will appreciate that, properly speaking, the dynamic type of curve, or rather, I should say, the curve taken in actual operating conditions, is what is wanted to tell us what we require to know about the valve, but inasmuch as the static characteristics are more easily obtained, and often do not differ unduly from the dynamic, it is convenient to supply the static characteristics.

At any rate, you know now what is meant by dynamic characteristics, and some of you may remember that not many years back a fierce controversy raged around this very subject.

Dynamic Curves.

One of the commonest characteristics of a valve is its alternating-current resistance, or impedance, which is the resistance which it offers to alternating current passing between the filament and anode. The makers of the valve almost always state this figure, but in any case it is simply arrived at by the change in anode current divided into

the change in anode voltage required to produce it (always assuming that the grid voltage remains constant).

Thus let us say that the grid-bias voltage is 3 volts, and that with an anode voltage of 100 volts the current is 10 milliamps, whilst when the anode voltage is increased to 150 the current comes to 15 milliamps. The difference in voltage is 50 volts and the difference in current is 5 milliamps (5/1000 amp.), so that the impedance is the change in voltage, that is 50 divided by the change in amps, that is 5/1000, which is 10,000 ohms.

Amplification Factor.

The amplification factor, or *mu* as it is generally called, is a matter which I have dealt with in these Notes quite recently. It is the change in grid volts necessary to bring about the same effect as a corresponding change in anode volts if the anode

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current is kept constant. It is arrived at by dividing the change in anode voltage by the change which is thereby rendered necessary in grid voltage to keep the current constant.

Supposing, for instance, that we have an anode current of 10 milliamps with an anode voltage of 100 and a negative grid voltage of 2 volts. Let us assume that the anode volts are increased to 150, and in order to keep the current from going up we have to increase the negative grid volts to 5 volts, then the difference in anode voltage is 50 and the difference in grid volts necessary to counteract this, so to speak, is 3 volts. The amplification factor then is 50 divided by 3, roughly 17.

Choosing a Valve.

The output of a valve in relation to the input depends largely upon the amplification factor, the higher the factor, of course, the higher this ratio. But as I have previously mentioned, you mustn't run away with the idea that a valve with a high amplification factor is necessarily better for some particular purpose than another valve with a lower amplification factor. The suitability of a valve for a particular purpose depends not only upon the amplification factor, but also upon other characteristics as well.

Uses for Photo-cells.

The uses of the photo-electric cell continue to increase, and one of the latest purposes to which it is applied, I understand, is for checking the speed of motor cars. I do not know whether it has been officially adopted for this purpose, but it has been so used in motor-car races and many unofficial and experimental purposes, and there seems no doubt that it can well be applied officially, if thought desirable. The car which is being timed passes through a light-beam, which may be invisible, and thereby upsets the balance of an electrical circuit which contains a photo-electric cell on which the beam of light normally falls. Two such beams are arranged at a pre-determined distance apart and, by means of electrical timing apparatus, the time that the car takes to pass from one beam to the other is very accurately registered. Photo-electric cells are similarly in use, particularly in the United States and Germany, for counting passengers going over bridges, or into exhibitions, or on board ship, and so on, also for counting vehicles passing over bridges or through viaducts where dues are payable. This arrangement supersedes the clumsy and inconvenient turnstile.

Keeping Out H.F. Currents.

When using a circuit in which a high degree of amplification is desired, it is very necessary to take precautions to avoid instability and distortion. One of the main things to do is to prevent high-frequency currents from getting to the anode circuits of the low-frequency amplifying stages. The high-frequency currents get across from the grid to the anode owing to the capacity of the valve, and therefore it is necessary to prevent them reaching the grid in the first place. The usual way to do this is to put a resistance in series with the grid, the value of this resistance being such that it acts to stop the high-frequency currents but does not seriously affect the low-frequency band. As a rule a value somewhere between 50,000 and 100,000 ohms meets the case.

High-note Effect of Pentode.

The impedance due to the capacity between the electrodes of the valves decreases as the frequency increases, and so the resistance must be greater for high-frequency currents than that of the valve at any given frequency. If the resistance is too high, on the other hand, the higher notes will suffer.

By using a suitable combination of resistance and capacity the resulting tone can be controlled and it is possible to cut down the upper or the lower register at will.

Tone control, or response control, as it is sometimes called, is rendered necessary in order to counteract the high-note tendency of a pentode valve; it is also useful against "scratch" when playing records, and is sometimes effective in cutting out certain kinds of interference. The actual values of the resistance and condenser vary according to circumstance, but an average value to start from is, say, 25,000 ohms for the resistance and 0.01 microfarad for the condenser; you can then try varying these values until you get the most effective control.

The resistance value should not be too high, however, or you may experience distortion, and, of course, it should be quite a small proportion of the grid leak value or volume will suffer.

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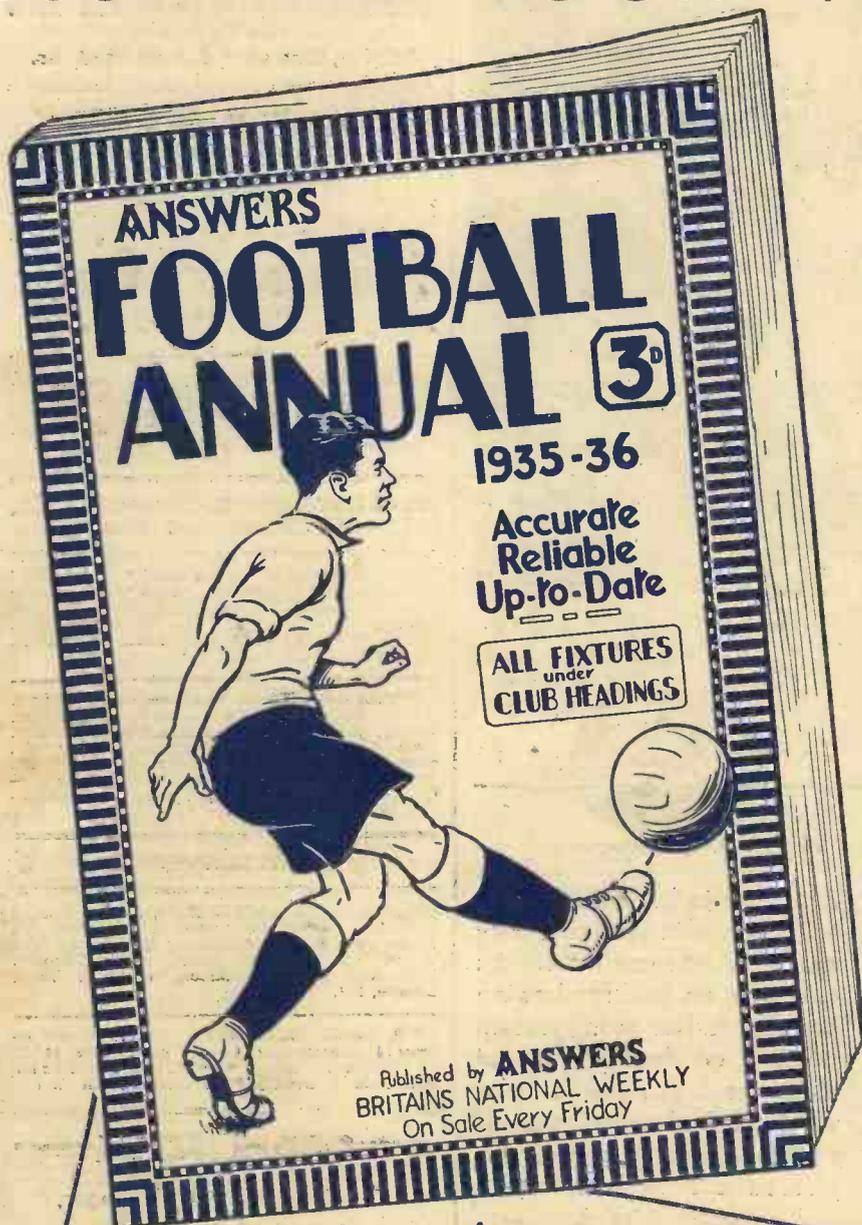
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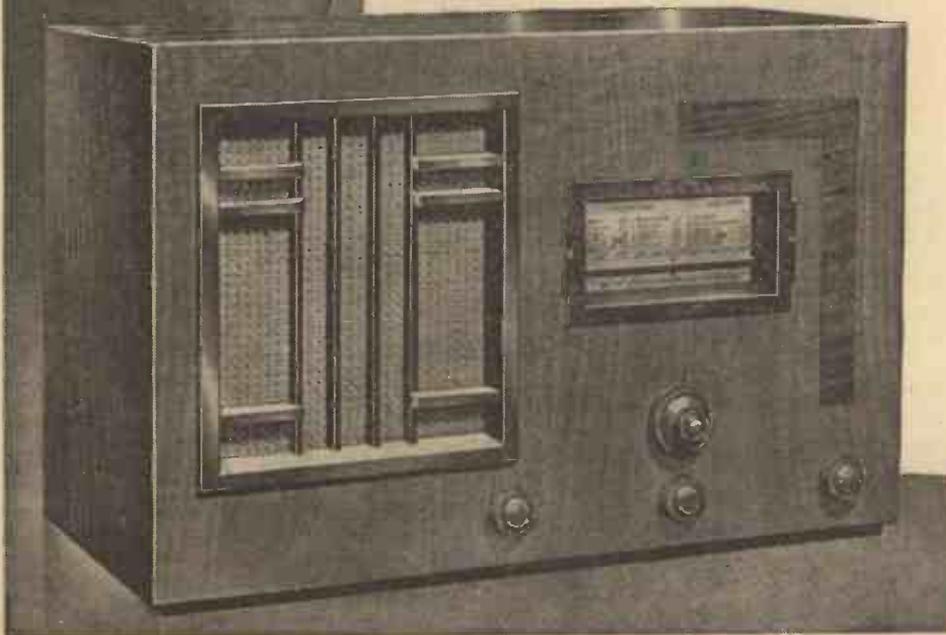
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THE NORTH'S B.H.
A RADIO DRAMA
IN GERMANY
PLAYERS WANTED

RADIO NOTES & NEWS

WHAT'S NEXT
MOON EFFECT
A FIRE CALL
DEAD VALLEY

Manchester's New Studios.

HAVING been unable to pay a visit to the new Manchester studios up to now I was specially interested to hear two engineer friends of mine discuss them from the point of view of technical excellence. They agreed that, apart from considerations of size, London has nothing better than the North Regional can show—in fact, there was talk of some of London's deficiencies being corrected at the Manchester headquarters, in the light of experience.

My friends' point of disagreement was North Regional's No. 1 Studio walls. Apparently the reverberation-period for this studio has been completely altered, and while one was satisfied the other engineer thought the improvement had been overdone.

This, however, is best judged by the listener. What do my northern friends think of the new results?

... And Then Silence.

THE wireless messages exchanged between the giant German liner "Europa" (49,746 tons) and the little Glasgow "Blairgowrie" (3,259 tons) vividly restated a drama of the seas when read to Lord Merrivale, in the Court of Inquiry, recently.

Before 10 p.m. on that night of storm, the "Blairgowrie" reported "Doubt if we shall be able to use our lifeboats. Crew aboard 26."

At 11.59, "Europa" to "Blairgowrie": "Making now 18 knots. Hoping to be to you at 2 a.m."

Again at 12.06, "Europa" to "Blairgowrie": "Cheer up, old man. We do our best we can despite high seas."

At 12.08 "Blairgowrie" replied: "Pretty hopeless, old man. Do not think we can last another 15 minutes. Laying right over to side. Huge seas coming aboard every second. Will hang on till last."

At 12.10 the "Europa" called the "Blairgowrie" again, but there was no reply.

Teutonic Television.

THE television news from Germany goes to show that the technical knowledge possessed by that country is being used to good purpose. To supplement their already excellent service the Germans now propose a two-way tie-up between Berlin itself and a point in the provinces, over special telephone lines. These lines would

be "doctored" to enable them to deal faithfully with a high-definition transmission, of 120 or more lines, and there is a likelihood of the project materialising early in 1936.

In the meantime, the Berlin P.O.'s mobile television transmitter, housed in fast motor vans, has been touring successfully. The power units are Diesel-driven,

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- Aircraft Radio - - - - - See page 500

and are thus independent of local electrical supplies, while the power used (some 16 kw.) is sufficient to provide a range of about 40 miles.

Prophets of Trouble.

ARE high-powered broadcasting stations usually harbingers of trouble? A politically sagacious friend of mine cornered me on this topic recently, and he had some startling facts up his sleeve.

POPULAR COMPOSER



A descendant of the great composer, Felix Mendelssohn is one of our successful young writers of popular songs. Here he is seen listening to his latest Cossor receiver.

First he pointed out that there is a regular swarm of lusty stations in south-east Europe, which is an acknowledged storm centre.

Then he reminded me that some years ago I had asked what the Abyssinians wanted with a big wireless station at Addis Ababa—and whatever it was they wanted, they've certainly got trouble there now.

Finally, he mentioned those new and powerful transmitters in the Far East, which have a knack of establishing themselves in districts that subsequently figure in reports of military activities. It's all very disappointing to lovers of world peace, but interesting to lovers of facts.

Weather Watchers.

READERS who may have heard brief weather reports and experimental mutterings on the lower end of the long-wave band, coupled with the names of aerodrome stations, may have wondered what it was all about. The Air Ministry now reveals that its radio weather service is being extended.

There is to be a central transmitting station connected by landline to the Air Ministry in London and along the air routes, and in other parts of the country there will be reporting stations. These will watch for weather changes with the keenness of Band of Hope boys on the morning of the annual outing.

All the reports from the Air Ministry observation stations will be decoded by the central authority, and can then be broadcast within a quarter of an hour of receipt if necessary.

For Music Makers.

DO you fancy yourself on the harp, piccolo, flute, violin, or other instrument of torture? If so, and you live in the London area, you may like to know that the Anglo-American Radio and Television Society is organising an orchestra.

Any reader of "P.W." who fiddles a pretty fiddle, trumpets a right rousing trumpet, or otherwise instrumentally gladdens his hearers, may obtain details from the hon. sec., who tells me that reserve orchestras will be formed as well.

When completed and rehearsed the main orchestra will go on the air in the society's concerts from Radio Normandie.

Fine chances here for Roy II, Maurice III, Henry VIII, and other would-be kings of melody.

(Continued on next page.)

FROM WIRELESS OPERATOR TO FAMOUS PRESIDENT

Postal Surprise.

THE bread that, being cast upon the waters, returneth after many days is not more surprising than the news paragraph. This latter, written in the heat of the happening; has its little day in print, and is then forgotten—nine times out of ten. The tenth time, however, may result in a chirpy letter from some friendly fellow, or in a frigid communication



from a very unfriendly solicitor—not so chirpy!

Consequently, when I got an official-looking envelope marked "Solicitor and Commissioner for Oaths," I opened it with mixed feelings. And this is what I found: item, charming letter about our hobby and our paper; item, message for "W. L. S." "who has been responsible for many happy hours"; item, invitation to visit Dorset for week-end.

I cannot, alas, accept the invitation! But I can, and do declare that it's an education to write for you fellows, for I never know what's coming next!

Tenders Invited.

SPAIN has now officially invited tenders for the establishment of her regional scheme of broadcasting, and the stations contemplated are a lusty crew. As forecast, Madrid is to use 150 kilowatts, on 1,639 metres, and there are to be six medium-wave stations, ranging from 20 to 60 kilowatts.

In addition, a 10-kilowatt relay is scheduled for Tenerife (Canary Islands), and two 5-kilowatt relays at Murcia and Oviedo.

The Madrid and Barcelona stations must be up and announcing within twelve months of the signing of the contract, and the whole scheme will be virtually complete in the second year.

Stonehenge Mystery.

COMMENTING upon my recent reference to "P.W." readers who are financial giants, a Scottish correspondent tells me that he has had two surprising instances of the way this journal gets about and crops up in unexpected places.



On one occasion he was in a Harley Street specialist's waiting-room when a bishop came in, sat down, produced the current "P.W." and began to read—"I don't know why, but this struck me as very funny," says my correspondent.

On another occasion he was on a walking tour near Stonehenge, and noticed a neat parcel laid behind a milepost. As it had evidently been out in the rain for a

night or two, he opened it and found it contained an old pair of flannel bags, a writing pad with a half-written letter to "Dear Wife," a slab of chocolate, and two or three papers, including "P.W." Can any of you Druids throw light on this mystery of Stonehenge?

Wireless and the Moon.

THE old question as to whether the moon has any effect on radio reception has now been answered in the affirmative. Scientists have convinced themselves that the rise and fall of the world's tidal waters, due to the moon's pull, have their counterpart in the stratosphere; and that the radio-reflecting layers that surround the earth have their ups and downs accordingly.

BROADCASTING BREVITIES

A discussion in the Midland programme which ought to prove interesting to cricket-lovers will be broadcast on July 22. It takes the form of a three-cornered talk entitled "Overheard in the Pavilion," and will deal with contrasts between pre-war and post-war cricket.

Henry Grierson—who has already broadcast on cricket, captained Bedfordshire, and now lives in Northampton—is in charge of it, and will elicit the views of the two Santalls, father and son. Both began as amateurs and then turned professional.

The older Santall, Sydney, is the Warwickshire coach and old county bowler. He was born in Peterborough in 1873, and played as an amateur for Northampton in 1891, then qualified for Warwickshire, for whom he played from 1894 to 1913, when he was appointed coach. His son, Reginald Santall, who is not quite 32, played his first first-class match for Warwickshire against Yorkshire before his seventeenth birthday, was an amateur in the seasons 1920-22, and then became a professional.

"Alice through the Looking-glass," Cecil Lewis's adaptation of Lewis Carroll's world-famous phantasy, last heard by listeners in 1930, will be broadcast on the National and Regional wave-lengths on July 22 and 23.

Moreover, the moon is now supposed to be charged with electricity. This also would be likely to affect radio reception from distant stations, so, what with one thing and another, the influence of the moon is assuredly considerable.

A Romantic Rise.

AMONG those who look confidently towards rapid television development is David Sarnoff—and if David, also, is among the prophets the words are worth considering. Not many men have seen such a romantic rise to fortune as this young wireless operator.

He was at sea when seventeen years old, and in 1912 when the *Titanic* disaster occurred he was on duty at the top of the Wanamaker Building, in New York. For seventy-four hours he sat continuously at his instruments until the entire list of survivors was received, and thus won fame which made him a marked man.

Seven years later he was commercial manager of the Radio Corporation, and since then he has risen in turn to General Manager, Vice-President, Executive Vice-President, and President of this great Corporation. Some day he'll write a book, and if you see it, grab it, for David knows his stuff.

Fire Alarm Extraordinary.

AN Italian amateur living in a village near Rome was sitting up late one night at his short-wave transmitter (they all do it!), when he saw a house on fire. No telephone and no fire brigade being available, he tried his luck with radio, and immediately got in touch with a fellow short-wave fan in Copenhagen.



This far-off worthy took down the name and address, picked up his telephone, and told the fire brigade in Rome that they were wanted at such and such a place, "pronto!" Without a doubt all amateurs would help just as readily if they had the opportunity, for amateur transmitters are ever keen to demonstrate the value of short waves and the amateur movement in general.

Blind Spots.

WE do not hear much nowadays of radio blind spots—where reception is poor or impossible—but a curious example has been reported by the air liner wireless men on the Cairo-to-the-Cape service. They have noted that although they can generally keep in touch with the ground stations along the route, there is always a sudden radio blanketing effect as the machines pass over the famous Valley of the Kings.

This is the region where the Pharaohs are buried, and it has been suggested by some that the district is hoodoo-ridden in consequence. Others, more practical, blame the screening on natural causes.

However this may be, the effect is sharply marked and occurs with disturbing regularity over the ancient burial place of Egyptian kings.

Broadcasting Bigamy.

THE matrimonially-avaricious citizen who, being married, takes unto himself a "second wife" is usually averse to publicity in the matter. But a wool-grader surprised an Auckland N.Z. magistrate by admitting, when charged with bigamy, that he went through a form of marriage at the "Friendly Road" broadcasting studio, and had the ceremony broadcast.



The officiating minister at "Friendly Road" station said he had performed the ceremony, but could not identify the parties as they were unknown to him, and he had solemnised four other marriages that day.

Accused was committed to the Supreme Court for sentence, and the magistrate watched him go from the court in amazement—a world-record-beater in frankness!

ARIEL.

SERVICING AS A CAREER

HOWEVER much care may be devoted to the manufacture and transport of radio receivers, damage and faults in a proportion of them will inevitably occur. Indeed, earlier or later, something or other is almost bound to happen to every radio installation, and it will probably be beyond the power of the ordinary listener to deal with it.

That is why there will always be a big demand for skilled service-men who are able to put sets right. In fact, as the number of broadcast licence holders increases and more sets are brought into use, so the demand for service-men will grow.

Seven Million Potential Customers.

Already there are over seven million wireless receivers in the country, and that means that there are seven million potential customers for radio servicing of some kind or another. And there aren't enough good service-men available even now.

Almost every week the radio trade papers carry advertisements of vacancies for service-men.

Now it must not be imagined that this is a profession of a very highly paid nature. A skilled service-man employed by one of the larger radio firms will get about three pounds or three pounds ten shillings per week.

That isn't a bad wage for a young fellow, but servicing is a stepping stone to better things for hard workers who have ambition. Sometimes service-men are elevated to managements of local agencies, and I actually know one who jumped from £3 per week to £10 plus commission as a district representative.

More frequently, perhaps, service-men in due course get transferred to inside staffs and become testing engineers at very comfortable salaries.

And simply because they are out and about meeting all kinds of people opportunities come their way which never occur to others. There is an instance I can call to mind of a man who was employed by a London firm, although most of his work lay in the Farnborough and Aldershot area.

Very Successful Careers.

So that he could cover the ground expeditiously he was eventually supplied with a small motor car. After a time his firm began to expand considerably, and they asked him carefully to watch the activities of various retailers with a view to the selection of appointed agents.

Naturally his salary was raised, but that was only the beginning. He started to get offers from the various local firms he was contacting. Eventually he accepted a managership, and later was able to found his own business, and the contacts he had made proved so useful that it prospered exceedingly.

There will always be a big demand for skilled service-men who are able to put sets right. And with the coming of the new television service opportunities in this branch of radio will increase, which makes it well worth consideration as a career, a subject that is dealt with in this article by

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

Again, a reader of "P.W." wrote to me some time ago to say that from being a home constructor he had progressed to servicing and then to a partnership in a motor-engineering business with someone whose radio outfit he had successfully serviced.

These may be exceptional cases, but even at the lowest estimate radio servicing is an

REPLY TO AN S.O.S.



With his universal meter and his attaché case containing essential testing gear, spares and tools, the service-man replies to an S.O.S.—"Service our set"!

interesting means of making a living, and with the extension of the use of electricity in the home the radio service-man will find his knowledge of electricity become more and more widely applicable.

Already some service-men are combining the servicing of such things as refrigerators with that of radio sets and, needless to say, those who can provide comprehensive services like that receive higher wages.

It must not be thought, however, that anyone who can assemble and operate a set is necessarily equipped with sufficient knowledge and experience to make a good service-man. Specialised training of some sort is almost essential.

How can that training be obtained? Well, in the first place, I would advise the potential service-man to take a course with one of the correspondence colleges, such as the International Correspondence Schools, Ltd., or the Technical and Commercial Radio College. I know there are some who maintain that a postal course is inadequate. But I, on the contrary, believe it to be a sound method of laying the foundation.

The Practical Aspect.

It will not be expensive, and you can take it from me that it can prove entirely adequate for many purposes. And the student who is determined to give his postal instructors fair backing by diligent application to the course will gain as much as from attendance at classes. Perhaps even more, for he will be able to adapt his hours of study to suit his own personal convenience.

The correspondence course can be supplemented by going to such lecture courses as are run by Polytechnics and other bodies, if the student desires.

When the course is completed practical experience can be gained by servicing the sets of friends and relatives. If the work is well done, these will invariably recommend the embryo service-man to others.

And when a certain amount of confidence has been gained some of the local dealers can be approached. It is not difficult to find dealers who would be glad to accept the services of a service-man on a payment by results kind of basis.

Of course, there is not usually a lot of money to be made in free-lancing in that way, but the apprenticeship will more than pay for itself in the end. And it is not as though the full day need be given to it. Those already having jobs can acquire this groundwork of a new profession during the evenings and week ends.

Plenty of Opportunity.

It must be emphasised, though, that there is no very short cut. It will not be a matter of merely a few weeks. It is little good trying to get a staff appointment with one of the large firms unless you have (1) a sound knowledge of electricity and radio, both theoretical and practical; and (2) some kind of experience.

It may sound a rather slow process, but nothing worth while is to be achieved without effort, and with radio still expanding and with television approaching, I can assure you that radio servicing is a proposition the young man particularly should consider very seriously as a career.

WHAT YOU WILL SEE AT RADIOLYMPIA

An exclusive forecast concerning next month's great radio exhibition.

By Our Special Correspondent.

FOR several years it has been a regular annual practice to say: "This year's Radio Exhibition is bigger, better, brighter than ever." That is not a case of crying "wolf"; the truth is that each year the exhibition really is bigger, better and brighter than the year previous. And this year is no exception. Although it is obviously too early to give a complete and comprehensive survey of the attractions that will make this year's exhibition "bigger, better and brighter than ever," it is possible to see that this will be so from the preliminary arrangements that have been made.

Display of Steady Advancement

There are three angles from which Radiolympia can be viewed: (1) As a display of the industry's products; (2) as a decoratively attractive shop-window; (3) as a collection of subsidiary shows. Viewed from either standpoint the 1935 Radiolympia gives promise of outshining all previous events.

As a display of the industry's latest products it will reveal a steady advancement along reorganised lines of technical development rather than sensational "stunts" and unusual innovations. The place of the superhet in the receiver market will be confirmed. Dual speakers will be more general, marking the increasing demand of educated listeners for a wider range of frequencies. Loudspeaker design, in fact, will show a marked advance. The average set will reproduce faithfully over a wider area of musical sounds. The improvement will be similar to that which would be secured if four notes were added to each end of a pianoforte keyboard.

It is already certain that there will be a marked increase in the number of models of short-wave receivers. All-wave sets will have a better representation also. Manufacturers are recognising that short-wave listening is gaining in popularity, despite the susceptibility of the short-wave band to electrical interference. While the 1935 Radiolympia will not earn the title of being "the all-wave exhibition," it certainly will be one of the forerunners to that event.

A Massive "Feature"

As a decoratively attractive shop-window Radiolympia will, this year, put all previous exhibitions in the shade. When the public enter the vast building, from Addison Road, they will be fascinated by a marvellous colour scheme that will dominate the entire scene from the opposite end of the hall. A massive "feature" is to be built, 240 feet by 80 feet, covering all the space at the west end. This will be converted into an ever-changing panorama of rainbow glory by an amazing cycloramic device operating a complicated system of colour flood-lights which work on a time switch. A kaleidoscopic effect of melting colours will be secured.

If there was a complaint at all last year—and that was a brave person who dared to make one—it was directed to the fact that there did not appear to be sufficient rest-seats for the many thousands who patrolled the stands. Cause for complaint will not exist this year. Alec Moody, the organiser, is going to provide seating accommodation on a very generous scale this year. In addition to "rest saloons" in various parts of the building, he is also going to provide two huge circular lounges at the front of the "each end" staircase.

As a collection of subsidiary shows Radiolympia will be an alcazar of entertainment. This year the Post Office will provide a highly interesting exhibit—"Post Office Village" will prove a fascination to all. To be taken "back-stage" of a post office is something most boys, between the ages of eight and eighty, have longed for.

AT RADIO'S MECCA



A typical scene at last year's show—a visitor examining the H.M.V. chassis exhibit.

Another of what might inoffensively be called side-shows will be the Television Section, for which the Radio Manufacturers Association are making themselves responsible. Because of the fact that television will be at that time merely in the experimental stage the R.M.A. have considered it their duty to the public not to encourage exaggerated ideas, but to present television exactly as it is. No false or unduly ambitious claims will be permitted, and as it is quite probable that the public transmission from Alexandra Palace will not be commenced by August, the R.M.A. feel that the time is not ripe for permitting all types of television receivers to be offered to the public. Instead, specimen models of television receivers will be exhibited and the public carefully informed and shown the extent to which television has developed.

And then there is the "Show of Side-shows"—the Radiolympia theatre. This will be larger in accommodation than the majority of West-End theatres, and have a stage wider than the stages of practically every theatre in the country. This year all seats will be "raked"—raised row by row, so that an uninterrupted view of the stage can be had in every part of the auditorium.

The Theatre Atmosphere

Genuine theatre atmosphere is to be given to this. The entrance to the theatre will be built along the lines of the most modern type of foyer, with box offices, kiosks, cloak-rooms and easy chairs. Illuminated arches will frame the entrance and uniformed commissionaires be in charge of the "Standing Room Only" boards. There will be three performances daily, the afternoon show being entirely different from the night performance each day.

Last year the attendance figures topped 200,000, and this year Alec Moody is confident that a quarter of a million people will visit the "bigger, better and brighter than ever" Radiolympia.

TELEVISION JOTTINGS

SOUTH LONDONERS who are worried about their prospects of receiving signals from the Alexandra Palace would have been reassured had they been with me on a little pleasure trip that I arranged recently.

It was on one of those marvellously clear evenings that followed a thunderstorm, and a friend and myself set out with the idea of finding vantage points in South London from which the Alexandra Palace was actually visible with the naked eye.

As it stands—without its 320-foot mast or masts!—it isn't too easy to spot, but once one has definitely identified its somewhat squat outline it cannot be missed.

We saw it perfectly clearly from the Crystal Palace Parade (at ground level, of course); from Streatham Common; from Wimbledon Common (but you have to know where to get to!); and from innumerable little places where there are short, sharp rises.

Considering how very far removed from optical properties are even the 5-metre waves, I don't think there will be any cause for alarm when one considers that 7 metres will be used for television. Although I live in a hollow, I think the top of their new mast will probably be visible from the top of my own 45-footer—but I'm not going up to see!

Mechanical or Cathode-Ray?

One aspect of the present position of television is that the mechanical systems, for the time being, seem to be practically ruled out. If we really are to have two separate types of scanning, with receivers that are adjustable for either, it seems as if the cathode-ray tube is the only piece of mechanism that is flexible enough to tackle the job. This must be regarded as purely a personal opinion; but I can't see how a mechanical system suitable for receiving both types of transmission can be put out on a commercial basis.

From the way things are developing at the moment, it seems that one of the various forms of "electric eye" will be used for scanning on each system. These electron-cameras, guns, multipliers, and the rest of them have introduced a brand new series of terms which the amateur must find rather confusing.

Speaking very broadly, they may all be said to utilise a moving electron-beam, scanning a small and compact image of the scene which is to be televised. In a way they may be regarded as the inverse of the cathode-ray scanner

(Continued on page 510.)

TESTING INSTRUMENTS

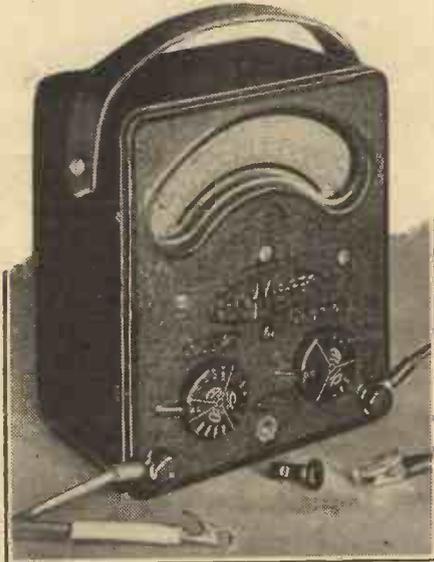
and Spare Parts

THOSE who are beginning their careers as service men will naturally wonder what testing instruments and spares they should equip themselves with.

There is, of course, practically no limit to the number of meters and other apparatus that one can use to advantage in this kind of work, but we aren't all endowed with the wherewithal to purchase them. Not, at any rate, to start with.

The best way is to commence with one or two good instruments and add to them

MEASURES A.C. AND D.C.



The Universal AvoMeter made by the Automatic Coil Winder and Electrical Equipment Co., Ltd. It has 36 different ranges in all.

as the work increases and the cash begins to flow in.

The question arises, is it better to buy separate meters, say a voltmeter, ammeter, milliammeter and so on, or one of the multi-range instruments? Well, let me say, here and now, that it is more economical to get a first-class precision multi-range meter. It is definitely less expensive to do this and, moreover, when you are visiting a client you will find it more convenient to have an instrument of this type with you than several separate meters. The multi-range job stows away nicely into an attaché case, leaving room for other essential gear.

Very Fine Instruments.

There are several very fine instruments available from different firms. Among these may be mentioned Ferranti, the Automatic Coil Winder and Electrical Equipment Co., Ltd. (who make the AvoMeter), and Messrs. Pifco, Ltd.

Take, for instance, the Universal Avo-

What shall I want? That is a question which the service man often asks himself when he is called out to put a set right. And in this article a guide is given to the most useful types of instruments and spares to carry around with you.

Meter. This is a very elaborate piece of apparatus for measuring both D.C. and A.C. Although priced at twelve guineas it is worth every penny, because it covers every A.C. and D.C. current voltage range that the service man is ever likely to require, and in addition gives readings of resistances from 1,000 ohms to 1 megohm in four ranges.

There are, in all, 36 ranges, and the instrument lends itself for use as an output meter when used on the A.C. voltage scales. It is a beautiful job.

For those who can't at first run to an ambitious instrument of this type there are others by the same makers. For example, the D.C. AvoMeter, which, for eight guineas, gives you 22 ranges with the same high degree of accuracy as the 12 guineas meter, but without the A.C. scales. Next comes the Universal AvoMinor, a miniature instrument suitable for A.C. and D.C. work, with a 3-inch scale and 22 different ranges. This costs five pounds. Last, but by no means least, is the D.C. AvoMinor, costing two pounds and having a 2½-inch scale. Ten ranges are available with this model.

Voltages and Currents.

In the Pifco range there is that excellent little meter called the Rotameter-de-Luxe, priced at two guineas. It has a resistance of 500 ohms per volt, and is suitable for measuring D.C. voltages and currents covering 0-400 volts and 0-250 milliamperes, in four and three ranges respectively.

Also included in the meter are a resistance scale for measuring resistances up to 200,000 ohms, and a special valve holder which enables filaments to be tested for continuity by plugging the valve into the sockets provided on the top of the instrument.

These brief details serve to give some idea of the multi-range meters available. Generally speaking, the more you spend on the instrument the greater are the uses to which it may be put. You get a bigger variety of ranges, and usually a larger scale to assist you in getting accurate measurements. The type of meter you buy will obviously depend on how much you can afford, but don't try to economise by buying cheap meters of unknown make.

