POPULAR WIRELESS, March 27th, 1937. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

MEDIUM-WAVE TELEVISION—A NEW IDEA

Popular Wireless & Television Times

MAINS UNITS AND SHORT-WAVE SETS

EVERY WEDNESDAY PRICE 3D

No. 773.
Vol. XXXI.
March 27th, 1937.

Also This Week:

AN INGENIOUS REMOTE VOLUME CONTROL

Our cover photograph shows the new H.M.V. all-world radiogram, model 495. It costs 22 guineas.

Editor: G. V. Dowding Asst.-Editors: A. Johnson-Randall, A. S. Clark

JUMPING JAPAN
FLYING BOATS
COME AND GO

RADIO NOTES & NEWS

THE GOOD EARTH
THEY SAID IT
COCKTAIL SETS

Honour for an Amateur

CONGRATULATIONS to G 2 V Q, Mr. H. Old, of Nottingham, upon receiving the M.B.E. This distinction was conferred on Mr. Old in recognition of his services in helping to solve the problems of police radio equipment.

Mr. Old's success in the Midlands reminds me that amateurs in other parts of the country have been linking up very successfully with police and other official bodies requiring radio assistance. 'Sfunny how the old prejudices against the amateur seem to fizzle fast when there's real work to be done.

Jumping Japan

THE statistics of Japanese radio are indicative not so much of a rapid rise, as of a gymnastic jump. The radio industry there has developed to the point where imports are practically nil.

There are thirty-one Japanese broadcasting stations, and one of them—Tokyo Central—is either about to lash, or is now lashing out with 150 kilowatts. As soon as Tokyo has settled down to this high power the station at Kyushu will increase its output to the ditto-repeato mark, thus giving Japan the equivalent of a double Droitwich.

Japan's five largest stations are of the Marconi type, two others are Telefunkens, and the remainder are home products. The country has about 3,000,000 radio subscribers, who pay fifty sen a month each, instead of the recently altered rate of seventy-five sen.

"Caledonia" Calling

THERE has not yet been time for me to hear from ether-watchers who are taking my hint to keep an eye and ear on the Empire flying-boats, which are making tests for the new transatlantic air service. But it certainly looks as though Imperial Airways are progressing very favourably with their ambitious programme.

The Caledonia's non-stop flight from England to Egypt, a distance of 2,500 miles, was a pretty hot prelude. And a non-stop tour of the British Isles through fogs, downpours, and other typical weather at an average speed of nearly 160 miles an hour can fairly be described as flying some. The tests with the wireless station at Foynes, Irish Free State, which were made on this trip were highly satisfactory.

Financial Fillip

WHEN the Radio Manufacturers' Association invited Mr. H. L. Kirke of the B.B.C. to talk to them at a recent luncheon he produced some facts and figures that were more stimulating than anything served in the glasses.

Look at India, urged Mr. Kirke. About 350,000,000 people just ready for the radio bug to bite them. Next year, he said, twelve new radio stations will be on the air, and foreign set manufacturers will be on the make.

Who will supply sets for that vast potential audience? inquired Mr. Kirke, looking at the radio manufacturers. It was the very question which was occupying their minds as he spoke; for it needs no currency expert to calculate that rupees and annas multiplied by 350,000,000 would improve a balance sheet.

Come and Go

"PEACE, CHEER AND JOLLITY"—in other words P C J, the Eindhoven short-wave station—has now removed to Huizen. Listeners who report on this station should address their letters to P C J Studio, *Hilversum*, Holland, for apparent ambiguity is inseparable from Dutch radio.

* * *

Father Coughlan, America's radio priest, who bade farewell to his huge wireless audience only a few months ago, is again buying time on the air. It appears that announcements of his irrevocable retirement really meant that he would be right back.

* * *

When the Stagshaw station takes over from Newcastle in the autumn the last link with our original B.B.C. stations will be severed, for Newcastle, then as now on 1½ kw., was one of the 1922 old-timers. The London, Birmingham, and Manchester stations have all been improved away long since.

A WONDERFUL SET

The Editor, "Popular Wireless."

Dear Sir,—You will doubtless have received many letters of appreciation re the "Super Centurion"; yet I cannot refrain from joining in the chorus of praise, having just completed this wonderful little set with the aid of your valuable guidance and the Peto-Scott kit, including a 1937 "Baby Stentorian." I am a complete novice to wireless construction; this is my first serious attempt, and I am delighted with it. The quality of the tone is splendid and quite loud enough for our little living-room. As a professional musician I naturally place "quality" above "quantity" of tone, but the reception is quite loud enough. At first I got a lot of heterodyne whistling, but this was owing to inexperience; now I can manage the tuning very well, thanks to your articles of instruction, and Hamburg, Vienna, Kalundborg, etc., etc., come through as clearly and free from interference as National or Regional stations. By the by, I found out that I can work my "Super Centurion" very well from an indoor aerial, both frame and straight wire; but, of course, the outdoor one gives better results.

Yours faithfully,
NOEL ALDER.

St. Hugh's, Kingshurst Drive, Paignton, S. Devon.

Here, There and Over Yon

THE switchboard for the Stagshaw (North-East Regional) Station of the B.B.C. is about twelve yards long, and has taken six months to build. It was made in the Felling works of Adamson, Green and Co.

* * *

The Argentine Government, in order to keep in touch with provincial governors,

Hint to Housebreakers

GENTLEMEN whose predatory instincts are developed to the point of depriving rightful owners of their moveable property should avoid the Brighton Belle, the Brighton Road, Brighton Races, and the Brighton Police. For those pocket wireless sets of the Brighton Constabulary are in the Feline Slumberwear class.

(Continued overleaf.)

NEXT WEEK—HOW IT WORKS WHAT HAPPENS INSIDE A MODERN SET

PARCEL OF HADDOCKS FOR AN ANNOUNCER

They led to the capture—within a few hours of the offence—of a man recently charged at Lewes Assizes with burglary.

"This case," said counsel, "illustrates the use of wireless in modern police methods."

"Guilty," said the accused.

"Twelve months' hard labour," said the judge.

The Good Earth

WILL my non-agrarian and anti-agriculturist friends excuse me while I ask all bosom (and besom) brothers how the old garden is looking this year? Arieline has been on at me about mine so very pointedly that I had to get up early last week-end and transplant what I conservatively estimated was well over 4,000,000 wall-flowers. She thinks that if she scatters the seeds with her own fair hands the *least* I can do is all the thinning, watching, deslugging, clumping, and all-along-the-bordering of the later stages.

Did I tell you about the sycamore that I planted with a view to making it carry my aerial to dizzy heights? I nursed that wretched tree like a Bart's matron, but for two seasons it has barely scraped together a team of leaves, because it doesn't like a wet situation. So I yanked it out and put in a willow—a master-stroke of policy, my hearties, for every time I look at him tit-willow has "swole wisibly."

The Last Round-Up

A FEW years ago the collection of radio licence tax in France was so casual that none but the quixotic Frenchman bothered about paying up. Then came a war on pirates, a war so severe and determined that all but the truly piratical listeners surrendered, and paid up like lambkins.

Now the war is being carried yet a step farther, right into the pirate's nest (-egg). For every radio dealer must record his sales, and inspectors swoop down like hawks upon all purchasers. If you have not paid your fee it is automatically quintupled, and you have to dub up five fees instead of the one!

And if you should be a malefactor of the so misguided, so malignant, so base and evil type—you Apache you!—that you are caught again, ten times the fee is payable. That'll make you prattle.

The Real Thing

NO arranged radio dramas can provide the excitement of the real thing, as heard by listeners in the neighbourhood of Bridlington when the Grimsby trawler Lord Ernle was wrecked below the 400-ft. Speeton Cliffs, Yorks.

Here are some extracts from the cool commentary sent out by radio operator Stephen Codling, when seas were breaking right over the wrecked vessel, and his cabin was in darkness:

"Cannot see and cannot hear what is going on; but I think the crew are still aboard."

"Haven't seen the lifeboat. Hope it gets here."

"Lifeboat alongside. I think they have sent a line aboard. I don't think there will be any walking ashore for us to-night."

"One man has got off to the lifeboat, but the line has broken. The other chaps are getting ready to jump."

"Lifeboat coming alongside now. I've got the call to go. . . . I'll be seeing you."

JOHN SHARMAN'S FAN MAIL

Since taking part in the recent broadcast, "Music Hall in the Making," John Sharman has received a large number of letters from listeners. Most of them are an appreciation of "Music Hall" as a regular variety programme. A number of others come from artists in various parts of the country who, although well known locally as concert artists, have never worked in London. Now they are seeking auditions, and John Sharman hopes to be able to arrange several for the most promising of them.

For the purpose of the recent broadcast, John Sharman invented a number of purely mythical names for the imaginary artists whom he was engaging to take part in "Music Hall." By a curious coincidence it seems that one of his fictitious names happens to belong to a man who has in fact worked on the variety stage, and a letter has now reached the B.B.C. from a friend of his who has not been in touch with him since the War, asking for his address.

One woman, an invalid now unable to visit theatres and cinemas, writes: "I was not in the least aware what difficulties you were working under, and I thank you sincerely for what we have had, even if we never get another after this week."

Wireless as a Career

ACCORDING to a letter which has reached me from W. S. R., of London, S.W., the lot of the marine wireless operator at sea to-day is anything but beer and skittles, in series, *ad infinitum*.

"You should have told your readers," he says, "that the commencing rate of pay is only £7 2s. 0d. per month, rising to £13 5s. 0d. in three years, i.e. £3 1s. 0d., per week."

I suppose there is a lot more could be said on this subject (for example, I think W. S. R. might have said that the above figures include full keep on board ship), but I am glad to be able to accede to a request made by W. S. R. He wants it made known that the address of the Association of Wireless and Cable Telegraphists is 194, High Street North, East Ham, London, E.6.

They Said It

SOLICITOR, to woman witness at Clerkenwell County Court: "The mechanic has said he left your wireless O.K."

The Woman: "It looked more to me as though he left it K.O."—("Daily Mirror.")

* * *

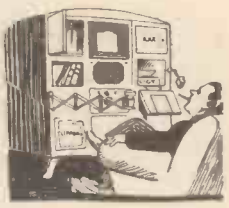
"Television has shown the B.B.C. a remedy (the ultra-shorts) for the wavelength shortage which has hampered broadcasting for fourteen years."—(Radio Correspondent of the "Daily Telegraph.")

* * *

"There is no doubt the microphone is unkind to women. When I was talking even my own mother did not know me. I was too refined."—(A woman delegate at a Leeds B.B.C. Talks Conference.)

Towards Perfection

NEWS that a Canadian concern contemplates for next year's models a novel design of cabinet combining radio-and-cocktail-cabinet in one interests me a lot; because I feel that this problem has never been tackled in a really big way.



Why doesn't some inventive genius get down to designing a radio cabinet with the following features: Concealed slipper-compartment, pipe-rack, box of matches-holder, bottle-and-glass department, foot-rest, cigar and cigarette casket, football coupon-holder, cribbage board, automatic lighter, pencil sharpener, penwiper, and card-shuffler?

A set like that, with trouble-free reception and clear television, would enable a married man to face an evening's domesticity with equanimity, if not, indeed, with dignity.

Announcer's Good Turn

RECENT rumpi (plural of rumpus!) about alleged B.B.C. bias in reading out the news bulletins remind me of one of the embarrassing effects of wireless when broadcasting was quite novel. Listeners of those days did not grumble at fancied imperfections of intonation. On the contrary, they regarded the announcer as a heaven-sent Good Samaritan, who was doing them personal favours by addressing them.

One announcer, arriving at headquarters to "clock on," found the largest and smelliest parcel he had ever seen awaiting him. It was a case of prime haddocks, sent by the skipper of a fishing-smack.

This good man had heard a friendly voice giving a gale warning, so he hauled in his nets and made for the old home port. When his rival limped back to port, having lost all his fishing gear in the gale, the skipper "laffed, and laffed and laffed." The haddocks were symbolic of this maritime jocularity.

ARIEL

MEET "MR. BALANCE" OF THE B.B.C.

His job is to get things adjusted so that when you hear the programme in your own home it sounds just right. It's tricky work and only an expert can tackle it, as you will agree when you read about "Mr. Balance" below.

TO the lay mind balance is either poise, as in a circus, or something desirable on the credit side of a banking account.

"Balance" at the B.B.C., however, is something utterly unlike either; and balance officials, or, as they are more properly called, studio assistants, have one of the most important technical tasks to do in day-to-day transmissions. They are the vital link between studio and the control room, and upon them falls the onus of knowing the characteristics of studios, microphones and, most of all, artists—who can be awkwardly temperamental.

Variety and cabaret turns, whether they come from St. George's Hall or from an internal studio at Broadcasting House, owe much of their effectiveness, and musical programmes, much of their tunefulness, to "Mr. Balance."

Consider a typical rehearsal of a variety show.