You will find that you are continually requiring to know voltages and currents. For example, if a battery set doesn't work

properly, one of the first things you do is to check up the H.T., L.T. and grid-bias voltages. Secondly, you will frequently want to know whether any current is flowing in the anode circuits of valves, and, if so, how much. Therefore, in addition to high and low voltage ranges, you will need milliamperes scales giving ranges suitable for all types of sets.

Special Split Adaptors.

In connection with this question of valve current measurement, let me give you a few useful tips. In the absence of special time-saving gadgets, the only method is to disconnect the H.T. positive wiring to the anode of the valve under test and to insert the meter between this disconnected lead and the valve anode. This is quite O.K., but it often means that you have got to juggle with the wiring a bit—not an easy job with many of the modern chassis-constructed designs.

A much better scheme is to purchase a set of split adaptors designed for jobs like this. The valve under test is first removed from its holder, and in its place is inserted the appropriate adaptor. Then the valve is inserted into the adaptor. On the side of the adaptor there are terminals so that

(Continued on next page.)

FOR CIRCUIT TESTING



The Ferranti A.C./D.C. meter, a compact and valuable instrument for the service man.

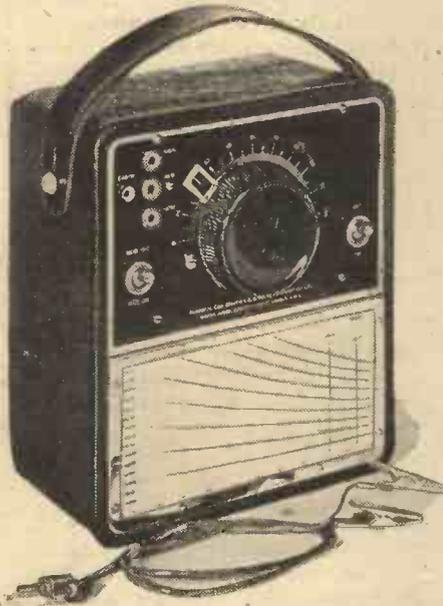
TESTING INSTRUMENTS AND SPARE PARTS

(Continued from previous page.)

a millimeter can be connected in series with the portion of the circuit under test.

What the service man does is to select the appropriate adaptor from his kit according

THE AVO-OSCILLATOR



Though not an essential instrument, a calibrated oscillator such as the above is very helpful for such work as condenser ganging.

to the type of valve he is going to test—there are adaptors for 4-, 5-, and 7-pin valves—join up his meter to the necessary terminals and proceed as already described.

Adaptors to suit practically every type of valve and anode and filament current measurements are obtainable from Messrs. A. F. Bulgin & Co.

They aren't expensive, the cost ranging from eightpence to about three shillings, according to the adaptor chosen. And they are invaluable gadgets to carry in one's mobile kit.

Another useful device made by the same firm is the All-valve Testing Adaptor illustrated in this article. It is perhaps more suitable for the service man's test bench, and it consists of a 9-pin plug with cable and a 9-pin holder on bakelite base. All the points are split and are taken to terminals so that current or voltage measurements can be obtained with ease. By using reducing adaptors the unit is suitable for testing 4-, 5-, and 7-pin valves. It costs fifteen shillings.

Some Other Requirements.

In addition to a good measuring instrument, and preferably some of the adaptors mentioned, the service man will require a few lengths of flex with crocodile clips, and most certainly a couple of good testing prods joined to two lengthy pieces of flex. These he can carry in his attaché case, which will also contain a pair of pliers, long-nose tongs, a screwdriver or two, wire cutters, a

bank of insulated connecting lead, and a small soldering kit.

I mention the soldering kit because defective leads and joints can then be put right on the spot.

In the case of a bad fault in which one or more component replacements or a repair to a winding are necessary, it is best to take the set away and do the work on the test bench.

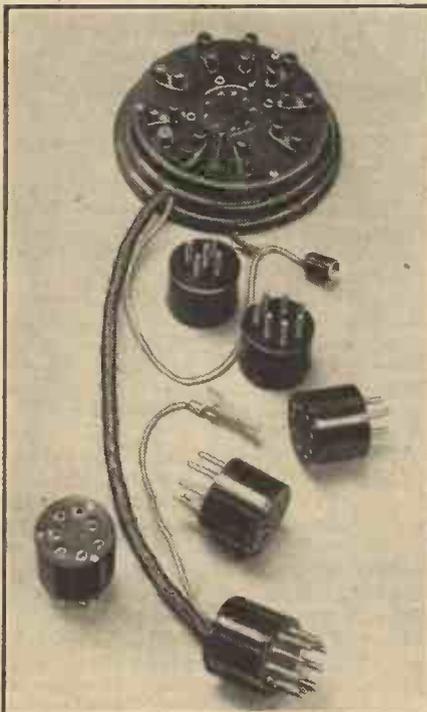
With regard to the spare parts that the service man should keep on hand, the stock will depend on whether he is a "free lance" or attached to a dealer. In the former case he will only keep by him such items as valves and a selection of resistances and condensers. If he is attached to a dealer he will have an ample replacement stock to draw upon:

Spare Valves are Advisable.

But it is a good scheme to have a supply of the popular types of valves, not only for replacement but also for testing by substitution. This is often quicker than taking a meter reading. No service man can be expected to keep a stock of components embracing band-pass coils, ganged condensers, transformers and so forth. This would entail carrying a "dead" stock which might never be required and which would become obsolete. Such parts do not give trouble in the ordinary course of events, and if, say, a transformer is found to be defective, it is easy enough for the service man to procure another of the same type, either from the makers or a nearby dealer.

Again, it doesn't pay to carry a stock of H.T. and G.B. batteries. Dry batteries deteriorate if kept in stock, even though they are not used. It is better to obtain the replacement battery from a dealer with a fairly rapid turnover. Should the service man be attached to a dealer his problem

AN ALL-VALVE TESTER



By means of this Bulgin outfit valves of all types may be tested. Each connection is split so that a meter may be inserted.

is solved. This advice is mainly for the unattached service man.

It is, however, a good plan to have by one a number of small items such as spare fuses (say, 1-amp. fuses for mains sets), wander plugs, aerial wire, plenty of flex, and so on.

If you ever want to check over a resistance and you haven't a meter by you with the required resistance-measuring scale, don't forget that you can carry out a test with the aid of an H.T. battery and milliammeter.

WITH ROTATING SCALES



A feature of this Pifco Rotameter-de-Luxe meter is the provision of scales which automatically change with the operation of the range-change switch.

Join the H.T. battery, resistance under test, and milliammeter in series. Ohm's Law will enable you to find the unknown resistance.

Your Own "Local."

So far we have only dealt with the essential apparatus for the service man. There is other apparatus which, owing to its great utility, will no doubt find its way into the servicing equipment as our service man "gets on." For example, there is the problem of measuring condenser capacities. This is not a vital part of fault finding, but, for all that, a capacity bridge for checking over condenser values is a most useful piece of apparatus. We can include that under desirable laboratory equipment. Likewise, an oscillator unit. The service man may want to calibrate a set, to check over dial markings, or to carry out certain tests without having to rely upon a broadcasting station to supply the energy.

An oscillator unit is really a very small calibrated transmitter, and with it one can "inject" a steady local signal into the receiver and so carry out ganging adjustments or the lining up of intermediate-frequency circuits in superhets with the utmost ease.

One excellent unit is the Avo-oscillator, a convenient little unit which provides a local signal, either modulated or unmodulated at will. It can be connected to any set under test and covers a range of frequencies from 105 to 1,500 kc., with an accuracy of calibration of 1½ per cent.

A. J. R.

ON THE SHORT WAVES



WHY THIS HAND-CAPACITY ?

This week W. L. S. deals with one of the most common troubles experienced by short-wave listeners, and gives some valuable advice on overcoming it.

OUT of every five letters I receive, at least two are from readers who complain that their enjoyment of short-wave work is completely ruined by hand-capacity troubles. I don't even imply that all the five are complaining about trouble; the other three may just be telling me what a nice chap I am.

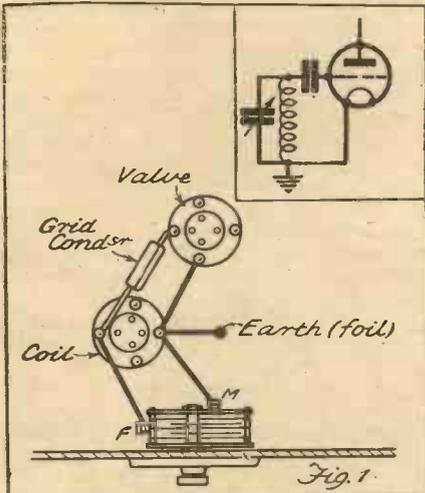
The percentage of hand-capacity sufferers, whatever it is, is far too large, and I think it's about time we got busy with my little green-fly syringe and tracked down the bug.

"Up in the Air."

What is it? And you may well ask! To be as concise as I can, let me say that "hand capacity" is due to a condition which results in certain parts which *should* be at earth potential being "up in the air" instead.

Accordingly, as soon as the operator's hands (which are, nearly enough, at earth potential) approach these parts of the set, a change in tuning results.

A GOOD LAYOUT



Keep the connections between coil, condenser and valve as short and straight as possible.

This undesirable condition, unfortunately, can be caused by innumerable different things. One is bad layout of the detector circuit (perhaps the most common); another is more closely connected with the aerial and the aerial circuit; and yet another is due to H.F. getting right through to the loudspeaker or phones on account of inefficient chokes and by-passing.

Let's talk about detector layout once more. Look quickly at Fig. 1. Here you have a variable condenser connected very shortly and directly across its coil, which,

in turn, is connected quite nicely to the valve holder.

The arrangement is fairly accurately reproduced in the little circuit diagram (inset). The bottom end of the coil really is at earth potential. Perhaps if the earth connection were taken directly on to the moving plates of the condenser instead of to the coil, which is an inch or so away, the condition would be even better.

Now, without pausing for breath, look at Fig. 2. I haven't gone out of my way, you will notice, to draw an appallingly bad layout. It looks reasonable; the placing of the parts, in fact, is rather more conventional than it is in Fig. 1.

All right so far, but now just look at the inset circuit diagram. The bottom of the coil is at earth potential all right, but what about the condenser? That, after all, is the thing that you catch hold of, and that's what matters.

What everyone overlooks is the fact that quite a short, straight piece of wire has an appreciable inductance when we are thinking of short-wave work. So the Fig. 2 inset doesn't exaggerate the state of affairs. We have a "stray" between the condenser and the valve holder, and another "stray" between the coil and the valve holder, and the cumulative effect is that the moving plates of the condenser aren't really at earth potential at all.

Now I fancy I can hear someone saying, "Ah, but I've got a metal panel with the condenser mounted on it!" Maybe you have, my dear reader, but that may not be at earth potential, either; no, not even if it goes to a metal baseboard and straight down to earth.

Try this Simple Test.

Just try this one, Mr. Metal-Panel-and-Baseboard. Tune in a signal, and tap your panel very gently. You probably hear a soft click and notice a slight change in tuning. Now, keeping your forearm clear of the rest of the set, reach over and tap the back of the baseboard or the earth terminal. Do you still get the same? I'll bet you don't! You see, even a sheet of metal all over the place doesn't ensure that your front panel will still be genuinely at earth potential.

First of all look into your detector layout and see that it's like Fig. 1 rather than Fig. 2. When you've got that right you can start attacking the other points. Of course you have tried the set both with and without an earth. Very often a set that is a perfect brute with an earth connection will simply eat out of your hand when you take the earth off.

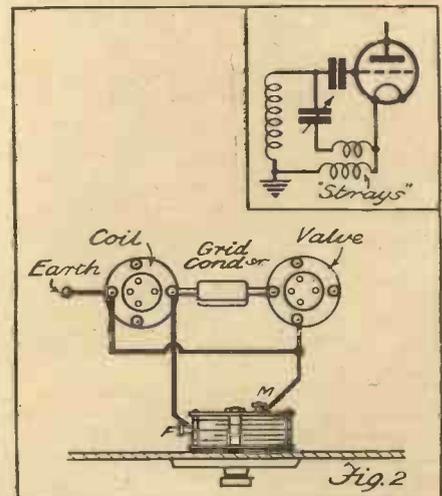
Sometimes it's *vice-versa*; much depends upon which floor of the house you work on. In other words, how long your earth-lead is. Many moons ago I used to suggest that readers "tuned" their earth-leads. A good many of them did it and wrote to thank me for the tip, since when I've almost forgotten it myself.

Tuning the Earth Lead.

Here it is, for what it's worth, once more: Insert a .0005 variable condenser in series with your earth-lead, and if, on any particular wavelength, you seem to find your tuning becoming slippery, adjust it until you find a point at which your front panel and tuning controls are absolutely "dead."

You may have to readjust it for different wave-bands. You may, on the other hand, find that it's no use at all. If that's the case, it's ten to one that your aerial is the cause of the trouble.

WHAT TO AVOID



Indirect wiring, such as shown here, may easily be the cause of bad hand-capacity effects.

To take a concrete example, a 66-foot aerial will give good handling, free from hand capacity and what-nots, on 21 and 42 metres, and for a fairly wide band round each of those settings. It will, if it is coupled too tightly, give dead spots and hand capacity round about 15 and 30 metres.

Just peg away until you can produce a set that's absolutely free from hand capacity and instability throughout its whole range. Don't waste too much time listening to stations until you've reached that stage; they'll be far easier to listen to after you've done the job.

You Must LISTEN to Radio Plays

YOU do not *have* to listen to broadcast plays. But if you do you must *listen*. That sums up one of the biggest lessons Mr. Val Gielgud has taught me about radio drama.

I went to him with this kind of frontal attack: "Drama Chief, what now?" I wanted to know whether radio drama had, in his expert estimation, proved itself—or failed.

Mr. Gielgud was disarmingly honest about his department's failures, to such an extent that when I left him it was only of the successes that I could dwell upon.

An Audience of Individuals.

"To the writer of imagination," wrote Mr. Gielgud some three years ago, "the thought of reaching simultaneously an audience of several millions must surely prove sufficiently intoxicating to encourage him at least to experiment with one play for broadcasting."

Yet even when he wrote that the Drama Chief knew—and said—that his audience was not an audience at all; not a corporate body, but a cross-section of society made up of individuals, for the most part at home with friends or relatives.

How has this unique kind of audience reacted to the radio play? That was the question I wanted Mr. Gielgud to answer. He did it admirably by showing the different types of appeal that go to make up a twelve weeks' schedule at Broadcasting House.

"To begin with there are the adaptations of well-known stage plays," he said. "As the radio audience increases the proportion of this kind of play tends to increase, too. For it is obvious that any general increase in listeners must contain a large number who are already interested in stage plays of one kind or another.

The Pure Drama.

"Next we have the sort of play it is not practicable or rather commercially worth while putting on the stage—including Shakespeare, Ibsen, Tchekov; not forgetting Restoration comedies. If only because there is no other way of hearing them, we shall always do a proportion of this category."

So far, you see, no mention of that sadly illusory type of play, the "pure radio drama." But Mr. Gielgud was coming to that. "Our third section deals with plays appealing to the radio drama fans," he said. "We try to encourage those who believe in the pure radio play—but I must confess my hopes in this direction have not been fulfilled.

"At first I did think that possibly another art form might be evolved, thanks to the good work of such dramatists as Tyrone Guthrie, Du Garde Peach and King-Bull, to mention only three. But it seems

says

VAL GIELGUD

B.B.C. Director of Drama

in this talk to

ALAN HUNTER

now that the idea has been carried rather too far.

"After all, the main object of good drama is to tell a good story. The art form has tended to oust the telling of the story from pride of place. The result has been that very often the radio play—pure radio art form and all—has failed to entertain."

This was most interesting. I wanted to know whether Mr. Gielgud had, then, given up all hope of evolving a synthetic radio drama form. He denied that, pointing out that in the Feature Programme was being discovered something uniquely radio—and at the same time entirely interest-sustaining.

RADIO COMEDY WANTED



Mr. Val Gielgud, who says he looks in vain for radio comedies. Here, then, is a chance for budding dramatists.

"The 'Famous Trials' series, for example, are pure radio drama. So are the historic actuality plays. These are the ways in which, to my mind, the original ideas of pure radio drama are materialising—not through complicated sound effects and that kind of thing."

I wanted to know how Mr. Gielgud

defended himself against the oft-made charge that radio plays are never designed to appeal to the lowbrow. The Drama Chief laughed.

"I usually say that my very good colleague in the light entertainment department caters more than adequately for the lowbrow!"

More seriously, he added: "Anyway, it is simply not true that we neglect low-brow tastes. Plays by 'Sapper' and Edgar Wallace go into the schedule!"

"Broad farce? It simply doesn't go over, we find. Just you shut your eyes next time you are in a theatre doing a broad farce—and see whether you can still laugh. Most probably you will want to cry!"

It Must Sound Simple.

Mr. Gielgud looks in vain for radio comedies. Here, anyway, is a chance for the budding dramatist. But the truth is that if the bud really blossoms the vested interests of the entertainment world will soon snap it up. For the world cries out for comedy writing. There never is enough of it—not good comedy, anyhow.

"The Dramatic Control panel? Well, I hope all the ballyhoo about that has now died down. Listeners, as such, ought not to be interested in how complicated the studio and effects arrangements are behind the scenes—for at the listeners' end the result ought to sound simple and easy to follow. If it does not, the play has failed."

I agreed fervently. Always the radio dramatist is fighting the latent tendency of the listener to lose interest, to switch over to something less difficult to follow. A complicated radio play—complicated to listen to—must fail on this score. And if a simple effect at the loudspeaker end is obtained by complications at the microphone end, why tell the listener? It is not his business.

Don't Fiddle With the Set.

I told Mr. Gielgud of the vast majority of listeners I knew who simply would not concentrate on their reception. He sighed, and ticked off some of the essential conditions for enjoyable reception.

"Sit down, for a start, in a comfortable chair. That's rather important! Don't have too much light in the room—a mellow light is more conducive to concentration.

"Have a preconceived notion that you are about to hear an entertainment. Qualified, if you like, by a determination to switch off at the end of five minutes if you are not entertained.

"Don't sit too near the set. And once you have adjusted the controls to a nicety, leave them alone. Nothing spoils the artistic effect more than a sudden change in the tone or the volume of the reproduction.

(Continued on page 509.)

BARRY KENT CALLING

News and Views from the "Big House"

THE B.B.C. prides itself on its policy of dignified restraint in dealing with angry critics. Whether righteous anger is worked off in other ways I cannot say, but it may be significant that an office order has just been issued warning members of the staff of Broadcasting House to stop throwing things out of the windows. Apparently there have been several recent cases of damage to passers-by.

New Talks Director.

Mr. J. M. Rose-Troup has been appointed Talks Director of the B.B.C. to take over from Mr. Charles Siepmann in September, when the latter becomes Director of Regional Relations. Which reminds me that there is now a plenitude of high-sounding titles in our broadcasting hierarchy, to wit, Director of Business Relations, Publications Business Manager, Director of Public Relations, Director of Programme Planning, Business Relations Manager, Director of Personal Relations, and Director of Internal Administration.

Exchange of Artists Internationally.

At the last meeting of the International Broadcasting Union the subject of the exchange of broadcasting artists between countries was ventilated. Most Continental countries were keen; but the B.B.C. was non-committal. Since then, the matter has come up at Broadcasting House, where the reserve of the delegates to Warsaw has been heartily approved. The B.B.C. is concerned more now with pushing British artists and British music generally. It is hoped to employ less and less foreign talent in the programmes.

Players for Light Combinations.

There is a great scarcity of competent players for light combinations. Students at the music colleges are not specially trained for this work. The opportunities in cinemas and music halls are less than they were. Therefore the B.B.C., through Dr. Adrian Boult, is asking the heads of the three principal music colleges to do something about it.

A Switch-Round.

When Mr. Cecil Graves takes over from Col. Dawnay, in October, one of his subordinates will be Mr. Roger Eckersley, for whom he worked as personal assistant for six or seven years before becoming head of the Empire and Foreign Department. Mr. Lindsay Wellington is absorbing the Foreign Department.

Women Announcers.

The appearance at the microphone of the Post Office "girl with the Golden Voice" has revived the interest in women announcers. But I can say definitely that the policy of the B.B.C. is not about to change in this matter. The majority of senior officials are opposed to women announcers, and Mr. Graves' accession to power will not help the pro-women party.

"Ally Pally" News.

There is feverish constructional activity at Alexandra Palace, where preparations

FAMOUS B.B.C. STAR



Miss Anona Winn, about whom our broadcasting critic has some appreciative things to say.

are being made for the London television service. I was interested to hear the other day that a theatre is to be included, so that large-scale demonstrations will be possible on the premises. The studios, transmitting rooms, and so on, are all being duplicated so that the Baird and E.M.I. systems can be handled separately. The engineers expect to be ready for testing by Christmas.

Threatening Letters.

I hear there is another of the periodical epidemics of threatening letters to the B.B.C. staff. These usually purport to originate with secret societies intent on exterminating some "alien" influence.

The fact that in the B.B.C. are a number of perfectly sound Englishmen with curious names is irresistible bait for the cranks. One friend of mine at the Big House keeps all his threatening letters, and has now assembled quite an interesting collection.

The Mystery Committee.

In broadcasting circles the proceedings of the Ullswater Committee are shrouded in the deepest mystery. It has been at work incessantly for months in circumstances of complete secrecy. It might almost be an inquiry into the Secret Service. A stupendous amount of evidence has been taken from all and sundry. It is rumoured that even individual members have been harassed from many quarters. Copies of all evidence and notes of all representations are sent automatically to the B.B.C., where rejoinders are prepared.

ON THE AIR

Our broadcasting critic discusses some recent programmes.

IF you are in search of a play full of the absurdest situations, you needn't look farther than Oscar Wilde's "The Importance of Being Earnest." This is a grand play. It has all the elements of a first-class radio play—a small cast, a scintillating dialogue and a funny story (humour and story being in perfect proportion).

A perfect cast performed this play. They were a cast of wonderfully contrasting voices. Wasn't this particularly noticeable in the case of Gwendolien Fairfax and Cecily Cardew? There wasn't a discordant noise from start to finish. Even the music for the interludes was well chosen. The dialogue moved briskly and in a business-like manner.

I followed the play from the book. I always do when I can. I couldn't help noticing some of the cuts. I also noticed one or two passages that were not cut, as one might have expected them to be. The cucumber sandwiches incident in the first act was cut right out. This was a pity, though I must agree that it was inevitable.

In contrast to the diversity of characters created by Oscar Wilde in his play, and the skilful casting on the part of the B.B.C., was the monotonous sameness of the characters and the sameness of the voices in that musical concoction called "Round the Bandstand."

Too Much Accent?

You can't go on for ever listening to an exaggerated manner of speech, no matter whether the manner is on the elegant side or the reverse. I am prone to tire quickly of the inelegant. "Round the Bandstand" had a small cast of players, all of whom sported the vilest accents, and there wasn't very much humour to afford relief. The only character to amuse me was the "Bandstand Chairman," whose first appearance was all too short, owing to a pressing desire on his part to transport 5,000 deck-chairs to the other side of the bandstand. The conversation at Pleasant Crescent just jarred, and when the four principal characters, aided and abetted by the landlady, reached the stage of pairing off, the sequel seemed too obvious to warrant any further listening-in.

Gypsy Petulengro, descendant of Jasper Petulengro, immortalised by George Borrow, opened a new series of seasonable talks called "On the Road." We still remember the gypsy's last broadcast. He told us the other evening of the results of that talk, of the thousands of letters and postcards it brought him, and of the many offers of marriage it involved. Though he asked this time not to be deluged with letters, I wouldn't be surprised if there are listeners who would like to know more about clans and samphire, how and where to find them and exactly what to do with them when they have got them.

The gypsy is an authority on tramps, fair-grounds, and the hundred and one ways of earning a living there. One admired his frankness as to the genuineness of those freak shows that so easily relieve the public of their coppers. The gypsy speaks rapidly and well. He had a good collection of stories—all Romany stories—and he can be certain that these were enjoyed.

Local sopranos whose repertoires of songs are getting too well known in the locality must have

(Continued on page 510.)



Coil-testing in progress in the Coscor factory. Every coil is tested many times, to ensure correct electrical characteristics and for mechanical soundness.

SERVICE AND THE COMMERCIAL RECEIVER

Some points on the essential differences between the servicing of home-built and commercial receivers.

cause the sets themselves as a whole are so reliable, and the valves, apart from batteries, are the only items which normally deteriorate with use. You will find that quite the largest proportion of your jobs boils down simply to replacing a single valve.

And here, in connection with valve replacements, it should be mentioned that the exact types and makes recommended by the makers should be adhered to. Especially does this apply to L.F. and output valves on mains receivers. In these cases the grid bias is obtained automatically by means of resistances, and the value of resistance to use for the correct grid-bias voltage may vary considerably between one make and another of the same type of valve.

If You Are "Stumped."

As an unattached service man you may not always be able to obtain the complete details of certain sets, and without knowledge of the circuit of a receiver you may not be able to trace the cause of some obscure

formation to enable the job to be undertaken with confidence.

If you find that it is necessary to take the set away with you, remember that very often it is only the chassis part itself you want, and that you will most likely have to remove this when you get home. Removing it on the spot, particularly in the case of a radiogram, will considerably simplify the question of cartage.

A considerable amount can often be learnt by poking around the inside of a receiver when it is switched on. So much so is this the case that it is inevitable that you will find yourself adopting it, and it is hardly necessary to give a warning on the possibility of receiving undesirable shocks from a mains receiver. The use of insulated pliers or screwdriver to do the poking will ensure that you are immune from this possibility.

And, while poking around, keep your eyes open for a missing terminal screw, a disconnected wire or a loose component. By developing a keen observation you may at times save yourself much time by spotting the trouble right away—and, incidentally, greatly increase your prestige in the eyes of your customer.

As a matter of fact it is very important, if you are to profit by recommendation, that you should give attention to the relations between yourself and your customer. Don't, for instance, put on a superior manner and ignore details about any symptoms that are offered. The more you know about the way in which the set has been behaving, the better.

Gaining Confidence.

Aim at giving the owner of the set confidence in your ability, and then, if the job proves a long one, and perhaps costly, the owner will be satisfied that it really was a difficult one. Don't do a lot of bluffing when you are unable to put your finger on the trouble quickly, and don't put on a mysterious air and pretend you have worked a miracle when you get a lucky shot and find the fault instantly. Neither of these tends to beget confidence.

Besides, the owner of the set may have been a constructor in the past, and may know something about the technical aspects of radio himself. Try to decide just how much he does know, and if he tries to help meet him half-way and discuss the matter in a friendly manner. He won't forget it on some future occasion when there is a bit of recommending to be done.

Finally, one more "don't." Don't get into the habit of looking for obscure troubles until you have exhausted the simple tests.

A. S. C.

SERVICING commercially-built receivers will appear to the man who is new to servicing as quite a different matter from servicing home-constructed sets, and will probably seem a much more difficult task. But both of these view-points are true only in a small degree.

It must be remembered that home-constructed sets are designed essentially to be easy to build, and are therefore inherently accessible and, consequently, easy to get at for purposes of tracing faults. It is largely the compact nature—and the large amount of screening this entails—that makes the inside of a commercial receiver look somewhat formidable when one is called in to find out "what is wrong with it."

Once you have done a few jobs on commercial designs you will find yourself getting "to know your way round them" as much as with the more familiar home-built outfits. There are, of course, numbers of ways in which the two tasks will differ, chiefly in connection with the method of approaching the job, and it is with these that I propose to deal in this article.

The Most Valuable Test.

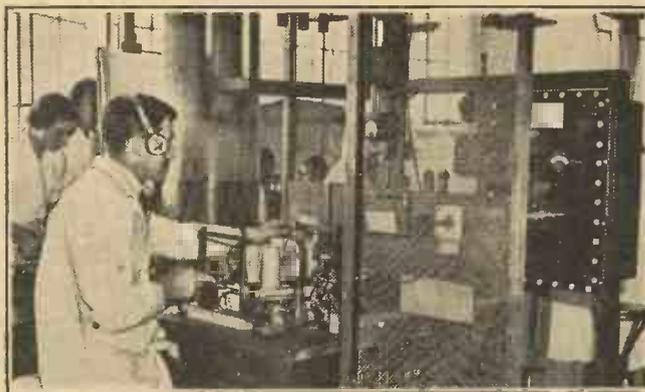
First of all, however, a few words on the similarities. Other articles in this number of POPULAR WIRELESS deal with the instruments needed for test work, and with the method of tackling a job of finding out what is wrong with a home-constructed design. So far as the question of instruments is concerned, and the way to use them, the information contained in the article on testing instruments applies equally well to commercial and home-built sets.

Also, in a general sense, the remarks in the article on testing home-built receivers apply to commercial ones. They give a good guide to the principles that should be applied.

Take, for instance, the changing of the valves, one by one, for those of a spare set. This is, perhaps, the most valuable test of all where commercial receivers are concerned.

Not because modern valves are unreliable—they are anything but—but be-

LOCAL CHECKING TRANSMITTERS



One of several small transmitters established in the H.M.V. factory for testing the sensitivity and selectivity of completed receiver chassis. A modulated H.F. signal is applied to the receiver terminals, and the output is then measured on a meter.

trouble. If you are ever stumped in this way, you cannot do better than return the set to the makers, or one of their agents to be put right.

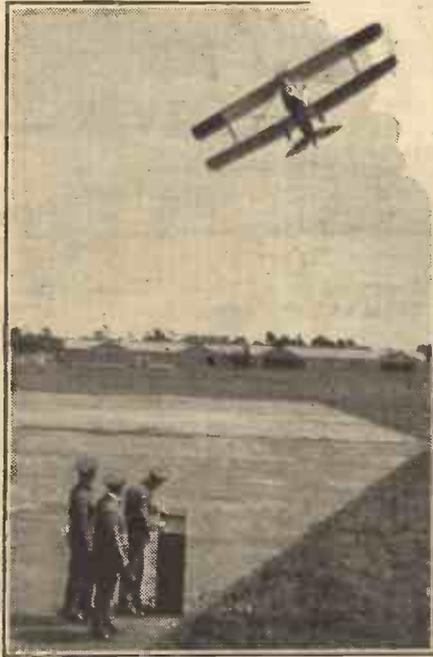
Unless you know what certain behind-the-panel preset controls are for, it is wiser not to alter them, or you may upset the balance of the receiver and make the fault even more difficult to trace. But in actual practice you are not likely to meet with many faults that completely baffle you, or with many sets about which you are unable to obtain or find out sufficient in-

ROBOTS OF THE AIR

Piloting 'Planes by Radio

By A. S. CLARK

A vivid description of the achievement of radio-controlled flight, and some thoughts on its amazing future possibilities, by one who is himself an experienced pilot.



"By simply pressing suitably labelled buttons on a control board the operator is able to make the machine climb, dive or glide, turn to the right or left, and land."

AN aeroplane roars overhead at one hundred miles an hour, circles and goes into a glide as the sound of the engine dies away. A short distance from the ground the glide is flattened and the machine makes a perfect landing, runs to a standstill, and remains stationary with its engine idling over.

The back cockpit is covered in, the front seat is empty, there is nobody in the machine! But here comes the pilot, striding away from a little portable control-box; he jumps into the front cockpit and taxis the machine into its hangar.

That is what the "Queen Bee" has made possible. It is the latest achievement of the combined sciences of radio and aeronautics.

Target Practice.

The control of mechanism by means of radio is almost as old as radio itself, but never before has anything of so advanced a nature been achieved. The basic principle of a wireless signal operating a relay must, of course, remain, but when the capabilities of the "Queen Bee" are noted one cannot but be amazed at the electrical and mechanical ingenuity that must have been entailed in its perfection.

So far the machine has been mostly used for target practice by warships, in which case it has been catapulted off to start its lone flight. By simply pressing suitably labelled buttons on a control board the operator is able to make the machine climb, dive or glide, turn to the right or left, and

land. It is also stated that all aerobatic manoeuvres are possible.

The machine itself is a special model of the De Havilland Tiger Moth, and has a Gipsy Major engine. It can be provided with wheels or floats, so that land or water may be used for alighting on.

From observations of the machine in flight it seems likely that some trailing device is used to indicate the correct height for the machine to flatten out when landing. Also, since it will flatten out automatically from a dive at a certain angle from the ground, one would imagine there is some form of auxiliary control connected up with a sensitive altimeter.

The Gyroscope "Pilot."

One is bound to write in the vein above, because naturally the Government have not broadcast the secret details of how this magnificent piece of radio control has been achieved. Radio-controlled boats are, however, quite familiar to us, so that it is not difficult to think out how the "Queen Bee" could work.

Most readers will have heard of the automatic pilot, a form of gyroscopic device which will fly a machine so level and straight that the human pilot can leave the controls for long periods and go into the

So here, right away, we have the means of making a radio-controlled aeroplane fly level and straight. All we have to supply now is a series of small electric motors which will move the controls of the machine and at the same time alter the planes of various gyroscopes so that the machine takes up a new position and is held therein as before. It can thus be held just as steady in a climb or glide as on a straight course.

Elaboration of the motor controls makes it possible to perform any manoeuvre desired. All that is required from the ground via the radio are the necessary impulses of the right kinds to set the various mechanisms in the machine in operation.

During tests and demonstrations which have been carried out over land near inhabited areas a pilot has been present in the front cockpit to take over immediately should anything go wrong with the mechanism. He does not touch the controls normally, but is there to take over in an emergency, just as he would be in the case where a pupil-pilot is flying the machine from the back cockpit.

His experiences, as he sits there, must be of rather a sensational kind. I, personally have found the "feel" of a machine when flying blind, with only a row of instruments

to go by, quite weird. What it must be like to have the machine take complete charge of things and dive you at the ground one minute, and turn you from left to right the next, cannot be imagined!

Miles Away.

But it shows what complete confidence is placed in the control mechanism, particularly when it is remembered that the man on the ground controlling the manoeuvres may be anything up to ten miles away. This distance is the greatest to which control has been practised up to the present.

No doubt ultra-short wavelengths have been used, but in view of the fact that the machine is always up in the air, and therefore is only separated from the transmitter by air, there seems to be no bar to the distances over which control will eventually be obtained.

And, this leads one to think of all the other possibilities of the radio-controlled

(Continued on page 599.)

EXAMINING THE NEW "QUEEN BEE" AIRCRAFT



Here is one of the R.A.F.'s radio-controlled aeroplanes. Note the large generator-driving propeller to the right of the engine.

passenger cabin. If an air-bump makes the machine try to turn, dive or bank, the gyroscope is loath to move with the machine and out of its spinning plane. Thus it is made to exert pressure on certain controls which are coupled up to the elevators, ailerons and rudder of the machine, and moves these air controls in such a way as to overcome the movements the machine tries to make.

have been used, but in view of the fact that the machine is always up in the air, and therefore is only separated from the transmitter by air, there seems to be no bar to the distances over which control will eventually be obtained.

And, this leads one to think of all the other possibilities of the radio-controlled

Finding Faults In HOME-CONSTRUCTED SETS

In this special article the chief faults of home-made sets are discussed and methods of tackling them are suggested and explained.

IN nine out of ten cases it is probable that the faults you will have to tackle will be fairly simple ones.

If the set has already been working satisfactorily—and I am going to assume this first of all—then you want to look for what one may term the obvious things. My own experience, extending over a number of years, is that petty faults are the ones which are the most mystifying and give rise to the most trouble.

IS THERE A DUD?



Removing the valves in a superhet so that the circuits can be tested and the valves checked over for characteristics.

Let us assume that you are called upon to diagnose a fault in a set which the owner tells you has suddenly faded away into silence.

For months he gets good results, and then, on switching on one evening, finds to his utter astonishment that the receiver will not give a sound.

Look Over the Aerial and Earth.

Well, don't start tearing the set to pieces straight away, because you may find that after hours of wasted work it will turn out to be something which you should have discovered in a few minutes. For example, suppose the set in question is an ordinary straightforward design intended for use with a conventional aerial and earth. This is where you should make a start. Check over the aerial and earth leads from the points where they enter the room and trace them as far as their respective terminals or plug-and-socket connections on the set. Make quite sure that the leads are undamaged and that they are connected properly to their terminal points.

If the aerial is of the outdoor type go outside the house and have a good look

at the horizontal and lead-in portions. Leads-in, in particular, have a habit of shorting on to guttering and similar objects which may be earthed.

Incidentally, although it is advisable to check over the earth you must remember that a fault here is not likely to reduce a really sensitive set to silence. It may, and probably will, cut down the volume by an amount dependent upon the type of set, and moreover, it will make a readjustment of the tuning necessary.

In the case of a small set, say a two-valver hitched on to a poor indoor aerial, a disconnection in the earth system may cut down the volume so much that if the owner doesn't suspect the trouble and therefore readjust his tuning accordingly, he may quite easily get the idea that the receiver has gone completely dumb.

Check the Batteries.

Now suppose that you find the aerial and earth system O.K., what will you do next?

Well, if it is a battery design, get out your meter and take the voltages of the L.T. and H.T. batteries. The L.T. battery should show its full 2 volts with the set switched on. If the H.T. battery gives a reasonable sort of reading you can pass it as O.K. as far as reception is concerned. Make sure that all battery leads are electrically sound and that the H.T. plugs are making good firm contact with their sockets.

If the set incorporates a fuse in the H.T. lead, have a look at it. It may have blown. But if you should discover that this is the case, don't go any farther until you have tracked down the reason for the fuse blowing. You will appreciate the importance of this without my saying anything more.

When the faulty set is of the all-mains variety you won't be concerned with L.T. or H.T. batteries, but don't forget to look at the mains input fuses and any others that may be included in the circuit.

So far you have tested the aerial and earth, batteries, and fuses. Suppose these are all in order, what are you going to do next?

The answer is, make sure that the valves are O.K.

If the set has been brought to you, you will most certainly have replacements of a suitable type, although possibly not of

precisely the same characteristics. At any rate they will be near enough for purposes of test.

If you are called to the owner's house you will, if you are a wise man, take your replacement valves with you, that is, assuming that you have some idea of the type of set you are going to service.

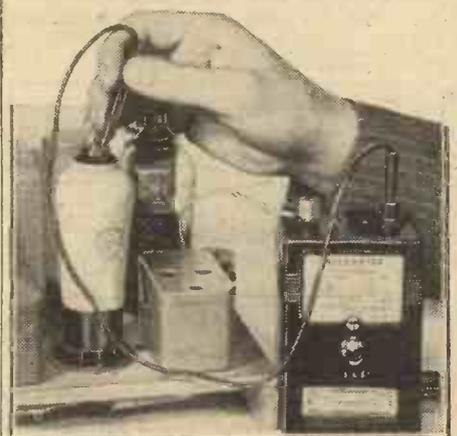
Verify the Anode Currents.

Well, then, take out the valves one by one, replacing each in turn with your spare. This is undoubtedly the quickest method when practicable.

The alternative method is to insert a milliammeter in the anode circuit of each valve in turn. The best scheme is to use a special valve tester consisting of a number of adaptors which are joined up to the testing panel by means of flex. One very effective tester is described in the article "Testing Instruments and Spare Parts." Another good scheme is to include in your kit a number of the special adaptor plugs obtainable from Messrs. A. F. Bulgin. These save a lot of time because they enable the milliammeter to be immediately connected into the valve circuit.

Failing this you will have to trace out the lead going to the anode of the valve you want to test, disconnect it from its terminal and insert your milliammeter. But first of all look at the valve itself to see what type it is. Then—you may know already, of course—find out from

AN IMPORTANT TEST



Measuring the anode current of a screen pentode by means of a Fico Rotameter.

the maker's list how much anode current it should take at the H.T. voltage normally used. Set your milliammeter scale

(Continued on next page.)

FINDING FAULTS IN HOME-CONSTRUCTED SETS

(Continued from previous page.)

accordingly—assuming you are using one of the multi-range meters.

Then with the milliammeter in circuit switch on and note whether a reasonable reading is obtained. If there is no reading at all, either the valve or a component in its anode circuit is faulty. Test the other valves in turn and remember that failure to obtain a reading with any of them will probably in the case of a mains set indicate a dud heater circuit.

A Matter of Continuity.

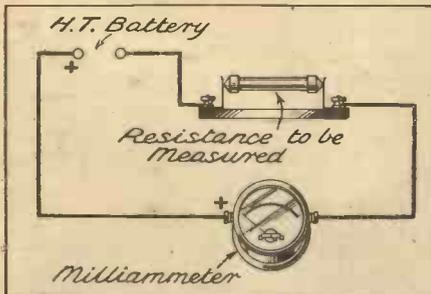
Returning to the first instance, viz., no reading on the meter, the trouble is more likely to be a dud valve than a component fault, but it is worth while disconnecting any resistances or chokes in series with the anode and testing these for continuity.

The modern multi-range meter is usually provided with a ready means of testing for continuity. For example, the Pifco "Rotameter" incorporates a small dry cell and a resistance-measuring scale with which you can immediately tell whether a winding or resistance is defective.

Another useful tester is a neon lamp in a holder to which is connected a length of flex terminating in a couple of test prods. It is, of course, only suitable in cases where the mains are available. The idea is shown in one of the sketches. You just plug the socket into a lamp holder and apply the prods to the two ends of the component under test. If the lamp glows the circuit through the component is unbroken.

We have now checked over the most likely causes of failure, and if everything so far is O.K. you may feel for the moment that you have come to a dead end. But don't let this worry you. Make a systematic

HOW MANY OHMS?



Using a battery and milliammeter to test a resistance. Start with a low voltage and gradually increase till a suitable reading is obtained.

search for broken wires or leads which have become detached from their terminals. Give any suspicious-looking leads a sharp pull—this sometimes locates an unsuspected fault. Go over the loudspeaker wires in case one of the leads to the input trans-

former has come adrift. These are all points which may produce complete stoppage of reception.

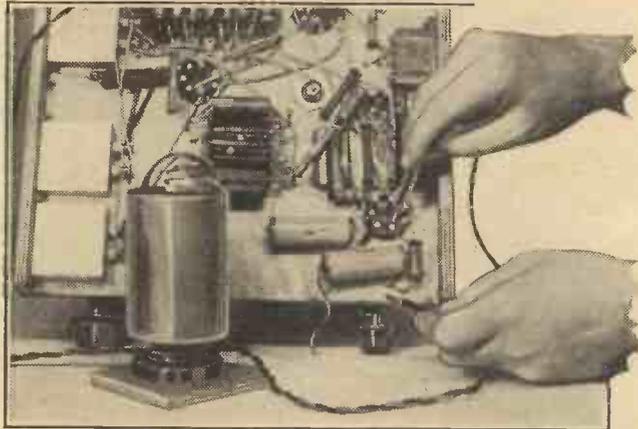
When you have checked over what I call the more obvious faults and have found everything in order, there is nothing for it but to make a thorough test for continuity throughout the circuit.

Disconnect The Components.

Starting at the aerial end and working towards the output, each winding and resistance should be checked over in turn. Remember that the only safe way of doing this is to disconnect the component from the rest of the circuit before applying the test prods. Otherwise all sorts of misleading results will be obtained.

Fixed condensers are not likely to give trouble from internal disconnections. The only time that there is much chance of this is when the owner of the set has used a pair of pliers for tightening the terminals, and from an excess of zeal broken the soldered wire away from the terminal shank inside the condenser casing. Such occurrences are uncommon.

TESTING THE INSULATION



The mains neon lamp is a fine test for continuity, or for insulation in some cases, though where A.C. mains are used care must be taken to disconnect any condenser that might pass the A.C. and so provide a misleading result.

Large condensers occasionally develop leaks, and although this is not the class of fault that one can say will produce complete and sudden silence to reception, it is as well to go over all by-passing capacities either with a neon lamp (on D.C. only) or the appropriate "resistance" scale on the multi-range meter in the ordinary process of continuity testing.

An internal short in a condenser can cause serious trouble, even though its results do not necessarily show up immediately. Up to the present we have only considered a case in which the symptoms are no reception. But the service man has to tackle many other types of faults. In fact he has to be prepared to put right every type of fault.

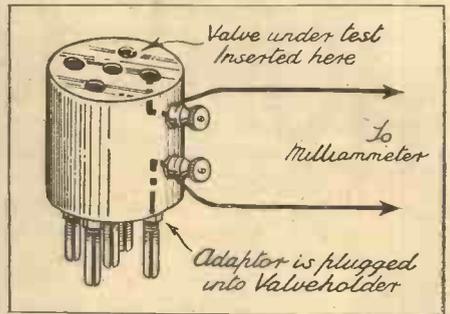
Layout Troubles.

Queer troubles occur at times in home-constructed receivers. Often these are due entirely to the constructor having used unsuitable parts or very old components which are not up to modern requirements. In the event of the service man receiving complaints of instability troubles, by which I mean howling, unnecessary oscillations, and so forth, it is advisable to go over the

layout. If the set has been copied from a published design the owner should be asked for the wiring diagram or blueprint from which the layout can be checked.

The experience of the "P.W." Query

FOR VALVE CHECKS



A Bulgin split adaptor, which is invaluable to service men.

Department is that a certain proportion of constructors will—no matter what warnings are given—invariably modify a published design.

Sometimes it is simply due to desire to accommodate the design in an existing cabinet. In others it is because the said constructor wishes to embody the most attractive features of one circuit with those of another. The result in either case is all too frequently failure.

The service man will meet with dozens of instances of this kind, and the only remedy is that of rearranging or rebuilding the set strictly in accordance with the published design.

Dealing With Ganging.

The modern receiver with ganged tuning control is not always immune from trouble. When the owner of one of these sets complains of "results not up to expectations," it is a sound scheme to check the ganging. One of the sections of the ganged condenser may be completely out of adjustment, or perhaps two of

the sections may be slightly out.

What is the best procedure to adopt? One method is to adjust by ear. The local transmission is first of all tuned in and an approximate adjustment of the trimmers carried out.

Then the set should be tuned to a weak station near the bottom end of the medium waveband and the trimmers once more adjusted until the best volume is obtained. After this the tuning knob is rotated to a setting towards the top end of the medium waveband and the ganging again checked over on a weak transmission.

A second method, and one which the service man will be in a position to adopt, is that of inserting a milliammeter in series with the H.T. supply to the anode of the detector valve and adjusting until maximum needle deflection is obtained on the incoming carrier wave.

If a milliammeter is connected in series with the anode of a detector valve, the needle will take up some steady reading depending upon the amount of current passing through the valve. The presence of the decoupling resistances or resistance L.F. coupling will often reduce the actual value

(Continued on page 504.)

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FINDING FAULTS IN HOME-CONSTRUCTED SETS

(Continued from page 502.)

below what one would expect from a perusal of the valve-maker's literature.

It is therefore advisable to use a milliamp scale giving a safe margin first of all, say, 0-10 milliamps. If the needle shows only a deflection of two milliamps you can safely switch over to the 0-5 milliamp scale.

The scale chosen should as far as possible give normal anode current reading with the needle about midway across between the minimum and maximum deflections.

Movement Due to Carriers.

Now when the set is tuned in to a station—the local—the needle will take up some position different from the steady H.T. reading.

If the set employs grid-leak and condenser (leaky grid) rectification, the new reading will be less than the steady H.T. reading by an amount depending upon the strength

fault. Moreover, the majority of mains designs are not easily overloaded. Distortion due to real overloading of the last stage does not take place until the volume

to take full advantage of the changed operating conditions of the valve.

The service man must bear these points in mind when dealing with L.F. distortion troubles. The last point concerns the output valve itself. Is it very old? If so, is its emission suffering through old age (or possibly through mal-treatment)? Measurement of its anode current or replacement by a spare will soon solve this matter.

The value of substitution in fault-finding work must not be overlooked. The actual fault in a component may be too slight to show up in many ordinary simple tests, but at the same time it may be sufficient to cause poor reception. Replacing, in such an instance, by a similar component known to be working properly may save considerable time in the end.

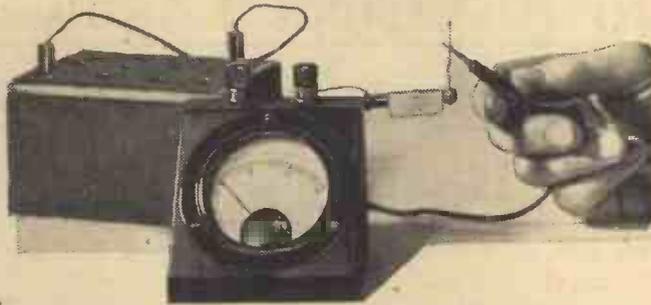
Dealing With Loudspeakers.

A typical instance where substitution can prove valuable is in connection with faulty loudspeakers. All sorts of faults which cannot be shown by, say, a continuity test can crop up in the speaker.

As a matter of fact it is a good idea to take a small permanent-magnet moving-coil speaker, provided with a well-tapped matching transformer, around with you.

And now I must close, and before doing so I would like to say that this article does not make any pretence of being a complete fault-finding guide. But I believe that it does contain a number of hints that service men—at least, those who are on the threshold of their careers—will find helpful. It

USING A MILLIAMMETER



A meter in use during a check of continuity and value of a high resistance. (See circuit on page 502.)

becomes much greater than for ordinary domestic listening.

So in the average mains set L.F. distortion is not very probable. Should it occur, suspect the bias resistances. Check these with the resistance scale on your meter, or by measuring the current passed through the resistance by a known voltage and applying Ohm's Law. There is also the possibility a by-passing condenser joined across one of the resistances may have developed a fault and so short-circuited the resistance. This is a point worth watching. Also make sure that the loudspeaker input transformer is correctly matched up to the output valve.

Pre-Detector Controls.

Sometimes what is thought to be L.F. distortion is really detector overloading, but there is no excuse for this with most modern sets, which are usually equipped with some form of pre-detector volume control.

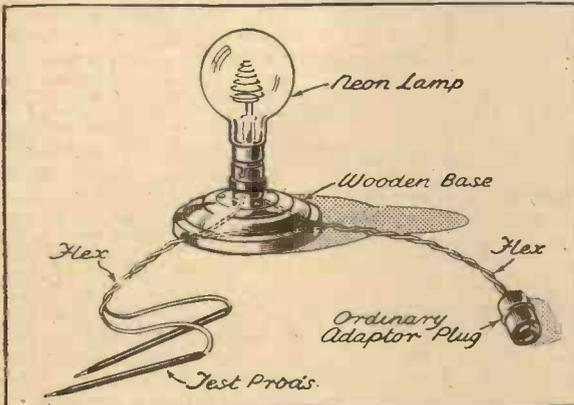
In a battery receiver distortion is more frequent because set owners often forget to renew their grid-bias batteries at the proper intervals, and also let their H.T. batteries run down too far, in which case the voltage at the anode of the output valve is inadequate.

The ordinary battery design cannot compete with a mains set as regards sheer undistorted volume. The use of the larger types of output triodes and pentodes in conjunction with mains eliminators overcomes the difficulty in many instances, but with H.T. derived from a dry battery the output must remain limited to what may be called "room strength."

Hence, to make the most of the means available it is essential to maintain the H.T. battery in the pink of condition, i.e. as near its maximum value as possible.

This doesn't imply that a battery set is useless directly the H.T. battery voltage has dropped below, say, 90 volts in the case of a 120-volt unit. But it does mean that the volume will have to be cut down a little by using the volume control if distortion is to be avoided on the loudest portions of the programme. Moreover, the grid-bias voltage should be reduced correspondingly in order

HOW IT IS CONNECTED



The circuit of the neon-lamp tester illustrated on page 502.

of the incoming carrier wave. This reading is therefore a measure of the sensitivity of the set, i.e. the louder the station the bigger the movement of the needle towards zero on the scale.

With anode-bend detection the reading increases with the strength of the carrier.

Therefore with a ganged receiver employing leaky grid detection a station is tuned in and the trimmers are adjusted until the maximum deflection of the needle less than the steady H.T. reading is obtained.

This can be used as a check on the aural method already described. The main difficulty, of course, is to find a milliammeter scale giving a sufficiently small maximum deflection.

Distortion From Overloading.

On the low-frequency side of the average receiver the most common trouble is probably distortion due to overloading or incorrect grid bias. In a mains design the grid bias and H.T. values will be fixed, the bias being automatically obtained by the voltage drop across the biasing resistance in the cathode circuit. Trouble is not likely to occur through incorrect bias unless the biasing resistance develops a

WILL IT FLOAT?



Two beads are up—and the third? Well, if it does not float there is something wrong with the battery.

is true that the troubles covered are of the rather obvious type, but these are the class which are met most frequently, and are therefore the most important ones. A.J.R.

B.B.C. RECEPTION CENTRES

by VICTOR KING

IN a recent article in "P.W." Mr. G. V. Dowding suggested that the B.B.C. should establish centres in the big towns for the purpose of assisting listeners to obtain good reception.

Now, while I am wholeheartedly in favour of the general idea of the B.B.C. doing something to improve the standards of reception, I think that the particular scheme outlined is fraught with danger, and rather than that anything on those lines should be attempted I consider it better that the B.B.C. should stick to its transmission in its same old sound but unimaginative manner.

Licences—Not "Radio Consumption."

There is no parallel between the B.B.C. and an electricity supply undertaking. It is a necessary part of the ordinary, common-sense distribution of power to make sure that that power is used to its best advantage, so that its consumption should always maintain an upward curve through increasing popularity and usage.

Electricity is a commodity, and the more of it that is used the greater will be the profits of the authority or company which manufactures it. The same cannot be said of broadcasting. The wireless waves created by a broadcasting station are not offered for sale, and it doesn't matter what kind of set or for how long it is used there will be no greater or lesser revenue accruing.

The revenue obtained from broadcasting results from a yearly fixed charge on listeners. It is the number of listeners which matters, not the numbers of hours those listeners use their wireless sets. I doubt whether the number of listeners would be increased by a problematical improvement in the efficiency of receiving apparatus, even if this were obtained by the B.B.C. instituting a series of pseudo-service stations, which I rather doubt.

Danger of B.B.C. Outlook.

Surely it is the quality of the programme material that creates the popular demand for radio sets and thereby increases the number of licences? That, and, of course, a downward trend in the cost of receiving apparatus. And I can assure you that there would be a reverse movement if the B.B.C. started in to lay down hard and fast rules and regulations for wireless receiving outfits.

Their engineers wouldn't be in wholehearted support of small pentode outputs feeding into small moving coils, even though these might fully satisfy the average listener. Just try to picture what

would happen at a B.B.C. Listener's Advisory Centre.

John Licenceholder calls in for a few pointers about his new set. He asks the polite B.B.C. technician what he thinks of the Y.Z. Mains Three. With a vivid picture of the Db. attenuation of the Nationals

.....
An article in which our popular contributor expresses some outspoken criticism of a scheme recently suggested in "P.W." Readers are invited to contribute their own views in the form of letters. In this connection we should like to draw the attention of all readers to the special prize offer on page 508.
.....

at 50 pp. and 8,000 pp., or whatever it is, and with a warm feeling in his heart for a 1 to 6 ratio of average to peak outputs, the B.B.C. technician could hardly consider that a serious query!

"—and I would advise an output of, well, something in the nature of eight PP5/400's in parallel push-pull and, yes, use a Colossus M.C. speaker with an eight-foot baffle. By the way, all the best listeners are employing 'tweeters' just now. No, should cost you a bit less than £100 the lot." Oh, yeah! Maybe I exaggerate a trifle, but no doubt you

could hardly give its O.K. to apparatus not capable of equally effective reception. Anyway, it couldn't be sincerely laudatory.

It could only act as something of a wet blanket in respect to "popular sets." The sets you and I and all our neighbours think to be good enough if not superlative. And how would the B.B.C. deal with questions regarding the respective merits of different makes of sets?

High Standards and High Prices.

It would all end, I am sure, with the B.B.C. trying to formulate standards for the industry to work to so that the B.B.C. could give its honest commendation to the products about which it would have to proffer advice and opinions.

And, as I have said, those standards would necessarily be so high that few would be able to afford to buy the sets built in accordance with them. Yes, I know the B.B.C. has in the past published circuits of quite modest sets in various of its publications. But that is quite a different thing from giving its tacit approval to complete manufactured instruments.

True, the B.B.C. centres need not deal with specific commercial sets, but could merely provide demonstrations of "ideal" reception installations. But what would be the good of that? Listeners would certainly flock to hear those outfits if the microphone were used for advertising them, but inevitably they would all want to know how and where to acquire similar sets. And it would be worse than useless to create a demand for which there would be no supply. The only result would be to make listeners dissatisfied with their existing sets.

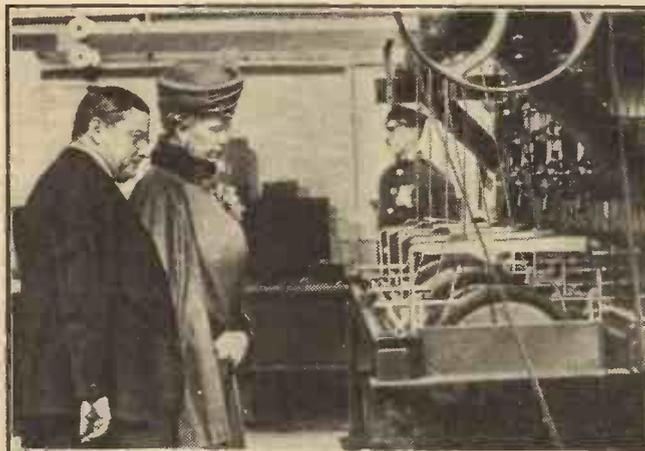
Leastways, some of them. Many would fail to be impressed. Those "ideal" sets would sound so different from their own that many might consider them to be rather poor. Such is the tolerance and adaptability and intolerance of the human ear!

Vital Psychological Aspects.

You see, radio reception has vital psychological aspects as well as those which follow the books of words. To sum up: The B.B.C. could never trade in sets unless these sets were to be constructed from B.B.C. specifications so that no bias in word or attitude should develop in favour of particular commercial interests.

It could not demonstrate radio reception on a wide scale and in that way serve any useful purpose unless details of the demonstrated sets were available so that they
(Continued on page 512.)

A ROYAL VISIT TO H.M.V. WORKS



This photograph was taken during a visit of the King and Queen to the H.M.V. factory at Hayes, and shows her Majesty displaying close interest in one of the factory processes.

see the drift. With its rightly rather smug feeling of triumph at being able to shake the ether with almost one hundred per cent quality of transmission (within the limits of the 9 kc. channels), the B.B.C.

RADIOGRAM TROUBLES

Some points to look out for when dealing with a faulty radio-gramophone.

OWING to its close relationship to the ordinary radio receiver, the radio-gramophone must inevitably be vulnerable to all of the faults that beset the older instrument. Therefore from the servicing point of view should any trouble be experienced with a radiogram while it is switched over to radio, the instrument can be treated in exactly the same way as if it were a plain radio set. That is fairly obvious, of course.

But there are a few faults that the radio-gramophone may develop which are peculiar to this instrument—pick-up troubles, spots of bother with the motor, and so on.

Many of these faults are purely mechanical and do not need any electrical knowledge to remedy them. Here's a typical example.

I was called in by a neighbour to have a look at—and listen to—his commercial radio-gramophone of excellent make, but which was misbehaving itself in a cruel fashion.

Lubricating the Motor Parts.

He explained the motor made a noise, and switched it on to show me. The gramophone played through the "demonstration" record perfectly!

We tried again, and again no fault evidenced itself. At the third time we were lucky; soon after switching-on, the gramophone motor evidenced most distressing noises—grunts and clatters that shook the motor-board, while the turntable movement was most erratic.

On the whole, however, the phenomenon was rhythmical, and so, as the motor speeded up after each noise, to be suddenly slowed down when the grating started, the governor was suspected. The back of the set was removed, and in a few minutes the trouble had been cured—just a spot of oil on a dry fibre pad in the governor.

Whenever a gramophone motor evinces an inclination to run unevenly, have a look

at the governor (if the motor has one). A spring may be weak, or the pad may want oiling. Next have a general run round with the oil-can and the grease—special gramophone grease should be used—and make sure no portion that should be oiled or greased is lacking in lubricant. And, by the way, Dr. Roberts has a few valuable things to say *re* motor servicing in his notes this week.

But motor trouble is not nearly so likely as some difficulty or other in the "sound" side, such as the pick-up or the amplifier. The latter type of trouble has been dealt with in previous pages, but there are one or two faults that are not uncommon and which are concerned with the pick-up and its connections.

One of these is hum, not *always* confined to a mains set. Battery receivers in houses with electric light sometimes suffer from it. It is usually due to long pick-up leads, and if the set is silent on "radio" but evinces hum on "gramophone," you can look to the pick-up leads as a likely cause.

Screen them carefully, as shown in the diagram. This operation holds for mains sets, too, except that the terminal shown marked L.T.—will be replaced by E. In mains sets, too, the need for earthing the frame of the motor, as well as that of the pick-up, is even greater than it is in the case of a battery-operated receiver.

Another fault that occasionally crops up is the sticking of the needle armature to one side or other of the pick-up. This results in a nasty buzzing noise on reproduction and very distorted bass notes. Gentle plucking of the needle one way and then the other, when the set is on, will show if the armature is sticking. In one direction a good "round" sound will be heard when the plucking is carried out, and in the other it will sound thin and probably not so loud.

Pick-up Adjustment.

The cure is the return of the pick-up to the makers. It will probably need new rubbers for the clamping pads, and these are not easily fitted unless by an expert in pick-up mechanics; it may be a tricky business.

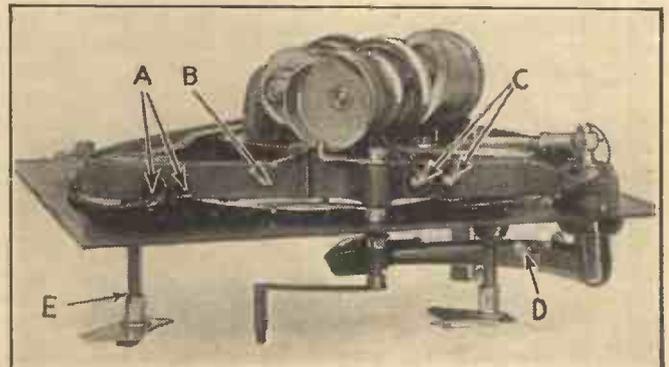
Other things such as slipping motor drives where band-driven turntables are used, rattles due to loose screws, maladjustments of automatic brake-stops, etc., are obvious faults easily found and remedied.

Where the cases of slipping drives are to be found it will generally be noticed that besides a certain amount of vibration which may be aural, or may only be detectable from touching the motor board lightly, the reproduction of a record will vary in pitch due to variations in the speed of the turntable.

Turntables that Slip.

Such slipping may sometimes be due to the actual turntable slipping on the spindle due to a misfit between it and the turntable. This is not a fault that is likely to develop after use, but is occasionally found in new

A TYPICAL AUTOMATIC CHANGER



Points where an automatic-changer unit may need attention. See that connections of pick-up at C are tight, that mains contacts at A are secure, that the earth at B is made, that the pick-up adjuster, D, is correctly operating, and that the "lifts," E, are not sticking.

motors, and may not evidence itself until the motor has been run a few times.

In the illustration of an automatic record changer several points that may need attention have been marked. In the first place there are the terminals A, where connection is made to the mains. This connection should be absolutely tight, and screened wire should be used if there is any trace of hum which appears to be due to the gramophone side of the set.

The Importance of Earthing.

B is a separate earthing terminal or screw that is supplied with the Garrard unit, and to this screw must be connected a wire going to the earth of the set. If this wire makes poor contact it will be a probable cause of any hum that may have "appeared" in the radiogram.

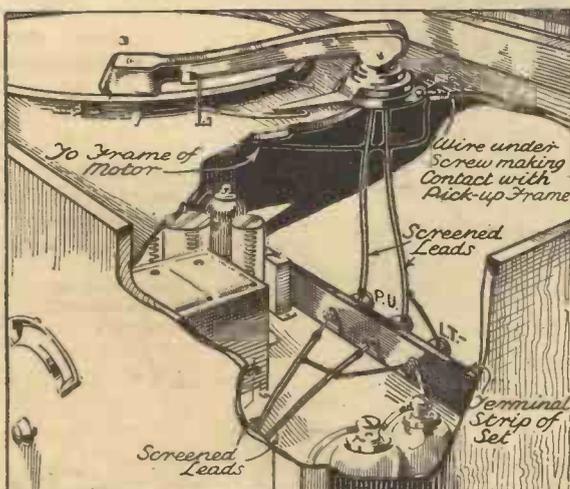
The terminals C are for the pick-up, and of course these connections must be perfectly tight.

Where attention may be due in an automatic gramophone changer is the point D. This is the screw that is used for the adjustment of the point of drop of the pick-up head for ten or twelve inch records. Normally sent out perfectly adjusted, it is not unknown for the user of the unit to loosen the screw D inadvertently.

Where the letter E is placed is the spindle that comes through the sleeve round the lifting arms for the changer. Sometimes these arms will stick and not allow the record to drop properly. In such an instance a little oil will soon put matters right.

K. D. R.

PREVENTING HUM



This sketch shows places where screening and earthing may help a great deal to stop a hum on the "gramophone side."

WHAT READERS SAY

The Interrupted Shave—A Popular Station—The "Comet" Three—From Crystal to Valve.

THE INTERRUPTED SHAVE!

The Editor, POPULAR WIRELESS.

Sir,—The most interesting radio experience I ever had was while shaving!

I had got up one Sunday just after Christmas determined to spend the day with a two-valve S.W. set, W. L. S. specification, I had made.

All the morning I sat with the 'phones on, logging 20-metre amateurs. Dinner was rushed, and back I went to the set. I had not even shaved. Then the trouble began.

Visitors were expected; I wasn't respectable. I must shave, change my clothes, etc. And so, with a sigh, I took the 'phones off. Then I had an idea. I ran two leads from the S.W. set to my "broadcast" set, the "S.T.600," and swung the S.W. set's dial till I heard the loudest musical programme on the speaker.

I started to shave, and was standing with razor poised when the music stopped. Then a voice, audible all over the room, said, "This is V K 2 M E (Sydney, Australia) calling." It was half an hour later before I finished that shave!

Accidental, perhaps, but how typical of short-wave work!

Yours truly,

C. B. RAITHEY.

Rippingale, Bourne, Lines.

The above letter is awarded our prize of one guinea as the one which, in the opinion of the Editor, is the most interesting. For full details of this prize offer see page 508.

A POPULAR STATION.

The Editor, POPULAR WIRELESS.

Sir,—I have often wondered which broadcasting station is the most popular with the keen listener.

Probably many fellow-readers will agree with me when I award the crown of popularity to the famous Dutch station, Hilversum. Its excellent light music

is beyond comparison: the transmission has a pleasing resonance, and punctuality is characteristic of its programmes.

Delightful intermezzi gramophone concerts combine to make a programme of a hundred per cent interest and enjoyment. It would be interesting to hear fellow-readers' views.

Yours faithfully,

F. A. BEANE.

Ridgewell, Essex.

THE "COMET" THREE.

The Editor, POPULAR WIRELESS.

Sir,—I am a reader of your paper and have been for about six years. Well, I am going back to the "Comet" Three days. That set took us constructors by storm. It was truly a "comet"! I built it right up to the pick-up stage—for, as you know, it came out "in three parts." First the body, next was the tail; with filtered output and pick-up. You may remember that it was flexi-coupled; but I took that out and put a small tapped coil by the side of it, and it proved very efficient. I "gave" the set to a friend. He still has it going strong, even now.

Well, to give a bit of information to the boys. I came across the blue print in an old bookshop in Southend, three years ago, of a six-valve A.C. super-het. No doubt you have heard of it—the A.C. Super Sixty. But I had no "book of words," so I had to work only by the blue print. But it was quite O.K. I always clean it up every year and rewire it, etc. This year it let me down after I had switched on. The set went all right for a few moments, and then distorted badly. I went over the usual routine, from aerial to earth, but could not find the fault. But I noticed one thing, when I tested for L.T. A.C., I only got a reading of 3 volts instead of 4. I suspected the 22-gauge tinned copper wire, so rewired the feed from the transformer to condenser with 18-gauge. I got my 4-volt reading, but also more distortion. I tested all valves for shorts, from pin to pin, but O.K. I then heated the filaments from a 4-volt battery and lo and behold, the first I.F. valve "screened grid" showed a dead short from grid to cathode! A new valve brought the set back to normal.

I am, yours, etc.,

ARTHUR YOUNG.

2, Newquay Terrace,
Fencepiece Road, Barkingside, Essex.

FROM CRYSTAL TO VALVE.

The Editor, POPULAR WIRELESS.

Sir,—I am writing my first letter to my favourite radio weekly, which I have read since 1923.

In those far-off days we used to have great times with our home-made gear. Silver paper and cardboard for variable condensers, pencil line grid-leaks, etc., etc. We, with but little money to spare, enjoyed it much more than the fans lucky enough to have money to burn. A great favourite crystal set I used, when we had a broadcasting station on the old 2 L.O., was one I used with no aerial.

I notice in "P.W." a firm advertising "Neutron" crystals! I thought crystal sets had gone for ever? It is years since I saw one. I still have several makes of crystals in the junk box.

Then followed one-valve sets, two-valve sets, and so on. For a long time I used a valve and crystal reflex set which gave splendid results, although a bit tricky at times; but for distance it was hard to beat. To this reflex I added another stage of transformer coupling. Great stuff that was! Then on to S.G. sets, followed by pentodes.

My favourite now is a S.G., detector, pentode, using eliminator and trickle charger—all home-made. I still use an old Brown loud-speaker unit, not yet having managed to run to the length of an M.C. speaker, funds still being low.

I prefer the baseboard to the chassis, it being easier to get at the "works" when necessary, providing, of course, components are carefully arranged and screening paid attention to.