Making Adjustments

The balance official at his desk in the silence room adjoining the studio listens, by means of microphones and loudspeaker, to what the ordinary listener would hear were the programme being transmitted. Through a thick plate-glass window he has a wide view of the studio, but insulated walls, ceiling and floor make it impossible for him to hear what is going on before his eyes except through his loudspeaker.

And he, at the turn of one or more of the fade units before him—they operate from zero to "full strength"—can vary the volume till he gets it to his liking—if that is possible. For he has the critical ear of the showman, or the musician. Often he will decide that the "mike" is a little too near the double-bass or too far from the drums.

To move the "mike" is the job of a few seconds, but that may only be done, perhaps, at the expense of the pianoforte, saxophones or violins. So everything stops while "Mr. Balance" has a hurried word with the conductor or producer and then sends the double-bass to a corner or brings the drums nearer. And so it goes on until the orchestra is balanced to his satisfaction.

Even in these days of the ribbon microphone, with its comparatively small area of "dead" field, artists stand at varying distances from it in order that a uniformly high standard of reproduction is obtained. It is again the balance official who decides where each shall stand.

Consequently, at the end of a rehearsal, you will find in the region of the suspended microphone a number of crosses, lines and circles chalked upon the heavy pile carpet, each a "pitching point" for one of the performers.

Things, however, are sometimes a little more complex than that. There is, for example, the tall, quivering contralto who leans confidentially towards the microphone, and there is the short comedian who stands on tip-toe when he broadcasts.

"Mr. Balance" has to make allowances for mannerisms like those. Crooners and many "straight" singers often cup their hands over their ears when before the microphone so that they can hear what they are singing, and to make sure that they are in tune. That may sound queer, but the difficulty of hearing oneself singing, especially when accompanied by an orchestra, is one that invariably worries newcomers to radio. This applies more especially to the crooner type of vocalist who uses a technique of his own. He is usually inaudible in the studio but, by means of careful mixing by "Mr. Balance," the result is that which every listener knows.

Frequently the chagrin of such a vocalist at his first broadcast is equal to that of a studio audience who hear far less than the fireside listener.

Musical Knowledge Needed

But it's all this business of balance, the happy art of getting things to sound, not so much as they do, but as they *ought*.

Musical programmes, whether by the concert organ, a popular small string band, a dance orchestra, or by the full symphony orchestra, demand a balance which only someone with an acute musical knowledge can give; someone who can follow the score accurately, always reading ahead of the orchestra, ready to anticipate that sudden crescendo which is followed by a "pp" passage a second later; giving full value to each, exaggerating neither.

The acoustics of one studio are usually totally different from those of another. There are the "dead" studios and lively ones; studios with a long "reverberation period"; others with a homely atmosphere, ideal for talks in the conversational manner.

"Mr. Balance" has to know them all.

But even he is sometimes a little bewildered by the curious reaction of a studio to certain notes of music. It is then that the research engineer can give valuable help. He, with delicate scientific apparatus is able to find the cause for resonances at certain frequencies even when these are inaudible in the studio itself.

POLICE RADIO IN LIVERPOOL

Police-sergeant Menzies, who has been placed in charge of the radio section of the Liverpool City Police. You see him here working on his latest short-wave transmitter.

THE DIAL REVOLVES

By Leslie W. Orton

ORIGINALITY is the keynote of a Havana station which I have heard on several occasions lately. Listening to this station, which I believe to be COCQ at Havana, the other evening I was somewhat surprised to hear news and station announcements interspersed with different sounds, sounds such as a trumpet call, police siren, fire bell and, most amazing of all, a baby crying, or, to be more exact, howling at the top of its voice!

Cuban stations are once again to the fore, and I find no difficulty in logging COCO, COCX, COCE and COCH. The last named is a particularly powerful signal nowadays. These Cuban stations appear to make up in volume what they lack in programme value—consequently some of them are amazing signals!

I have recently heard a faint station on approximately 32 metres which I believe to be CO9JQ at Camaguey, Cuba. I shall be pleased to hear from readers who have heard this station.

TRY TO TUNE-IN THESE

JZI	Tokio		31·46 metres
JZJ	,,		25·42 ,,
Both transmit same programme.			
JVN	Nazaki, Tokio		28·14 metres
JVT	,,	,,	44·44 ,,
JVP	,,	,,	39·95 ,,
JVM	,,	,,	27·93 ,,
JVH	,,	,,	20·55 ,,

Central America

Latin-American stations always appear to cross the "ditch" readily, and the present time is no exception to the rule. HIN at Ciudad Trujillo (another way of saying Trujillo City) is still providing one of the best signals from this part of the world and frequent announcements in English make identification easy. HI1A at Santiago, also in the Dominican Republic, is also coming in well.

A re-shuffle of call letters has occurred in Venezuela, and consequently identification of stations is rendered somewhat difficult. Nevertheless I have heard YV5RD and IRE well during the past week.

HJ1ABB, Barranquilla, 4ABB and 4ABL, Manizales, and many unidentified stations from South and Central America have also provided good signals.

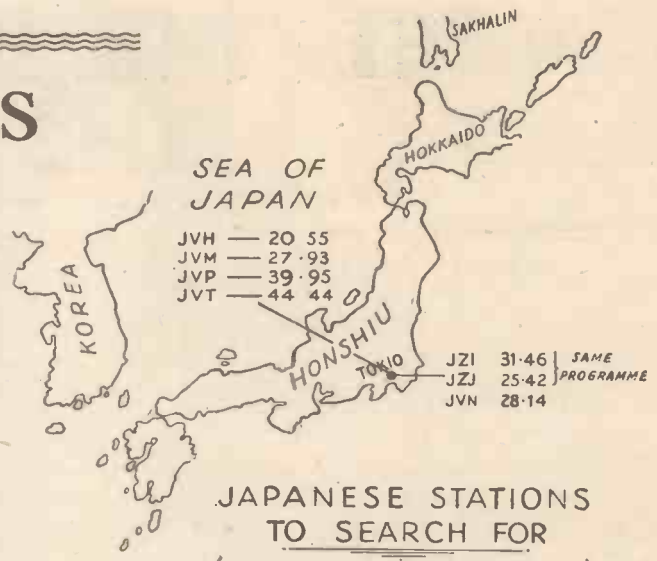
North America

North American reception is still good, and perhaps the best band to listen on for the States is the 30-metre band. Here W-2XAF, Schenectady, 1XK, Millis, and 3XAU are all coming in at amazing strength. On other bands, W-8XK, 2XAD, 2XE, and 3XAL are well heard.

W8XAL, Cincinnati, has also been coming in extremely well, and I listened to and thoroughly enjoyed a programme entitled "In Pleasant Valley" from this source the other day; volume was excellent.

Little has been heard from Canada—CRCX was heard faintly on one occasion—and nothing from Africa.

Eastern stations continue to be well heard, and besides hearing JZJ and JZI at Tokio I have heard Bandoeng on 29·24 and 15·93 metres.



JAPANESE STATIONS TO SEARCH FOR

(MANY ARE COMING IN WELL NOW.)

10-Metre Reception

10-metre reception is still excellent, and I have logged many amateur and a few police stations, but, unfortunately, no broadcasters.

I have before me two reports of reception of W9XAZ at Milwaukee which, incidentally, I accidentally referred to as W9YAZ in a recent report. Please accept my apologies. The first report comes from a listener in Perranporth, Cornwall, who has heard 9XAZ on various occasions between 7 and 9 p.m. on 11·37 metres. The second is from a Sawbridgeworth, Herts., enthusiast who has 1,350 verifications to his credit. He reports hearing 9XAZ before 6 p.m.

I also have an interesting report from a reader who picked up W9XPD relaying KSD, St. Louis, on 9 metres. The programme, which concluded with the playing of the "Star Spangled Banner," was heard at good strength at 2 in the afternoon.

As readers know, 10-metre broadcasters are all of a more or less experimental nature and, consequently, schedules are irregular. I have heard that W3XE in Philadelphia has discontinued operating on 9·7 metres, and I shall be pleased to receive any information regarding this or any other 10-metre stations from readers.

Readers will be sorry to hear that, according to official information, VUB, Bombay, and ZHI, Singapore, have closed down.

Spain

It has been reported from a generally reliable source that EAQ, Madrid, has discontinued transmissions. But Madrid and EAQ are still holding out, and, so far as the latter is concerned, carrying on more or less as usual, as I can definitely testify, having listened to government news from this source almost nightly.

By the way, news from the rebel side may be obtained from Malaga on 42·26 metres; Burgos on 48, and Valladalis on 42·6 metres. These stations have been heard irregularly and can be distinguished by their "Vive Franco!"—a slogan never heard from government stations!

TECHNICAL JOTTINGS

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

Some varied items of interest to all

The Output Valve

I have often noticed, in letters from readers, that quite a lot of people have the idea that the output volume or power from a set depends upon the rated output of the last valve. They think that by putting in a high-power valve in the last stage they will immediately and automatically get just so much more power from the receiver.

Although this may have a germ of truth in it, in some cases it will, on the bald facts above, be usually quite wrong. All that you get by using a high-power output valve is the *ability* to handle larger outputs, just as a man who increases his factory space has the *ability* to handle a larger business turnover; but the ability, in the latter case, does not necessarily bring the business and, in the former case, it doesn't mean that the *power* is there to be handled.

Power-handling Capacity

It is only useful to put in a larger output valve if the one which you are at present using is unable to handle properly the power which is delivered to it from the previous part of the receiver. Of course, if it is acting as a bottleneck, then you will be well-advised, from the point of view both of quality and quantity, to substitute one with a larger power-handling capacity. But if the output valve is well able to handle whatever power is available, then obviously you are not going to increase anything by using a larger power output. Another way to think of it is to regard the output valve as a tap: the flow of water through a tap when the tap is fully open will be limited by the diameter of the pipe, and putting a larger tap on will not increase the flow of water.

(*Please turn to page* 71.)

ON THE SHORT WAVES

MAINS UNITS

Some hints on using an eliminator with a short-wave set.

By W. L. S.

THIS page is dedicated, not to the user of an all-mains short-wave set, but to the man who has a good battery set, decides to use an eliminator instead of the H.T. battery and, instead of living happily ever after, walks right into a nasty bunch of trouble.

If, at the same time, he happens to change over to mains valves and does the conversion thoroughly, then he will probably pick up some tips just the same. It is my experience, however, that a short-waver using indirectly heated valves generally gives *less* trouble than one with battery valves and mains H.T.

You May Be Lucky

Imagine that you have been using a nice battery set for some months. You have just bought (or otherwise acquired) an H.T. eliminator giving an output of 50 milliamps at 180 volts, or something of that sort. Perhaps it is all ready for connecting up; if you have only one H.T. tapping from your set, and all voltage adjustments for screened-grid valves and the like are made inside the set, you can connect up right away.

Next, you switch on. Possibly (and only *possibly*) you will find the set behaving as usual—no hum, no instability, no trouble. If that is so you needn't read any farther—but before you drop out of the ranks let me tell you that you're confoundedly lucky!

Still more possible, you find things all right when the set isn't oscillating, and are just preparing to give three hearty cheers, when you touch the reaction control. Not so good! When the detector oscillates it brings in a marvellous hum with it.

If you're really unlucky you will have a terrible all-pervading hum, which completely wrecks the performance of the set and spreads, like jam, all over the dial. No movement of the controls seems to have any effect upon it, and before you can think of receiving signals you have to remove the eliminator and go back to battery H.T.

Now I'll describe all the things I should do in the various cases. It may be an admission of ignorance—but I'm here to be shot at, anyway. If you know any tips that I don't, I shall be glad to hear of them.

CUTTING OUT HUM

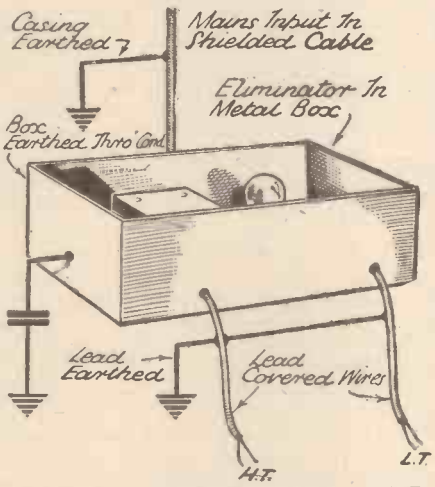


Fig. 1. Earthing the case of the mains unit and using shielded cables for mains input, H.T. and L.T., will assist in cutting out hum.

Fig. 2 (right), shows another anti-hum dodge, viz: joining two condensers between the anodes and filament of the rectifier valve.

First and foremost, if the set hums all over the place I should wonder whether there was enough smoothing in the mains unit and should proceed to add a little more. Find the bank of condensers across the main H.T. output, and add another 2 or 4 mfds. to them. If this makes things slightly better you're on the right track. If you're unlucky you may have to add another 8 or 12 mfds. before the thing is tame. If that's the case you can take it for granted that you have borrowed a pretty rotten mains unit, and may as well return it to the owner.