I wonder how many of your readers have been puzzled over the silence of a carefully-built set, and only after long puzzling have discovered 'phone tags still lying on the floor?

A few grouses! Why are transformer terminals still placed in awkward corners? Why are valve holder bolts not "set in" with square heads to prevent turning? Why are coil terminals so irritatingly small, and fine coil wire soldered straight to tags on bolts? A small piece of thicker wire should be used here to prevent being easily broken. All sets should be automatically grid biased. I never now use a grid-bias battery.

In conclusion, I have never built a set that refused to function. Only once did I have a transformer breakdown (it was a cheap French make). I hope to see other readers' letters in "P.W.," especially from the old hands, and from some who have had strange experiences during their "wireless hours."

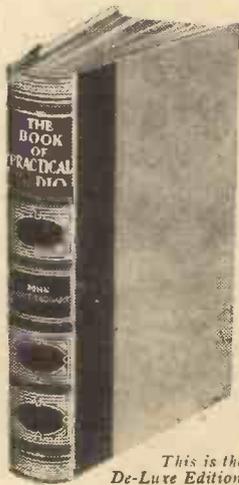
With best wishes for continued success of an old friend, "P.W."

Yours sincerely,

W. O. GENT.

43, Stenhouse Place East,
Edinburgh, 11.

Send your letter in now and tell others of your experiences.—Ed.



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The ARGOSY Magazine

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 M.S.S. 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 Office, 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

TAKING THE REGULATION CURVE OF A MAINS UNIT.

E. G. (Windsor).—"I have got a good milliammeter, and a good voltmeter. But as you know, the latter cannot be relied on to measure the voltages from an eliminator, because the current taken by the instrument when measuring decreases the voltage delivered.

"So I tried to get a 'regulation curve' for this mains H.T. unit, only to find that the firm has now given up making them. Can I draw up the curve for myself?

"I like 'messing about' with the instruments and drawing graphs, etc., so if you could suggest a simple way of going about it, with connections, I should like to try and make a permanent chart of the voltage to be expected at various loads.

"I've got lots of time, enthusiasm, and odds and ends of components, so what do you say?"

We say "go ahead," for a regulation curve is not at all difficult to draw up, and should prove very useful indeed.

Apart from the milliammeter and voltmeter, to measure what is happening, the chief requirement will be a variable load. Resistances will do, if their ratings can be relied on. But a more interesting and probably more convenient load can be obtained from a good hefty power valve and grid-bias battery.

By "hefty," we mean one that takes a really big anode current. With grid bias we can reduce this to various currents, thus supplying the required variable load.

You will need to have the valve mounted in a valve holder, a switch for the L.T. (this is important) and a large grid-bias battery with plenty of tapings. Either a mains valve or a battery valve will do, but if it is to emerge undamaged its switching must be carefully done, for the reasons given later.

Connect the G.B. battery's negative lead to the power valve's grid terminal. Its cathode or filament will be connected to G.B. +, and to the - of the mains unit via the milliammeter.

Taking the mains unit as starting-point, the full H.T. circuit (excluding any instrument switches) will be as follows: The - terminal of mains unit to - terminal of the milliammeter; + terminal of milliammeter to filament (or cathode) and to G.B. +, as well as to - terminal of the voltmeter; and finally + terminal of the mains unit to + terminal of voltmeter and to the plate terminal of valve holder.

If the valve's L.T. is switched off the only load on the eliminator will be the voltmeter itself. Then with L.T. "on" a high bias voltage will permit a small current to flow, which can be increased by decreasing the bias, step by step, until large readings are obtained on the milliammeter.

The L.T. switch must be used before and after every alteration of grid bias. The correct procedure, when drawing up the chart, is to switch off L.T., replace bias plug, switch on L.T., take new readings, switch off L.T. again, and so forth—never move a bias plug when the L.T. and H.T. are both on.

The curve will prove to be easily drawn, and probably nearly straight; arrange the voltmeter readings up one side, and milliammeter readings along the bottom.

Half a dozen readings, well spaced, will enable you to record permanently how much voltage drop can be expected as the loads on the milliammeter are increased.

WORKS BETTER WITH THE SCREEN OFF.

T. G. F. (Halifax).—"Not being satisfied with results on the weaker stations, I suspected something wrong with the intermediates, and overhauled them thoroughly. Nothing wrong so far as I could see, but there was a curious sequel.

"Coming back to attend to the set after an interruption, I was pleased to find it going quite a lot better than before when the really distant stations were tried for. And after making sure of this I found that the cause, apparently, was that one of the screening covers had been left off.

"Replacing it definitely brings the sensitivity down again. But working any of the

ONE GUINEA FOR A LETTER!

AN INVITATION FROM THE EDITOR TO "P.W." READERS

I WANT readers of "P.W." to help each other. I want them to use the columns of this paper to express their views on all and every aspect of the great hobby of radio; I want them to "swap" experiences; I want them to tell about their triumphs—and their failures—with the various sets they have built. I want, in short, to encourage an exchange of views, opinions, likes and dislikes. . . .

Send me letters for publication, in order that "P.W." can become, more than ever, the best medium for imparting all kinds of knowledge about radio.

YOU must have had, many and many a time, interesting experiences when building or operating your set. Tell other readers about your radio experiences. And, incidentally, get to know each other through the medium of "P.W."

For the best letter out of each batch published I am offering a prize of one guinea. Send your letters to the Editor, "Popular Wireless," Tallis House, Tallis Street, London, E.C.4.

other coils without their screens has the opposite effect, and throws the set out.

"I even tried changing this unit over with its fellow, but in either position the best results are obtained when the cover is left off. What is the cause of this?"

Whatever the first cause may have been, the important point is that placing the cover in position gives rise to a mistuning effect. And it is therefore better that the coil should be left without a screen over it.

It is a matter of common experience that a screen placed closely over an oscillatory circuit often affects the tuning; but in the case of matched coils, all having screens, any alteration caused by the removal of a screening cover from one unit should throw it out of tune with its fellows. Your coils must have been wrongly adjusted or mis-matched, and the discrepancy is wholly or to a great extent overcome by removing the screen, so we should leave it off.

HUM WHEN TRANSFORMER IS MOVED.

R. G. (Ilford).—"I was always under the impression that whereas you had to be careful with H.F. wiring, it was generally quite a different matter with L.F., which could be shifted around anywhere within reason without causing trouble.

"My experience with an L.F. transformer is therefore all the more puzzling. All I want to do is to mount it underneath the baseboard (shelf) it is on, instead of being on top. But it hums every time.

"The wires are in almost exactly the same position, and not more than an inch and a half longer, but the hum is very pronounced. Can I do anything in the way of decoupling, do you think, to enable me to have the transformer below the shelf instead of on the baseboard, as at present?"

We do not think that the altered wiring is at fault so much as the new position in which the transformer finds itself. Are you sure you are not bringing it too close to a mains unit, or other wiring which has around it a varying magnetic field due to mains current?

We suspect that some such cause is at fault, and the best way to prove this is to fit the transformer with rather long temporary flex connections, and then try the effect of moving it into new positions in the lower compartment; or alternatively of moving any mains transformer or similar component there which is so close to the new transformer position that it may be introducing the hum.

It should be possible to find a place, in this way, where there is no trouble from hum; but patience may be needed, because sometimes small alterations have large effects. Remember, it is always worth trying the effect of reversing the primary (or secondary) connections in such a case as yours.

VOLUME CONTROL FOR PICK UP.

S. D. (Thame).—"There is no distortion on 'radio,' but since I fitted the pick-up I find I get harshness on the louder records, so I want to put a volume control on the pick-up.

"I can get one, 50,000-ohms. Is this right, and what are the connections to the three terminals?"

A value of 50,000-ohms is suitable unless the pick-up makers definitely specify some other value. The connections are very straightforward.

One lead from the pick-up goes to one of the outer terminals of the potentiometer. The other pick-up lead goes to the other outer terminal of the volume control.

Its slider terminal is connected to the radiogram switch (in place of the pick-up lead formerly connected there, but which is now disconnected and joined to the potentiometer instead). The other pick-up lead's original connection to grid-bias battery remains unaltered.

CHECKING A VALVE'S AMPLIFICATION FACTOR.

E. H. W. (Newcastle-on-Tyne).—"Is there any way in which an amateur can check for himself the amplification factor of a valve that he owns?"

"I know it can be calculated, obtained from the leaflets of the makers, etc.; but can it be actually measured on ordinary instruments, so that any valve about which there is uncertainty can be tested for amplification?"

There is no difficulty in checking the amplification of any given valve if means are available for accurately recording plate current, and grid and plate voltage changes.

As you doubtless know, within the working limits of its plate voltages the plate current will be found to vary with plate voltage—the higher the voltage the greater the current.

Similar variations in the plate current can be attained when the plate voltage is left set at a given value, but the valve's grid bias is altered; but a small change in the voltage on the grid will be found equal to a larger change of anode voltage, to produce a given alteration in the anode current.

When the small grid voltage change is divided into the larger plate voltage change, the amplification given by the valve is determined; so a valve can easily be checked in the following manner:

Suppose that under working conditions the plate current at 100 volts is 2 milliamperes; and it is found that alteration of the plate voltage to 60 (leaving everything else as before) reduces the current to 1 millamp. Make a note that a 1-millamp change requires 40 plate volts.

Without further alteration, restore the plate current to 2 milliamperes by altering grid bias. If it takes 2 volts to do this, divide the plate volts alteration by that of the grid volts to check the amplification. In this case 40/20, which is the amplification factor.

(Continued on next page.)

RADIOTORIAL QUESTIONS & ANSWERS

(Continued from previous page.)

DIFFERENCE BETWEEN ANODE AND CATHODE CURRENTS.

P. E. V. (Hollinwood).—"At first I thought something might be wrong, because the anode current shown by the milliammeter was smaller than the current flowing in the cathode lead. But perhaps this is accounted for by the extra current flowing via the screening grid?"

"If so, it is not the anode current only that is available for producing automatic grid bias, but the combined anode screened-grid current? And the bias developed will be greater than would be caused by the anode current alone flowing through the resistance?"

Yes, you must take into consideration any screens as well as the anode, since the bias developed across a cathode-lead resistance will depend on the valve's total H.T. current, whether flowing via anode or screen.

If, for example, a 1,000-ohms resistance were in the cathode lead of a valve which had an anode current of 2 milliamps, and a screen current of 1 milliamp, the bias developed across the resistance would be $1,000 \times .003 = 3$ volts—not 2 volts, which would result from considering the anode current alone when multiplying the ohms and amps.

YOU MUST LISTEN TO RADIO PLAYS

(Continued from page 497.)

"Finally, start at the beginning and leave off at the end! Don't crash in five or ten minutes after the play has been on the air—that is just as likely to lead to disappointment as arriving at a theatre during the second act!"

I hope you find these hints valuable. Coming as they do straight from the Drama Chief they have considerable interest, certainly. And they show that he does not stop at broadcasting plays; he listens to them, too.

Nor is Mr. Gielgud resting on such laurels as may have been grudgingly bestowed upon him during the past season. He is full of plans for a big autumn series.

Judging from his hints, I should say the so-called lowbrow will be more than usually well catered for. Such plays as Edgar Wallace's "On the Spot" and "Sapper's" "Bulldog Drummond" will be included. So will Priestley's "Eden End" and Somerset Maugham's "The Circle."

"No, we are not worrying about television just yet," smiled Mr. Gielgud, as I left. "In the end, when television is as widely distributed as sound broadcasting, it will have its effect on radio drama, of course. But meanwhile—!"

I understood.

THE LINK BETWEEN

By G. T. KELSEY.

I AM glad to observe from one or two of the latest set releases that the manufacturers do not consider that we have yet reached finality in the matter of tuning dials. I am afraid that in some respects this particular aspect of set design is rather a fetish of mine, for the plain truth is that I have an abomination for skimpy dials. I do like to be able to see what I am doing, and in those not altogether uncommon cases where the pointer or other indicating device points to the names of about three stations at once, I always have thought that

it would be far less confusing to omit the station names altogether and just to leave the scale calibrated in wavelengths.

Fortunately, that criticism does not apply to many of the modern sets, and taken all round modern dials are entirely satisfactory. And the tendency at the moment seems to be to improve upon the present high standards. Well, it's all to the good, for in the hands of the unskilled listener the dial means everything, and even the skilled ones, I suspect, are quite partial to "a bit of jam on it" when it comes to tuning. At any rate, I am, and I am honest enough to admit it.

I suppose it is my weakness for ingenious dial devices which has made me take so kindly to the latest effort by Corsor, although it is my firm belief that the idea is so very original and, more to the point, it is so obviously efficient, that it would instantly appeal to anybody who examined it.

The makers call it "thermometer tuning," presumably because a rising and falling "column of mercury" is used to indicate the station names. The station names and wavelength settings are tabulated up the side of this clever "thermometer," and one of the obvious advantages of the scheme is that it is impossible for the rising and falling column to be opposite the name of more than one station at any given instant. Extreme tuning accuracy is thus ensured, and the device must greatly facilitate the selection and identification of distant stations. Trust Corsor to set the pace!

If you haven't yet examined this latest tuning scheme, take my advice and call in at your local Corsor dealer's shop when next you are passing. You have my word for it that it will be time well spent.

A Television Topic.

The fact that the forthcoming television service is to be established on ultra-short waves is no doubt a happy solution to a very difficult problem, but we may as well face the facts and realise that it is not going to be all child's play on the receiving side.

The design of receivers for ultra-short-wave reception is not in itself such a formidable task. But the difficulty arises when it comes to trying to design apparatus for the reception and uniform amplification of a band anything up to 2 megacycles in width.

Apart from the fact that it will call for some entirely new ideas in ultra-short-wave receiver technique, it is apparent that the question of losses will have to be studied very much more closely.

Having regard to this last mentioned fact, I am glad to give prominence to the news that B.T.S. has succeeded in producing a new low-loss high-power-factor dielectric material which henceforth will be known as "Megacite," and which is a particularly efficient insulator where the higher frequencies are concerned.

An official of B.T.S. tells me that this new material is already being used by them in the manufacture of their ultra-short-wave coils, holders and chokes, and that it is to be used by them exclusively in the production of a new and wide range of ultra-short wave components which are to be released at an early date.

Well, that is a move in the right direction, and I congratulate B.T.S. upon their enterprise. I only hope that some of the other manufacturers will spring a few ultra-short-wave surprises on us in the near future. We can certainly do with them, for I shouldn't like to have to build a complete television set with the limited number of components available at the present. However, perhaps they are all waiting for the "Show," in which case the sooner the Show arrives, the better it will be for all concerned.

ROBOTS OF THE AIR

(Continued from page 500.)

aeroplane, for it is a romantic enough subject and has often been exploited by authors of sensational fiction. The dropping of bombs on an enemy ship at sea is an obvious use which immediately springs into the mind.

But one has only to remember that perfected television is not far away for a whole host of even more amazing possibilities to rush through the mind. Imagine a radio-controlled aeroplane equipped with numerous bombs and with a television transmitter permanently focussed on the spot of ground immediately below it.

With Infra-Red Rays.

No longer need the machine stay within sight. The operator could follow its progress along a mapped-out course in front of him at the aeroplane's base. He could watch for the objective to come into view in the television screen, and would simply have to

press a button to release bomb after bomb right on the target, perhaps 20 or 50 miles away. Who knows?

And we can let our imagination run farther to the time when infra-red television is also perfected. Equipped with this the radio-controlled machine will be able to fly with amazing accuracy even in bad visibility.

As a reconnaissance machine and a spotter for artillery work it will be ideal. Even haze and mist which would obscure the ground details to a human observer will be transparent to the infra-red eye of television, and will but serve to hide the machine from the anxious eyes of the enemy anti-aircraft gunners.

Of Immense Value.

It is almost terrible to dwell on the future possibilities of such inventions in war-time, but there is the compensating feature that they can prove of just as much use in saving life in peace as in destroying it in war.

Think how infra-red television may one day aid the pilot of a giant air-liner forced to make a landing in obscuring mists. Truly, peace hath her victories of no less renown than war.

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NEW WEARITE COIL

Universal Inductance at a competitive price.

THE introduction of a new coil by Messrs. Wright & Weale, Ltd., is an event of considerable importance as all home constructors will agree. It is not so much the rarity of the event as the fact that new "Wearite" coils are obviously produced at discriminate intervals and only when there are technical developments or considerable price adjustments to be communicated.

It is not difficult to recall some of the previous "Wearite" coil innovations, such as what were probably the first complete superhet coils for home constructors, the introduction of inexpensive dual-range coils, those first-of-their-kind screened types for general purposes, the inexpensive and effective iron-cored coils, and so on.

The latest, the one which forms the subject of this review, is a universal coil. It is a very neat and compact screened coil unit selling at the most attractive price of 5s. It is named and listed as the "Unigen," which is obviously a clever contraction of "Universal-General Purpose."

The Circuit Can Be Varied.

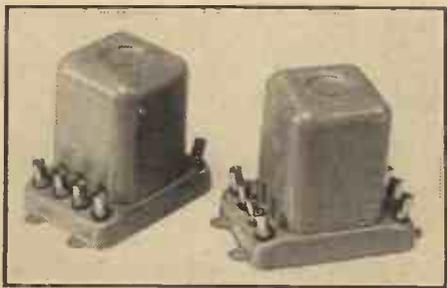
It includes separate medium- and long-wave aerial windings as well as a tapped-grid winding and reaction. The aerial coupling scheme is excellently arranged and is probably the most important feature of the new component.

Practically all readers will have had first-hand experience of the need for a high degree of selectivity in order to cope with modern ether conditions, and they will all be aware that selectivity and sensitivity are two qualities which are very much inter-related.

Normally, those who, because of their local conditions or their station-getting requirements, do not meet the need for as high a degree of selectivity as others are handicapped by the fact that mass-produced components must necessarily cater for the worst as well as the best conditions. They have to lose a certain amount of sensitivity in many circuit arrangements because of the greater selectivity required by the less fortunately placed.

But the new Wearite "Unigen" coil can fully satisfy the individual needs of all. By varying the aerial connection to one of these coils employed in an aerial circuit you can change over from a separate aerial winding with its maximum selectivity to the

VERY FLEXIBLE



Two of the new universal coils that have just been placed on the market at 5/- each.

tap on the grid winding with its maximum sensitivity or vice versa. It is a simple matter of terminals.

The coil is designed in accordance with the requirements of the R.C.M.F. standards, and the inductance of the medium-wave winding is 157 microhenries and that of the long-wave winding 1,900 microhenries. Together with a standard 0005-mfd. variable condenser, wave ranges of 180-550 metres and 750-1,950 metres are covered. Each coil manufactured is matched to within one half of one per cent of the standard in order to ensure efficient ganging.

"Sets A High Standard."

It is truly a universal coil, for it can be used as a single aerial tuner, as an H.F. transformer following either ordinary S.G.'s or variable-mu valves, or two of them together as a band-pass unit.

We have no hesitation in saying that the Wearite "Unigen" is a very good coil indeed, and sets a high standard for universal coils of any price, let alone at the modest five shillings at which it is listed.

Using the separate aerial windings, there is good selectivity plus an absence of break-through with a sensitivity exceeding that which normally obtains in similar circumstances.

Readers will undoubtedly meet the "Unigen" in forthcoming "P.W." designs. In the meantime, there must be many possessing sets which would be considerably improved if their present coils were replaced by "Unigens."

ON THE AIR

(Continued from page 498.)

been grateful to Maggie Teyte for the suggestions contained in her bouquet of old-fashioned memories. They must have envied, too, her rich tones and clear enunciation. Two short songs that I particularly liked were "The Night Has a Thousand Eyes" and "Forethought." Edmund Waller's poem, "Oh, Lovely Rose!" was exquisitely sung, as were also the other Songs of Memory.

When 66 per cent of a music-hall bill is good comedy, we haven't much to complain of; and when this 66 per cent is itself 100 per cent comedy, we have nothing at all to complain of. I welcome these music-hall bills with their four or five comedy stars. The "Clever Daughters of Mrs. Waters" should top every bill they appear in; so should Clapham and Dwyer, and Tommy Handley. But when they all appear in one bill, there's a bit of a teaser for somebody.

Gert and Daisy are always faultless. They never put over old gags. I love them when they talk of neighbours; they have a swell one at present. "Butcher calls six times a week, once with a scrag-end and five times for the money." That's typical. Their songs, too, are always clever. Compare them with those of second-rate artists. They have a beauty now on "Smells," and a marvellous version of "Won't you buy my pretty flowers?"

And I mustn't forget their lovely dig at those weighing-machines that, besides giving your weight, tell your fortune as well. Listen to what Gert got for a penny. "Weight, with coat, 10 st. 1 lb.; affectionate, clinging and easily led. Without coat: weight, 9 st. 11 lb.; domineering, self-willed to a point of obstinacy."

I was pleased to hear Clapham and Dwyer on the air again after a long interval. They put on an act that seemed to be about everything under the sun. As outside broadcasters they were at their best, attempting everything the B.B.C. has yet done.

I always enjoy hearing Anona Winn. She has a beautiful voice and can sing a difficult song really well. Her latest trio of songs is about as good a lot as she has ever sung.

Listening to the running commentary of the Royal Air Force Review from Duxford Aerodrome, I thought I had at last discovered the identity of A. J. Alan. Squadron-Leader W. Helmore reminded me very much of the famous unknown story-teller. The squadron-leader spoke amazingly well, and as an impromptu speaker he hasn't a rival, I should say. C. B.

TELEVISION JOTTINGS

(Continued from page 492.)

at the receiving end, where the picture is built up by the moving beam of electrons.

How many readers noticed the somewhat broad hint, recently dropped, to the effect that the sound transmissions accompanying the new television programmes might be radiated on one of the medium-wave transmitters? It was suggested that the publicity that might result from this would have a beneficial effect upon the sales of television receivers.

Seems hard luck on those who like an alternative programme! But probably only those items that are sufficiently interesting as "sound only" would be thus treated.

The 30-line television transmissions are going from strength to strength, almost as if they hope to rival the "high-def." television! Some of the recent programmes have been most ambitious, and the B.B.C. is undoubtedly gaining invaluable experience from them, restricted as they are in scope. No one who saw "Skyline" could deny that it was a valiant effort; its programme value was undeniably good.

L. H. T.

NEXT WEEK!

WIRELESS CONTROL FOR AEROPLANES.

More about the "Queen Bee."

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

YOUR GRAMOPHONE MOTOR

And interesting jottings on varied subjects.

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

READERS have asked me from time to time whether a gramophone motor should be oiled or just left alone. A good many people seem to have the idea that the motor should *not* be oiled, in case the oil gets thrown about and perhaps even on to the record.

The answer is that the motor *should* be oiled, but naturally the oil should not be used in such an amount that it is thrown off by the rotation of the turntable or of the governor. The little friction pad which engages with the rotating disc of the governor and forms the speed regulator should not normally be oiled, unless the speed regulator seems very "fierce." If you oil the pad too much you may not get the necessary range of speed adjustment.

For oiling a gramophone motor you should use a fairly thin oil, but not *too* thin; the type of oil which is sold specially for sewing machines is very suitable.

Mind the Spring.

More ambitious amateurs sometimes attempt to feed grease into the drum which contains the spring. I should tell you right away that the spring of a gramophone motor should be treated with great care and circumspection and on no account should you attempt to remove it from the drum. If it once gets loose it is apt to expand to about the size of the room and can do very serious damage to anybody who happens to be near.

Remember that it is a very powerful spring indeed. If you want to get it out—although in the ordinary way there is no reason why you *should* ever want to remove it—take the whole motor to an expert dealer and let him attend to it for you.

There is no reason, however, why you should not wash out the grease from the spring drum by means of paraffin oil, finishing off with petrol, and when it is dry you can refill it with fresh grease. Vaseline or motor-car grease is suitable, but the best kind of lubricant is a mixture of thick grease and finely divided graphite. This can be obtained at a gramophone dealer's and also usually from a garage.

Preventing Hum.

Whilst I am on this subject, I may perhaps mention that a good deal of the hum or other noise caused by a spring gramophone motor is due to the motor not being mounted on rubber bushes on the motor board of the cabinet. I have sometimes seen a motor mounted without any rubber and been told by the owner that the rubber washers didn't really make any difference.

They *do* make a lot of difference, and you will be well advised to put a rubber washer at each screw-hole, under the metal motor plate, and another one over the plate, with a small metal washer on the top, held down by the screw, so that the motor plate touches nothing but rubber both above and below. This largely prevents the vibrations from the motor reaching the woodwork of the cabinet, which acts as a sounding board.

Wear on the Record.

Finally, in making an overhaul of your gramophone motor it is important to see that the turntable does not wobble and that it lies as nearly as possible in a horizontal plane. If you place the soundbox or pick-up so that the needle rests on the blank part of the outer edge of the record whilst the record is rotating, you will soon see whether the needle has a tendency to run towards or away from the record. If the turntable is so far out of level that the needle tends to run outwards, it is obvious that in normal use it is pressing against the one side of the sound track very badly. This is bad for the record as well as for the reproduction. The best setting is to have the turntable, if not completely level, then so sloping that there is a very slight tendency for the needle to run inwards.

The "Blurb Squelcher."

What d'you think of this for a name—"blurb squelcher." No need to tell you where it comes from. "Blurb" is the American name for long-winded announcements that nobody wants, and "squelcher" speaks for itself. This "attractive and useful little device," which is smaller than a regular valve, is simple in construction and operation, and requires no alteration to the circuit of the receiver. The unit consists of an adaptor made to fit any valve and a long length of flex with a push-button at the end. The adaptor is inserted between the valve and the socket. When any blurb comes on the squelching is done by the simple process of pressing the button, keeping it pressed as long as necessary.

So far it appears to be indigenous to the U.S.A., but I daresay you can think of other countries where it might have uses.

Wireless in the Car.

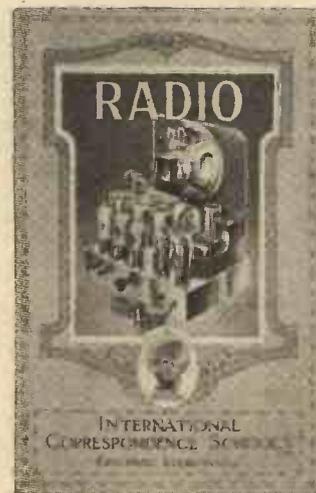
Wireless in cars is becoming increasingly popular, and probably many of you have already got a set of some sort or other fitted in your own cars. Those of you who haven't can hardly have failed to notice the strains of the wireless programme coming from stationary or passing cars on the road.

I think the popularity of car radio is going to increase enormously. At first many people raised the more or less obvious objection that radio in the car would distract the attention of the driver and might be dangerous. Actual experience has proved this fear to be entirely groundless. Everyone knows how lonely a long-distance journey by car alone can be, but with the radio set working the loneliness completely disappears. That of itself is a very sound justification for radio in the car, because lots of us have inevitably to take long car journeys alone.

Another advantage of a set in the car, which was pointed out to me by a reader a few weeks ago, is that where there are passengers it tends to keep them quiet, especially the "back seat driver"!

(Continued on next page.)

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YOUR GRAMOPHONE MOTOR

(Continued from previous page.)

The Short-Wave Region.

The short-wave region, which was for so many years regarded as the Cinderella of wireless, has during the past year or two come into its own. Not only has it shown its value for beam radio, but also it has become absolutely essential for the transmission of television. Marconi's experiments quite recently have been exciting a great deal of interest; he has shown how waves only 1 metre in length can be made to follow the curvature of the earth. Waves not more than a centimetre or so in wavelength are used in regular transmissions across the Channel, whilst radio waves down to $\frac{1}{2}$ mm. length have been generated and received under laboratory conditions.

Long and Medium Wavelengths.

It is interesting to compare all this with the very long waves which were used in the early days of wireless communication—I am talking now of times before broadcasting started. In those days we thought only in terms of a wavelength of perhaps 20,000 or 30,000 metres. Then when broadcasting started we had to come down to what we now call the "medium" wavelengths, and in due course the special virtues of short waves were gradually laid bare.

Some people said in the old days that only very long wavelengths could possibly be transmitted over long distances, and that very short waves would be stopped by all kinds of obstacles, as well as being so attenuated as to be useless after a short range of travel. Experience has shown that short waves can be made to travel immense distances, and that communication can be maintained with an almost incredibly small amount of power in the transmitting aerial.

All of which only goes to show the folly of preconceived ideas in regard to anything scientific, and to indicate that the thing which appears to be without any use or application to-day becomes the very thing needed to-morrow. Or, as scripture has it, "The stone that the builders rejected is become the head of the corner."

Is the Aerial Dying Out?

The super-sensitive set is now so much the order of the day that I suppose the outdoor aerial will soon become a rarity if not in fact a thing of the past. The days when we wanted a full-blown P.M.G. outdoor aerial are quite gone, and many sets of to-day use no aerial at all.

The erection of an outdoor aerial was one of the main bugbears to wireless reception in the early days of broadcasting, and it is all to the good that this has been now rendered quite unnecessary by the improvements in the sensitiveness of sets. The fitting of an indoor aerial of some kind is, however, a very simple matter, and, notwithstanding the sensitivity of a receiver, it is often a good plan to use some form of indoor aerial, bearing in mind that even a short length of wire may make a difference equivalent to a stage of high-frequency amplification. By this I do not mean to say that you would actually alter the design of the set, but that the distance-getting qualities and, if you like, the volume, will

be appreciably enhanced by the indoor aerial as compared with the results without any aerial at all.

Worth an Extra Stage.

It is such a very simple matter to fit up a length of wire round a side of a room, or from another part of the house down to the room where the wireless receiver is used. So if it is convenient to rig up some kind of indoor aerial, don't despise such an aerial, because you may find it very useful indeed. It can be mounted quite inconspicuously, and even, at a pinch, rubber-covered wire can be laid along the picture rail, where it is entirely out of sight; this is not the most efficient arrangement, but it will probably be much better than no aerial at all.

And before leaving the question of the aerial I should remind you that whatever else you may do or leave undone, a really good and efficient earth connection is the most valuable of all both in stabilising the set and improving its sensitiveness and other qualities.

Cathode-Ray Screens.

I have been asked at different times whether the phosphorescence in a cathode-ray television screen (that is, the "per-

NEXT WEEK

FULL DETAILS

OF

THE NEW

"UNIVERSAL THREE"

An up-to-the-minute set
for any mains.

sistence of fluorescence," if you like to call it that way) is not a drawback, in that it will cause a blurring of the pictures.

At first sight you might think that it was essential to have an instantaneous effect in the screen, any particular spot to be bright only at the precise moment the cathode beam is falling upon it, and to lose its brightness the instant the beam passes on. But it is not quite so simple as all this; you will see why if you remember that one of the main reasons why we see a complete picture on the fluorescent screen, instead of merely a flying spot, is that the eye possesses the "persistence of vision" property. Now if the persistence of vision business is present in the screen, it is to that extent unnecessary for it to be present in the eye. The slower the rate of progress of the spot over the screen, the more important it becomes that there should be this persistence effect, either in the screen or the eye, or both.

High-Definition Pictures.

When it comes to high-definition television receivers, where the spot has to fly over the screen at a much greater rate, the persistence effect in the screen, as also in the eye, will tend to cause a blurring of the picture. If the picture is a "still" one it doesn't matter a bit about the persistence,

in fact, in a sense, the more persistence the better, both in the eye and in the screen, or certainly in the screen. Inasmuch as the aim of the television receiver is to show moving pictures, then the amount of persistence must be limited, otherwise we shall get a complete blurring, since one set of impressions will remain whilst another one is being produced, just as though Walt Disney drew pictures of Mickey Mouse in different positions without removing from the film the pictures of Mickey in previous positions.

Reducing the Lag.

Having regard to the importance of higher and higher definition in a television receiver, manufacturers will ultimately, I think, come to the conclusion that the less persistence they can get in the screen itself the better. Unfortunately, if you get rid of the after-lag you tend also to reduce the quickness of response, so that the picture for a given intensity of the cathode beam impact is not so bright as it would otherwise be. What you want is instantaneous response to full brightness, according to the strength of the beam, and instantaneous disappearance of the activity after the exciting beam has passed on.

Tuning a Superhet.

When tuning a superheterodyne receiver it is a good plan to use a milliammeter for the purpose of showing when the set is accurately tuned. The milliammeter should be in the anode circuit of the intermediate frequency valve; it does not need to be an accurate meter, because it is only intended to give an indication when the current is at the lowest point and not to give an accurate measure of the actual value of the current. Usually a milliammeter reading 0 to 5 or 0 to 10 milliamps. will be quite suitable. As you know, it is very difficult to tune a superheterodyne set to exact resonance by the unaided ear, especially if the set is fitted with self-adjusting volume control. Furthermore, if you do not get the set accurately tuned to resonance, you will get distortion.

At any rate, by putting the milliammeter in the intermediate frequency anode circuit, and tuning until the meter reading gives the lowest reading, you will have a visual tuning indicator which is of great practical value.

B.B.C. RECEPTION CENTRES

(Continued from page 505.)

could be duplicated. And if this were done all other (and mostly cheaper) sets would by inference fail to receive the approval of the B.B.C. and be to that extent "written down" in the public estimation.

I feel that the radio industry is at present giving the set-buying public what it wants at prices it can afford to pay, and throwing in a jolly good measure of the vital spirit of fair trading. Anything which tended to upset the machinery of this on-the-whole-very-clean industry would result in the majority of listeners paying much more for sets of a kind most would fail to appreciate.

So, I say, let the broadcasters stick to their last until the last.

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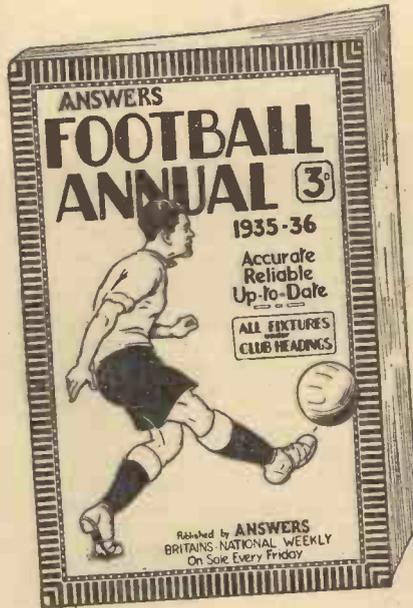
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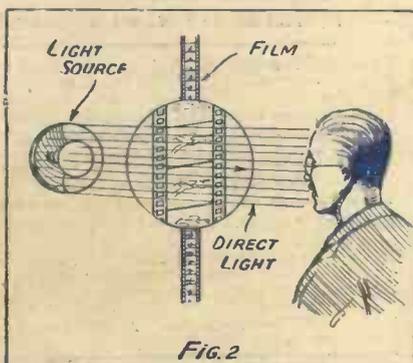
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Date.....

"The witch-doctor, his lips curled back in an ugly snarl, bent forward and touched where the white man pointed. The next moment he leapt back, clashing his hands and howling with pain. He threw his spear to the ground and danced about like one in agony. Reginald watched him coldly, then picked up the fellow's iron spear. Laying it across the wireless set, he turned to its owner."

AND THEN WHAT HAPPENED?
TO FIND OUT YOU MUST READ
"THE MAKERS OF MAGIC" IN
THE AUGUST "WIRELESS."



"Direct lighting is possible in the case of the transmission of films. . . . To make the illustration clear I asked the artist to show an observer instead of a photo-cell."

JUST ONE OF THE MANY FACTS
IN AN INFORMATIVE ARTICLE
ON THE OPERATION OF PHOTO-
ELECTRIC CELLS AND THEIR
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"The double-diode-triode is three valves in one, and in addition to carrying out the duties of second detector and amplifier, also acts as automatic volume control stage."

THAT'S CLEAR ENOUGH! AND
SO IS EVERYTHING ELSE IN THE
ARTICLE DESCRIBING HOW TO
MAKE AN A.C. SUPER WITH A.V.C.
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"(1) That not only do all their teeth fall out, but their hair has turned white in the night.
(2) That their name is mud. (3) That they are being battered to death by a howling mob of home-constructors in Manchester."

"WHAT'S IT ALL ABOUT," DID YOU ASK? IT'S PART OF THE ENTERTAINING POT-POURRI BY JOHN SCOTT-TAGGART CALLED "FROM MY ARMCHAIR," WHICH APPEARS IN THE AUGUST "WIRELESS."

"And what could be nicer on that summer evening run out into the country with a friend than to pull into some shady spot and enjoy the tones of soothing music the while you watch the sun go down in its blaze of red?—But what about picnics? Here truly the car radio is a real advantage. Just open the car door, turn the knobs, and you can enjoy your alfresco meal to the music from some orchestra."

HOW OFTEN HAVE YOU THOUGHT ABOUT GOING IN FOR RADIO ON YOUR CAR? THERE ARE FOURTEEN PAGES TELLING YOU ALL ABOUT IT IN THE AUGUST "WIRELESS."



"... Mudbury Wallow, as I was saying, will lead the way. I have long been thinking over a death ray that will be the worst lard—er—er, that is to say the lardst ward.
'Wast lerd, you mean,' I hissed.
'... Will be the last word in death rays.'"

YOU WILL FIND PRICELESS PROFESSOR GOOP AND WILEY WIRELESS WAYFARER A SCREAM FROM BEGINNING TO END IN THE AUGUST "WIRELESS."

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AND TELEVISION REVIEW

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AND TELEVISION TIMES

No. 686.
Vol. XXVII.
July 27th, 1935.



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

+ + +
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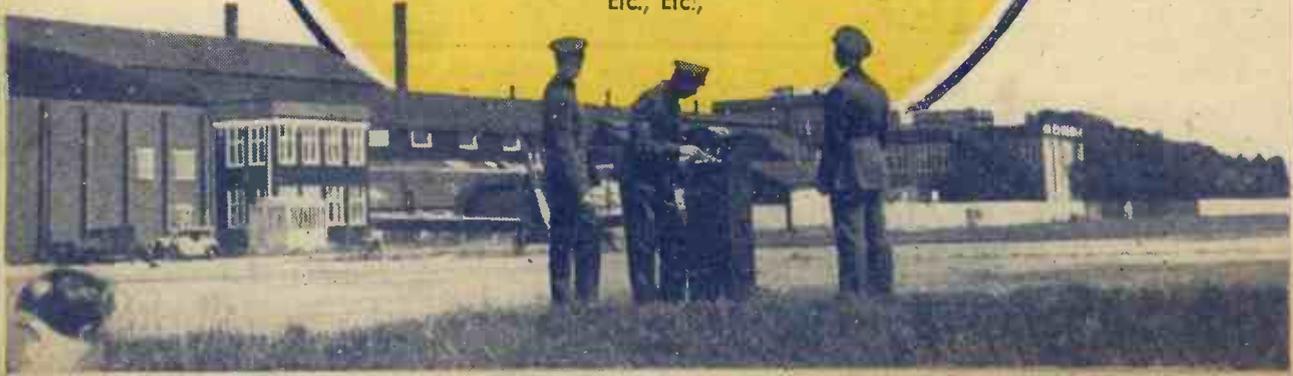
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SIR JOHN REITH IS WRONG

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P.W., 27/7/35

POPULAR WIRELESS AND TELEVISION TIMES

MANAGING EDITOR: N. F. EDWARDS.

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BREAKFAST RADIO
B.B.C. PROGRESS
CHELMSFORD'S MASTS
PRISON MUSIC

RADIO NOTES & NEWS

U.S. ENTERPRISE
OLD "P.W.'s."
WICKED PRIDE
GHOSTLY NOISES

Kabul Calling Soon.

THE Afghan Minister in London recently signed a contract on behalf of the Royal Afghan Government for the erection in Afghanistan of five wireless stations.

The most powerful of the five new stations will be situated near Kabul. It is to be capable of communicating with London, Melbourne, Rio de Janeiro and Tokio, so wise guys will rightly infer that short waves will be employed.

Manufacture has already been commenced at the Marconi works at Chelmsford.

Further details will be found on the last page of this issue.

The Early Bird.

ARE you one of those unlucky fellows who, instead of greeting the new day with a cheer, get up every morning feeling frowsy and finding pre-breakfast civility almost impossible? If so, try a course of breakfast-hour radio!

There are some lively programmes on at that time of day, but it is not of these I am thinking. What is far more likely to make you forget your hang-over feeling is the remarkable reception possible about 8.30 a.m. from Europe's low-powered stations. Little Norwegians and Swedes—nonentities in the ordinary way—come thumping in like super stations at times.

So when you take a crack at the egg-shell to-morrow morning, take a crack at this breakfast-hour reception as well—it's full of surprises. (I hope the egg won't be!)

Busy Day.

THE B.B.C. engineer of this year of grace is not a pampered individual, with palatial office and a placard on the door "Back at 3.30." No, sir! He more closely resembles the gentleman in Longfellow's poem, whose brow was wet with honest sweat!

Among their activities the engineers are out in vans round Plymouth way, testing sites for a new transmitter there; they are going ahead with the new station at Lisburn, near Belfast; they have picked a site at Beaumaris for the new North Wales

relay station; and they are getting down to brass tacks with Scotland's new transmitter at Burghhead.

Between whiles there's a lot going on at Daventry and Droitwich, so time does not lag for the men-at-arms and squires of Sir Noel Ashbridge.

The Overflow Habit.

THE B.B.C. has not said much about its overflow from Broadcasting House to the Maida Vale premises, in Delaware Road, but there is an amusing side to this expansion. In addition to the large orchestral studio, four new ones are being built at Maida Vale, and a nice homely canteen to seat seventy is being equipped. There are land lines and telephone lines galore joining the Portland Place headquarters with "Broadcasting House No. 2," and the B.B.C. recently instituted a private motor-bus service between the two places!

A POPULAR PERSONALITY



Hildegard, the charming Continental cabaret and broadcasting star, listening to her Cossor receiver. She records for Columbia.

Following the old school tradition, adjoining premises at Maida Vale are already being taken as offices. And, best of all, the new organ there is a *portable*—admirably suited for a further flit at any moment!

Fertiliser Radio.

ONE of the most remarkable radio installations in the world is that placed under the charge of M. Kataevich, at Drieprostol. It takes the form of an elaborate multi-aerial system, from which

transmissions on short and ultra-short wavelengths are radiated, on considerable power, a few inches above the surface of the ground. Below the aerials is buried an elaborate earth-wiring system, extending for twelve acres or so, and over this various crops are planted, for test purposes.

The experiment is run by the Moscow Institute of Cereals, and the idea is to discover if these very short-wavelengths will act as artificial manure.

"Lower Away."

BRITISH broadcasting will lose a landmark, and so will Chelmsford, when the two 425-ft. steel masts that have towered above that town are completely dismantled. The work began at the end of June, but will not finish much before October, for each section has to be unbolted and lowered to the ground separately.

The masts are familiar sights to travellers on the L.N.E.R.'s line to Ipswich. They were erected in 1913, and attracted much attention when the old original "5 X X" was tested there, to determine if long waves were worth while. Many historic broadcasts have been carried out from aerials slung from these masts, but airmen hate the sight of them, so go they must.

Prison Radio.

NOW that the idea of radio in prisons has come to the front again, it seems to crop up in the news from everywhere. I have recently told you of instances in Australia and Belgium—now comes Switzerland's turn.

Geneva's chief of police has recently given permission for a set to be placed in the prison of St. Antoine. The installation

work is to be carried out by a prisoner who is serving a sentence for attempted murder.

Warm Welcome for Cool Station.

ICELAND is a good spot to think about at this time of the year, and, as it happens, there is plenty of food for thought about Icelandic radio.

For one thing, it's time that public acknowledgements were made for the
(Continued on next page.)

THE UNCANNY BEHAVIOUR OF A READER'S SET

weather warnings that Iceland broadcasts twice a day in English, for the benefit of seafarers. You and I, snugly at home, may not heed them much, but these warnings may make all the difference between wives and widows—as Iceland well knows, for the proportion of her population lost at sea is greater than that of any other country.

In paying tribute to this island people, let us also congratulate them on their remarkable radio-growth, and on the decision shortly to increase Reykjavik's power from 16 to 100 kilowatts. At present there are too many distractions on 1,442 metres to give Reykjavik a fair chance, but when his power is increased we shall welcome him to our aerials as a proven friend to Britain.

"Good-Day, Sir."

SOME of the uses to which the photo-cell may be put are distinctly ingenious. One enterprising San Francisco radio store found that customers were frightened off when examining a radio set if an assistant offered to show them the model, so a photo-electric beam was arranged that brought the set into action when customers came close to it.



The effect is uncanny. As you walk up to a set it says, confidential-like, "You are admiring my cabinet, but come closer, lift the lid, and I will explain the Duo Manifold Anti-Peaking action—" and so forth!

The illusion is so good that customers almost invariably give the set "Good-day" when they leave it!

It really does seem that there are no limits to the uses to which this amazing device can be put.

The Spooky Speaker.

A HOMERTON reader of "P.W." has raised the hair on my scalp by describing the recent behaviour of his four-valve set.



"About half an hour after it has been switched off," he says, "there is a distinct but feeble shuddering from the loudspeaker. First time it frightened my wife's mother, but worse followed.

"There is a sharp chattering noise, like false teeth grating together, and this comes after the shuddering, which is deeper and softer.

"I am not superstitious myself, but it is very uncanny, like a breathing when nobody is there. Have other listeners had trouble like this?" he asks.

No, no. A thousand times, no. We'd rather die than say Yes.

Those Old "P.W.s."

A BRISTOL reader of "P.W." who has bought himself a new house (lucky chap!) has suffered the well-known pangs of parting with old treasures that are denied a place in the new premises. The wireless components he had stored in cellar and loft found new homes as soon as they got to ground-level—but what about the wireless books? Recalling the pleasure they gave him, he is reluctant to destroy them,

MIKE SLIPS AND QUIPS

A film critic speaking of Bing Crosby:
He has blue eyes and light blue hair.

Australian talker referring to possibility of Austria-Hungary rearming:
In the event of that happening, the Little Entente will march on hungry.

Character in "The Sheridans," broadcast from Melbourne:
Excuse me, miss; do you know a man in this street with one eye named Brown?

Aunt Agatha, from Sydney:
To be kissed gently on the cheek by the sun and the breeze is all I ask of life.

If you are a car driver you'll be able to drive round yourself.

An O.B. commentator:
Do you see that big bully—er—burly policeman guarding those flowers . . .

It is not possible to get any more people in Macquarie Street, and the crowd is increasing every moment.

An Australian advertiser at the mike:
—If you want a pull sweat-over—er—a pull-over sweater.

Mrs. Grey, reading story from Australian station:
I wanted to take out my anatomy and run through it.

During birthday calls at Sydney:
Mummy Richards and her daughter were both born on the same day.

Children's Hour artist, talking of the cow that jumped over the moon:
Yes, he was the same cow in this story.

and he says, "I know you cannot help in the distribution, but what would you advise me to do with them—some in bound volumes?"

I told him—what may interest others in a like position—to get in touch with any club for the unemployed, or with organisations like hospitals, Toc H, Boy Scouts, and radio clubs—they generally want all the wireless literature they can get, and the enthusiasm for bound volumes is unbounded.

Incidentally, the best thing to do is to approach the local hospitals and organisations first of all. This simplifies the problem of collection.

Wicked Pride.

READING the Riot Act is a task I seldom undertake, but some of you sinners are simply asking for it, the way you write to me! Letter after letter I get, betraying a sinful and grievous pride. Not the silly, stuck-up kind, nor money-consciousness, nor family-smootiness, but a loathsome pride in using old valves.

I say nothing against keeping an old favourite valve on the go for sentimental reasons, for I am a great respecter of the true veteran. But to run your set on old valves for years and years, to put new H.T. on the cracked plates of '28, to force those poor attenuated filaments to yield the last electron, in sheer minginess—that, my hearties, is to do a great wrong. If anything could make it worse, it is this "I've had-the-valve-for-seven-years" attitude that crops up in my correspondence. I name no names, but many of you will take my meaning.

Microphone Howlers.

THE favourable reception accorded to some microphone howlers I recorded not long ago tempts me to give more samples of verbal slips.

One occurred in an appeal for a Sailors' Home, in the course of which the speaker said:
"There is a room, and a piano in which they can smoke to their hearts' content."



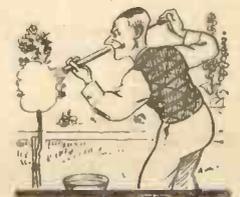
In another appeal a lady surprised her listeners by saying, "And who are responsible for all these homeless children?—Why, you and I, of course."

And finally, there was the classic case of the American beauty specialist, who solemnly assured all the girls who were listening that "Immediately after your bath, just a light rub with the cream and a touch of the powder, and you will feel you can meet anybody with perfect confidence."

Horticultural Note.

DANISH men of science have made some notable contributions to the world's knowledge, but the latest discovery reported from that country is a queer one. It seems that M. Herideck has been experimenting on the reactions of flowers to radio music. And the results have been unexpected.

Pinks, which with their strong scent and vivid colouring might have been expected to like the loudspeaker's blare, are definitely disturbed by it. While roses—a notoriously delicate and touchy tribe—are said to thrive on regular doses of wireless programmes. Until further details are available I suspend comment on these horticultural curiosities of Denmark, and pray merely for strength to keep on spraying my roses. They are daily attacked by sharks and tigers masquerading in the form of greenfly, and though I slay my thousands they breed their tens of thousands before I can catch them! Any suggestions from fellow sufferers?



Where CONSTRUCTORS Go Wrong

by JOHN SCOTT-TAGGART M.I.E.E., INST. P., FEL. I.R.E.

HEAVENS, what a subject! What an opportunity for bitterness, for sarcasm, for rudeness—and for a sympathy that passeth all understanding.

For are we not all constructors? Do we not all—and I say this with a modest simper—go wrong sometimes? And are we not all in need sometimes both of kicks and ha'pence? Every professor worthy of his salt, and every professional radio engineer worthy of his bread and dripping, does some constructing or, at least, assembling; and in the doing of it he can make some small yet vital error. He can—as I have done—touch a naked wire at the back of a test panel without making certain that a two-thousand-volt D.C. generator, situated in another part of the factory, was muzzled; and he can, as I did, fly through the air with the greatest of ease.

"Defies all the Laws of Probability."

I know a very eminent radio engineer who never by any possible chance gets a circuit connected up correctly the first time. He switches on and there is silence; or grunts; or wild hysterical screams. He switches off, does a little peering and prodding, switches on again, and all is well. His consistent habit of initial failure defies all the laws of probability. It is whispered in the bazaars that half his inventions have arisen through connecting up a circuit wrongly and finding it works better that way.

But do not imagine that I condone all this. Wrong connections often mean burnt-out or damaged components or valves. If they always burnt out it would not matter; you would know about it; you might even *scent* that something was wrong. But if a valve is over-run by putting a grid-bias battery accidentally across the filament, performance may drop off and you may not appreciate what is the matter.

Label the Suspected Part.

If, therefore, you find you have misconnected, see whether you have done something that might injure a component or valve, and thereafter suspect that part, preferably labelling it. The best thing, of course, is to test everything affected. And yet how many would go to that trouble?

Probably the most susceptible to damage are valves and resistors. The latter are rated in watts, and putting the full H.T. voltage across a quarter-watt resistor may alter its resistance; in fact, it may cause it to swell up and burst. And when you find the careless fault—especially if it isn't yours—you may do likewise.

The most grave result, however, of careless connections is not that the set will not work at all, but that it will work well but not

The first of a series of practical articles by Britain's leading set designer.

No 1. "IN THIS CONNECTION....."

well enough. Ask any radio service man what is the sweetest music to his ears and he will tell you—silence! The set that is dead is probably dead easy to put right. Probably a loose terminal or a forgotten H.T. plug is all that is wrong.

It is the invalid set that causes the worry: the set that gives rather anaemic volume or produces varicose harmonics. In radio servicing, as in life, it is easier to be an undertaker than a doctor.

It is an axiom that the really faulty set is easier to put right than the set that is *nearly* satisfactory. It is the same with medical men; a doctor would much rather tackle a plain case of appendicitis than chase Aunt Jane's vague prickly pain that wanders all over her body and is worse when she has haddock and strawberries for supper.

A wrong connection, or a connection that just doesn't connect, can cause all kinds of vague symptoms such as poorish quality,

is broken *inside* its covering; spaghettis, of course, are notoriously bad. The worst night I ever spent was following the receipt from a reader of half a dozen lengths of wire with connectors at the end—and in each case the connector was stamped on to the wire end without the insulation being removed! I imagined thousands of constructors trying to get results with connecting wires less effective than pieces of string. For all I know, these "wires" may still be in use, or at least in circulation. And yet no currents will circulate in them.

I have known terminals to be faulty, and certainly scores of plugs make faulty connection with either their predestined home—a socket—or else with their attached wire. Often a strand of silk or patch of rubber—or sometimes lacquer—is the cause of a faulty connection.

A Common Source of Trouble.

Ill-fitting valve pins are a common source of trouble, and shrewd readers may have noticed that I always use valve holders which grip their valves with the tightest of embraces.

And what of *wrong* connections? These, too, are plentiful and shameful. If you have a blue-print it seems impossible to go wrong—especially if you have followed one of my Rapid Construction Guides. Or you may—and this is more human than shameful—have omitted a connection. The Rapid Guide is the best check.

If you use different components instead of those specified as being in the designer's original set, you can very, very easily go wrong. The components may even be just as good as the original components and may be listed as permissible alternatives, but the terminals may be in different places. Differential condensers are nightmares in this respect. Coils also have given trouble, but nowadays I refuse to pass a coil as an alternative unless its terminals are so placed that no mistake is possible; "explanatory leaflets" are taboo with me.

Reversed Wiring.

Some components, although possessed of only two terminals, can be connected the wrong way round. High-frequency choke coils very

sometimes in performance—according to which way round they are inserted in a circuit; Westectors and dry electrolytic condensers are also easily connected the wrong way round, with self-punishing results.

Potentiometers are also sources of trouble if wrongly connected; the "law" may be broken.

In this connection, therefore, as in all your other connections, see that your set is never out of joint.

WATCH THOSE CONNECTIONS



"Westectors and dry electrolytic condensers are also easily connected the wrong way round, with self-punishing results. Potentiometers are also sources of trouble if wrongly connected...."

tendency to oscillate, inability to work up to full volume, sloppy or floppy or dippy reaction. All these symptoms could be traced to a grid leak that didn't leak.

How many constructors go wrong through missing their connections? Thousands! Is there any excuse? None whatever. Terminals should always be tight, the wires should be clean before insertion under the terminal head, and the wire should be complete! It is a fact that sometimes a wire

BARRY KENT CALLING

News and Views from the "Big House"

AFTER a long struggle, all restrictions on the range of short stories for Sunday broadcasts have been abandoned. Beginning in the autumn, there is to be a regular period of thirty minutes devoted to one or more short stories on Sunday evenings.

Carols from America.

The B.B.C. Christmas Day programme this year will be built round a special contribution from the Columbia Broadcasting System of America. In this contribution, Lionel Barrymore will be starred as Scrooge, supported by an all-star cast, the whole thing being done in Hollywood. The timing is not yet settled.

Radio Artists and Film Contracts.

The B.B.C. is experiencing some difficulty with artists missing rehearsals through having to carry out film engagements, and it is proposed to make it compulsory for all artists to declare their film commitments at the time they sign their radio contracts. I hope this will not be interpreted so that radio artists will be discouraged from accepting film engagements. It seems to me highly important that there should be the best possible exchange.

Interference with Rehearsals.

Val Gielgud, the Drama Director at the B.B.C., is all "het up" these days because his rehearsals are being harassed by a multitude of noises, knockings, hammerings, and what not, all to do with redecoration and internal reconstructions which appear to go on all day and a good part of the night as well.

A Piano Problem.

A great struggle has been in progress between the supporters of the upright and the supporters of the grand piano for B.B.C. work. It is maintained by some producers that upright pianos are essential for the intimate type of programme. On the other hand it is claimed that the superiority of the sound emitted from the average grand piano is so marked as to nullify the advantage in the intimacy of the rival.

To settle this problem once and for all, Mr. Eric Maschwitz has arranged for special recordings by Mr. Pepper and Mr. Croom-Johnson, each playing for a short time, first on a grand piano and then on an upright. The difference in quality will be judged scientifically—that is, if there is any.

Dance-Band Organisation.

Henry Hall's present contract with the B.B.C. has a full year to run, and I am able to state authoritatively that there is nothing but satisfaction with the present

arrangement so far as the B.B.C. is concerned. It is not true to say that the B.B.C. will appoint a new director of dance music. There will be some internal adjustments of duties consequent on Mr. Gerald Cock going to television. But these will not affect the authority or position of Mr. Hall.

Mixing Artists.

Increasing enterprise on the part of variety producers of the B.B.C. has resulted in the introduction of serious music artists

GYPSY NINA



The famous American Radio Star who recently came over to this country. She is an accomplished accordionist and singer.

into variety features, just as they are appearing on the music-hall and cinema stage outside. The Music Department of the B.B.C. has objected most strongly on the ground that a serious artist appearing in light entertainment is bound to suffer both in the quality of ordinary work and in prestige. This raises an interesting new point, which the governors of the B.B.C. will be asked to rule on.

"Big Bill" Campbell.

"Big Bill" Campbell, of "Coo-Coo-Noodle" fame, is breaking fresh ice in another typically Canadian programme on July 29th (National). This will be a backwoods enter-

tainment entitled "The Rocky Mountaineers," and the scene will be set in a lumber-jacks' bunk-house. Al and Bob Harvey will be presented as John and Elmer, Jerry Fitzgerald, erstwhile vocalist with Henry Hall, will be the "Singing Mountie," and Bill Campbell takes the rôle of Old Zeke Winters. Supported by the Bunk-house Boys, Big Bill may be expected fully to maintain the usual mirthful level.

Woodmen of Arden.

On August 1st a description will be given for Midland listeners of the celebrations by the Wardmote of the Woodmen of Arden of their 150th anniversary this year. They shoot off on that day their triennial match with the Royal Company of Archers (the King's Guard for Scotland). This match is at nine score (180 yards). The first was held in 1878, and the Royal Company have won nine matches and the Woodmen eight.

The Mote is on the Forest Hall grounds near Meriden, which is believed to be the centre of England. Whoever hits the gold first at the Wardmote becomes Master Forester for the ensuing year, and the archer who hits it second becomes Senior Verderer.

The present Master Forester is the Earl of Aylesford, and the Warden is his uncle, the Hon. C. D. Finch-Knightley. Membership of the Woodmen of Arden has been limited to eighty since the year 1815, but an exception was made for the election of Sir Robert Peel as a supernumerary member. The uniform worn by the Woodmen consists of green coat, buff waistcoat—both with brass buttons bearing the Arden motto—and white duck trousers.

"HAIL, HASSAN!"

Our Broadcasting Critic Praises the recent transmission of Flecker's Famous Play.

"HASSAN" is the biggest experiment we have had on the air for weeks. We know that it has been the practice of the B.B.C. to cut all plays (except Sunday Shakespeare), so that they shall not take more than 60 minutes, and in special cases 90 minutes, to perform. "Hassan" began at 8.30 p.m. and finished somewhere about 11.30—a 3-hour performance, but for a 10-minute interval for the News Summary.

The question is: Is such protracted listening too much to expect of listeners? It would be interesting to know what percentage of ordinary listeners listened to the whole of "Hassan." Lovers of the drama must have listened to it all. After that marvellous scene between Hassan and Yasmin which brought Part 1 to a close, no real drama-lover could go to bed without hearing the rest. He may feel, as I did, that Part 2 wasn't quite up to the standard of Part 1. But this wasn't sufficiently below standard to produce any feelings of disappointment.

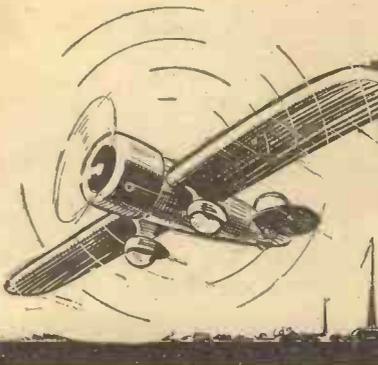
A Great Play.

But I am digressing from the point I wish to make. After listening to "Hassan" I came to the conclusion that listeners should be able easily to listen to an entire play of the length of "Hassan," provided it had all the qualities of "Hassan." "Hassan" is a great play. But nothing inferior to "Hassan," I think, would be listened to for three hours.

I thoroughly enjoyed "Hassan." The beauty of the lines, the beautiful unaffected voices of the actors, their passionate acting, the ease with which they were understood, the wealth of big people in the cast, the number of excellent small parts, the very captivating music that Delius had specially written for this play, all contributed to the making of a unique performance.

Henry Ainley, Malcolm Keen, Leon Quartermaine, Ion Swinley, and others all vied with one another for pre-eminence. If one wished to be unduly critical, one might feel, perhaps, that Henry Ainley was inclined to rant, especially in the poetical passages. Apart from that he was a joy to listen to. By the way, as you listened to Ainley, were you not

(Continued on page 534.)



WIRELESS CONTROL for AEROPLANES

WIRELESS controlled apparatus is one of the most fascinating things which have ever been invented. To the ordinary man it savours of magic. Even the case-hardened engineer must get a thrill when, for example, he sees a pilotless aeroplane carrying out the most intricate evolutions in the air at the command of a man on the ground who is merely pressing buttons on a small control board.

And what a thrill for the man pressing those buttons!

In a previous article a member of the staff of "P.W.," who is a qualified pilot, has dealt with the mechanism in the aircraft itself which enables the distant control to be carried out. It is now my intention to say something about the controlling instruments.

Series of Impulses.

As has been shown, series of impulses are transmitted by radio from a ground station and these are picked up by a receiver, fixed-tuned at the right wavelength, on the aeroplane. It is preferable to employ ultra-short wavelengths in order to diminish the possibility of interference from normal radio channels and also to gain freedom from atmospherics.

The fact that ultra-shorts have a limited range is not a drawback, because obviously the machine must be kept in sight, so that its flying range is restricted to ten miles or thereabouts, and the very-low waves can cover that easily with but moderate power.

The impulses transmitted are something like the buzzer a business man uses in his office to call different members of his staff. One buzz for the office boy, two buzzes for the secretary, three buzzes for Mr. Tompkins, and so on. The mechanism in the aeroplane includes a selector device so that the series of impulses of different numbers cause different things to happen.

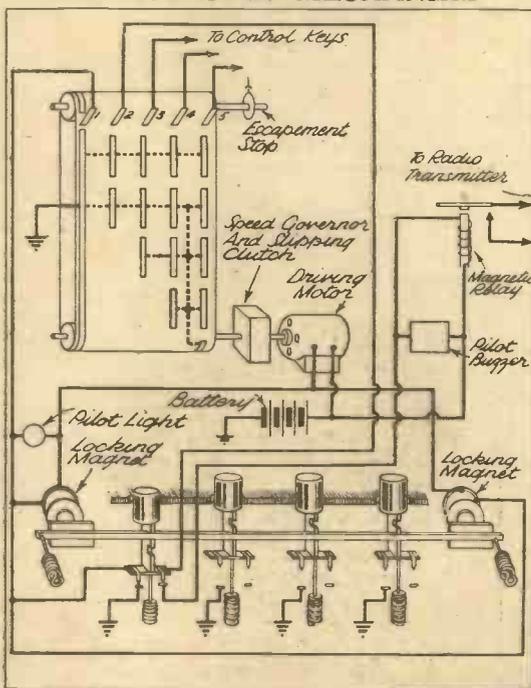
Usually the series start at two. One impulse would cause nothing to happen, the idea being that odd strays in the ether cannot affect the selector. A further refinement is to make it essential that the controlling impulses shall be of exactly the right duration and spacing before the selector will work, or they can even be coded.

Like the Automatic Telephone.

A very familiar application of the impulse series idea is to be seen in the automatic telephone. When you put your finger in the aperture of the dial to dial a letter or number, then twist the dial round and release it, a brush runs along a series of

Last week details were given of the "Queen Bee," the R.A.F.'s radio controlled aeroplane, in the air. In this article an insight into the ground mechanism required for remote control by wireless is given by G. V. DOWDING, Associate I.E.E.

AN INGENIOUS MECHANISM



Details of the mechanism described by the author for sending out selective radio signals to cause the radio-controlled aeroplane to perform certain evolutions.

contacts and a certain number of impulses are sent along the line to actuate the selector at the telephone exchange.

A pilotless aeroplane could be controlled by means of impulses transmitted manually by means of a push-button or Morse key, but that crude method necessitates the operator applying his mind to two operations: 1, the sending of the right impulse series for a particular operation; and, 2, the manipulation of the aircraft. Also it is slow and admits the possibility of sending faulty signals. The human element is allowed too much scope!

Therefore the Royal Air Force has adopted an automatic form of control board. There are a number of buttons and each one is plainly labelled "Left," "Right," "Rise," "Glide," etc.

All the operator has to do is to push the appropriate button, and he is left free to concentrate upon the evolutions of the machine in the air.

That is as much as we know about the R.A.F. ground apparatus which controls the "Queen Bee" in flight. The actual mechanism is secret. As it is impossible to find out the details of this secret, and as I'd no doubt be shot at the Tower if, even did I know them, I passed them on to you, I have invented a scheme which could do the job quite well!

The Method of Doing It.

This is the sort of thing I often do. It is amusing practice and has on at least one previous occasion resulted in the production of an improvement on the apparatus originally employed. I commend the idea to all inventive readers.

The accompanying diagram illustrates, in a simplified form, the control
(Continued on page 534.)

THE GROUND PILOT



This simple-looking control-box enables the operator to make the "Queen Bee" do just what he wants it to do while it is manoeuvring in the air.

I TEST THE "SILVER KING"

Leslie W. Orton, Secretary of the Anglo-American Radio and Television Society, describes his experiences with our famous double-channel receiver.

AT first sight the "Silver King" (described in a recent issue of POPULAR WIRELESS) might appear to be nothing more or less than a "stunt" receiver. But its appearance is deceptive, and when you have read of my experiences with it you will, I think, agree with me when I say that it is well worth constructing.

When the set is constructed and placed on a table ready for test, one is inclined to be nonplussed for a moment, because the set has two fronts! For a moment or so I was in doubt as to which side to start with (the short or medium wave).

Being nearly eight o'clock, I decided to tune the short-wave side to a short-wave station and search upon the medium waves. No sooner said than done. Listening to W 8 X K on its 19-metre band, I trekked round the set and began searching for stations.

Good "DX" Results.

Being daylight, with a trace of thunder in the air, I discovered that, though the British stations came in well, Continental stations suffered from static. Nevertheless, the "DX" (or long-distance) abilities of the set were shown off well, for Budapest was audible at moderate strength, whilst Stuttgart, Breslau, Rome and Trieste, not forgetting Radio Normandie, came in at excellent strength. Many stations were tuned in at moderate volume, but I was too anxious to turn to short waves to bother to identify them all. Hilversum,

Ecole Superieur and Florence, however, were among those identified.

Leaving the medium-wave portion of the receiver tuned to Radio Normandie, I again trekked around the set. It was now getting dark, and almost immediately after tuning off W 8 X K I hit the 20-metre amateur band with a proverbial bang. The air was alive with amateur stations, all American.

The first American station tuned in (on this amateur band) was W 1 A J Z at Harwichport, Mass. The operator at this station is a lady, and her voice came over extremely well, despite the fact that she said that conditions were poor and she did not expect to be heard at any distance.

A RISING STAR



Pat Hyde, the beautiful eighteen-year-old crooning accordioniste, who records with her Swing Music for Parlophone.

his love are unusual in the extreme. Jack Hylton and Paul Whiteman are among the big shots who have recorded this hit from "Anything Goes," for H.M.V., while Decca have made an unusual recording of it wherein six artists give their respective interpretations of the song.

So we have Bob Crosby, Kay Weber, Johnny Davies, "Pec Wee" Hunt (of the Casa Loma Orchestra), Bob Howard and Victor Young all having a go at the same number.

On Regal-Zonophone June Clyde, the co-star with Jack Buchanan in "The Flying Trapeze," sings it, while Henry Hall, Carroll Gibbons and the Savoy Hotel Orpheans are to be found as exponents of the number on Columbia.

On the first page of Notes and News this week you will find a picture of Hildegard, the famous Franco-American cabaret and radio star, who is now in this country. I have already mentioned her first record, on Columbia, of "I Believe in Miracles," and now would like to draw your attention to another.

It is of one of the numbers she broadcast a few weeks ago, and which I understand was received with great enthusiasm by listeners. The title is *Darling, Je Vous Aime Beaucoup*, and it is a unique mixture of French and English, sung in the intimate style which Hildegard carries off so well. The other side of the disc holds *For Me, For You*, and the number is DB1556.

Lovers of classical music will welcome the signing up of Sir Henry Wood for Decca, and also be interested in the expression of satisfaction that the great conductor provides in a letter to the Decca Record Co. which has been circularised to the trade.

As a matter of fact, her station came in at greater volume than W 8 X K, although the latter station employs a power of 40 kw. and W 1 A J Z only 200 watts!

If I gave a description of all the stations I heard I should fill up my space far too rapidly, and therefore I will content myself with giving you the call signs of the better-heard American amateur stations. They were W 2 G O Q (Wayne); W 3 M D (Vine-land, N.J.); W 2 H F S; W 3 A D; W 2 C K; W 3 S I; W 3 B C C; W 5 Z A; W 6 S S; W 1 X O; W 1 D D; W 2 G G; W 2 A D A, etc.

In case broadcast enthusiasts imagine that the "Silver King" is of no particular value where short-wave broadcasting stations are concerned, I hasten to add that I have heard 2 X A F, 1 X K, 3 X A U, 2 X E, 2 X A D and 2 X K as regularly as a B.B.C. station. I have also heard many Latin-American stations as well as Nairobi. But, owing to the times I have searched, I have not heard Australia on the set yet.