If the thing hums only when the short-wave set is oscillating, the first thing I should do is to move the mains unit farther away from the set. If this improves results you're on the trail again. If it still hums look to your earth connections. Probably the mains unit is in a metal box, and probably the box has a terminal somewhere on it.

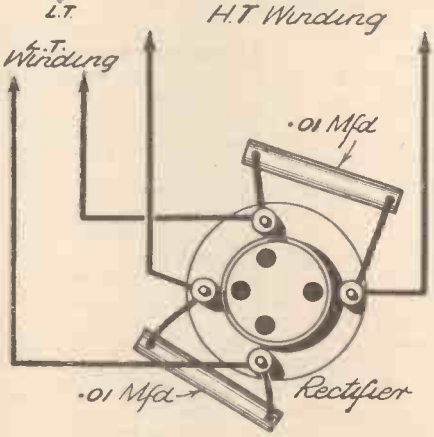
Earth it, through a condenser (anything from a ·01 mica to a 2-mfd. paper condenser should do here). Next, always listening in between "stunts" to see if you have cured the trouble, try screening (a) the mains input to the eliminator; (b) the H.T. output and, if you have it, the L.T. output as well. Use ordinary lead-covered twin cable and earth the outside.

If all this hasn't cured the hum or, at least, made some impression on it you are extremely unlucky. Your next excursion will take you *inside* the mains unit. You will now attack the rectifier (if it is a valve rectifier) by connecting ·01 condensers from its two anodes to the filament. Some people take them, one from each anode, to the centre-tap on the filament winding, but I have found it more effective to take one to each end of the filament. This means mounting them as shown in Fig. 2—they lie neatly alongside the valveholder.

At this point I have just called a halt in writing and 'phoned a friend who was having severe trouble with "tunable hum," to see if he had cured it. Tunable hum is a pest; it comes in only when the receiver is oscillating, and then "in patches" all round the dial.

Well, this friend of mine has cured it by doing the strangest thing imaginable—namely, removing the metal case in which his mains unit reposed! He had it on the bench; he put it on the floor, and things were better. He removed it from the metal box with the idea of doing a little rebuilding, but suddenly thought of trying it again without making any alterations. While it was out of the box, but otherwise untouched, everything was O.K.

ANOTHER SCHEME



Bad Mains

So there's another tip for some of you who suffer from hum when the short-wave set is oscillating.

Bad mains are often very troublesome. Some people I know can never get a receiver quiet, and yet when they bring the gear along to me it behaves quite perfectly. Don't try to do a lot of "jury-rigging" with your mains wiring by running long flex leads from lampholders and all that sort of thing. Run your eliminator, if possible, from a power point; or, if you have to extend the wiring, use lead-covered wire, as, indeed, you are technically obliged to do if you stick to the letter of the law.

Earths are another tickly spot. An indifferent earth on a gas-pipe or water-pipe may prove infinitely worse than no earth at all. So, if you have one on the set, try the effect of removing it. You may even try the old dodge of tuning your earth lead by putting a variable condenser in series with it.

ON THE SHORT WAVES—Page 2.

POINTS from the POST-BAG

W. L. S. Replies to Correspondents

I. R. P. (Aberdeen) wants to know whether there is a short-wave club hiding its light under a bushel in that neighbourhood. If there is, will the secretary (who, of course, is sure to read "P.W."!) please make himself known to Mr. I. R. Price, 99, Fountainhall Road? I. R. P. has a one-valve standard baseboard set that does everything he could wish for, but whenever he tries to add another valve, the whole thing goes up the spout.

Incidentally, he says he finds C O C D (Cuba) the most consistent station from outside Europe—and it happened to be the very first station he heard on short waves when he was trying-out his first set.

Curing Ploppy Reaction

A. K. S. (Louth) has a "Simplex" Two, but is troubled with ploppy reaction. He finds, however, that if he takes the grid leak to earth (instead of to L.T. positive), things are perfect. Well, the remedy for his trouble is to do just what he's already done. Perhaps he has a valve that is a little bit ticklish in that way. Personally, I seldom have difficulty in getting smooth reaction with grid leak to positive, and rectification is certainly more efficient in that position. But it was not always so. Remember the old habit of returning the grid leak to the slider of a potentiometer connected across the L.T. Incidentally, A. K. S. might try that, using either a variable potentiometer or one of the fixed ones which are now made specially for the purpose.

E. W. (Liverpool) has a 5-valve A.C. superhet with the usual connections for gramophone pick-up. He wants to know whether he can feed the output from his short-wave set into these terminals, *and* derive its power (L.T. and H.T.) from the mains set.

Points to Note

Well, there shouldn't be any difficulty about the H.T., but from what I know of the modern mains receiver, the L.T. transformers are not built to deliver 2 amps. more than their designed load. It would be safer to use a separate 4-volt transformer for providing the short-waver's L.T. The output circuit should be watched, too. It should be transformer-coupled to the pick-up terminals. Of course, the whole thing is really impossible to answer without seeing the full circuit both of the short-waver and of the mains set; but E. W. is not likely to do any damage by trying. He just won't get results if there's anything wrong, and he needn't expect fireworks.

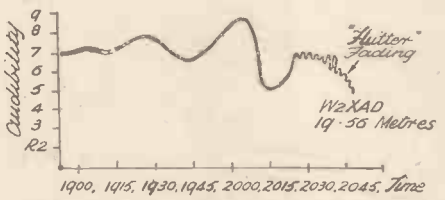
L. W. J. L. (Sidmouth) is trying to run his short-wave set from the same aerial which serves an A.C. broadcast receiver on the floor below, but he gets a bad hum. He sends a little sketch suggesting the position for another aerial, but is worried because he thinks another licence will be needed.

No, L. W. J. L., the mere fact of using another aerial doesn't necessitate a second licence. But, of course, I don't know the full circumstances and so I should advise you to put your question to the G.P.O. who will tell you exactly where you stand in this matter. I suggest that you try tapping on to the existing aerial through a small condenser (say .0001). This should cut out the hum. If it doesn't, try another aerial in the position you suggest.

L. W. J. L. also asks where the "Q" "R" and "T" codes may be found printed. They are in the R. S. G. B.'s "Guide to Amateur Radio," and also in the Amateur Call-Book.

The DX Certificate

T. W. M. (Exeter) sends in a terrific list of the Q S L's that he proudly owns, and asks whether it qualifies him for the DX certificate. Certainly—any two from each of the six continents would do so, but we must insist on having them sent in for checking. He uses a small set, and says that it isn't fair to expect the owners of eight-valve superhets to compete with "hot" small sets. I rather agree; but the owners of the big sets usually think the boot is on the other foot. Interesting stations from whom T. W. M. has Q S L's include H S 8 P J (Bangkok), K A Y (Manila), V W Y 2 (Poona), Z L T (Wellington, N.Z.), Z S S (Cape Town), V P 2 C D (Antigua), H H 2 B (Haiti), and scores of other lesser-known stations, as well as the usual long list of "old favourites."



A curve showing "flutter" fading on the American short-wave station W 2 X A D.

Several readers have recently commented upon the prevalence of high-frequency or "flutter" fading on W 2 X A D and some of the other Americans, and so I amused myself a few nights ago by drawing a rough curve on W 2 X A D. I struck a good night for the purpose. Soon after 8.15 p.m. he started off in the most ghastly flutter, and by the time he closed down he was unintelligible. It sounded exactly as if he were being modulated by a 25-cycle A.C. hum.

Incidentally, he now carries on transmitting till 10.30, as, no doubt, you will have discovered for yourselves.

P. F. B. (Bournemouth) asks for identification of a whole crowd of strange stations. Unfortunately most of the peculiar call-signs appear to be the result of mis-reading of the Morse code. Please be sure of your call-signs before you ask questions about them. I have heard strange things myself and then realised that bad sending has been the cause.

The number of "funny ones" heard seems to be diminishing, but I logged a suspiciously loud signal from J 9 C A a few nights ago. I don't know what part of Japan "J 9" is in; it may be genuine, but this man sounded loud enough to be a pirate. Incidentally, a pirate was tracked down within a few miles of me last week. He was alleged to have been causing severe local interference, but I had never heard anything of him. I have my suspicions about a few other funny noises that loose themselves in my locality occasionally—but apparently they have *not* been caught.

Short-Wave News

HAS the 10-metre band ever been packed so full of signals as it has been these last few week-ends? I doubt it. On Sundays, from 3 p.m. until "fade-out"—which may be as late as 9.30 or 10 p.m.—it is chock-full of North Americans, packed so tightly that only a single-signal superhet will separate them. And there seem to be more on 'phone than on C.W.

All the various broadcast stations below 10 metres (I didn't have time to stop and identify them all) have also been coming over at full strength, and the "calling all cars" fellows have been terrific. What a year for DX reception this is.

Loud Central Americans

I amused myself with a really selective receiver on the 49-metre band a few evenings back (if you can call the period from 10.30 p.m. till 2 a.m. an "evening"!). On the whole, the Central Americans were louder than any other stations. I heard C O C O, H P 5 B, H J 3 A B H, H J 1 A B G, H J 4 A B L, H J 4 A B B, C O C D, Y V 5 R C, H J 1 A B B and Y V 6 R V, "just like copying them out of the call-book," as a friend observed at the time. In terms of tobacco, it worked out at about forty-eight stations to the ounce!

It is amazing the way the nearer stations are coming across on 19 metres nowadays. Zeesen, I imagine, has a greater field-strength in this country on 19 than he has on any of his other wavelengths. For two hours this afternoon he came in at over-powering strength without the slightest fading. With one touch on the volume control he was overloading the receiver.

The 40-Metre Band

How many readers listen on the 40-metre amateur band on a Sunday morning? I ask this because I am rather interested to know how anyone with an inselective receiver gets on with it. With my superhet, which is as selective as anything I've touched so far, I have quite a full-time job finding a station that isn't badly "hashed" by someone else. What a flatly-tuning two-valver must be like I really can't imagine.

After an hour of this mess, I went up on 80 metres in desperation, and found a fine collection of really good transmissions up there—mostly British. Eighty metres is well worth looking round if you like to hear "ham" work at its best. The other band—160 metres—is at the top of its form, and one can hear some quite long-distance stuff up there, but it is still infested, on occasions, with "gramophone-grinders." Won't that pest ever die out?

Amateurs are wondering where they will stand after the Cairo conference this year. They will probably plead for a widening of their bands, but it is the general opinion that they will be lucky if they are left with all that they have at present. They certainly work under difficulties, and the number of stations that manage to cram themselves into a band 300 kilocycles wide is unbelievable. And the number of cases of "off-wave" operation is negligible.

W. L. S.

THE EVERY-BAND TWO

The second and concluding article describing construction of the "P.W." Research Dept's. latest all-world design for the battery user. Those who build this set will have a choice of long, medium, and short-wave programmes as well as the television sound transmissions from the A.P., and all this is achieved without coil changing.

Described by A. Smith

Simple layout and wiring are features of the Every-Band Two.

CONTINUING the construction of the Every-Band Two, we come to the preparation of the coil-base in readiness to take the coils which were described last week.

The coil-base is made from a piece of ebonite 7 in. × 7 in. and $\frac{3}{16}$ in. thick. It is first cut into the shape of a circle 7 in. in diameter. This may be done in a way to suit the tools available. If you have a fret-saw you will find that this will make a nice clean job of it, and very little finishing with a file will be necessary. It may be cut, however, by means of an ordinary tenon saw, first cutting off the four corners, then the eight corners so formed. The whole thing is then made round by using a fairly coarse rasp, finishing with a fine file.

ACCESSORIES REQUIRED

V1	V2
Mazda L-2.	Hivac Y.220.

H.T. 120 volts.
L.T. 2 ,,
G.B. 4½ ,,

Loudspeaker: W.B. Stentorian.

Now divide the circumference into six equal parts, by means of a pair of dividers, set to equal the radius. Now draw the six radial lines. The drilling of the coil-base needs no comment, as all dimensions are given in the diagrams. The "V" stops around the periphery are cut by means of an ordinary fine flat file, using the corner of it. These should be done as accurately as possible, otherwise the switch contacts will not be located properly. Make sure that the points of the "v's" come exactly on the radial lines. Do not file them too deep. If they are more than about one-eighth of an inch deep the stop strip may not disengage easily. The corners are rounded to enable the stop strip to engage and disengage easily.

The coil-base is now ready to be turned into a complete coil unit by mounting the coils on it. Make sure that you mount the coils on the right side (opposite side to the marking out). The mounting screws of all the short-wave coils are also contact screws, as the mounting loops of them are the ends of the windings. All screws are ½ in. × 6 B.A. cheese-headed. The positions of the soldering tags are shown in the diagrams. When everything has been mounted the screws must be cut and filed so that each one projects $\frac{3}{16}$ in. above the surface of the base. This is important to ensure proper contact with the contact strips on the baseboard when the set is in operation.

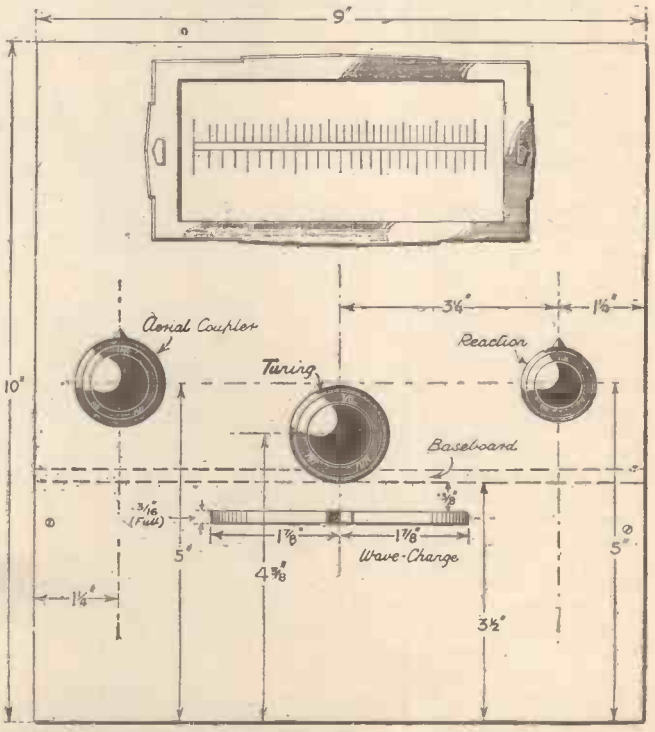
Having completed the coil-unit, by wiring the broadcast coil to its appropriate contact points and interconnecting the common earthing contacts, the baseboard of the main portion of the set should have its important holes drilled. The positions of these are shown in the diagram of the bottom of the baseboard. Once again to ensure proper switch contact these holes should be drilled as accurately as possible. When these holes have been drilled, mount the wood side runners on the bottom of the baseboard. The baseboard is now ready to have the components, etc., fitted to it. The first thing to do is to fit the contact strips and stop strip on the bottom side. The dimensions of these were given last week. Contact strips from old flash-lamp batteries are of a suitable material. The contact strips are not bent to shape until they have been mounted by means of 6 B.A. by $\frac{5}{16}$-in. screws and 6 B.A. nuts.

The next thing to fit is the pivot rod. This is a piece of 2 B.A. screwed rod about 1½ in. long. It should be fitted by means of one nut on the top side of the baseboard and two on the bottom side. The end of the rod should be flush with the top of the nut on the top side. The two nuts on the bottom side should be each $\frac{3}{16}$ in. thick. If they are not it will be necessary to make up the required spacing of $\frac{3}{8}$ in. by means of washers.

The components—including terminals—

(*Continued overleaf.*)

YOUR PANEL-DRILLING GUIDE



The panel layout is symmetrical, and the wavechange disc supporting the coils is pivoted on the underside of the baseboard.

THE EVERY-BAND TWO

(Continued from previous page.)

are now fitted into their correct positions which are shown in the diagram of top of baseboard. The only component whose position is critical is the tuning condenser, but the holes for this have already been drilled, so this must come in the correct position. Before mounting the tuning condenser, its drive should be fitted, otherwise it will be difficult to fit. Now do the wiring as far as possible.

The next job is to mark and drill the wood panel. The hole for the tuning drive escutcheon is cut with the aid of the template supplied with it and a fret-saw or keyhole-saw. The slot for the wavechange control should be cut as accurately as possible, as it is to some extent a guide for the coil-base. The ends of the slot must be cut back at an angle towards the back of the panel with a file, as the width of the coil-base is greater at the back of the panel than at the front. When all the drilling and cutting have been done the panel components must be mounted, and then the panel is ready to be fitted to the baseboard assembly.

THE PARTS EMPLOYED

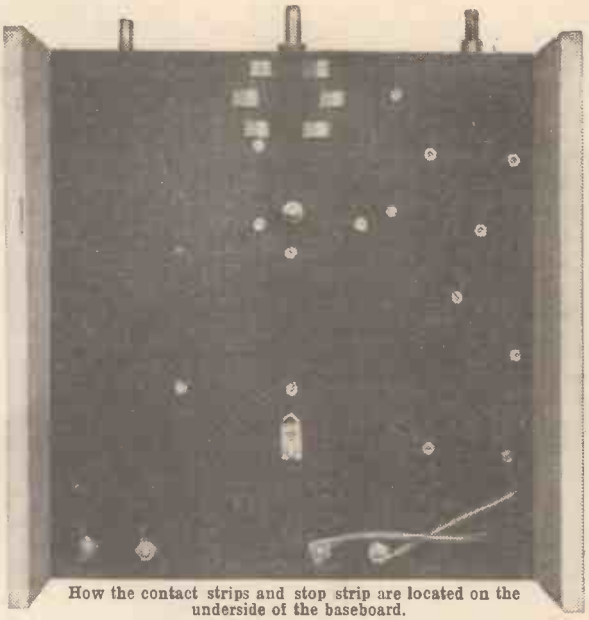
- 1 Polar ·0005-mfd. tuning condenser, bar type.
- 1 Polar V.P. horizontal drive for above, with degree-marked scale.
- 1 Bulgin Midget coil, type C40.
- 1 B.T.S. ·0005-mfd. reaction condenser, with insulated bush and spindle.
- 1 Polar ·0005-mfd. Compax condenser.
- 1 Eddystone 4-pin short-wave valve holder, baseboard-mounting type.
- 1 Eddystone 5-pin short-wave valve holder, baseboard-mounting type.
- 1 Wearite H.F. choke, type H.F.J.
- 1 Varley Ni-Core II L.F. transformer.
- 1 T.C.C. 2-mfd. fixed condenser, type 50.
- 1 T.C.C. ·0001-mfd. fixed condenser, type 34.
- 1 Erie 2-meg. 1-watt resistance.
- 2 Erie 5,000-ohm 1-watt resistances.
- 4 Belling & Lee terminals, type R.
- 1 Ebonite baseboard, 9″ × 9″ × $\frac{3}{16}$″ (Peto-Scott).
- 2 Wood runners for above, 9″ × 3½″ × $\frac{3}{8}$″ (Peto-Scott).
- 1 piece of ebonite for coil-base, 7″ × 7″ × $\frac{1}{16}$″ (Peto-Scott).
- 1 Wood panel, 10″ × 9″ × $\frac{3}{16}$″ (Peto-Scott).
- 3 Paxolin formers, 2″ × 1″ diameter (Peto-Scott).
- 4 Clix Wander plugs.
- 1 Belling & Lee wander-fuse.
- 2 Clix accumulator spades.
- 20 ft. 18-gauge T.C.C. wire for wiring and U.S. and S.S. coils.
- 7 ft. 22-gauge D.C.C. wire for L.S. coil.
- 6 B.A. screws and nuts, wood screws, soldering tags, 2 B.A. rod and nuts, washers, flex, etc.

Mounting the Coil Unit

Before doing this, however, the coil-unit must be fitted to the baseboard by slipping its pivot hole over the pivot rod in the baseboard, not forgetting that if the two nuts used for mounting the pivot rod are not each $\frac{3}{16}$ in. thick the spacing must be made up to a total of $\frac{3}{8}$ in. by means of washers. Now fix the coil-unit by two locked nuts so that it just pivots easily. Make sure that the stop strip engages and disengages properly when the coil-unit is rotated. You can see if all the contacts are making properly, by watching the movement of the contact strips when contact is made and broken on rotating the coil-base. When you have made quite sure that everything is in order here, fit the panel to the baseboard assembly and complete the wiring.

Everything should now be ready for the first test. The positions of the coil-base for the various wavebands is easily located.

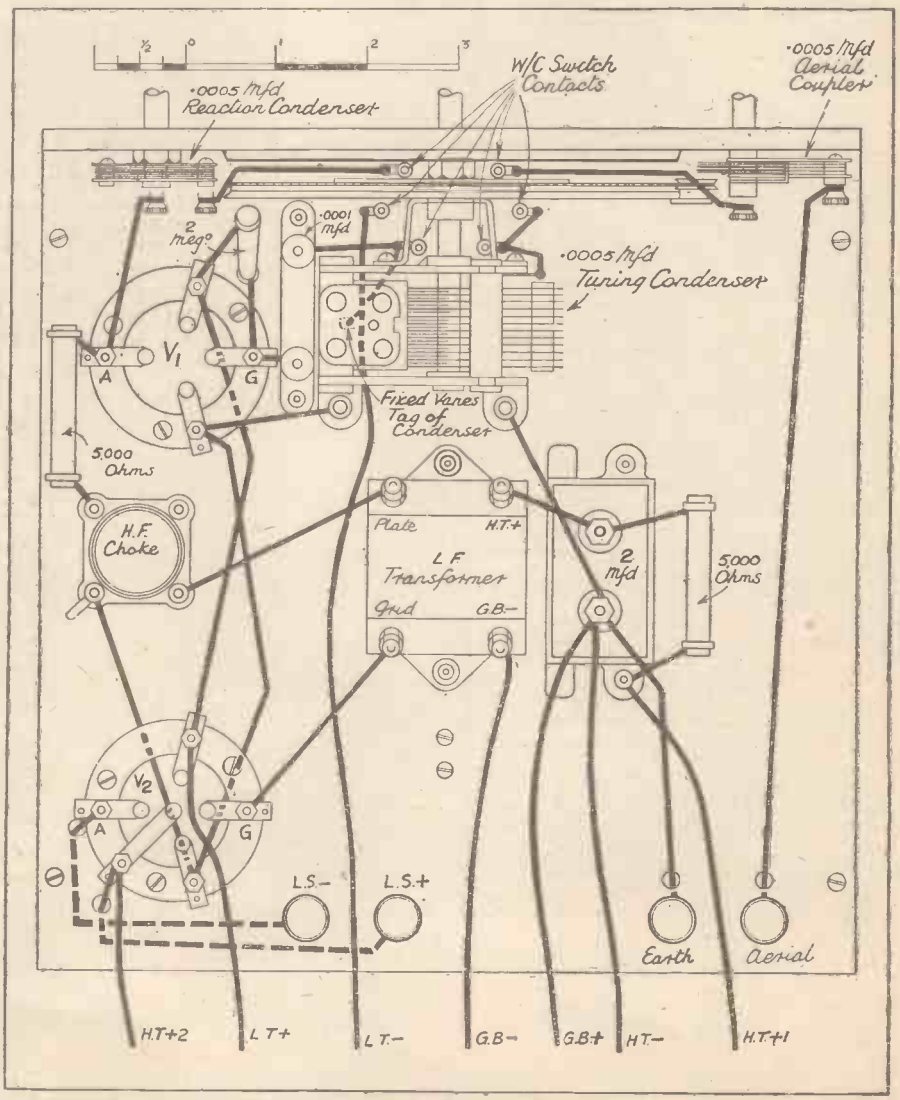
The coil at the front of the set is the one in use. So rotate the projecting coil-base, so that the U.S. coil is in this position. We would suggest that you paint "U.S." on the top side of the coil-base projection. Now turn base in a clockwise direction (looking on top of the set) to the next stop. This brings the S.S. coil into position. Mark projection S.S. The next position, the third, will be L.S., the fourth medium waves (mark M.W.), and the fifth long waves (mark L.W.). The sixth and last position is "OFF."



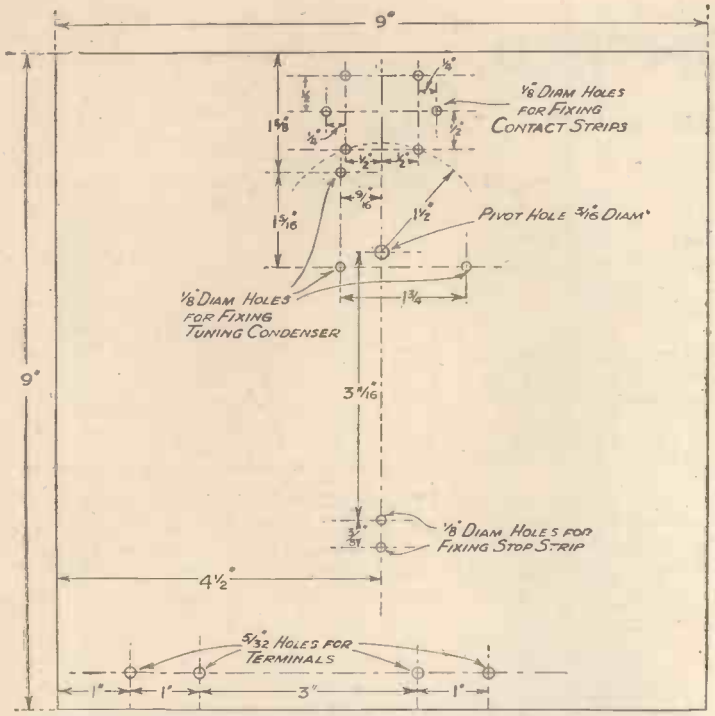
How the contact strips and stop strip are located on the underside of the baseboard.