A Big Fight Relay.

Some idea of the clarity with which short-wave broadcasting from America was heard can be gauged by the fact that I heard the Max Baer v. Braddock fight without missing a word from beginning to end.

I need hardly add that the description of the fight was thrilling. Uppermost in my mind ring the words "Braddock's left has caught Max on the chin!" They came with such regularity that they became really monotonous! At one time I heard Max laugh when he was hit on the jaw.

If you want a receiver which can give you local entertainment and the thrills of long-distance reception at the same time, you cannot do better than build the "Silver King," for no other set does both things at once.

A goodly list of records by Sir Henry and the Queen's Hall Orchestra has been made, and I advise you to study it and to hear the pieces that have been recorded. One of the finest, in my opinion, is *The Ride of the Valkyrie*, a particularly fine piece of artistry which does full justice to that weird composition of Wagner. And, what is greatly to the point, Sir Henry's Decca records cost only 2/6, against the previous price of 4/- which we had to pay to obtain records by him.

The items that our broadcasting critic enthused about a short time ago when he referred to the broadcast by Norah Blaney and Gwen Farrar are now available on an H.M.V. record. It is entitled *Old Favourites*, and is a very good pot-pourri of some of the world-wide hits of the past. "Fonso, the Hot Spanish Knight," which C. B. so enjoyed, is included, and so is the rather delightful "Little Garden Subbub." The number of the disc is B8321.

"You're the Top" Again.

And talking about memories, I am reminded of a good record by Synchronophone Ltd., on the Octaceros series, by H.M. Royal Horse Guards Band. It is entitled *Melodious Memories*, and should find a niche in the collections of many gramophiles (664).

Hits of All Countries is another Octaceros of note, by Jerry Hoey and his Orchestra (671), while I quite enjoyed Tommy Kinsman and his Band playing *Lullaby of Broadway* on another of the same make. Incidentally, the other side of this record gives another illustration of the generality of the recording of *You're the Top*, for here we have it played once more by the same band (1165).

Two of the greatest personal successes of the recent Covent Garden season were scored by sopranos, Lily Pons and Grace Moore. Two records by Grace Moore deserve special attention—"The Dubarry": *I Give My Heart* (H.M.V. DA1309) and *Without Your Love* (duet with Richard Crooks), (DA1309)—for they show the great singer and film star at her best.

Lily Pons, likewise making her first appearance at Covent Garden in "The Barber of Seville," won

(Continued on page 533.)



SOME time ago I recommended you to beg, borrow or otherwise obtain copies of the Parlophone records made by Harry Roy's Tiger-Ragamuffins. They are exquisite pieces of recording, and the two pianos, string bass and drums make a snappy ensemble that should be a sheer joy to any lover of rhythm. And now I have just had a copy of the latest record by this fine group of instrumentalists, *Fox Trot Medley*, on Parlophone F178. It is a very fine record, and I mention it first because I think so highly of it.

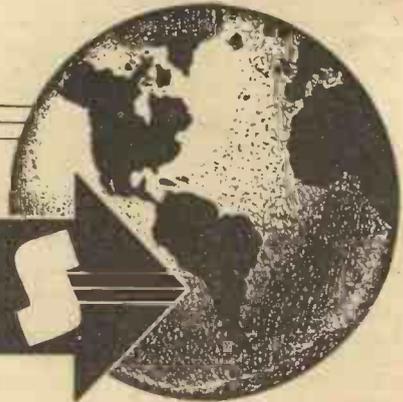
On another record in the same list is a full-blooded Harry Roy rendering of *I've Got a Note and I'll Take the South*, played on F175. This record and F180 make a good pair, for the latter disc, of Nat Gonella and His Georgians playing *Jig Time* and *The Peanut Vendor*, is brimful of character.

The Latest Hit.

We are in for a glut of the latest hit, a number that has been hailed as the rage of a year in America and as the "top song of the year." The number is *You're the Top*, but while admitting its goodness I cannot class it above "Lullaby of Broadway," and if it beats "Easter Bonnet" I shall be surprised. However, you will have good opportunities of judging for yourselves, for *You're the Top* has been recorded umpteen times, as well as being well broadcast and played by various dance bands.

H.M.V. announce it as a live song with a difference, and here they are right, for the list of similes introduced by Cole Porter, the composer, in exaltation of

ON THE SHORT WAVES



COUPLING THE AERIAL

W. L. S. deals with the three main forms of short-wave aerial coupling and explains the practical and theoretical features of each.

WE need not necessarily be talking about short-wave work, or even radio at all, when we agree that many things are spoiled by a "weak spot." We know that no chain is stronger than its weakest link; but do we always know which is the weakest link?

I don't; but the link I want to talk about this week is the first in the whole chain—the connection between the aerial and your receiver. It is here that many troubles are introduced into an otherwise good set, and we ought to spend a little time going over the elementary ground.

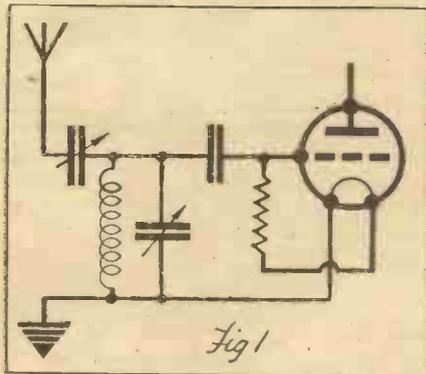
Using a Series Condenser.

It would be fairly safe, I suppose, to assume that 90 per cent of my readers are using the type of coupling shown in Fig. 1—the aerial is simply hitched on to the top end of the grid coil through a variable condenser.

In some cases it may be a decent air-dielectric neut. condenser; in others it will be a preset type of doubtful pedigree and venerable age. In a few, I think (or I would like to think) that there must be a very small fixed condenser in use.

Whenever I sit down to write about radio I go off into a kind of sermon about human nature. It's a funny thing, but it's more

THE COMMONEST METHOD



interesting than some branches of radio, and it certainly has an enormous bearing on results! The particular bit of it that I'm getting at now is the one that makes you screw down that preset or twiddle that neut. condenser until you've got as much of it in circuit as you can possibly get.

Half the troubles that I have found in readers' sets have been due to this one simple fault—too much aerial coupling. It has led to inselectivity and instability, the latter showing up (need I say it?) as hand-capacity trouble.

If you tune in a certain station you may quite well find that you can increase your aerial coupling on him without having any harmful effect at all; but it doesn't follow that this holds good all round the dial. If you can couple your aerial extra tightly on 20 metres, the odds are that it will produce a ghastly dead spot on about 30 metres, and another, possibly, on about 15.

Everything having panned out so nicely on 20 metres, you may not even connect these "blisters" with your aerial coupling, and there's a nice "Reader's Problem" all ready-made.

No, readers; if you *must* use the Fig. 1 style of coupling (and I often do it myself), do make it loose. Don't attempt to use the maximum possible degree of coupling or you'll surely run into trouble. A neutralising condenser half in provides a reasonable amount for a longish outside aerial; the same condenser all in will serve for a shorter affair.

SIMPLE OPERATION

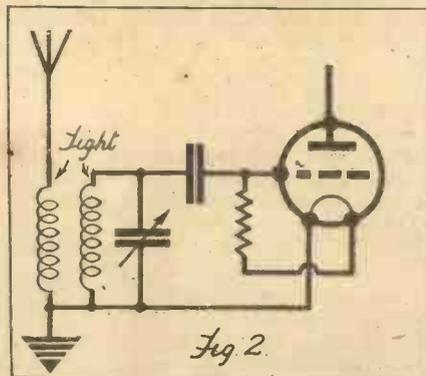


Fig. 1 shows direct coupling with a variable condenser. It is quite good so long as the capacity is kept low. An untuned aerial coil, as in Fig. 2, has many advantages, including quieter background and greater freedom from hand-capacity effects. The tuned aerial coil scheme of Fig. 3 provides a very good degree of selectivity.

I strongly advise you to try out the untuned inductive coupling shown in Fig. 2, although the present craze for two-winding, four-pin coils is rather apt to discourage you from it. But you can arrange an extra winding on a four-pin coil; there's usually a fair amount of space above the top of the grid winding, and you can connect one end to the low-potential end of the latter, and the other to—well, what's wrong with the 'crocodile-clip, after all?

Alternatively, you can make something like a six-turn aerial coil, separately wired, and connect to a little hinge arrangement so that it can be coupled to whichever coil is

plugged in the holder. Six turns will serve to cover the whole waveband quite well, slight changes in coupling being necessary for each new coil that is inserted.

Inductive coupling of this kind as a rule gives a quieter background, greater freedom from hand-capacity effects and dead spots, and no disadvantages whatever. In the old days it used to be referred to simply as "tight" coupling, that word usually implying the use of an untuned coil.

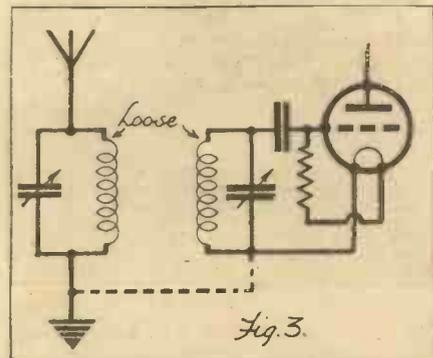
Two Tuned Circuits.

In complete distinction to this we have the loose *tuned* coupling shown in Fig. 3. Here we are definitely introducing another control into the receiver, but it is almost as effective as a stage of H.F. from the selectivity point of view.

The degree of selectivity obtainable from a set of this type will come as a complete surprise to most people, simply because they've never bothered to try it out. The coupling between the two circuits *must* be loose, and may be almost non-existent from the appearance of things. Six inches, with small diameter coils, is sufficient to give quite a fair amount of coupling when both circuits are really in tune with each other.

Such a set needs quite a bit of handling, though, because it is very difficult to keep

FOR GREATER SELECTIVITY



the two controls from interlocking. Re-tuning of the aerial circuit will probably involve a slight re-setting of the grid coil as well, and until you get used to the two-handed technique you won't get the best results from the set.

One joy is that the experienced operator can let his reaction control completely alone, controlling oscillation by the aerial circuit, which he adjusts so that when it is completely in tune the set just stops oscillating. Just give the scheme a try-out. It's worth it.

ON THE SHORT WAVES—Page 2.

Points from the POST-BAG

A BIGGISH bulletin from A. W. (Cape Town) contains some interesting items of news, among which are the following: Skamlebaek (O X Y), on 49.5 metres, is providing a good transmission now in South Africa; Rome, on his 31.2-metre wave, is also stirring things up out there; W I X K (ex W I X A Z), on 31 metres, is one of the most consistent of the American transmissions heard in S.A.

Will short-wave enthusiasts in Leeds please sit up and take notice? I have a letter from Mr. H. Russell (B R S 1 6 5 0), of 59, Cameron Street, Burmantofts, Leeds 9, asking me to stir them up a bit. If anyone interested will get into touch with him, Mr. Russell is very keen on arranging some regular meetings, and possibly on forming a small society.

Reception from Melbourne.

R. D. E. (Standon) is such a ubiquitous and consistent listener that it's quite impossible for me to make a remark without being politely "taken up" by him! My recent remarks about the scarcity of reports on V K 3 M E (Melbourne) have brought

THE AMERICAN IDEA



This photograph of a neat amateur station hails from America, and shows the gear at station W 2 C F V, which is situated at East Orange, New Jersey.

forth another letter from him, saying that he has four verifications from this station, which has been heard on the speaker each time.

R. D. E. has also logged H P 5 J (Panama) on 31.28 metres several times after 2.30 a.m., and remarks that the 31-metre band is very good right up till 5 a.m. nowadays. I wish I were a sleepless wonder, too, but after doing 19 hours' work in my average day I feel like a little nap before starting the next one!

To return to R. D. E., other points in

his letter concern the reception of his first Icelandic station, T F J, on 24.5 metres, and an Australian amateur, V K 2 E P or 2 E T, working with Americans on 20 metres.

E. H. (Tottingham) comments on the round-the-world echoes mentioned by R. J. A. He has noticed them on G S I (19.66 metres). His log includes a good bag of amateurs from the lesser-known countries, and he remarks on the welcome "come-back" of K 4 S A, Porto Rico, who used to be such a star station, but has been off the air recently. Another item of news from E. H. appears in the next column.

From a Saltash Enthusiast.

F. W. (Saltash) would like to know the exact wavelengths of J N G and W N G, both heard well below 16 metres. They don't appear in my official list, which is a fairly full one. He remarks that Saltash wants waking up in the short-wave line. He has written dozens of letters to the local paper, and is now offering to lend his two-valver to anyone who would like to try them, free of charge!

C. M. (Glamorgan) has made up a short-wave adaptor out of some old parts, and is rather worried because it will only oscillate over the lower part of the dial of the tuning condenser. When he mentions, later on, that this latter has a capacity of .0005, I'm not surprised to hear it. Wrench some plates out of it, C. M.! You're certainly covering the given range of your coil with the bit of it that will bring things in. Make the condenser much smaller and you'll have that range spread comfortably out over the dial.

I suggest, too, that you make yourself a set of coils as outlined on page 353 of the June 8th issue. If you want to use 2½-in. formers, you must reduce the turn numbers to something between two-thirds and one-half of those given for the small ones.

F. N. (Glasgow) is in trouble with a reaction control that seems to take it into its head to tune as well! Sounds to me like too many reaction turns, but it might be almost anything from a faulty choke to a bad circuit. He wants to get in touch with other enthusiasts or with a local club, and his full address is Mr. Frank Noble, 209, Baltic Street, Bridgeton, Glasgow, S.E.

W. L. (Romford), in his first letter to me, gives his impressions of short waves as a comparative novice. He uses a biggish mains set with a short-wave adaptor, and seems to be getting on very well. He, too, wants to get into touch with other "locals," who are asked to call on Mr. W. Limehouse, "Brookfield," Elm Road, Romford.

A Reader's Suggestion.

Fig. 4, on this page, shows a reader's suggestion for a neat "semi-variable" condenser for aerial coupling. In view of my remarks on the preceding page it is very appropriate. The gadget consists of two small brass plates, fixed at the bottom to an ebonite base and clamped together at the top by a small ebonite strip with notches cut in it.

Three or four notches can be provided to give various capacities and the best adjustment found for each waveband. I think the sketch shows the scheme better than I can describe it. I always prefer something of this kind to a real variable, which upsets calibration.



E. H. passes on the following information: W 2 X A D is now transmitting on Sundays from 3.30 p.m. till 8 p.m., and W 2 X A F from 9.15 p.m. till 5 a.m. This new schedule has been in operation for a few weeks, and is very acceptable to short-wave enthusiasts who have to do most of their listening on Sundays.

Amos 'n' Andy may now be heard from W 8 X K (48 metres) and W 1 X K (31 metres) at 1 a.m. On the same two stations, at 12.45 a.m., Lowell Thomas, the well-known American news commentator, may also be heard.

V K 9 G W (Bowmanville, Canada), on 49.22 metres, is a very good transmission nowadays. He may be heard soon after midnight, and generally peaks at about 1 a.m.

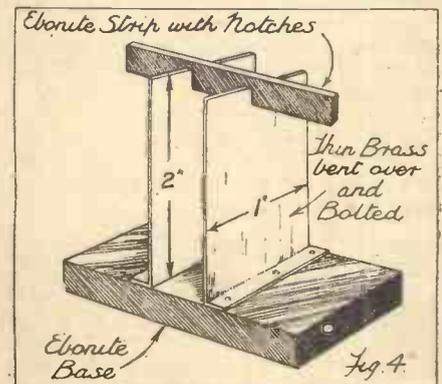
The 20-metre amateur band is still very lively for the entire evening, the fade-out usually being as late as midnight. The American "phones" are somewhat variable, but the higher-powered amateurs are putting perfectly consistent telephony into this country night after night. One enthusiast over here reports having logged over 350 different American amateurs on "voice."

Results of Recent Tests.

Recent ultra-short-wave tests, not forgetting the gallant attack on Snowdon by Mr. Douglas Walters (G 5 C V), have shown that longer and longer distances are within the capabilities of the 5-metre band. South London amateurs, whose range has hitherto been limited to fifteen miles or so, are finding that they can get across to G 2 N U at Romford, which isn't a particularly elevated spot.

Perhaps some readers will recall "P.W.'s" aeroplane tests in 1933. The planes landed at Romford, and some of us who were listening to the tests

A SEMI-FIXED CONDENSER



An ingenious aerial-coupling condenser designed by a reader for short waves.

succeeded in hearing the signals when one of the planes was only a few feet off the ground.

In this month's Q & T there is a description of the world's highest 5-metre amateur station—W 1 X R, on Mount Washington, 6,284 ft. above sea level.

As the writer inquires, "How would you like to climb on to a water tank perched atop the very summit of a mountain to readjust a transmitter, assuming, of course, a wind of 90-100 m.p.h. and a temperature of, say, -10 degrees F.?"

Timing Ski-Races.

Two-hundred-mile contacts from Mount Washington are no longer a rarity. Five-metre "link" contacts, too, are becoming popular in the U.S.A., various groups of amateurs having organised networks by which messages can be passed over several hundreds of miles with very little loss of time.

Among curious uses of ultra-short waves must be mentioned the timing of ski-races! The Schenectady Amateur Radio Association is responsible for this, and we are told that the races could not possibly have been timed without radio, starting and finishing points not being within visible range of each other. Considering that some of the speeds were in excess of a mile a minute, accurate timing was a necessity.

W 8 X K has dropped his regular schedule on 13.92 metres, and, apart from commercial telephony, there now appears to be little to listen to below the 16-metre band.

W. L. S.

My Most Nervous Moment

WHEN BROADCASTING

What is generally known as "mike fright" attacks almost every radio artist at some time or another. From the specially interviewed selection of stars below some hitherto unpublished "nervous moments" have been culled—pity the poor frightened stars!

NERVES! Blue funk! The inscrutable "mike" staring you in the face—and you've lost your nerve! Or your voice! Or—more prosaically—just your precious manuscript!

It is at such moments that artists of the air live a lifetime. That they survive the ordeal of the sudden calamity amazes them—and yet, very probably, the listening millions are unaware that anything is amiss.

When Something Goes Wrong.

Practically every radio artist I have spoken to admits to "mike fright"—and indeed many of our leading stars frankly confess that they always suffer to a certain extent.

Over and above this perfectly human weakness—which, of course, every good artist learns to conquer at the crucial moment of taking the air—there arise from time to time perfectly awful moments when Something Goes Wrong.

Not as often as one might imagine, perhaps. For Broadcasting House becomes, with the passing of the years, a more and more perfectly smooth running machine. Rehearsals cover a multitude of sins of omission. Scrutiny of scripts—not to mention censorships galore!—have done a great deal to eliminate the failure of the human element.

Clock-Watching.

Yet, such is the nature of broadcasting, embracing as it does all the other entertainment arts in its octopus-like grip on artistic material, there are awkward moments created by the sudden transportation of the performers from one sphere of activity to another.

Lost scripts and errant taxicabs seem to figure largely in the tales I have had unfolded to me by reminiscent artists. Then there is the ever-present bugbear of Watching the Clock—for it is one of the major sins of the broadcasting game to overstep one's time. Nemesis is sometimes swift and awful—a flick of a switch and one is "off the air" with the cream of the turn

lost, if not to posterity, at least to about ten million listeners on that particular evening.

Leonard Henry tells me that he still quivers with excitement when he recalls the awful ordeal of the Brighton relay on Jubilee Night. Apparently the show had to start four minutes late—and that sent everything wrong.

"I was doing all the announcements, you know," explained Henry. "I had to squeeze what should have been at least twenty-second announcements into something like ten seconds.

"On my wrist I had a stop-watch—and every time the audience laughed I pointed grimly at it, reminding them as nicely

"Why couldn't we go over time a bit? My dear old soul—Rudyard Kipling's speech was due sharp at nine! Still, it was a thrill for your Leonard—even if it did seem desperately nerve-racking at the time."

Leonard still seemed to be shivering as he spoke. "No, it's not that," he smiled, "you caught me just coming out of my bath! Pip! Pip!"

Introducing a New Character.

Jeanne de Casalis, who plays scatter-brained parts with such superb aplomb, told me of one of her most nervous broadcasting moments. "It was when I introduced myself in my latest guise of Cecilia Crank," she said. "Yes, that was a bad moment. She had to lecture on glands, you know. A dried-up old maid of a creature—a super health enthusiast.

"A very trying experience, bringing out an entirely new character after doing Mrs. Feather for, let me see, it must be well over three years now. I was really perturbed—until I heard how much everyone liked Cecilia!"

You might imagine that nothing could upset Tommy Handley, who although still quite a sprightly young man is, indeed, one of the "veterans" of broadcasting. But he, too, has had his nerve-racking moments, he tells me.

At Savoy Hill.

"It was way back in the old Savoy Hill days," he recalled, "when just ten minutes before the show I found that I couldn't find it—my screed, I mean.

"Hadn't bothered to learn it, as a matter of fact, knowing I

would have the manuscript in front of me at the 'mike.' And there I had to stand—doing my piece all from memory.

"It just shows how much we must take in subconsciously, doesn't it? I recovered the wretched papers a day or two later, and to my surprise I found I had almost exactly reproduced it from memory over the air. But it was a bad moment—one of the worst I ever had!"

(Continued on next page.)

THREE POPULAR BROADCASTERS



Here are three of our most delightful stars of the air, all of whom confess to nervous moments through one cause or another. (Above) Jeanne de Casalis, alias "Mrs. Feather" and "Cecilia Crank"; (left) Anne Ziegler, who scored a big success in "The Geisha" recently; and (right) Bertha Wilmott, one of our leading radio stars.

as I could that their laughs were doing listeners out of so much artistic entertainment.

"My own turn was supposed to be six minutes long—but the way things went I had to cut it down to what I thought would be two and a half minutes. Imagine my feelings—a six-minute turn going west! Actually I didn't even get two minutes—on my stop-watch it turned out to be exactly one and three-quarter minutes!

The B.B.C. at the TRIBUNAL By GARRY ALLIGHAN

Sir John Reith Is Wrong

IN a few months' time the B.B.C. will be called on to render an account of its stewardship. The ten years of its chartered life will end and a survey of its activities is called for. If the B.B.C. had been a registered company instead of a chartered corporation it would have to face a shareholders' examination every year. More than seven million people in this country are the subscribers to the fund that maintains the B.B.C. in existence, and the purpose of this series of articles is to investigate, on their behalf, the operations of the B.B.C. and constructively criticise where criticism is merited.

The Best System.

After ten years of British broadcasting I am convinced that the B.B.C. system is the best for this country. I do not think it would be the best for America, but neither do I think the American system would be suitable for wholesale application here. There is, in England, a tradition for Civil Service administration. There is an instinct for bureaucracy. That is why B.B.C. methods, which would suffocate a more self-assertive people—or be suffocated by them—are acceptable to the British temperament.

And if B.B.C.-ism, in principle, has suited this country, so also have B.B.C. programmes. I am not insensible to the fact that details of programmes rouse the ire of individuals; I am, for the moment, referring to programme policy. Just as, at any given hour, every B.B.C. programme is pleasing to some, so it is possible, at any moment, to find individuals who are incensed thereby. And the amazing thing is the violence of the disagreement that is rife among listeners. I have, repeatedly, opened a letter from one listener denouncing a broadcast in terms as extreme as, in the very next letter, another has praised it. If the B.B.C. took any notice of correspondence Broadcasting House would be peopled with a population of screaming lunatics.

Nation-Wide Recognition.

Details of programmes apart, it is my profound belief, based on years of intimate contact (as a radio journalist) with the listening public, that, in the main, there is a general appreciation of the B.B.C. programme policy. On one other point am I equally confident: there is a nation-wide recognition of the value of Sir John Reith to British broadcasting and the nation generally. It is not difficult, of course, to meet the jaundiced, the disgruntled and the "smart-alecking" wits who cannot resist a gibe at Sir John, his policy or his statements. It has been so since time began:

the Lesser always sneer at the Great when they cannot grasp the greatness of Greatness. But their frothy criticism is as effectual as mice scratching away at one of the Pyramids.

I always face Sir John's critics with one unanswerable question: "What man can you name into whose hands you would feel safe in placing this great instrument of

The author of this article—the first of three on the B.B.C.—is a well-known radio journalist and an official of the Radio Manufacturers' Association.

broadcasting?" The usual answer is: "Oh, there are dozens of men who could do the job as well or better." But when I explain that I am not asking for the names of dozens of men but for the name of one man there is a most embarrassing silence,

THE D.G.'s GUARD



The Director General of the B.B.C. is always news, and his sayings and doings are avidly devoured by the press. But no story about Sir John has ever had so much prominence as that some months ago concerning the posting of ex-policemen in the grounds of his home at Beaconsfield. The photo shows two visitors talking to one of Sir John's guards at the gates of his home.

when heads are figuratively scratched and far-away looks come into vacant eyes and, finally, the conversation is changed in a desperate attempt to avoid positiveness.

In paying my personal tribute to Sir John Reith let it not be imagined that I agree with him completely or believe him to be invariably right. There are certain matters in which I believe he is profoundly wrong. But he is gloriously wrong: not meanly wrong, nor wrong through faint-heartedness

or worthlessness; not the wrong decision of the man too hesitant to make any decision, nor the wrong belief of the agnostic who knows not what to believe. Sir John Reith, when he is wrong, is wrong as a result of noble aspiration, too exalted to be applicable to the mundane state; wrong because being right would mean compromise with conscience or conforming with the popular opinion; wrong when it takes courage to be wrong.

Listeners Want Entertainment.

Sir John is, in my opinion, wrong when he regards the primary function of the broadcasting instrument to be that of propagating ethics: a cultural vehicle. I maintain that it is the first duty of the B.B.C. to entertain, not educate. The overwhelming majority of listeners obtained radio sets, and pay an annual ten shillings, for entertainment, not education. If there was any danger of Sir John's ideal being realised and the microphone being handed over to the culturalists, the sale of radio sets would take a nose dive. And the B.B.C. revenue would soon be "in the red."

That is one of the matters in which I consider Sir John Reith to be fundamentally wrong. But note, I ask, that he is wrong in a progressive way: his wrongness is the reverse of harmful to the best interests of the people. He is not wrong as would be he who might say: "I will use the microphone, not to entertain, but to propagate war." He is not wrong as would be he who sold the microphone to pornography-mongers, or market-riggers, or armament boosters, or sedition evangelists, or wage-cutting industrialists, or medical quacks, or faith-destroyers, or any other of the tribe of propagandists whose efforts leave the world worse than they found it.

Those Sunday Broadcasts.

I think that Sir John Reith is wrong when he insists that the Sunday broadcasts should retain the character they now have and have had for ten years. I believe that the weekday programmes of the B.B.C. should be of such a character that they are fit for the ears of listeners on any day of the week. In fact, I think they are.

If a B.B.C. programme is too coarse, or too suggestive, or too blatant or too vulgar for Sunday listening, it is too coarse, suggestive, blatant or vulgar for weekday broadcasting. I know of no programme that the B.B.C. has ever broadcast on any weekday that could not equally well be broadcast on the Sunday. If there has been such a programme, Sir John Reith

(Continued on page 523.)

HOW "SCRAPBOOKS" ARE MADE

The famous pair—Leslie Baily and Charles Brewer—who produce the popular "Scrapbook" broadcasts tell how these are created.
OUR SPECIAL CORRESPONDENT.

AFTER a breath-taking climb up three flights of steep stairs, up through the offices of the Light Entertainment Department at St. George's Hall, the blue-suited B.B.C. page boy ushered me into Charles Brewer's neat and small office.

A big man, quietly dressed, his dark hair just touched with grey, was sitting, back towards me, at a table littered with papers and books.

I coughed. Charles Brewer turned.

"We're so busy planning our next 'Scrapbook' that we didn't notice you," he said, introducing me to his companion, a man with horn-rimmed spectacles, a big chin, and shy, apologetic laugh: Leslie Baily.

The Next One.

"When and what is the next?" I queried. "Scrapbook for 1919," returned Brewer.

"In November," echoed Baily, "when Charles returns from a trip to America."

November! Fogs, evenings at the fire-side.

Looking out at sun-drenched Portland Place, shimmering in the summer heat, I expressed surprise that they should be at work already. Baily-Brewer explained that the "Scrapbooks" take several months to build up. And the farther back into history they go, apparently the longer they take, because it gets more difficult to find the personalities who were famous at that time. "1905," the last one, was the most difficult of all in that respect.

Baily-Brewer added that the most difficult thing is to get women singers, etc., of those far-away years. Many are no longer able, or willing, to appear in public; and those that are able are unwilling to broadcast in a programme which would give away the secret of their age!

I asked the question I had often wanted to ask: "How did all this 'Scrapbook' business start?"

"Well," said Leslie Baily, "there are very few original ideas in the world. I don't mind admitting that I got the original 'Scrapbook' idea from a 2s. 4d. seat in a cinema! The film was Paul Whiteman's 'King of Jazz,' and what struck me was the method they used of turning pages of a book as scene followed scene.

Early Northern Programmes.

"I was living in Leeds then. In London Denis Freeman was producing the 'Miscellany' programmes. Those were highbrow. I thought I would like to try putting together a more popular miscellany, which I called 'Scrapbook,' and offered to Edward Liveing, the North Regional Director. He agreed to experiment with one

programme. It was an instant success, and led to a series, produced by Wyndham Gooden at the Manchester studios.

"Before the end of that series I had moved to London, and I felt the 'Scrapbooks' would be better with a theme running through each. I decided to devote each to a year. I told Eric Maschwitz of the idea one day at lunch. Typically, he grasped the notion with such energy that I had to put on a double hustle to get 'Scrapbook for 1913' written for the date he there and then reserved for it."

A Terrific Task.

Baily ran a slim hand over smoothly groomed hair, and shot a glance at his radio "twin," who smiled, realising that this was where he came in.

"That's all very well, Leslie," he said, "but I'd like to know just why I was chosen to produce that first London 'Scrapbook'?" Brewer turned to me. "You know," he said, "I think Leslie must have asked Eric Maschwitz to give me the job, because I'd once produced a

we feel will give a good entertaining memory of the year.

Baily: To-morrow I'm going to bury myself in the British Museum library.

Brewer: He'll probably be there three or four weeks. Meanwhile, I'm going to get from the B.B.C.'s libraries supplies of gramophone records and musical scores.

Baily: When we were planning "Scrapbook for 1905" I listened time and time again to fifty old records, so old you couldn't tell whether it was Marie Lloyd or Caruso!

Brewer: Then there were twenty opera and musical comedy scores to look through.

Baily: And about a hundred volumes of history and reminiscences.

Scouring the World.

Brewer: After that, the next job is to find famous personalities in the world of politics, the stage, the screen, sport and adventure to take part in the programmes. The London telephone directory is our bible! For those we can't find there, we go to the police, the army, the navy, the newspapers, the hospitals, theatrical agencies. In fact we scour the universe—from the Far East to the Mac West. Eventually we get on the tracks of the celebrities of yesterday. Then I have to persuade them to broadcast.

Baily: And until Charles gets his cast settled I can't get on with writing my script, because the script of a show like this is built round the personalities. Sometimes

there are hitches in getting them to sign on the dotted line, and then as the date of the show approaches I have nightmares of a "Scrapbook" with half the pages missing! There have been occasions when last-minute material was put into the script a day before the transmission.

At Last—The Day!

Brewer: But we always seem to struggle through.

Baily: Yes, and one thing about it is that my confrère here is always as cool as a cucumber. I can only remember him really ruffled once.

Brewer: But we'll draw a veil over that.

Baily: Yes, we'll draw a veil over that.

Brewer: And while my sparring partner here is writing his script (he vanishes into the country to do that) I

arrange rehearsal times, studios, fix recordings, budget for an orchestra, chorus and effects staff.

Baily: Then I weigh in with my script.

Brewer: Which is censored, if necessary.

Baily: And then rehearsals start, with Charles in control.

Brewer: A week or ten days before "the night"—

Baily: Then der Tag—

Baily-Brewer: And then we start thinking about the next one.

Myself: Well, it's been awfully nice of you to tell me all this.

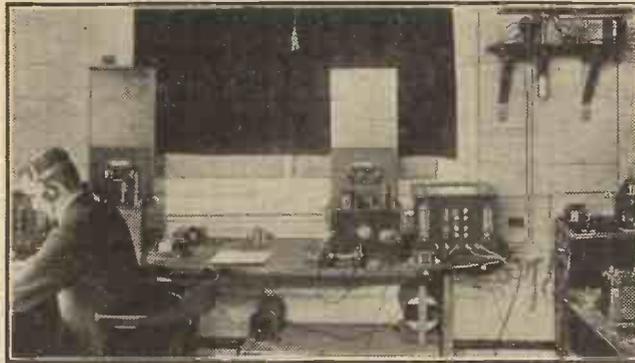
Baily: Not at all!

Brewer: The pleasure is ours!

Baily-Brewer: Come up and see us again some time!

And they bowed me to the door.

LOOKING BACK TWENTY-FIVE YEARS



The advancement of radio is brought home to one by consideration of such a photograph as this. It is of a Marconi station of 1910, and shows the receiving room at Clifden, Ireland, which provided the first transatlantic wireless telegraph service and started operations in 1908.

Baily show when I was working with Midland Regional at Birmingham."

Baily nodded, and said it was because he had been impressed with Brewer's work that he asked Maschwitz to "team" them up together. Actually, Baily moved from Leeds to London, and Brewer from Birmingham to London, almost at the same time—and the "Scrapbooks" are the result.

I glanced at the litter of music, books, directories, and notes on slips of paper which covered the table, and raised an interrogatory eyebrow. Baily-Brewer replied thus:

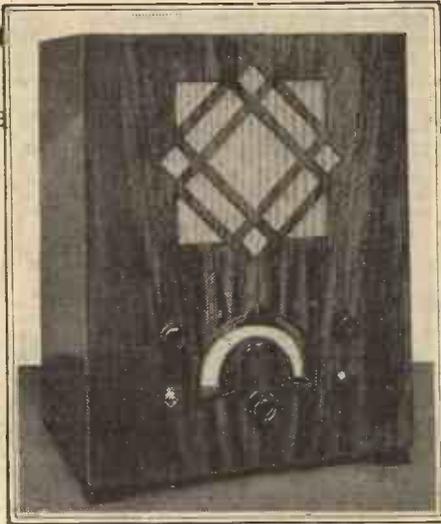
Baily: We're discussing the general line of "Scrapbook for 1919." I've been through my files and reference books, made a list of the events and shows of the year—

Brewer: We're picking out those which

The New "UNIVERSAL THREE"

AN ALL-ELECTRIC SET FOR ANY MAINS SUPPLY.

HIGH QUALITY—SENSITIVE AND SELECTIVE.



OVER a year ago, in response to the requests of a large number of readers, we published a mains set design containing three valves (excluding rectifier) and able to operate on either D.C. or A.C. mains. It was called The "Universal Three," and met with acclaim the moment its description was read by our enthusiastic constructors.