The Voltages

Now that we know where we are regarding wavebands the valves may be inserted, and the aerial, earth, batteries and loudspeaker connected up. The battery connections are as follow: G.B.+ to positive of G.B. battery, G.B. — to —3 volts. H.T.—to negative of H.T. battery, H.T.+1 to about 84 volts, H.T.+2 to 120. The L.T. is normally connected.



The above-baseboard wiring presents no problems. Note carefully the leads which go to the wavechange switch contacts.



This diagram shows the dimensions for the holes which have to be drilled in the baseboard to take the contact and stop strips, tuning condenser bolts, aerial, earth, L.S.+, and L.S. — terminals.

Set the wavechange switch to "M.W." (medium waves) and turn the aerial coupler to maximum (fully clockwise). Now you should be able to tune-in the local stations, with possibly a little reaction. If everything appears to be in order here turn to the long waves and see that Droitwich is there. Now try the S.S. and L.S. wavebands, and see if you get the normal heterodyne whistles as you pass over the stations with the set just oscillating. If this is so, everything is in order.

Now on the U.S. band, of course, you will not hear anything unless it is between three and four o'clock in the afternoon, or between nine and ten o'clock at night. The sound transmission from Alexandra Palace comes in about 10 to 15 on the tuning dial. It will be necessary to set the aerial coupler at zero (fully anti-clockwise) or nearly so.

On other wavebands, of course, the aerial coupler behaves as a volume and selectivity control.

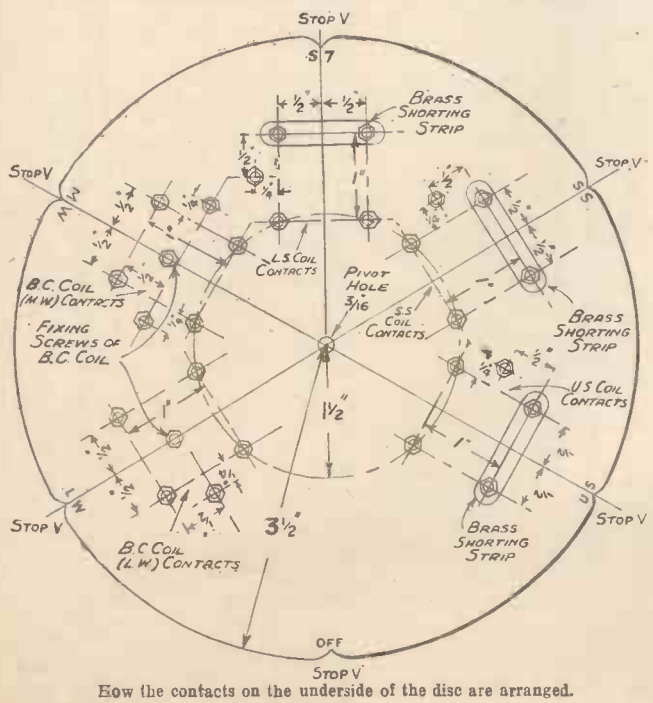
The best position for H.T.+1 must be found by trial. A fairly high voltage—perhaps the maximum of 120—may be necessary on the U.S. band, but on the other wavebands better results may be obtained by using a considerably lower voltage.

Just in case you might be tempted to use different valves from those specified, we would ask you not to do so in the detector stage (V_1). If you do you may have difficulty in obtaining reaction on the U.S. band.

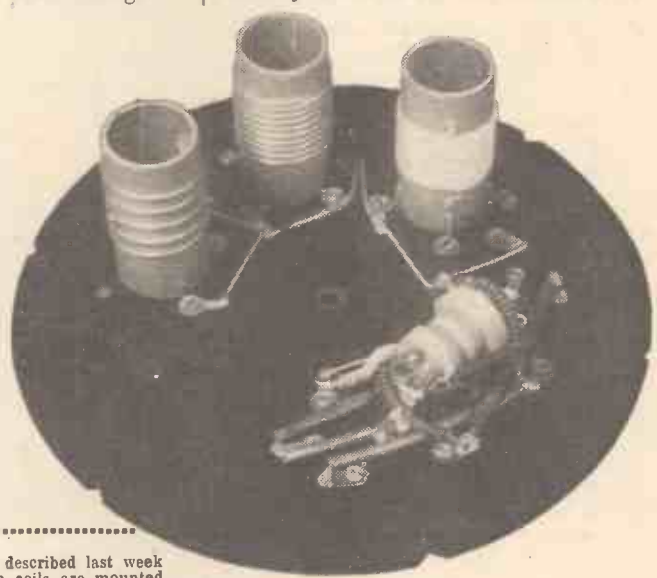
It is possible that you may find an optimum position for the aerial-coupler when receiving a short-wave station. Incidentally, the lower the setting of the aerial coupler, the more easily will reaction be obtained, owing to reduction of aerial damping.

To obtain smooth reaction it will be necessary to find the best position for H.T. + 1. Generally speaking, the lower the voltage applied, the smoother the reaction.

It is probable that you will be unable to tune down to the television "vision" signal. The coil for this waveband has been made so that the sound signal is obtainable at maximum signal strength.



How the contacts on the underside of the disc are arranged.



As described last week the coils are mounted on the disc, connections being made to bolts which pass through the disc and form contacts on the underside.

NEW BROADCASTING STATION FOR BRNO

Big increase in power

THE Czechoslovak Telegraph Administration has placed a contract with Marconi's Wireless Telegraph Co., Ltd., for the supply of a high-power broadcasting station to be installed near Brno, where for many years a 32-kilowatt Marconi transmitter has been in operation.

The new Brno transmitter will operate with an unmodulated carrier power of 100 kilowatts, but the design of the station is such that the unmodulated carrier power can be increased to 200 kilowatts without undue complications, should it be desired at a later date to operate the station at a higher power.

The working wavelength of the new station will be chosen within the band of 300–545 metres, to which the transmitter is adjustable. A crystal drive with a stability of five in one million ensures that the most stringent international frequency stabilisation requirements are fully met.

The distortion factor of the new installation is kept to a low value, and at 90 per cent. modulation does not exceed 4 per cent.

As may be expected, the frequency response of the equipment is of a high order, and amounts to ± 2 decibels over a band of 35–10,000 cycles.

The improvements embodied in this new Brno station will make it a valuable addition to the highly efficient Czechoslovak broadcasting system.

A CORONATION TALK

A TIMELY talk on a coronation of long ago will be given by Mr. Roger Fulford. He will deal with the Coronation of George IV in the Regional programme on April 3rd.

Drama was lent to the occasion of the crowning of "the first gentleman in Europe" by the appearance at the Abbey, at half-past five in the morning, of Queen Caroline, who unsuccessfully demanded admittance.

The ceremony itself was much the same then as to-day; the King must have presented a remarkable spectacle with his nine-yards-long train of crimson velvet and his wide Spanish hat ornamented with white ostrich feathers. The Privy Councillors also provided an uncommon sight, as it was ordered that they should appear in Elizabethan fancy dress.

REMOTE VOLUME CONTROL

An ingenious scheme for adjusting volume without moving from your chair by the fireside

ALL those who operate sets capable of providing large volume with good quality will agree that if the volume is right for music it is often outrageously wrong for the announcer's speech.

If one's set can do it, orchestral music is reproduced much better with the volume control set nearer maximum than minimum. Under such conditions a good set is capable of providing entertainment not far short of the real thing, but the illusion is quickly lost when the announcer comes to the microphone to name the next item.

An Unbalanced Effect

The set which, a few moments before, gave forth so excellent a copy of a full symphony orchestra, now attempts to reproduce human speech *at the same loudness level*. The effect is ludicrous in the extreme and is rendered even more annoying by the accompaniment of microphone "hiss" which results from excess of amplification at the transmitting end.

No one can be quite content to have an orchestral concert interrupted at intervals by the greatly amplified voice of the announcer, yet few are energetic enough to fly to the set at each announcement to reduce volume to the required extent.

Some form of controlling volume at a distance would, therefore, come as a welcome relief to owners of high-quality receivers.

Where, however, an indoor aerial is used it is possible to arrange matters so that a ready solution to the problem is achieved.

Experience has taught me that the simplest possible aerial of this type is the most efficient. It should be erected in the room which contains the receiver, and should consist of a single straight stretch of insulated wire running across the room about a foot from the ceiling; the down-lead going direct from one end of this to the set.

With such a scheme it is easy to arrange for the far end of the aerial to be over the listener's armchair. The listener is then only the height of the room (less a foot) from one part of his set, and a solution of the problem of distant volume control becomes more of a reasonable proposition.

Solving the Problem

If, by some means, the listener can "reach up," so to speak, and rob his aerial of a little of the energy it has picked up from the transmitter, the loudspeaker's output would be correspondingly diminished. Ability to do this to a varying degree would, of course, solve the problem of distant volume control.

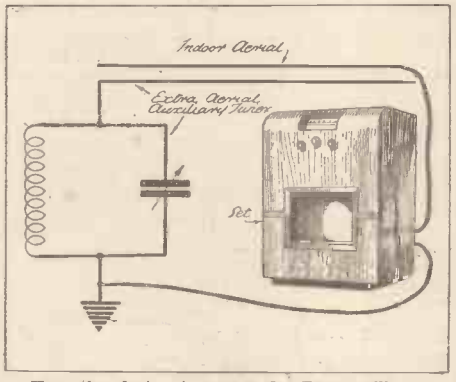
It is well known that two neighbouring outdoor aerials which run *very* close together "pull" one another when tuned to the same station. This effect can easily be exaggerated to its limit with an indoor aerial by purposely running an additional aerial *as close as possible* to the aerial which serves the set.

If this extra aerial is connected to earth via another wireless receiver which is placed near the listener's chair, control of volume on the main set will be effected merely by tuning and de-tuning the "auxiliary" receiver.

Since the "auxiliary" receiver will not be required for listening, it need have no detecting device, and can, therefore, consist merely of a coil and condenser *of the same kind* as the aerial coil and condenser in the main set.

The condenser is connected in parallel across the coil. The end of the coil to which the moving vanes are connected goes to

REDUCING THE POWER



How the device is arranged. The auxiliary tuning consists of a ·0005-mfd. variable condenser and a broadcast coil.

earth, and to the other end of the coil is attached the extra aerial.

The down lead of the extra aerial is at the end of the main aerial nearest the listener's chair. It is, in fact, a replica of the main aerial, but "the other way round." The "roofs" of the two aerials run parallel, and are only separated by their insulating covers.

It will be found that there is a point near the top of the dial of the "auxiliary" receiver where there is no effect on the volume and tuning of the main set. If the dial is then turned towards its minimum reading volume will be progressively decreased until the main set is nearly silenced. Between these two points (which will be quite widely separated) the finest possible control over volume from the main set can be exercised.

A. N.

A PANEL-DRILLING HINT

How to keep panels free from bolt heads.

CONSTRUCTORS who prefer to see a clean panel, unadorned by bolt heads and unnecessary holes, will find that, providing one is working on fairly substantial ebonite, a "blind" hole at the back of the panel, tapped to take the required screw or terminal, fills the bill.

The main difficulty is to know how deep to drill, and the following little device will be found to make a very useful stop:

Secure about three-quarters of an inch of stout ebonite tubing having a bore of roughly quarter of an inch (an old lead-in tube is just the thing) at equal distances round the tube drill, and tap three holes to take 6 B.A. screws. Slip the stop over the drill to be used, and adjust for distance; thus, if quarter-inch ebonite is being used the point of the drill should protrude from the stop slightly over three-sixteenths of an inch. The three screws are then tightened.

The hole can now be drilled in the usual way, until the stop touches the panel. A refinement is to fix a further two screws at the opposite end of the stop, thus making the whole thing practically solid.

HENRY HALL HAS A HOBBY!

His Collection of Tunes of the Past

EVEN for several years before he came to London, Henry Hall, director of the B.B.C. Dance Orchestra, made a hobby of collecting every song-hit published during the last thirty years.

Many of them—these songs of grandmother's day—were to be had for the buying; of others there was only the publisher's file copy; for the remainder Mr. Hall has been hunting ever since, whenever his rehearsals and broadcasts, composing and arranging, have given him the fleeting opportunity.

So, to-day, ranged on shelves in his office behind the Maida Vale studios, he has a series of beautifully bound volumes containing about 26,000 of the tunes that have been played, sung, hummed and whistled since the early years of the century—a unique and valuable library.

"I do not believe that I have overlooked any song-hit of the last thirty years," he says. "The forty or fifty volumes include the songs from the shows and the films, ballads and complete scores of almost every musical comedy.

"It has taken me years to get hold of some of the songs and I have, as a last hope, been to Charing Cross Road several times. It was worth while, too, for there among some of the old music stalls I have made several useful finds. Some of the pieces were worn and torn and dirty, but they have at least enabled me to make copies. Now, in manuscript, they are included in my collection. Some of them even the publishers have been unable to get, and I have loaned them several in order that they may make their own copies. I, in turn, have been able to make manuscripts of those solitary files that the publishers have.

"Not long ago I was able to pick up a song that had made a habit of haunting me for a good many years. When I was a boy and went to my first music hall I heard this tune for the first time—'Every little movement has a meaning of its own'—and it was sung by a girl who stood on the top of a noisy piano and did a rather curious bit of balancing.

"Some of the songs in the collection are actually so old that it is impossible for me to tell if they were 'hits' of their day, but they are quite worth preserving." In most cases, however, Mr. Hall not only knows the publication date of his songs, but has them indexed in years.

RANDOM RADIO REFLECTIONS

By Victor King

There's a lot to be said for the B.B.C., after all :: Increasing Television Brilliance.

PRO-B.B.C.

I LIKE people to agree with my views (most of us do), but I dislike those who go to extremes in their endeavours to convince one that they are on your side.

For example, I have had occasion to criticise certain aspects and activities of the B.B.C. Constructively, I hope.

But the main result seems to have been to draw to my letter-box a flood of such anti-B.B.C. correspondence that I wonder my front door mat hasn't caught fire. (My letters are re-directed from Tallis House to my private address.)

Condemnation, curses and vitriol! I'd rather not have such letters, thank you very much, for I'm not a candidate for the leadership of an anti-B.B.C. crusade. Forgetting certain imperfections, I think the Big House is to be congratulated on the way it has built up British broadcasting to its present world leadership in the art.

Most extremists go all out on the "highbrow and stodge" theme. Well, on Sunday the B.B.C. certainly goes grey and gives the advertising continental stations an opportunity to indulge in an orgy of "bottled" dance music. But who listens to these stations during the week? Not many, I'll wager.

What Figures Show

Anyway, let's examine some facts. I've been investigating the question of programme material for an American concern, and this is what I find: The B.B.C. transmits less serious musical stuff, such as symphony and opera, than any other of the larger continental countries. And they put over the most dance music (Holland provides the least).

Denmark gives more time to religious broadcasts than the B.B.C. And let us compare the B.B.C., that so-called dictatorship of the old-school-tie, with the Soviet Union, which is supposed to be a dictatorship of the proletariat.

The B.B.C. devotes roughly 1½ per cent. of its programme time to opera and operettas, and the U.S.S.R. 10½ per cent.

The B.B.C. allocation for news and talks is 15 per cent. or thereabouts, The U.S.S.R. slaps in 38 per cent. of these broadcast commodities.

Serious music occupies approximately 15 per cent. of the B.B.C.'s time, as against 20 per cent. for the Central Broadcasting Department of the All Union Radio Committee (the Russian equivalent).

And if you grumble at the point nought nought something per cent. of programme time the B.B.C. gives to advertising its publications, think of the solid 2·7 per cent. that the Russian C.B.D.A.U.R.C. (see above) slices off to boost all kinds of things.

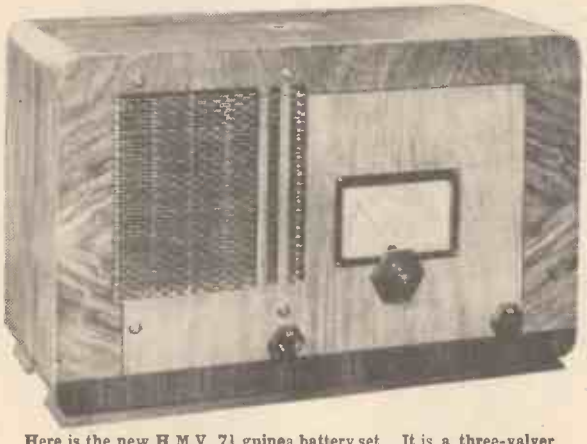
The only light material emitted by the Bolsheviks is contained in a 10 per cent. chunk into which is squashed variety and dance music.

In a recent report referring to their radio activities there is a list of the material figuring in their programmes at the present time. Over a third of the total is "mechanical"—presumably gramophone records.

And "music-symphonie, chamber and vaudeville entertaining" is a lumping together that reveals significant possibilities of the grimness of Soviet radio fare.

In view of all this I feel that it is crazily fanatical not to temper criticisms of our B.B.C. with moderation. Let's give them their due—but no more, lest they all rush out to buy bigger top-hats!

FOR THE BATTERY MAN



Here is the new H.M.V. 7½ guinea battery set. It is a three-valver and is listed as the Model 167.

By the way, some time ago I suggested that some of the cheerier lads from the Big House, such as John Watt and "Bill" Hanson, should be sent to Alexandra Palace to dilute the starch that has been settling round television.

I now understand that this is being done. Another victory for the spirit of popular entertainment.

KNOTTY OPTICS

SOME time ago I commented on a television idea due to a Mr. H. G. Newman, of Southwick, Sussex. You may remember it. He thought he should be able to "modulate" a strong beam of light with a television picture and thus get an amplification effect. I gave it as my opinion that there would be no brilliance step-up. Brother Newman accepts this verdict and returns to the problem with another idea.

He first of all uses a combination of mirror drums in order to obtain a high definition. The source of illumination is a neon lamp which fluctuates in accordance with the television impulses. Now let Mr. Newman himself explain the subsequent steps. He says:

"Not enough light, of course. Next move. Neon glow looks like ruby glass used in dark room which will pass only red rays. Project a strong blue light through fluctuating neon lamp and—nothing happens. Afraid your No. 2 (point in my previous paragraph.—V. K.) put an end to that.

"Next. Search an encyclopedia and read quite a lot about light and colour. Among other things, that red and blue light make yellow light. So I am trying to add red of fluctuating neon to strong blue light projected on to a yellow colour filter. Any hope? Or should I say 'germ'?"

Well, first of all, red and blue don't make yellow, but green and red do. But that is probably a slip. It won't affect the idea as such. Now what is Mr. Newman trying to do? He is interposing a yellow filter to pass yellow light. But as the components of his yellow are green and red, this filter must obviously pass either component singly. The strong green or the weak, fluctuating red. Therefore, the conditions are unchanged by the filter. It might just as well not be there.

No Increase Likely

No, Mr. Newman, I hate to be dogmatic, and I do not profess to be very well up in light and optics, but I think I am absolutely right in saying that it is impossible to obtain increases of brilliance by juggling with filters or attempting to "heterodyne" light rays.

You might be able to add slightly to apparent brilliance by juggling with colours, but I do not think that the real light value of initial fluctuations can be increased by such means.

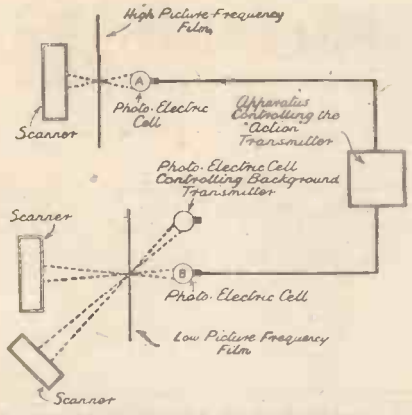
This sort of thing reminds me of "electrical bridges." I used to have the idea that, by upsetting the balance of a "Wheatstone Bridge" or mixing weak currents with strong alternating ones, "valveless" amplification ought to be possible. But experiment quickly showed that the resultant effect never exceeded in value that of the initial weak current. One went a long way round to make no difference!

However, our friend mustn't get despondent (and, judging by the tone of his letter, I fancy there is little danger of it). If he keeps on being enterprising in his thoughts he is almost bound eventually to think of something that is both worth while and practical.

By the way, I have been toying with the idea of running an ideas corner in connection with this feature. The Editor has agreed to the suggestion in principle. The main idea would be to give free publicity to such inventions and ideas submitted by readers which I thought were promising enough to warrant my bringing them to the notice of the radio industry and other likely buyers. But, of course, it would only be for schemes protected by patent applications or registered designs. Are there enough of you desiring a little limelight to justify such a feature?

MEDIUM-WAVE TELEVISION

Brief details of an interesting new system of television which makes possible high-definition transmission on medium waves, by E. J. Smith



Schematic details of the tranmitting apparatus.

HAVING read of the difficulties of short-wave television, of the limited range and the difficulty of distortionless amplification, I asked the question: "Could not the number of signals, necessary to televise a scene, be so reduced that the picture could be transmitted with high definition on a carrier wave of medium length, thereby overcoming the difficulty of range which, in the case of ultra-short-wave transmissions, is little greater than visual range, and also overcoming the difficulty of amplification?"

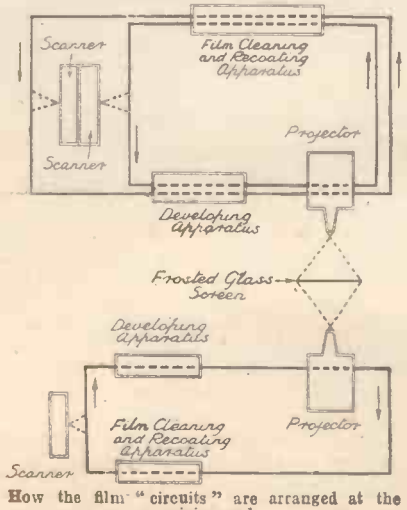
Limited in Scope

The waveband frequency of 9 kilocycles per second is, prima facie, hopelessly inadequate for the transmission of pictures, each consisting of tens of thousands of elements, and viewed at the rate of 25 per second. The following system of television, however, is based upon the realisation that with many television scenes a relatively large area of the transmitted picture is stationary, e.g. theatre background scenery, distant view "shots" and the like; and, in consequence, a large proportion of the radiated signals are merely repetitious. The invention described below obviates this unnecessary repetition by analysing the scene into stationary and moving parts, and using a separate transmission channel for each.

Obviously, this system of television is limited in scope, as it is essential that the movement should be small in comparison with the total area of the picture. Consequently this system is most suitable for the transmission of plays and special films. However, the entertainment value of such special transmissions may be almost as great as an event of public interest—which events often take place at inconvenient times from the point of view of the "teleobserver"—viewed simultaneously with its occurrence.

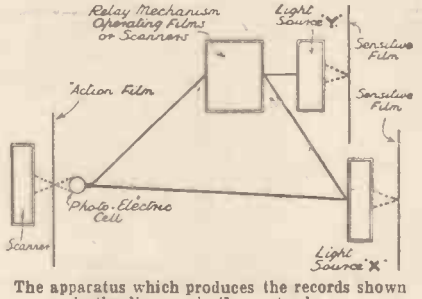
The background, including stationary objects in the foreground, is transmitted with high definition, but at a low picture-frequency, e.g. one frame every four seconds, upon a carrier wave of medium length, and is recorded temporarily in the receiver. The "action," or moving parts, is transmitted with high definition, and at a high picture-frequency, e.g. 25 frames per second, upon a second carrier wave of medium length.

AT THE RECEIVER



How the film "circuits" are arranged at the receiving end.

AN AUXILIARY JOB



The apparatus which produces the records shown in the diagram in the next column.

By means of variable velocity scanning the relatively small number of elements to be transmitted by the second channel, i.e. the movement transmitter, can be accommodated within a relatively narrow band width. In the receiver the reproduced background is "corrected" every 1-25th of a second by the high picture-frequency transmission.

This invention makes use of the intermediate film method, both for transmission and reception. The scene to be televised is photographed upon two films simultaneously, one at high picture-frequency, e.g. 25 frames per second, and the other at low picture-frequency, e.g. one frame every four seconds. When developed these films are "compared" by means of synchronised scanners.

Method of Scanning

Each picture of the low picture-frequency film is scanned twenty-five times, whilst each picture of the high picture-frequency film is scanned only once. When the light falling upon the two photo-electric cells, A and B (see diagram), differs in intensity, the difference in the strength of the currents produced by the photo-electric cells causes a signal, the strength of which is determined by photo-electric cell A, to be radiated from the "action" transmitter. The velocity of scanning of the two synchronised scanners is variable; the speed of scanning being decreased when a signal is radiated. The low picture-frequency film is simultaneously scanned at a low speed, the resultant current controlling the background transmitter.

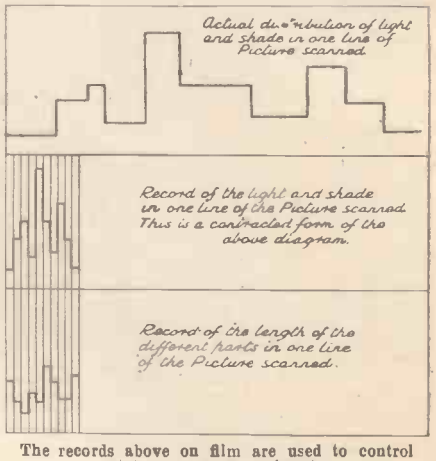
Technical difficulties seem to require the use of a further idea, described in this article, to accomplish the variable scanning.

Recording the Background

In the receiver the background is recorded upon an endless film which, after development, is fed to a projector at low picture-frequency. The second transmission, i.e. the action, is recorded upon two endless films, one film being a complete record of the signals received, whereas the other film is a record of the "action" in silhouette form. The film carrying the silhouette is passed through the same projector as the background film, but at high picture-frequency, thus throwing upon a screen the background minus the areas of difference. The other high picture-frequency "difference" film is passed through a further projector which projects upon the same screen, and in registration, the necessary picture difference areas to complete the picture.