And no wonder, for it was a good set, with a wide appeal to the set-builder, owing to its simplicity of construction and the fact that it could be used anywhere where there were electric light mains of between 200 and 250 volts. In other words, practically anywhere where electricity had been installed.

Result of the Grid System.

Since that date—namely, June 2nd, 1934—the grid system has spread farther afield, bringing A.C. to thousands of homes; while D.C. has been taken to extensive areas that have developed on the outskirts of many of our largest towns. Such outskirts—and, in fact, the towns themselves—will eventually go over to A.C. Some will go over soon and some later on, but the change is inevitable.

At one time the all-mains set owner, or the prospective owner, would consider that any change in the type of mains he was on would be disastrous to the operation of his wireless set. Nowadays such a dread need not exist, for the universal valve has robbed the changing mains boggy of all its terrors, and has incidentally added advantages of its own to the home constructor.

Rapid Progress.

Since the original "Universal Three" valves have made big steps forward, and the universal valve has been well in the front of the advance. It is therefore fitting that we should now, twelve months or so after the original set, publish a design on similar lines as regards circuit, but of improved operation and performance and of more modern appearance, for the benefit of those who, as we have indicated, have obtained the advantage of mains supply since the date of the "Universal

DESIGNED AND DESCRIBED BY THE "P.W." RESEARCH DEPT.

Three," and for those who want to modernise the set.

Not that the New "Universal Three" has been brought out solely for the benefit of the users of the older model or for those with newly acquired mains. It is a set that will fill the bill in the cases of thousands of readers with mains supply who have either no mains set and want to build one, or those who wish to change to a modern design without paying very much for the receiver.

For one of the great advantages of the

concerned it is too often the case of home-made being obvious in appearance as well as in the actual fact. No home constructor wants his set to look amateurish. He may, and does, take a pride in the construction of the receiver, and a natural pride in the results he is able to get, but he does not want to advertise the fact that he built his set himself by having an unattractive, and perhaps shoddy, exterior.

The New "Universal Three" can never be accused of shoddiness in appearance or in technical design, for attractiveness is one of its most prominent qualities.

A neat "Metaplex" chassis is used for the radio portion of the set, while a plain plywood baseboard and baffle assembly is employed for the loudspeaker and the mains section.

Absolutely Up-to-Date.

The two units fit into a modern design cabinet, one above the other, forming, as the photograph shows, a most compact and up-to-date receiver that is worthy to grace the best room of anybody's home. And the quality of reproduction is such that the appearance is in no way "let down."

The circuit employed is one that has been thoroughly tested and tried, and which is

specially designed to give not only a full degree of sensitivity but also selectivity of no mean order.

Band-pass tuning is used before the first screen pentode so that good station selection is obtained without high-note loss, a sacrifice that too often is made when exceptionally sharp tuning is desired.

Low Damping.

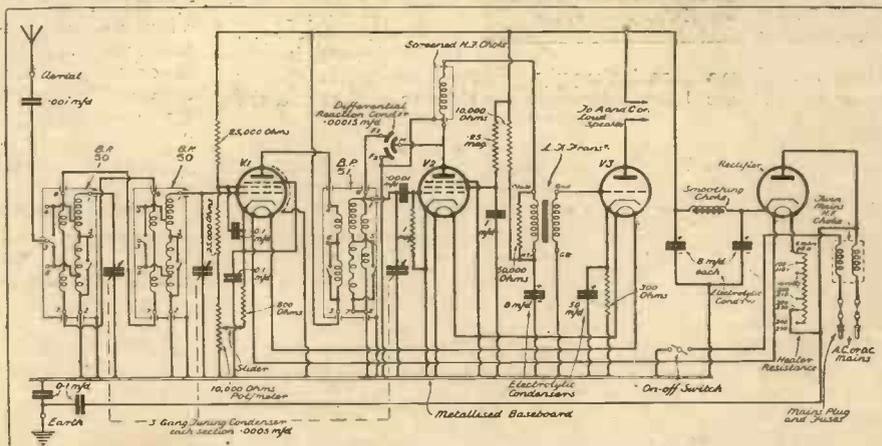
Following the screen pentode VI, is an H.F. transformer coupling which further enhances the selectivity, especially as rectification is carried out by a

screen pentode, exerting very low damping on the tuned circuit and providing a very high amplification of the L.F. modulation.

A specially "flattened" L.F. transformer couples the detector to the output valve, which latter is a triode and is capable of giving an undistorted output of some 2,000 milliwatts. Thus excellent quality is

(Continued on next page.)

THE CIRCUIT OF THE NEW A.C./D.C. SET



[Band-pass aerial tuning, H.F. transformer coupling and a specially arranged L.F. circuit combine to give high quality and excellent selectivity in this latest any-mains three.

universal valve is that it allows construction to be easy and remarkably cheap.

The New "Universal Three" is a set that anyone can build, and at the same time rest assured that not only will he have a thoroughly efficient set but also one that will rival in appearance the latest commercial designs. This is a very important point, for where the home constructor is

THE NEW "UNIVERSAL THREE"

(Continued from previous page.)

obtained throughout the chain of valves with efficiency of operation and high selectivity. The result is a set that will get stations a-plenty with a strength and quality that will satisfy the most exacting.

Simple Operation.

The operation of the set could not be more simple, for the tuning is by single dial controlling the triple-gang condenser, while quite ordinary type differential reaction

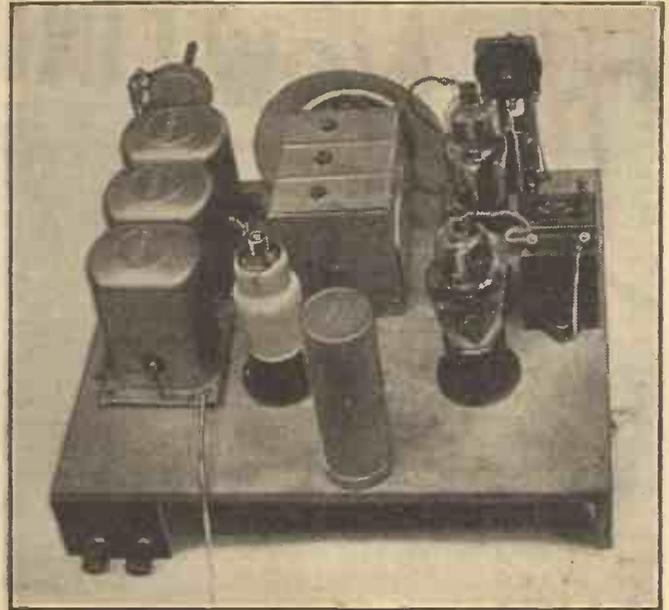
important feature when a pentode detector is used.

The fourth valve in the chain is the mains rectifier, which is used on both A.C. and D.C. mains. It needs no power transformer, and is operated directly in series with the mains for the provision of H.T.

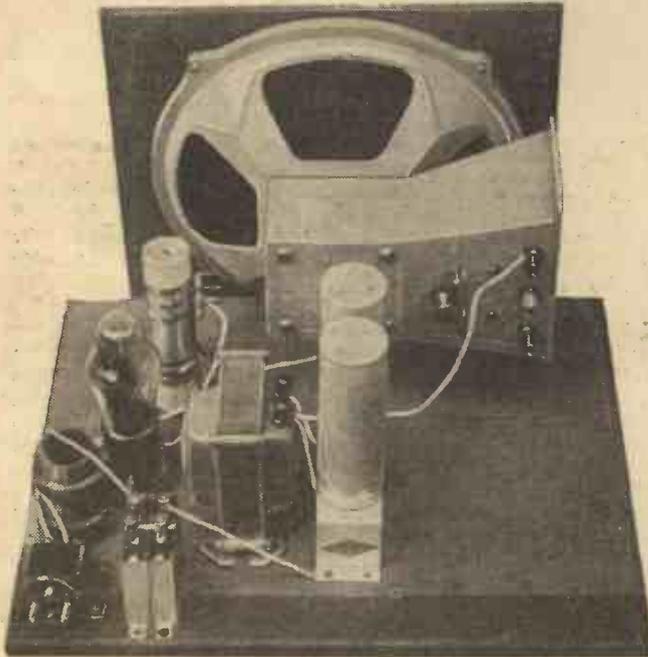
All the heaters of the valves are connected in series and the current through them is controlled by the Bulgin resistance.

A special feature of the set is the twin

TRIPLE-GANG BAND-PASS



THE LOUDSPEAKER SECTION



allows the sensitivity to be increased where a particularly distant station is required. Since the first valve is a multi-mu pentode it can be controlled by the bias potentiometer to give pre-detector volume control—an

mains supply. These chokes and the condensers connected to the earth act as efficient decoupling where the H.F. impulses are concerned.

TWO VIEWS

of the new "Universal Three." On the left is the mains portion and speaker, while above is a picture of the upper side of the "Metaplex" chassis showing the neat layout.

The condenser in series with the earth terminal and the chassis of the set makes it perfectly safe to connect to any type of D.C. mains, whether the positive or the negative pole of the mains is earthed. In series with the aerial is a .001-mfd. condenser, which carries out the task of isolating the aerial from any mains voltages so that a shock cannot be obtained from the aerial, whether or not the person touching the aerial is also touching the actual earth, or ground.

Isolating the Set.

This isolation of the set, or rather any part of it that may be in contact with the mains is important. With D.C. mains that have the negative pole earthed there is no danger of a shock to anyone touching the earth side of the receiver. But if the mains have the positive side earthed then a severe shock is possible should a person touch real earth and any point of the set in contact with the negative main. Hence the safety condensers above mentioned.

But we shall have more to say about the receiver next week, when the full constructional details are given.

THE FEW PARTS REQUIRED FOR THIS MAGNIFICENT SET

- | | |
|--|--|
| 1 Varley iron-cored 3-gang coil unit, type B.P. 57 | 1 Graham Farish 800-ohm 1½-watt "Ohmite" resistance, in horizontal holder. |
| 1 Polar Midget 3-gang .0005-mfd. tuning condenser. | 1 Graham Farish 300-ohm 1½-watt "Ohmite" resistance, in horizontal holder. |
| 1 Polar semicircular drive for above, with scale marked in degrees. | 1 Peto-Scott "Metaplex" (both sides) 12 in. × 10 in. baseboard, with 10 in. × 1½ in. wood runners. |
| 3 Clix 7-pin chassis-mounting valve holders, with screw terminals. | 1 Peto-Scott terminal strip, 2½ in. × 1½ in. |
| 1 Varley "Ni-Core" II L.F. transformer. | 2 "Clix" indicating terminals, type B. |
| 1 Bulgin screened H.F. choke, type H.F. 9. | 1 Bulgin mains resistance, type M.R.38. |
| 1 Bulgin toggle on-off switch, type S.80. | 1 Wearite smoothing choke, type H.T.12. |
| 1 B.T.S. .00015-mfd. differential reaction condenser, with insulated bush and spindle. | 1 Wearite twin mains H.F. choke, type H.F.11. |
| 1 Erie 10,000-ohm potentiometer. | 1 Bulgin combined mains plug and fuses, type F.15. |
| 2 Peto-Scott component mounting brackets, type 23. | 1 T.C.C. 8-mfd. dry electrolytic condensers, type .002. |
| 1 Dubilier 50-mfd. electrolytic condenser, type 3003. | 2 T.M.C.—Hydra .1-mfd. fixed condensers, type 30. |
| 1 Dubilier 8-mfd. dry electrolytic condenser, 500-v. working. | 1 Peto-Scott twin electrolytic condenser bracket. |
| 1 T.M.C.—Hydra 1-mfd. tubular fixed condenser. | 1 W.B. 5-pin valve holder, A.C. type. |
| 2 T.M.C.—Hydra .1-mfd. tubular fixed condensers | 1 W.B. Senior "Stentorian" loudspeaker. |
| 1 Dubilier .001-mfd. fixed condenser, type 610. | 1 Peto-Scott "Fitzall" cabinet with shelf and L.S. baffle. |
| 1 Dubilier .0001-mfd. fixed condenser, type 670. | 2 Coils B.R.G. "Quikon" connecting wire. |
| 1 Erie 1-meg. grid leak, 1-watt type. | Screws, flex, etc. |
| 1 Graham Farish ½-meg. 1½-watt "Ohmite" grid leak in horizontal holder. | |
| 1 Graham Farish 50,000-ohm. 1½-watt "Ohmite" resistance, in horizontal holder. | |
| 2 Graham Farish 25,000-ohm 1½-watt "Ohmite" resistances, in horizontal holders. | |
| 1 Graham Farish 10,000-ohm 1½-watt "Ohmite" resistance, in horizontal holder. | |

VALVES.

Coasor	H.F. 13V.P.A. metallised.	Det. 13S.P.A.	Output 402P.	Rectifier. 408.U.A.
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SPECIFIED FOR THE NEW UNIVERSAL THREE



1 NI-CORE II-LF. TRANSFORMER, PRICE 11/6

You can buy a transformer at two or three times the price of this excellent component without getting any greater efficiency. The "Popular Wireless" Technical Department knew this when they specified this nickel-cored masterpiece for their new set.

1 IRON-CORE 3-GANG COIL UNIT BP57, 33/-

Varley have been famous for many years as leaders in coil construction. This unit is no exception to their high standard: you cannot get better coils than these.



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For many of us, price marks a boundary; but no limit need be set to the enjoyment from one's pipe. Price and preference can be reconciled. Hosts of smokers who first considered cost, now "fill up" with "Airmen" for choice.

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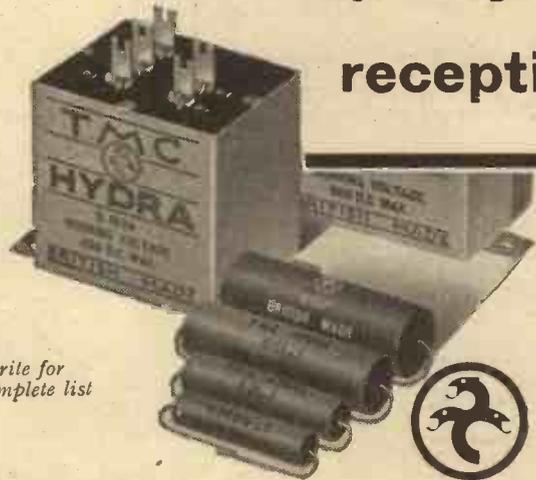
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TELEVISION

IN spite of grim forebodings and pessimistic warnings that television is going to be far too complicated a matter for the home constructor, I venture to predict that he is going to have quite an interesting time of it, after all. Just at present, with so much still undecided, he can't do much more than accumulate certain useful pieces of gear and peg away with the initial experimental work.

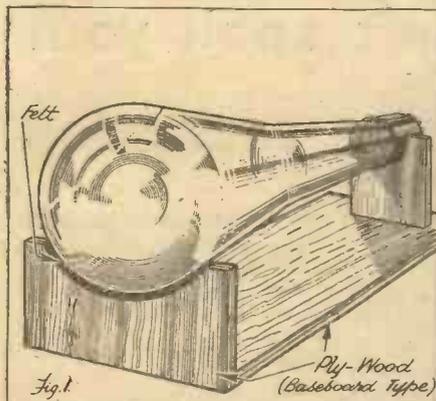
As soon as transmissions commence, however, he will be in a far more enviable position, and the time seems ripe to talk a little about the home construction of television accessories and apparatus.

A Fascinating Business.

Anyone with the inclination can to-day rig up a cathode-ray tube with suitable time-base equipment for the reception of the existing 30-line transmissions. He can also be preparing time-bases for other numbers of scanning-lines, and he will find the whole business very fascinating.

The first requirement, naturally, is a cathode-ray tube, and since one won't get to the polished-mahogany-cabinet stage for quite a long time, I suggest the use of a simple wooden stand (Fig. 1) for the tube itself. My own, as a matter of fact, happens to fit quite snugly into an old baffleboard,

MOUNTING THE TUBE



A simple wooden cradle is all that is really necessary to accommodate the cathode-ray tube in safety.

the inside of the circular opening having been lined with felt. A little skeleton affair like that of Fig. 1, however, is perfectly adequate.

Readers who have advanced to the stage of possessing a short-wave superhet, as well as a cathode-ray tube and time-base equipment, should be thinking about the final layout of these parts. Here, again, I give a pictorial suggestion (Fig. 2). I find it a distinct advantage to separate the purely radio side of things from the rest of the gear, and in my own rough layout I have mounted the receiver at one end of the bench, separating it from the cathode-ray tube, exciter unit and time-base equipment by a large metal screen. Metaplex or foil-

SOME NOTES ON THE ARRANGEMENT OF APPARATUS FOR TELEVISION EXPERIMENTS

By L. H. THOMAS

covered plywood seems quite adequate, but in a final model, reduced to a smaller compass, very complete screening will probably be required.

Two faults may arise if this is neglected—pick-up from the receiver power-pack giving rise to traces of 50-cycle interference on the screen of the tube, and pick-up from the exciter and time-base units causing unnecessary noise in the receiver.

Minimising Interference.

An ultra-short-wave superhet has to be a supersensitive affair, and any risk of electrical interference must be minimised if we are to receive clear pictures. Personally, I find great difficulty in producing a really silent background, even when using an outside di-pole with screened lead-in; much of the man-made static that worries me really seems to be picked up by the aerial itself, in which case all the noise-reducing systems in the world won't help it.

It is most important that this should not be augmented by any other extraneous noises generated in the gear used for the actual reception of television, and one must, therefore, be particular about (a) adequate screening or (b) complete separation of the receiver proper from the scanning gear. In a way (although I know I should be laughed at if I suggested this seriously) I think there is much to be said for the latter.

It seems to me that a compact receiver in a nice cabinet, feeding its output through to a completely separate unit performing the entire job of scanning, is quite a reasonable layout. In passing, I have always lamented the present craze, in ordinary radio receivers, for mounting the speaker in the same cabinet as the set, so perhaps I'm funny that way.

Only One Control.

A few further points occur to me about the receiver itself. If it is a superhet, there need only be one real control on the panel, unless one likes to have a kind of "bandwidth" control readily available. This can easily be done by introducing a variable factor somewhere in the I.F. amplifier—the possible ways of doing it are far too numerous to need mentioning. I don't know that I am in favour of having such a control on the front panel, however, as there should only be one "best" setting for it, and after that has been found it should be left severely alone.

In my own receiver at present I am

using three I.F. stages, all being quite flatly tuned by the use of a tuned coupling with a very high L/C ratio, the "C" being the self-capacity of the coil and nothing else.

I am developing a receiver with two signal-frequency H.F. stages, which I hope to compare with the superhet when I get something on which to compare it. That, of course, is the main trouble just at present.

Not Suitable for "Vision."

Will those readers who are misguided enough to imagine that a super-regenerative receiver will serve for the reception of vision please take "No" for a definite answer? I know that the super gives a beautifully broad band—the ease with which one can tune in amateur 5-metre telephony on it shows that—but the modulation frequency (i.e. the frequency at which the detector anode current is interrupted by the quench valve) is right in the middle of the band of television frequencies.

Incidentally, it is a sign of the times that the popularity of the superhet, even for amateur 5-metre work, is increasing fast. The super-regen. is a crude affair, and except for portable work it seems time that we pensioned it off.

INTER-UNIT SCREENING

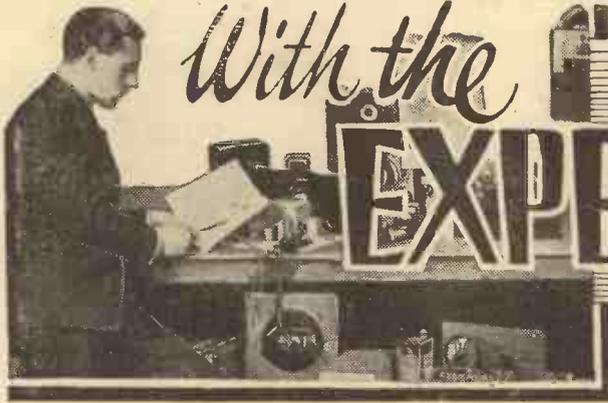


The tube and time-base apparatus should be well screened from the receiver if these two sections are placed fairly close.

A superhet for sound reception on ultra-short waves is an extremely simple receiver to construct and operate, and no one with any knowledge of the ultra-shorts need be in the least afraid of tackling one. The oscillator is the most critical portion, but one has to know how to build a decent oscillator, whatever kind of receiver one happens to favour.

Several suitable types of I.F. transformer for "sound" superhets are already on the market; one hopes that specially designed transformers for vision reception will be available very shortly.

As a matter of fact I know the various manufacturers are busy on the job, so probably we shall get the goods shortly.



With the

EXPERIMENTER

LAYING THE LIGHTNING BOGY

PHEW! It is high summer as I write—or, rather, type with my machine—propped up on a friendly rock far down in Cornwall. Summer, with its joys so strangely alien to the true interests of the one-hundred-per-cent radio fan!

Atmospherics tending to mar all but the nearest programmes; waning signal strengths due to the Kennelly Heaviside layer being—like so many of us—temporarily *en vacance*; yes, and LIGHTNING!

As the dark thunder clouds loom so menacingly upon the distant horizon many a nervous set owner with an outdoor aerial must experience a slight shiver of impending evil. It is small comfort to know that "Lightning seldom, if ever, strikes twice in the same place." What tends to cause the worry is the fear of the first hit!

Millions of Horse-Power.

As lightning pursues its erratic and often crazy course from cloud to cloud, or from cloud to earth, one does permit oneself to wonder exactly what chance the poor old aerial stands in the event—the admittedly unlikely event—of a direct hit.

We might even muse on the vast disparity between the power of a received signal—even from the nearest station—and the potential power invested in an average-sized thunder cloud. The signal can be expressed in millivolts per metre, the lightning flash in millions of horse-power. Before the flash occurs between the two points of potential difference as much as a thousand million volts or more may be set up.

Yet, such is the bewildering progress of science, it is less than a bare two hundred years ago that people were arguing as to whether lightning was electrical in nature or not.

Benjamin Franklin, the famous American scientist of the eighteenth century, actually believed lightning to be caused by "the inflammable breath of the Pyrites, which is a subtle sulphur and takes fire of itself." And that, my hearties, was way back in 1737.

The Famous Kite Test.

Just over a decade later he made good this nonsensical thesis by propounding the startling suggestion that lightning was in reality only electricity writ large. But he was not believed!

A great man, Franklin. Great because he always saw the practical application of a theory. Rather a good experimenter, in fact! Anyway, as soon as he realised—or thought he realised—the electrical nature

of lightning, he wanted to experiment. He wanted to "draw off" electricity from thunder-clouds. And that is how his famous kite experiment came into being.

He sent a kite made of silk right up into the thunder cloud, inserting a metal key between the join in the wire and a piece of silk held in one hand. When he put a knuckle of the other hand to the key he drew off a spark—and then, to prove the theory up to the hilt, he charged up a Leyden jar in the same way.

The First Conductors.

It was not until 1754 that there was any suggestion of protecting buildings from lightning with rods—or conductors, as we now call them. America led the way even in those days—the first conductor going up in 1762.

That was only fifteen years before the War of Independence—when poor old Franklin was, of course, regarded by our august Royal Society as an *enemy*. He was at that time advocating points for lightning conductors, while some of the Royal

It took a good few more years to show that, in the matter of lightning conductor efficiency, the best arrangement was a pointed one—but also of as great a surface area as possible. Also it is not even to this day widely appreciated—among wireless fans—that bends in the path of the conductor to earth must be rigidly avoided.

A wayward lightning discharge does not stand on ceremony. If it is offered the slightest resistance to its headlong dash to earth it will zig-zag off in the most terrifying manner. I have seen examples of this too often to have any doubt on that score.

An Extraordinary Case.

Indeed, in my 'prentice reporting days I seemed always to be delegated to the job of visiting all houses where aerials had been struck by lightning!

I came upon some extraordinary sights, I can assure you. The worst was down in Essex, where the owner of the set and a quite exceptionally high aerial had neglected to do anything about earthing it.

Instead, he had left the aerial lead just dangling inside the window.

Lightning had come surging along the aerial in a direct hit, and arriving at the dead end inside the house, had proceeded to play Old Harry. It had darted up the curtains, setting them alight. It had run along the mantelshelf, melting candle-sticks and old coins. It had played the most inconceivable tricks—fortunately without very much damage.

I Learned My Lesson.

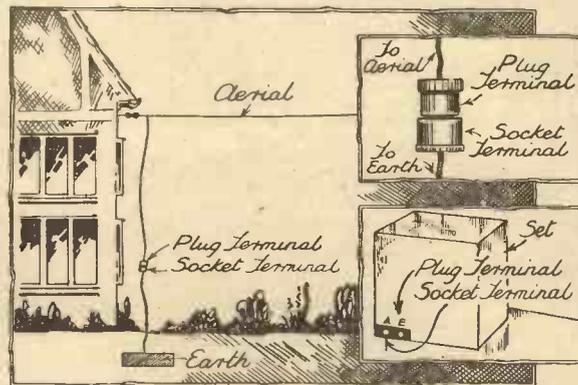
Seeing that taught me a lesson I never forgot. The lesson being a very simple one: earth the aerial when there is the slightest chance of a thunderstorm.

I cannot say that I am too much in love with the usual aerial earthing switch. It always seems to me to be a breeder of awful inefficiency. The atmosphere of the average town so quickly causes oxidation of the necessary external connections that I am suspicious of signal leakage.

Those huge double-pole double-throw switches—where are they these days? One hardly ever sees them. I do not mourn their passing. In theory they provided the ideal form of earth switching. In practice they merely detract from the efficiency of the aerial system as a whole, sapping precious signal volts through all too obvious leakage paths.

(Continued on page 534.)

SIMPLE, YET MOST EFFICIENT



The chief merit of earthing the aerial in this manner is that a straight and direct run from the aerial to the earth is obtained.

Society members insisted on the superior merits of knobs.

The President of the Society, to his credit, resigned when George III asked him to advocate knobs—if only to disparage Franklin. A waggish friend of Franklin composed this immortal epigram on hearing of the affair:

"While you, Great George, for knowledge hurt,
And sharp conductors change for blunt,
The Nation's out of joint.
Franklin a wiser course pursues,
And all your thunder useless views
By keeping to the point!"

OUR READERS' OPINIONS

A selection of letters to the Editor from "Popular Wireless" enthusiasts all over the country

"FROM NUMBER ONE."

Sir,—Wireless. Popular Wireless! And what a run you have given us since your first issue, No. 1, June 3rd, 1922! How we lapped it up! Then, No. 2 "P.W.," "packed with pictures and expert advice," out Friday, June 9th. The day would not come soon enough. Those were the real "wireless-widow" days. And the sets. We've built them all! Well, at least some of them.

First, the "35/- Crystal Set." Chaps, unless you have experienced it you don't know the thrill of listening to the original Savoy Orpheans on a set every bit of which you have made yourself. How many these days know what "Woods" metal was used for? I still have a "solid dielectric" variable condenser made in 1922, composed of semicircular vanes interleaved with celluloid!

Later, we had "Ariel" giving furtive hints about secret comings and goings by the "Tech. hounds," with the result we had the famous "P.W." Combination Set. And didn't it cause a sensation? Readers were invited to hear it at the "P.W." office. (S.T. brings the set to our homes these days.)

We made our own L.F. transformers for this set with iron-wire cores! I used to get the Bournemouth relay (from Liverpool) on this set. Then there was a "posh" edition of this set by Capt. Twelvetees in 1925.

One of the Finest "Threes."

Of course, we must not forget the "Unidyne" circuits. The coming of 2-volt valves, etc. Eventually we come to that outstanding set "The Magic Three"—it may be dead, "but it won't lie down"—but I think the "daddy" of all straight threes was the "Comet."

So we have grown and progressed right on through the S.S. stage, "Economy Threes," etc., to Capt. (Please don't do it!) P. P. Eckersley's "Three," one of the finest "threes" you have ever put out. Reasonable cost, good quality, absolutely reliable, and one-knob tuning. Truly a great set. You have put out S.T.'s, of course, but I regard these as purely S.T.'s specials.

In all these years one would expect to bump into every kind of radio trouble imaginable, but I have been extremely lucky. I think most of the trouble constructors experience these days is due to using cheap "unnamed" components and careless wiring. Use the designer's components or alternatives and no others is my advice.

There is one component I should like to see an improvement in and that is the on-off switch. It is marvellous the mystifying effects and noises a faulty switch is responsible for. I have had many a long chase and finished up at the on-and-off switch.

A good earth is essential, too. You cannot beat 4 ft. of $\frac{1}{2}$ -in. galvanised iron pipe, driven down into the ground, but don't

forget to "tin" a little patch, leaving a good blob of solder near the top before driving it down. This facilitates soldering the earth wire afterwards. Some of the earthing systems in use by constructors are weird and wonderful, wonderful inasmuch as they get any results at all!

With all our experience of things it is surprising the little things we forget. After altering or constructing a new set, I carefully see that all H.T. plugs, likewise S.B. plugs, are in, and switch on in great anticipation, only to be rewarded with silence! I invariably find the L.T. wires dangling on the floor beside the accumulator and not connected!

I have also been lucky with valves, too. Capt. Eckersley, in one of his constructional articles, said: "Fuses are essential. I wish I could be persuaded to use them more!" I don't use any, and have never yet (touch wood!) "blown" a valve. How's that for luck?

Yours truly,

M. Hirst.

283, Rimrose Road, Bootle, Liverpool, 20.

ONE GUINEA FOR A LETTER!

AN INVITATION FROM THE EDITOR TO "P.W." READERS

I WANT readers of "P.W." to help each other. I want them to use the columns of this paper to express their views on all and every aspect of the great hobby of radio; I want them to "swap" experiences; I want them to tell about their triumphs—and their failures—with the various sets they have built. I want, in short, to encourage an exchange of views, opinions, likes and dislikes. . . .

Send me letters for publication, in order that "P.W." can become, more than ever, the best medium for imparting all kinds of knowledge about radio.

YOU must have had, many and many a time, interesting experiences when building or operating your set. Tell other readers about your radio experiences. And, incidentally, get to know each other through the medium of "P.W."

For the best letter in each batch published I am offering a prize of one guinea. Send your letters to the Editor, "Popular Wireless," Tallis House, Tallis Street, London, E.C.4.

S.W. THRILLS.

Sir.—I see in POPULAR WIRELESS you ask your readers to write with a view to helping each other with experience, etc. Well, the best advice I can give anybody is: "Get on to short waves." As a listener and experimenter of four years, I can vouch for the thrills and never-ending interest.

The American stations, W 2 X A D, W 2 X A F, W 8 X K, W 3 X A L, all put over first-rate programmes. One of the most interesting things I heard was the "Dionne Quintuplets" from their own hospital and the voice of Dr. Dafoc. I

have heard Hitler on several occasions from the German short-wave stations. Australia is nothing new, Nairobi in Kenya is a good bag, V E 9 G W of Canada always gives a good programme, P R F 5 of Rio de Janeiro is very consistent, V U B of Bombay conveys the Eastern atmosphere to one's den.

Alive With Stations.

The *Normandie* can be heard working G B C Rugby, and some very interesting news is often gleaned. As for amateur transmitters, at this time of the year the 20-metre band is alive with them from all parts at various times of the day. On the 40-metre band, chiefly European and British amateurs can be heard. They are always worth listening to; many an amateur transmitter started as an ordinary listener, as indeed I did.

Yes, it is well worth the little patience and sometimes late hours involved, and I am always thankful I adopted this most fascinating side of radio as a hobby. And don't forget, no matter when you switch on, there is *always something* to be heard. Here's my last word: Learn the morse code.

Yours truly,

James E. Hunter, opp. G 6 H U
10, Tasmania Gdns., Fairlop Road, Barking-side, Essex.

P.S. The set I am using is an O-V-I.

A REAL ENTHUSIAST.

Sir,—Well, "P.W.," you've asked for it, and now you'll get it—and readers, if any, take warning, or encouragement, by me.

My first set, when completed, was a wonderful array of plug-in coils and knobs, with a Lissen unit laid in a gramophone horn hole for a loudspeaker, which could be heard above the ticking of the clock, after one got used to it. Six-volt valves, bright emitters, and H.T. galore.

Valves burned out frequently, six going in one evening (variable condenser shorting). "P.W." tipped a fuse. Hand capacity and instability were a bugbear, and it was a proud moment when the loudspeaker could be heard ten feet away, and even prouder when Daventry could be separated from Radio-Paris. 100-ft. aerials, 40-ft. poles—and, at the other extreme, an indoor aerial with the oven door handle for an earth.

And so I have progressed through "P.W." circuits, gathering junk and experience. Very few battery circuits have I not nibbled at, and home-made 18-in. L.S. cones have come and gone. Now it is M.C. and "Tweeter," and for two years I have sworn by my combined "Ferro-Q" Class B.4.

"Television? I Shall Be There."

Oh, yes, I do take liberties with circuits. There's more fun, and there are always fuses. I have never turned aside from "P.W." for circuits or help, and know now the difference between an electron and an electrode. I have never had a manufacturer's set yet, and though it is easy to be a trout among a very few minnows, I think I may lay claim to be the first home constructor within four miles, and first, through "P.W.," with S.G. valve, H.F. pentode, and "Class B." Likewise with M.C. speaker and "Tweeter."

Again, I have the Kelsey Adapter under way, which promises great things when I get it going. And what next? Well, when television really gets going, "P.W." and I will be there.

(Continued on next page.)

OUR READERS' OPINIONS

(Continued from previous page.)

Accumulators have a ten-mile journey to be charged. Much midnight oil has to be burned to enjoy the fruits of labour. But it's worth it. And, lest I sound too opulent, let me remind you that gardeners are not among those who can dive frequently to a cheque book, and midnight oil has to be burned because the daylight hours are filled with work.

The first sound of wireless I heard was midnight striking on Big Ben on the ear-phones on a three-valve set with full reaction. And, believe me, it gave a thrill that a 2-watts output of symphony concert never has, or will. So, beginners, get to it. The spade-work has been done in many directions, but there's some left yet where you may turn and find ground untilled.

Yours truly,

W. H. Stacey.

The Ark, Kingmore, Kingsbridge, Devon.

CURIOUS EXPERIENCE

Sir,—Some time ago I built a 10-metre receiver using the split Hartley circuit. Instead of using one tuning condenser with both fixed and moving vanes live, two condensers in series were used with their moving vanes at earth potential, and perhaps I should mention that these tuning condensers were rather large for the purpose, the reason being that ones

of lower value were not to hand at the time.

The H.T. was adjusted until the set oscillated and the set was switched on. It was found that there was, as well as the usual pop indicating that the valve had commenced to oscillate, a second pop, which, judging by the rushing sound heard afterwards, did not indicate that it had stopped oscillating. This second pop seemed to suggest that the circuit could be made to oscillate at two different frequencies at the same time.

A Single-Valve Super.