The variable velocity device, already referred to, is most suitable for ordinary film transmissions, but may be practicable with the intermediate film method of televising events, though the delay between the actual event and the reproduced image would be increased.

A CONTROL FILM



The records above on film are used to control certain parts of the apparatus.

The device requires the use of two transmission channels. In this method the scanning speed of the receiver light source (a cathode-ray tube) is variable and controlled by one transmission, while the intensity of the light source is controlled by the other. The intensity of the light source is also under the control of the scanning speed of the beam, in order that due compensation may be made for the altered illumination due to the change of speed of the beam.

A record of the "action" is obtained upon a film which, after development is scanned, and the resultant current output is used to control the intensity of light from a light source X. Any variation in

(*Please turn to page 72.*)

VAL GIELGUD, B.B.C. Drama Director.

"I'M NO HIGHBROW," Says Val Gielgud

"Radio drama must stand or fall as interesting entertainment . . . I don't believe any sane listener prefers second-rate synthetic radio-drama to first-class theatre plays that adapt themselves easily for microphone use."

AN ALAN HUNTER INTERVIEW

BECAUSE Val Gielgud, the B.B.C.'s Director of Drama, has a rather obvious Oxford accent, many people imagine he is a highbrow. By such flimsy superficialities are men judged!

I always like interviewing Val Gielgud. It is always a stimulating experience. This distinguished-looking official, with his black pointed beard and dark eyes that half smile behind horn-rimmed spectacles, knows what he wants to say—and says it with conviction.

His department comes in for more kicks than most. Possibly the reason is that, if you listen at all to a radio play, you must listen completely. Light orchestras may provide a soporific background to other activities. But radio drama insists that you *listen*—and thereby arouses dormant critical faculties.

Val Gielgud can afford to smile at his tormentors, who are numerous. He can point to the facts. In the last quarter of 1933 his department accounted for twenty-five programme features. In the corresponding quarter of 1936 the B.B.C. schedules showed more than seventy programmes for which he was in some way or another responsible.

Apathetic Listeners

There is, suggests Val Gielgud, a "moronic deadweight" of listeners who, through sheer apathy, simply don't listen. It is among this section of the public that he is most apt to hear the parrot cry: "You're a highbrow!"

The stigma of that dreaded word is often misapplied. It most certainly is when applied to Val Gielgud. While amused at being thought high-browed, high-hatted or even highfalutin, he is sufficiently aware of its error, to take the trouble to hit back.

"After all," he mused, "what *is* highbrowism? I think it means the cultivation, with malice aforethought, of any minority interest—any interest that is alien to the ordinary public.

"Yet I cater for minorities. I have to. So does every broadcast programme chief. There is no such thing as a majority of the whole of the listening public. But I see to it that I cater for a different minority each time, so that in the long run I imagine I provide something for everyone."

Val Gielgud is acutely aware of the fallacy of the axiom about pleasing all the people all the time. He aims to please a few thousands, perhaps, at a time. Over a reasonable period of time, then, by pleasing different sections, he contends that the public as a whole is served.

"Do make it clear I don't expect listeners to hear every play I am responsible for having broadcast," he emphasised. "Let listeners put the radio play into its proper perspective *vis-à-vis* other occupations. Treat the radio play like a visit to the theatre or the cinema—as an occasional pleasure only."

That remark seemed to indicate that Val Gielgud regarded the radio play as a definite entity. The phrase "radiogenic drama" flitted across my mind. I asked him exactly how he would define this peculiar term we hear bandied about so much these days.

Four Main Points

"We must go back to the beginning for that," he replied. "Eight years ago I set myself to achieve four main points. I claim to have succeeded in three, but admit having failed in the fourth.

"First, I have tried to do something the theatre has never been able to make a financial success of doing—the complete works of Shakespeare.

"Secondly, I have tried to lift the works of such authors as Ibsen and Tchekov out of the "hot house" atmosphere of Arts Theatres, and to bring them into the lives of ordinary listeners. Many have discovered, to their astonishment, that these plays are not dreary at all, but highly entertaining. Incidentally, they make very good radio.

"Thirdly, I have tried to do something by radio to counteract the film technique in handling historical themes. As opposed to 'The Private Life of Henry the Eighth' we have done 'Gordon' and 'Gallipoli,' for instance. We try to make the real facts produce the drama, whereas the films tend to make history into an entertaining but nevertheless largely fictional yarn.

"Fourthly, I have tried—but more or less failed—to discover a school of radio playwrights. It is true that L. du Garde Peach, Horton Giddy, Tyrone Guthrie, Philip Wade and various members of the B.B.C. staff have written some very successful plays directly for the microphone.

"But I always feel the so-called pure radio drama is rather forced, under glass as it were, with hardly ever enough impetus to go ahead on its own vitality."

Reverting to the horrid imputation of highbrowism, Val Gielgud added: "It is absurd, because I have always had in mind that, at all costs, radio drama must stand or fall as interesting entertainment."

I suggested that many listeners would, in fact, quote Ibsen and Tchekov as having, to say the least, a highbrow tinge.

"Well, he might have aped the most popular forms of theatre entertainment and left the problem at that. No doubt if we had done so, we should have been spasmodically amusing. But it is possible to entertain without interesting. Just because I try to make radio drama at once entertaining and interesting, I fail to see why my policy should be called highbrow!"

And this radiogenic drama—this so-called pure radio drama supposedly peculiar to the microphone?

"The answer is to be found in the feature programmes we are now developing," replied Val Gielgud. "Trials, radio biographies, scrapbooks, mosaics of poetry and music: these belong to the real "stuff" of the microphone.

"If, in addition, we go to the theatre for our radio plays, no excuse is needed. The dominant motive is always to provide listeners with first-class material for their entertainment.

"I for one don't believe any sane listener prefers second-rate synthetic radio drama to first-class theatre plays that adapt themselves easily for microphone use.

"You know, listeners themselves agree with this point. The most popular broadcast plays last year were *all* stage successes in the first place."

Well, are these the sentiments of a highbrow? I think not.

CHARLES SHADWELL TO THE RESCUE

Many listeners to a recent Music Hall programme were intrigued by Announcer "Freddie" Grisewood's sudden exclamation, "Oh, dear, I'm left completely in the dark and can't see a thing!" Charles Shadwell noticed the announcer's plight, whipped out his cigarette lighter, and by the aid of its glow Mr. Grisewood was enabled to announce the next "turn."

The explanation of the contretemps is simple: A certain act was to be done with the auditorium lights out, but an over-zealous stage-hand unfortunately switched out the announcer's light also.

SEEN ON THE AIR

News and Views on the Television Programmes, by our special radio-screen correspondent,

L. MARSLAND GANDER

RECENTLY I had a heartening and instructive experience. I attended my first meeting of the Television Society, having been honoured by election as a Fellow.

This organisation was founded by a small band of pioneers ten years ago, with Viscount Haldane as its first president. Now it is a flourishing body with a live membership of 350 enthusiasts, and Sir Ambrose Fleming is president.

The total membership may not sound impressive from the numerical point of view, but the Society's fine leadership in independent thought and television progress is generally acknowledged. None who has heard a debate can fail to be impressed by the high standards of the Society. Any suggestions made by it are worthy of weighty consideration by the television industry.

A Plea for Less Secrecy

Now, in the discussion to which I listened several important points emerged. The first was a plea for less of the futile secrecy which prevails as regards sets, circuits, and new ideas. It is now common knowledge that the manufacturers spend a good deal of time taking in one another's washing.

Each manufacturer has to keep an eye on his competitors, and he does so by buying receivers of every available make and dissecting them privately. It seems to me that it would save a great deal of effort and amount to the same thing in the end if the manufacturers were a little more open.

Another plea relevant to the same point was that inventors should be less anxious to dash round furtively to the Patent Office, and more ready to discuss ideas with fellow researchers. This may be an altruistic suggestion, but it will obviously help television forward more rapidly.

In general there is need for a freer exchange of ideas, more co-operation, less cut-throat competition, perhaps more uniformity in design and methods.

Standard Aerial Wanted

To quote my own experience : I have had installed at my office and home four different television sets. Each set required a different type of aerial, in the opinion of its manufacturers. Average members of the public, as distinct from experts, will want one type of aerial for all sets, to be free to change from one receiver to another as fancy moves and when the purse permits. To be constantly erecting and dismantling aerial systems is a nuisance ; not that sets are cheap enough to permit a frequent change yet, but I am looking ahead. The television aerial has to be erected in the highest possible position. Therefore, I had mine fixed to the chimney stack. But the prospect of having armies of technicians clambering on the tiles is rather depressing.

A plea was also made at the meeting for standard nomenclature. I strongly endorse it and would go a stage farther by urging the abolition of all needless jargon. Some time ago there was long correspondence in our more serious daily newspapers, arising, I think, from a British Association meeting, over the need for the simplification of scientific language. Television is a particularly fruitful field for the lover of jargon, who can make himself utterly incomprehensible to the person with an ordinary knowledge of radio terms.

Experts should not find virtue in mystifying but rather in clarifying television language. When, as at present, the same thing has several different names the situation is hopeless. Yet there is a standard reference book. Potential amateur constructors should not be "blinded with science."

Considerable discussion arose at this meeting over the statement that a Marconi-E.M.I. receiver had worked with an aerial feeder 500 feet long, without reduced performance, and the claim that a feeder a mile long could be used.

* * *

Constant watching of the television programmes is leading me to revise some earlier impressions. Some programmes wear badly, others improve on acquaintance. For example, I am much less pleased with the news reels than at first. Part of this feeling may be due to the fact that film definitely does not reproduce so well as the "real thing" in B.B.C. transmissions. It is also unfortunate that the news reels have to be repeated so frequently.

Cartoon-Film Transmissions

The B.B.C. have also begun to transmit some moderately successful but not brilliant cartoon films. On the whole, unless there can be a double improvement, both in the quality of reproduction and in the entertainment value of the material, Mr. Cock is right in cutting down the amount of time devoted to film transmission.

Another question on which I am changing my mind is that of ballet. I had written off ballet as virtually impossible on the small television screen. "Façade" by the Vic-Wells Co. made me think twice. Now another Vic-Wells production in the studio, Act II of Tchaikovsky's "Casse Noisette" has given me cause for reconsideration.

I am not so blinded by my television faith that I cannot see television ballet as a poor substitute. The figures are small and sometimes muzzy on the screen, but in spite of all the viewer savours a great art. The Sugar Plum Fairy is an exquisite creation better seen in miniature than not at all, which is the alternative for the majority of viewers. But, above all, the real reason for my fascination with this programme was the new meaning given to familiar music by transmission on the ultra short waves.

Revelation in Reproduction

When, O when will our musical public awake to the revolution in their midst ! There is not, and never has been, any such quality in musical transmissions as that broadcast from Alexandra Palace. Many visitors to viewing rooms hear a section of film sound-track or a gramophone record and go off with a wrong impression. Broadcast performances of the Television Orchestra are a revelation.

By the way, repetition of most of the afternoon programmes in the evening seems now to have become standard practice. If this is to be done I cannot see why we should not have a third hour of programmes daily without delay.

KEEPING OUT DUST

A practical tip for those who use electrical measuring instruments

IT is a well-known fact that when measuring instruments, such as milliampere-meters and voltmeters, are kept lying about in busy workrooms, the dirt and dust settling upon them is apt at times to get behind the glass of their dials and to cake together in the form of hard masses on the dial itself.

EASILY REMEDIED

A ring of thin felt will prevent dust from working its way underneath the glass front of the meter.

Not only do such small accumulations of dust and fluff look unsightly under the dial-glass of the instrument, but they are also actually harmful, since if even a very small grain of grit or dirt becomes attached to the pointer-spindle or to the hair-spring, the instrument's action and accuracy of reading are very much liable to be upset.

The provision of a ring of thin felt under the dial-glass can safeguard an electrical measuring instrument from all such eventualities.

Cut out a suitable ring of thin felt or similar material and place it under the dial-glass and in contact with the dial face itself. The presence of the felt ring will, in most cases, hardly show at all. Yet the ring will act as an effective barrier against the inroads of foreign matter of all description.

J. F. S.

TELEVISION TOPICS—*Collected by A. S. Clark*

A weekly feature which will keep the reader au fait with all the latest news and developments in television science. It will appeal alike to the newcomer to television and the advanced experimenter.

"TELEFRAMES"

Items of general interest

SMALL-TUBE TELEVISION

AN interesting scheme which has been adopted in certain quarters for American home-constructed television receivers consists of the use of a very small cathode-ray tube, and consequently small picture, and a lens to magnify it up to reasonable proportions. The tube has a screen about 2½ ins. in diameter and is similar to those used in test oscillographs.

While the scheme scores from the point of view of inexpensiveness, both tube and associated parts costing less than those that would be required for larger scale work, it is probable that the real reason for the adoption of the scheme is that large-screen tubes are not normally available in America as they are in this country.