However, by keeping close to the second pop a station was eventually tuned in. Imagine my surprise when, a few minutes later, I was informed that it was Luxembourg I was listening to. I immediately thought of the usual explanation that it was a harmonic, but this seemed rather ridiculous when, later, the rest of the long-wave stations were tuned-in in their correct order. Also the fact that they were all heard at their usual comparative strengths suggested that the phenomenon was not a short-wave freak, but that it must be due to the circuit itself. The following explanation suggested itself.

The circuit was capable of oscillating at either or both of two frequencies, one of which was that of the grid circuit and the other of higher frequency, probably that of the anode circuit. Let us suppose that after the first pop and before the second one the oscillations were at the frequency of the anode circuit, and, further, that oscillations at the frequency of the grid circuit began at the second pop.

Now when a long-wave signal arrived at the grid it was mixed with the oscillations at the frequency of the anode circuit, and rectified as at the first detector in a superhet, an intermediate frequency signal appearing in the anode circuit. The frequency of this beat was the difference between that of the anode circuit oscillations and that of the long-wave signal. The beat frequency was thus still of short-wave order, since the long-wave frequency was small in comparison with that of the local oscillations. The H.F. choke therefore barred the way to this beat frequency and forced it back to the grid again. If the grid circuit was tuned to this frequency the valve then acted as detector with reaction, the adjustments being made to keep the circuit working just below the second pop. The valve was therefore doing the work of both the first and second detectors in a superhet, and instead of lowering the frequency of the incoming signal was actually raising it.

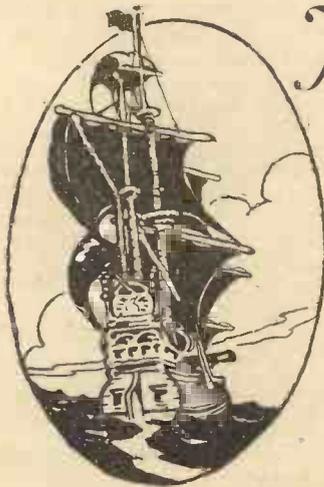
I may mention that by lowering the wavelength of the receiver considerably I succeeded in tuning-in a large section of the medium-wave band in exactly the same way. At present I can see no useful application for this phenomenon, but look upon it as an interesting problem. If any readers have had a similar experience and have alternative explanations to offer, I should be pleased to hear from them.

Yours truly,

M. E. Maxwell.

31, Atlantic Avenue, Belfast, Ulster.

(This letter is awarded the guinea prize in accordance with the offer on the opposite page.)



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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

SHUNT FEED FOR THE L.F. TRANSFORMER

"SHUNT FEED" (Ilford).—"Is the following method correct for shifting an L.F. transformer to shunt feeding, so that no H.T. goes through its primary?"

"Leave anode circuit as before, except to wire a suitable coupling resistance in the place formerly occupied by the transformer primary.

"From the anode side of this coupling resistance take a lead to the L.F. coupling condenser, the other side of which goes to the A terminal of the L.F. transformer.

"H.T. terminal of transformer goes to the L.T.—H.T.—earth line. G. terminal of transformer to grid of following valve holder. G.B. terminal of transformer to grid bias."

Your suggested method should be quite O.K., provided that the values of resistance and coupling condenser are right for the particular type of transformer in question.

GRID CONDENSER'S EFFECT ON QUALITY.

A. S. P. (Marazion, Cornwall).—"I am worrying out the details of a quality-first amplifier, and although the values of the amplifier itself are giving comparatively little trouble, I am rather concerned about the input.

"I understand that the value of the grid condenser of the detector affects high-note and low-note reproduction, but I wish you could make this part of the detector's action clear for me. The actual values I will work out for myself, that being part of the fun of finding the arrangement best suited to one's own particular conditions. But as far as this question of grid-condenser value is concerned I am working in the dark.

"Will you please explain how the size of condenser alters quality, and also, to some extent, the amount of such alteration. For instance, if I put a .001 mfd. in the detector's grid circuit, in place of an .0001-mfd. grid condenser, I get different low-note response. Why?"

"Alteration of the grid-leak value will also affect quality, I know, but at the moment it is the condenser that is worrying me.

"Is it a question of altered impedance? And, if so, how can I calculate the extent of that alteration?"

"I am tempted to ask for some examples, but I would rather work out the actual figures for myself, if you can give me some light on the whys and wherefores."

We cannot hope to explain all the considerations involved, because the action of the detector is far more complicated than one might expect from its few connections. But we think we can make clear the point that has been worrying you.

So far as the condenser is concerned, it is largely a matter of impedance. And in the case of the grid condenser there are two different impedances to consider for the same condenser—impedance to the high frequencies to which the preceding grid

circuit is tuned, and also the impedance to low frequencies in the audibility range.

When a condenser is interposed between a valve's grid and its grid circuit the condenser must obviously act as a coupling or high-frequency conductor. So the impedance must not be unreasonably high at the frequency of the H.F. currents to be passed.

At the same time, while detection is taking place the L.F. voltages developed on the grid must be applied across the grid leak connected from grid to filament (cathode); but since the tuned circuit itself is also across those two points, the grid condenser must act as a barrier to the L.F.

Thus the one condenser must simultaneously bar L.F. and pass H.F. This it is able to do by virtue of its varying impedance (or rather, reactance) to varying frequencies.

AN ORIGINAL RECEIVER IDEA



A very original theme carried out by a French radio enthusiast. Both the set and loudspeaker are built into the wall. Note the skull design on the loudspeaker fret.

A condenser's apparent resistance, or reactance, to a given frequency is given by the formula

$$\text{Ohms} = \frac{1,000,000}{\text{frequency} \times 6.28 \times \text{mfd.}}$$

Thus, on 300 metres, which is equivalent to a frequency of 1,000,000, the H.F. reactance of a .0001-mfd. condenser will be $\frac{1}{6.28 \times .0001}$ (since the two 1,000,000's cancel out); and this works out at rather less than 1,600 ohms.

To L.F., at a frequency of 1,000, the same condenser has the following reactance $1000 \times 6.28 \times .0001 = \text{over } 1\frac{1}{2} \text{ million ohms.}$

From this you will appreciate how the grid condenser's maximum capacity may affect quality, resulting in high-note loss (the higher L.F. frequencies) if too large.

Remember, however, that there are many other factors, including parallel reactances, to consider.

And also the very important choking effect due to a grid condenser which is too large for the grid leak to "clear" the charges on it from moment to moment. So far as reactance is concerned, however, the formula given will enable you to find the condenser's apparent resistance to different frequencies.

THE S.T. "EXTRACTOR" ON OTHER SETS.

B. P. (Towyn, N. Wales).—"For ten years I have been keeping an admiring eye on S.T. designs, and I very much fancy his latest, the 'Extractor,' as used in the 'S.T.600.' Can this be applied to other sets to improve them?"

No. The "Extractor" was designed expressly for use with the special coils of the "S.T.600" and other "S.T." receivers. It is unsuitable for use with other sets.

THE GOOD EARTH DELUSION.

H. D. R. (Crystal Palace, London, S.E.).—"I know the earth is all right, because the lead is only about forty inches long to the end, where it is soldered to the iron pipe. This is a drain pipe, going straight down into the drain.

"There is crazy paving round this for twelve feet, but, being attached to the drain itself, the earth gets all the moisture there is going. Yet distant stations are poor, and the set seems better when I run a long lead of 22 gauge right out of the room and up to the bathroom, where I can make a water-pipe connection to the tap.

"Is this extra long earth lead acting as aerial, or what?"

Despite the soldered joint, we strongly suspect that drain-pipe earth. Because the pipe disappears underground there is no justification for supposing that it makes good contact with moisture below ground; in fact it may be connected to the lower waste-water system by a joint that is an insulator, so far as electrical effects are concerned.

From what you say, we think this may be happening in your case, and another earth should be used.

ADDING AN EXTRA H.F. CHOKE.

G. K. H. C. (Walton-on-the-Naze, Essex).—"The valve makers' technical assistance people suggest that the H.F. choke used is not good enough for the job, and that I should get another to replace it, or add a second choke.

"To increase the impedance, should the extra choke be added in series, like a resistance, or is impedance increased, like the capacity of a condenser is increased, by adding in parallel?"

In series, every time, like resistances. If inductances are wired in parallel the total inductance is decreased.

If the self-capacity of a choke is small, as it should be, its choking effect will depend almost entirely on its inductive reactance, and the rules for this are as for resistance—simple addition in series, and "reciprocal reduction" in parallel. So, as for resistances, the effective ohms are doubled by joining two equal chokes in series, and are halved by connecting them in parallel.

POWER OF B.B.C. STATIONS.

"CURIOUS" (Newport, Isle of Wight).—"Is it right that the Regional stations have been reduced in power? How do they compare now with Droitwich, in kilowatts?"

It was some of the Nationals that were reduced recently, not the Regionals. The present kilowatt figures for the various stations are as follow:

Droitwich, 150 kilowatts; North Regional, Scottish Regional, West Regional, London Regional, and Midland Regional are all 50 kilowatts; Scottish National, 50 kilowatts; London National, North National and West National, 20 kilowatts; Belfast, Newcastle, Aberdeen and Bournemouth, 1 kilowatt; and Plymouth, .3 kilowatt.

THREE-FOLD TONE CORRECTION CIRCUIT.

J. B. (Blackpool).—"I have been up against tone correction trouble, and have now been told that 'P.W.' recently gave particulars for making a tone corrector circuit using resistance, condenser, and H.F. choke, for control of middle notes, as well as the usual high- and low-note control.

"Please give the number in which this description appeared?"

You will find the details in an article on "How To Improve Your Quality," page 355, June 8th issue of "P.W."

SIR JOHN REITH IS WRONG

(Continued from page 523.)

stands indicted for having permitted it ever to have been broadcast.

That does not affect my basic point, which is that when Sir John Reith is wrong he is wrong in such a way that he has no need to be ashamed. His wrongness can be reckoned unto him for righteousness. I maintain that his Sunday programme policy is wrong, but not wrong as it would be wrong were he to give the microphone over to salacious sketches, smutty stories or bawdy songs. He is wrong in the best way.

Programme Staff and a "Mission."

I believe Sir John Reith is wrong in the spirit that he is anxious to inculcate and cultivate among the B.B.C. staff. I am not referring to the stories of "quarter-deck" manners, because, being a frequent visitor to all departments at B.B.C. headquarters for several years, I disbelieve such stories. I refer to the cloistered "come-ye-apart" spirit; the attempt to make the programme staff feel that they have "a mission," and that the dedication of all their faculties to the service of the microphone is a vocation no less binding on their individual lives than holy orders.

In that I believe Sir John to be wrong; but, again, he is wrong on the good side. He is not wrong as he would be were he to care nothing whether his staff were men of low morality and of no regard for their responsibilities to the weal of the world. He is wrong, but his wrong is a virtue—a misplaced virtue, in my opinion, but to be valued far more than the rightness of those men in the theatrical profession who have been right in declaring "the show must go on," and to do so have worked their staff to a standstill, underpaid their operators, and stranded their chorus girls.

Organisation That Is Too Isolated.

The fact that when Sir John is wrong in this matter of staff he is wrong in a good cause does not prevent me criticising him on this point. In my opinion the chief weakness of the B.B.C. organisation is that it is too isolated from the common people. There is a West End outlook, a Mayfairish idea of being *élite*, an implication of superiority, a "not-as-other-men-are" attitude. It is a manifestation of the public school spirit outside the public school. It is Old-School-Tie-ism amok. It is the substitution of *esprit de corps* for efficiency

and the *laissez-faire* of dignity for the salesmanship of the "show game."

Sir John is wrong in that. He should recognise that broadcasting is the democratic entertainment; that it is the home-interest of the people; that the West End is not London any more than London is England (much less his own Scotland); that the B.B.C. is in the show business; that business morality demands that the people who pay at a compulsory box-office should not also be compelled to accept a form of entertainment they would not pay for voluntarily. What is wanted in the new B.B.C. is a new concept of the B.B.C. duty to the B.B.C. public. More humanity is needed—a getting-closer to the people, a shoulder-rubbing with the galleryites, a shedding of the moth-balled Sunday clothes of saintly superiority and a donning of the homespun and corduroys of workaday ordinariness.

The Public Will Respond.

I can assure Sir John that if he will admit that he is wrong to develop the Superior Manner at Broadcasting House, and will instruct his staff to get down to their public, he will find that the public will respond to all the ideals he has for them. The most popular preacher I know (and without the capacity for popularity saintliness is but seed sown on thorny ground) is the Rev. Dick Sheppard, and one of his secrets is that he has never found time to acquire the Pulpit Tone.

The most successful doctor I've met (and medical success is measured by skill in getting past the patient's reserve) is my own, and that is because he is too good an Irishman to have developed the Bedside Manner.

This article is the plea, addressed to Sir John Reith, to initiate a new atmosphere and attitude at Broadcasting House: to expel the Pulpit Tone and the Bedside Manner from the studios, and to treat his 30,000,000 listeners as if they were brothers-under-the-skin, with human frailties and human desires, with human appreciation for jollity and innocent frivolity, with human emotions of joy and sorrow, pity and remorse, laughter and sadness, all of which respond instinctively and naturally to simple entertainment, free of sophistication, University "cleverness" and cultural aestheticism.

ROUND THE RECORDS

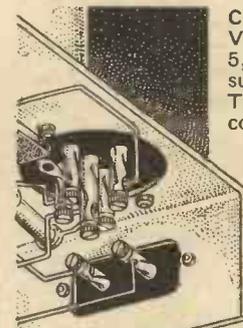
(Continued from page 518.)

all hearts by her brilliant singing and her personality. The day following her Covent Garden debut she spent an afternoon in the H.M.V. Abbey Road recording studios, and as a result we have a fine record of the aria with which she had "brought down the house"—"Una voce poco fa." The warm, fresh quality of her voice is perfectly recorded, and the ease and clarity with which she sings notes of dizzy heights will provide a thrill for every musician.

And now a few lines for the benefit of piano lovers. While the Beethoven Sonata Society continues its noble work of recording all of Beethoven's Pianoforte Sonatas played by Artur Schnabel, H.M.V. publish a delightful performance by Backhaus of Beethoven's lovely *Sonata in E flat major*, the one with the pictorial sub-titles "The Farewell," "Absence," "The Return"—one of Beethoven's rare excursions into frankly descriptive music (DB2407-8).

Another pianoforte record of extraordinary interest is that by the young British pianist Cyril Smith, who captures the oriental spirit and charm of Balakireff's difficult and colourful Oriental Fantasia *Islamey* (C2755). You should hear these records. K. D. R.

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WIRELESS CONTROL FOR AEROPLANES

(Continued from page 517.)

I have devised, and I hope you will agree that it has some attractive and, perhaps, quite novel features.

I will first of all tell you what it can do and then how it does it. There are as many controlling keys as are required for the different operations of remote control and these keys are grouped on a neat board.

Supposing the operator desires to make the aeroplane turn to the right. He merely presses the button labelled "Right." A pilot light at once glows to show that the control is working and, as a further check, a pilot buzzer audibly gives the signals corresponding to the sequence of impulses sent out.

Only One Button at a Time.

The longest signal would not take more than half a second or perhaps a second to send out, but should the operator in the excitement of the moment attempt to press another button almost immediately and before the first signals had cleared nothing could happen because all the other buttons are automatically locked until the sequence is complete.

Now glance at the diagram. There is an endless band of flexible insulating material driven by a small motor the speed of which is limited by a governor. A slipping clutch might not prove essential in practice, but as an advocate of the principle of complete coverage I have included one "just in case"!

On the band there are strips of conducting material (such as silver, to ensure good contact) and a row of fixed brushes, one brush for each of the lines of conductors. I have numbered these brushes because I shall refer specifically to one of them in a moment.

Each of the keys operates a double pole switch and on the stem of each of the keys are locking niches. Let us see what happens when one of the button keys is pressed. It must be pressed right down before the pilot light will light to indicate that the device is working. The switch contacts close and two of them complete the motor circuit.

The band starts to move round. Number 1 brush is scraped by a long, continuous strip of conductor which also closes the motor circuit, so now the motor must continue to run until the band completes a full travel.

How Signals are Formed.

In series with the motor are two magnets which attract a locking bar that holds the key down and locks all the others until the signal has been sent out.

The signals are formed by one of the other brushes scraping across successive strips of conductor and there will be as many strips as the number of impulses necessary to each sequence. The signal circuit is made by the other pair of contacts on the key switch.

When the pressure of the finger is removed from the button key it stays in position, of course, as it is locked, but the motor-starting contacts break so that the whole onus of completing the motor circuit and the magnetic locking, and the glowing of the pilot lamp are all thrown back upon the continuous strip of conductor on the moving band and its brush. This strip breaks at the point where the band has run round once and that is when the motor, light, etc., are switched off automatically. A small escapement stop ensures that the band stops at exactly the right place each time.

Any Number of Keys Possible.

The slipping clutch on the motor would be necessary only if the armature of the motor had considerable momentum. I haven't shown all the button keys connected up because it will be appreciated that the wiring is similar in each case.

Only the one magnetic relay would be needed and this would close as many times as there were strip conductors concerned with the button key pressed. In effect, the magnetic relay is, of course, a kind of automatic Morse key.

THOROUGHLY TESTED BEFORE DESPATCH



A batch of receivers undergoing a six hour heat test at the Ferranti works. This is only one of the many tests that Ferranti sets are subjected to before being passed out as O.K.

"HAIL, HASSAN!"

(Continued from page 516.)

reminded at all of Gypsy Smith's voice? Myself, I couldn't but notice the similarity more than once. This manner of speech is undoubtedly an art.

Gwendolen Evans as Yasmin gave a characteristic display, and the scene between her and Hassan to which I have already referred will long stay in my memory. Among the smaller parts to catch my eye (or ear) was that taken by Hector Abbas, as Ali, described in the programme as a Nondescript. He came to a sticky end early in the proceedings, but Abbas made the very most of his short time before the footlights.

"Hassan" as a performance is a landmark in the history of radio drama. As a play, too, it must hold an equally exalted place. As I see it, there isn't a bad line in it. Nor a mediocre. Every line is good. Its poetry is good; its metaphors are very picturesque.

Now then, you racegoers: What is "Tattersall's Talk"? If you can't tell me, the chances are you won't know either what a "Home and Dried" horse is. Well, "Tattersall's Talk" is the name given to the language of stable-lads. And a "Home and Dried" horse is the term stable-lads use of a cast-iron certain winner (before the event)—so certain a winner in fact that the horse is home and dried before the rest of the field have finished the race. My informant is Walter Bury, the racehorse badger, who gave a very interesting talk on what goes on behind the scenes at a race-meeting. Mr. Bury also asked a question which he himself couldn't answer.

"Why are stable-lads called stable-lads, seeing that some of them are old and grim little men who have been years and years at the job?"

"Seeing Life" promised to be the only humorous item of several days broadcasting. But it didn't fulfil its promise. In fact, it didn't fulfil anything till the cabaret part of the show began. Sammy Shuttleworth and his London acquaintance carried on a banal conversation whenever they had the chance, at which we were supposed to laugh.

The cabaret turns weren't too bad. Hildegarde, whom we have heard before, appeals to me more when she sings her *Jawohl Ja Gut* sort of number. She sings her sentimental numbers well, too, I suppose. But there have been far too many of these songs this week. First Hildegarde, then Diana Ward, then Phyllis Robins, and others. Ronald Frankau was rather frugal with his offering. He just did "I'm frightfully Freddie" and that's all.

A good turn was Luciano on a mouth organ. Diana Ward sounded at first like a second Hildegarde till she turned 100 per cent American. This seemed to worry Sammy Shuttleworth, who took the opportunity to begin another quasi-humorous account of his wedding-day. This was the end of "Seeing Life" for me.

C. B.

WITH THE EXPERIMENTER

(Continued from page 529.)

My own way is to adapt the aerial and earth terminals of the set so that I can use interlocking leads—the aerial lead ending in a plug and the earth lead in a socket. Then I simply disconnect these from the set and press them together, throwing the continuous line well clear of the house wall.

It seems to me this is at once the ideal earthing arrangement for the aerial and the least likely to cause any inefficiency. Indeed, when the aerial is not actually earthed there can be no loss of signals—because then there is no close proximity of aerial and earth leads at all.

One thing I would remind you of: a well-earthed aerial is a sort of protection against lightning hitting the house. For it then forms a pretty effective lightning conductor. But that does postulate a good earth in the first place—and at this time of the year how many buried earths can be called good?

Don't Use a Waterpipe.

But, remember, a water-pipe is *not* to be dreamed of when thinking of lightning-conducting. If normally you use a water-pipe and it acts well as the wireless earth, it is still worth burying a plate or driving in a spike for the lightning earth.

Don't let this little article put the wind up you—for the chances of your particular aerial being ever struck by lightning are remote, if not millions to one against. You have only to think of the many thousands of miles of telephone wires—just as high as the average aerial, if not higher—and remember how seldom they are struck to be quite reassured.

Still, to misquote rather horribly a well-known proverb: Thrice armed is he who has his law of probabilities just—but ten times he who gets his aerial earthed *just!*

The Experimenter

RECENT TELEVISION ADVANCES

Jottings of interest to all.

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

TRANSMISSION of television impulses from one place to another by wire on the ultra-high frequencies constitutes a special technical problem in itself. At first it was thought that it would be necessary to have the television studio in some special place in relation to the transmitting aerial, owing to the reasons just mentioned. But television engineers have succeeded in the development of a special kind of cable which carries these high frequencies effectively.

This new cable is known as the "co-axial cable," and has been developed largely by the American Telephone and Telegraph Company. It greatly assists in the technique of television. For example, when the top of the Empire State Building was selected as a television aerial site it was believed that the performers would have to go skywards in the elevators of the building in order to be "seen on the air." But with this new co-axial cable that idea has been killed, and the television camera, like the microphone, goes to the performers instead of the performers having to go to it.

American Practice.

Television shows will be staged in the studios of the famous Radio City. The new cable, over which the images can travel as easily as the voice over a telephone wire, will be installed between Rockefeller Centre studios and the ultra-short-wave image transmitter in the Empire State Building skyscraper.

The television broadcasts will be picked up at the Radio Centre, and will be transmitted by this special type of cable under the streets to the jumping-off site at the Empire Building.

A New Amplifier.

Along with this co-axial cable a special new transmitting valve of enormous amplification has been developed, and United States engineers are claiming that these two features, with others, put the U.S. far ahead of any European country in the matter of television.

By this new amplifier they claim that they can produce very much larger pictures on the screen—even as large as several feet square. The images are claimed to be clear and without flicker, whilst the lines that "paint" the pictures are so finely cross-meshed that the pictures are as clear as newspaper half-tones.

Network of Stations.

This new cable will enable television stations to be linked into a network. The obvious alternative is short-wave connections, but many engineers consider that, since the transmissions are so susceptible to static and other interferences, it would be better if a cable could be designed which would handle a wide band of frequencies sufficient to carry television pictures. This co-axial cable is believed to be the answer to their prayers. Being able to bring the television to the artists instead of the

artists to the television is a great advantage. The problem recalls that which arose when broadcasting first started.

German Experiments.

I have reports from Berlin that great progress is being claimed there in connection with television transmission over a distance of fifty miles. The transmission took place from Witzleben to Gildenhall, and the transmission of the sound and vision is reported to have been excellent.

The head of the German broadcasting service, Dr. Hadamowski, delivered an address from Witzleben to an audience at Gildenhall, and he was both seen and heard perfectly.

Increasing the Range.

If this proves to be capable of reproduction it seems to be a great step forward, because hitherto we have rather assumed that television broadcasting would be limited from any particular station to a radius of about 25 to 30 miles. This German experiment would appear to have practically doubled the distance. You can soon see the importance of all this, because even a comparatively small percentage increase in the radius—let alone a hundred per cent increase, which this is—will minimise the number of relay stations necessary to cover the country, and thereby very greatly lessen the capital and upkeep cost.

Trouble with a Mains Set.

I have a letter from a reader who tells me that he had trouble with a mains set in which the valves seemed to work badly after they had been in use for some time, and on more than one occasion one of the valves went west.

After examining for all the usual causes of trouble, such as voltages, currents and so on, he discovered that the real cause was that the valves were getting excessively hot when in use. It turned out that the cabinet was so small and the assembly so compact that there was no room at all for ventilation; also, there were various resistances in the set which made it still hotter.

This question of ventilation is a point which needs careful attention. It is all very well to make a small, compact set, and, so far as it goes, it is all to the good—making sets more and more compact is one of the main trends of design nowadays—but it must not be done at the expense of proper ventilation.

Compact Assembly.

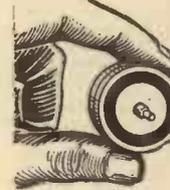
Remember that practically every set has heat-producing components in it, quite apart from the valves, and it stands to reason that if there is little or no means for the heat to escape everything inside is going to get precious hot. Several of the components in an average set are not at all designed to stand any great rise in temperature. For example, transformers and

(Continued on next page.)

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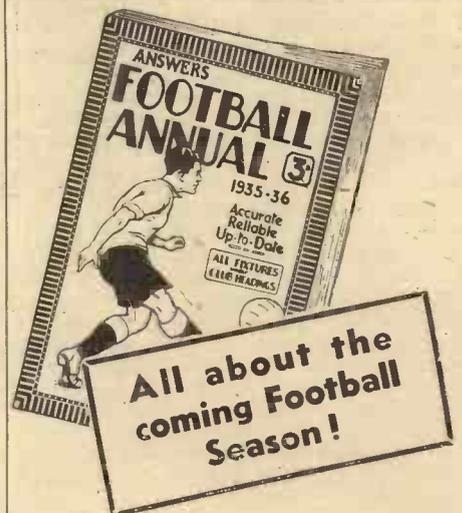
WARNING

Do not purchase any radio receiving valves until you have ascertained their origin and guarantee of performance and life—in fact until you have considered the 362 range of valves.

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RECENT TELEVISION ADVANCES

(Continued from previous page.)

condensers, especially if the latter are of the high-capacity paper-insulated variety, will soon suffer from the heat if the latter is at all excessive.

So when you are arranging things, always remember to allow sufficient ventilation for the heat to escape, and for all the various components to operate normally under reasonably cool conditions.

This advice has often been given before, and many people think it is just being fussy and that there is nothing in it. But, as a matter of fact, there is a good deal in it, and if you make the cabinet too small in the first instance, it is a great nuisance having to redesign the whole thing afterwards.

Fibre Needles.

Many people use fibre needles in playing their records, in the belief that these needles do not cause any wear on the record surface. This is a mistaken belief because, of course, it is obvious that any mechanical engagement between the two surfaces is bound to cause a certain amount of wear. Personally, although I know my view is not a general one, I dislike fibre needles, and I never use them. I think that although they do not perhaps wear the surface in the same way as a steel needle, or a permanent needle, they produce a peculiar kind of roughening of the surface of the record, which to my ear is even worse. At any rate, the fact remains that rightly or wrongly fibre needles are very popular.

Tone and Amplification.

As regards steel needles, I prefer to use either a soft or a medium needle and then to make up the volume by amplification. With an ordinary mechanical gramophone, using non-electric reproduction, the amount of sound you get depends directly upon the needle you use, as you have no means of amplifying the sound afterwards.

But I suppose the great majority of people nowadays use electrical reproduction, and I am assuming this when I talk about the different types of needle to use. There is no point in using a loud needle and then toning down the volume by means of the volume control. All you are doing is to take more out of the record than you need and whittling it down with the control; far better to conserve the record by using a soft needle, which will produce much less wear and tear, and making up by the amplifier.

Wear on the Track.

Remember that the record track acts like a *cam* to push the needle from side to side, and the more the needle mass (e.g. loud needle) the more reaction there is (I mean mechanical reaction, of course) between the point of the needle and the side of the sound track. If the needle is a more flexible one (e.g. soft needle) it is obviously not so "heavy" on the walls of the track.

"Permanent" Needles.

As regards "permanent" needles, these are made of a material which is exceedingly hard, and so is worn down by the record relatively slowly. But remember that on

its part it wears the record track away and it does not adapt itself to the shape of the track, that is "bed itself in," so readily as an ordinary steel needle. It is for this sort of reason that I personally do not like permanent needles; I always think they are scratchy. It is an advantage to have a needle which does not need to be replaced for perhaps fifty playings or more; but, in spite of that, I prefer a nice "soft" steel needle.

We all have our preferences in these little matters; I have given you mine and you can try them out and see if you think there is anything in what I say.

Car-Radio Pointers.

Several readers who have radio sets in their cars have told me that they have been in trouble with sparking in the electric windscreen wiper on wet days when this is in use. I can quite imagine this, although in my own car the windscreen wiper is of the suction type from the intake of the

IS YOUR SET O.K.?

Every home constructor should read John Scott-Taggart's exclusive series of articles **WHERE CONSTRUCTORS GO WRONG**

now appearing in "Popular Wireless." Next week our famous contributor deals with the vital matter of layout in his usual straightforward and trenchant style.

ALSO NEXT WEEK

A Special Article - by Alan Hunter
"THE B.B.C.'s NEW STATIONS"

Don't Miss the August 3rd Popular Wireless

On Sale July 31st. - Price 3d.

engine and so does not cause any trouble of this kind. In the electric wiper of certain types you are certainly liable to get sparking which will upset things at the radio receiver. The only cure is to use some sort of filter, as you do to cut out the interference from the spark plugs and the magneto.

This kind of interference is on a par with that which you get in the radio set at home when somebody switches on or off an electric light in the house (or even a neighbouring house sometimes), or when the electric bell rings, or the refrigerator motor starts up, and so on. Each of these things acts as a sort of spark transmitter and has to be dealt with on that basis.

A Workshop Hint.

When you are using a file (especially a nice new one, which you want to keep sharp) for the purpose of filing soft metal, such as aluminium, zinc, or even copper, it is a good plan to rub the file over first with a piece of chalk so that the chalk gets in between the teeth of the file. This is a favourite trick

of engineers and mechanics and saves them quite a good deal of money in the course of a year in cost of renewal of files. ¶

If you use the file without chalking it, you will get the teeth blocked up with bits of aluminium, or whatever it may be, and these are very difficult afterwards to get out. Once the teeth are blocked up they are, as it were, streamlined and cannot bite into any metal which you want to file, so that the file simply slides over with hardly any cutting action. The chalk, on the other hand, permits the file to cut just the same, but prevents the filings from getting firmly lodged between the teeth.

*Ware Solder.

By the way, you should *never* use a good file for smoothing off *soft solder*. The proper way to do is to melt the solder until it is just pasty and then wipe off any excess quickly by means of a rag. But if you *must* finish it with a file, use some old file that doesn't matter. If you use a good file for the job it is absolutely certain to become choked with the solder and will be as good as useless for any other purpose afterwards.

RADIO FOR AFGHANISTAN

AS indicated on page 513, the Afghanistan Government has placed a contract with the Marconi Company for the supply and erection of five wireless stations.

The installation of an up-to-date wireless system of communication will be a valuable contribution to the development of Afghanistan's commercial and social relations with other countries and an equally important factor in the country's internal communication service.

The most powerful of the five new stations will be situated near Kabul and the other four at Maimana, Khanabad, Khost, and Diyazungi.

The Kabul station will communicate with the principal capitals of Western Europe, with Moscow, Tokio, Shanghai, and New York by means of directional aerials, and to Rio de Janeiro, Cape Town and Melbourne with omni-directional aerials.

World-Wide Communication.

This comprehensive scheme of world-wide communication can, if necessary, be enlarged still further to include other places within the scope of the directional aerials, provided the wavelength is suitable. As an example, the aerial directed for Tokio and Shanghai could include Peking.

For reception, directional aerials will also be installed, thus providing a better signal-to-noise ratio, and reducing the effects of atmospherics.

Automatic transmitting and high-speed recording is provided for one transmitting and one receiving channel, arranged for a maximum speed of 200 words per minute. The receiving and transmitting sites will be separate and will be about ten miles from the City of Kabul, where the central telegraph office for the control of the wireless stations will be located.

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SOUTHERN RADIO, 323, Euston Road, London, N.W.1. Near Warren Street Tube. Phone: Museum 6324.

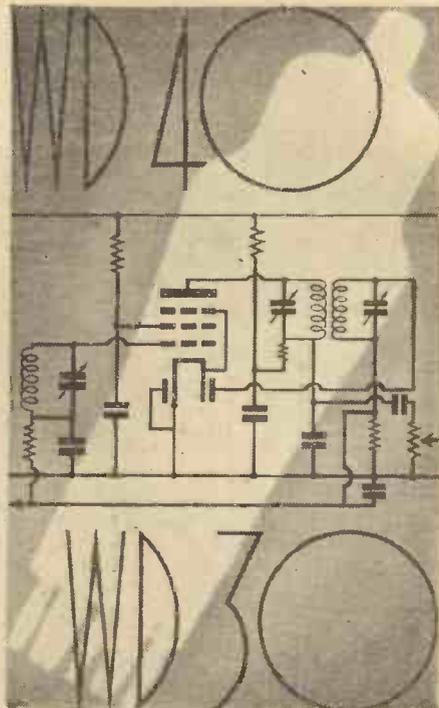
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MISCELLANEOUS

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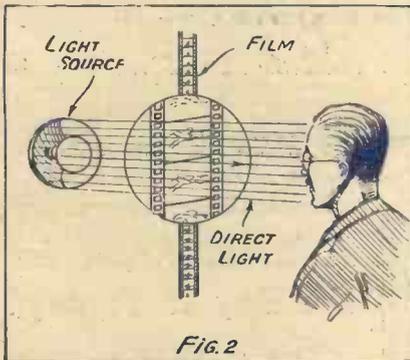
Signed.....

Address.....

Date.....

"The witch-doctor, his lips curled back in an ugly snarl, bent forward and touched where the white man pointed. The next moment he leapt back, claspng his hands and howling with pain. He threw his spear to the ground and danced about like one in agony. Reginald watched him coldly, then picked up the fellow's iron spear. Laying it across the wireless set, he turned to its owner."

AND THEN WHAT HAPPENED?
TO FIND OUT YOU MUST READ
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"Direct lighting is possible in the case of the transmission of films. . . . To make the illustration clear I asked the artist to show an observer instead of a photo-cell."

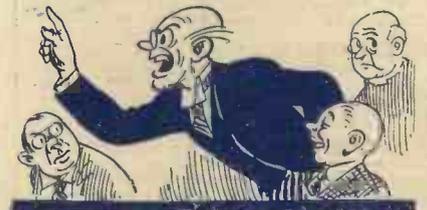
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SO IS EVERYTHING ELSE IN THE
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IN THE AUGUST "WIRELESS."

"(1) That not only do all their teeth fall out, but their hair has turned white in the night.
(2) That their name is mud. (3) That they are being battered to death by a howling mob of home-constructors in Manchester."

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" . . . Mudbury Wallow, as I was saying, will lead the way. I have long been thinking over a death ray that will be the worst lard—er—er, that is to say the lest ward.
'Wast lerd, you mean,' I hissed.
' . . . Will be the last word in death rays.' "

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