* * *

MARCONIPHONE TELEVISION

Television enthusiasts who visit the Ideal Home Exhibition at Olympia between March 30th and April 24th should make a point of visiting the Marconi Television Hall. They will be made most welcome and will be able to inspect the television apparatus made by this firm.

* * *

THE TELEVISION SOCIETY

Those interested in the technicalities and advancement of television cannot do better than join the Television Society, particularly if they live in the vicinity of London. New members are always welcome, and full details about how to join are obtainable from the Hon. Gen. Secretary, J. J. Denton, Esq., 25, Lisburne Road, Hampstead, London, N.W.3.

* * *

TOWARDS UNIVERSAL SERVICE

There are those who maintain that television and general broadcasting will always remain separate services. There are also those who consider that television will be the broadcasting of the future whether people always turn on the vision when they listen or not.

It is significant in regard to the second idea that television programmes are to be sent out so far as the sound is concerned. from medium-wave broadcasting stations. (See column three.)

* * *

YET ANOTHER COUNTRY

Norway has now become television conscious, and experiments leading towards a service in that country have recently been taking place.

During the great Radio Exhibition at Oslo, one of the personalities televised was Björn Björnson, son of the renowned Norwegian poet.

* * *

AMPLIFICATION TYPES

It is interesting to note that three distinct types of amplification, all at high frequency, may be employed in vision receivers. First of all there is normal H.F. amplification at signal frequency, namely at the wavelength on which the television programme is radiated. Then there is I.F. amplification in the case of a straight circuit. This takes place on a short wavelength, although one with a smaller frequency than the signal frequency.

Finally there is video frequency amplification. This can take place after the signals have been rectified, like normal L.F. amplification. It is still at high frequency, however, due to the enormous band of frequencies covered by vision signals.

Operating a complete high-definition cathode-ray sound-and-vision receiver, which was built and operated in the "P.W." Research Dept. long before the Alexandra Palace transmissions commenced. We hope soon to be in a position to present valuable information to home constructors of television receivers.

IMPROVING RECEPTION

READERS who remember our account in a recent number of the installation of television at a road-house near Box Hill will also find interest in recent alterations that have been made in the aerial installation there.

It will be remembered that in order to keep the aerial reasonably far from the main road to avoid car interference the aerial had to be erected on low ground, with the result that only just sufficient pick-up resulted to provide pictures.

In order to improve matters it was decided to try the effect of an aerial on the roof of the building in spite of the proximity of the road. The result was a definite increase in pick-up from Alexandra Palace, but no worsening of the interference due to ignition systems of passing cars.

If anything the interference was a trifle less noticeable. The reason apparently was that while interference pick-up was greater, so also was signal pick-up, so that the ratio was about the same while a gain in quality of the pictures resulted.

It also appears feasible that the reduction in gain in the receiver which could be adopted, showed less on the picture than on the interference, with a consequent beneficial effect.

The fact that emerges is that in the erection of television receiver aerials, distance from a road should not be achieved at the expense of the efficiency of the aerial as a pick-up of vision signals.

B.B.C. ANNOUNCEMENT

Regional listeners to share in television programmes.

THE B.B.C. announces that twice within the next month owners of ordinary broadcast receiving sets will be able to hear the sound portion of television transmissions from Alexandra Palace. The first occasion will be at 9.0 p.m. on Tuesday, April 6th, when the artists will be Frances Day, Irene Prador and Lydia Sokolova. Sound will be transmitted as usual on 7·23 metres, as well as on the Regional wavelength.

On April 15th evening television transmissions will begin at 9.0 p.m. with a thirty-minute programme by Henry Hall and the B.B.C. Dance Orchestra, and the sound part will be heard also by Regional listeners.

TELEVISION TOPICS—*Continued*

A NEW THYRATRON

TELEVISION experimenters will be pleased to learn that the new Mazda thyratron valve is now available at 20/-. This valve has been specially designed for use in thyratron-type time bases, and characteristic data are given on this page.

The valve is of the indirectly-heated type, and is gas-filled. The operation of the valve is quite independent of ambient temperature, so that the temperature of the room will not affect the setting of the time-base controls. It is equally suitable for both frame and line sweep circuits.

As can be seen from the accompanying list of technical details, the maximum permissible anode current is 300 milliamps. To prevent the discharge current of the charging condenser from passing this value, a suitable resistance should be included in the time-base circuit employed. The makers state that a useful valve to follow this thyratron for purposes of amplifying the sweep voltages is the Mazda A.C/P valve.

TECHNICAL DATA

Heater voltage	4
Heater current	1.5
Peak anode current in milliamps	300
Peak anode voltage	400
Peak voltage between any two electrodes	700
Approximate voltage drop in gas	40
Approximate control ratio	20
Type of filling	Gas
Maximum sweep frequency of time base (kilocycles)	15

The figures concerning the important factors of the valve are given in the table.

With reference to the last factor, it should be borne in mind that the frequency of the line sweep in a high-definition television receiver for the Marconi-E.M.I. transmissions is about 10,000 cycles or 10 kilocycles, so that there is a very ample margin in this respect. The frequency of the line sweep is, of course, obtained by multiplying the total number of lines in the picture by the number of complete pictures per second.

The difference between the peak anode voltage and the peak voltage between any two electrodes requires a little explanation. The peak anode voltage of 400 is measured between the anode and cathode and is the highest for normal working. The peak voltage of 700 between any two electrodes is the voltage at which a cold discharge through the gas takes place.

A photo of the latest Mazda thyratron described on this page.

AN ACTIVE SOCIETY

RECENTLY a Radio, Physical and Television Society demonstration was arranged at the premises of Messrs. Kamroe Radio Co., Ltd., 128, King Street. W.6 of an H.M.V. television receiver, at which a party of thirty members and friends attended. The demonstration was entirely successful, the members expressing the view that it was the best they had ever seen, and they considered that the picture, being black and white and without appreciable flicker, was ideal for entertainment.

At the lecture given on the society's headquarters on March 5th by the President, Dr. C. G. Lemon, the subject chosen was "Experiments in Light," and consisted mainly in showing how the human eye is very easily deceived. The beginning of the lecture dealt with the construction of the eye, and particular stress was laid on the *fovea centralis* at which the centre of vision occurs.

The main part of the lecture consisted of demonstrations showing how the eye can be artificially fatigued to different colours, and thereby giving an entirely different colour version of an object and also by means of rotating discs colours were produced from black-and-white drawings. Complementary colours were produced by intermittent fatigue and recovery and the capillary structure of the eye was also shown by means of an optical system.

The Forerunner of a Series

The lecture concluded with brief reference to fog penetration by means of the reversal phenomena of phosphorescence produced by infra red radiation.

This lecture is the forerunner of a series of popular scientific lectures which will be given from time to time.

The society headquarters have been redecorated and a library has been installed, which contains radio and scientific publications for the benefit of members. Two meetings are held weekly: on Wednesday evenings at 8.15 members can attend for general discussion, use of library, Morse test and calibration of apparatus, and on Friday at 8 p.m. lectures are given on Radio and other subjects.

Mr. J. G. Hobbs gave a lecture on "Signal Generators" on March 12th. Enquiries concerning the society should be addressed to the Hon. Secretary at headquarters, 72a, North End Road (off Talgarth Road), West Kensington, W.14.

We are always pleased to receive details of the work of television societies and clubs, and to publish notices of general interest.

TELEVISION FOR BEGINNERS

G. Stevens describes the application of the superhet principle to vision reception.

Superhet Vision Receivers

IT is to be hoped that you know what a superhet is—in theory at any rate—because it would take a lot of room to explain the whole thing from the beginning, besides probably poaching on radio preserves! But if you don't know, ask the Editor for an article on Superhets and How They Work or don't, as the case may be.

What we are principally concerned with here is the differences between a superhet for ordinary radio signals and one for television, and the special points about the circuit.

Question of Frequency

As usual, it boils down to a question of frequency. We have got to accommodate that band of 2 megacycles in the video frequency output, and to carry this band through the receiver the frequency of the intermediate frequency stage must not be lower than 2½ megacycles, or 4 to be on the safe side, and keep it clear of the sound transmitter.

The I.F. Stages

If you think of a carrier wave, whether radio frequency of 40 megacycles or intermediate frequency of 3 megacycles, modulated by a frequency of 2 megacycles, you will see that there will be no trouble unless the carrier frequency approaches that of the modulation. We couldn't have a carrier of a megacycle modulated by one of 2 megacycles because the tail would be wagging the dog!

The first thing, therefore, in choosing a frequency for the I.F. stages in the vision receiver is to select one as far as possible from the modulation frequency. This is a rash statement, so we will hastily modify it and say—but not too far away or it will introduce fresh difficulties in amplifying.

Why do we use a superhet? We have seen the difficulties in amplifying a television signal with a "straight" circuit, which were all introduced by the high frequencies involved in the radio frequency stages. To get over these difficulties we have to reduce the frequency at which the bulk of the amplification is done—hence we introduce an oscillator and amplify the beat frequency between it and the incoming radio frequency.

Now if we make this beat frequency high we are out of the frying-pan into the fire, because it will be just as difficult to amplify a high frequency in a superhet as in a straight set.

So the limit to the frequency of the I.F. stages is set by ease of amplification compared with the original television carrier frequency, which is round about 40 megacycles. So we have as our lower limit 40 megacycles and as the upper about 10 megacycles, which is not too difficult to deal with from the amplification point of view.

Interference

The exact value which is selected for the I.F. is governed by two more things, the chief of which is the possibility of interference from harmonics of the oscillator and interference from the sound transmitter which is only 3 or 4 megacycles away from the vision. The interference between the intermediate frequency and one of these may produce a tiny chequered pattern over the screen, which it would be impossible to remove. In particular, the I.F. should not be a multiple of any of the other frequencies involved. Incidentally, most of these points crop up in ordinary radio receiver design, and we suffer from those troubles known as "second channel whistles" and also "harmonic whistles," but where vision is concerned the effects are much more important.

Splashes of Light

In listening one is used to an occasional chirrup or hiss, but when looking at a moving picture these chirrups are translated into splashes of light or patterns on the screen which are far more irritating. Unfortunately, television is competing against a well-established rival—the cinema—and anything which makes one think of the early days of flickering, badly shown pictures is to be avoided—especially when you are showing your receiver to an admiring group of non-technical people!

ROUND THE B.B.C.

No. 4.—The First Real Television "O.B."

This week K.D. Rogers takes us back again to the Alexandra Palace and tells us about the arrangements for a really ambitious television broadcast.

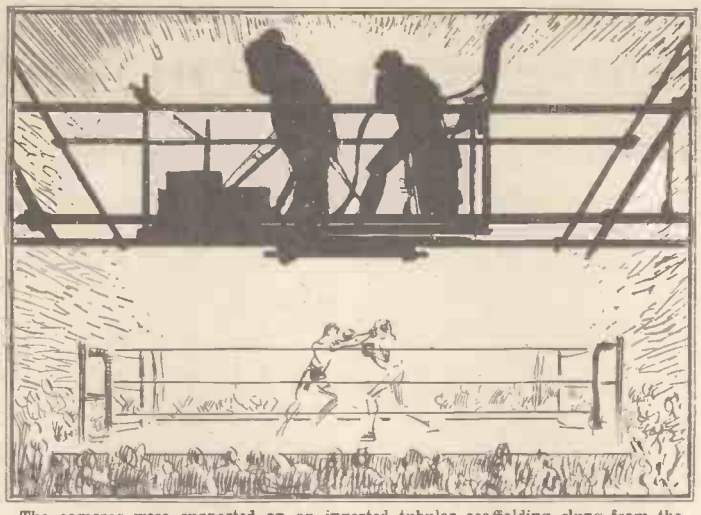
"ARE you going up *there?*" The voice of my guide round the Alexandra Palace made me pause.

"Why not?"

"Well, it doesn't look too good to me. It's not ready yet, you know."

The "it" was the inverted tubular scaffolding slung from the roof of the concert hall of the "A.P." to carry the platform for the two cameras which were to televise the boxing contests that were to take place shortly after my visit. Not an important occasion in the boxing world, for only amateurs were to appear, but a very important one in the annals of the newly born television service.

"It's our first real O.B." said my guide. "We have done other outside shows in the grounds of the palace, but this is our first show where there is a public audience and a national sporting event."



The cameras were supported on an inverted tubular scaffolding slung from the roof of the concert hall at the "A.P."

But I did climb up the rickety ladder to the double-plank platform of the scaffolding. There, some feet above the ring I could look down on the place where blood and brawn were to be spent as the antagonists snorted their way round the canvas. Two matches were to be televised, and a knock-out was expected in one. Unfortunately, as those of you who "looked in" know, that hope was not realised, but at the time of my visit a few days before the event the expectations of the television programme builders ran high.

Three thousand people would see the fight in the hall, and also the two weird white cameras and the great trailing cable which wound its snaky path out through the door of the hall and along to the control-room. They would see the dangling microphone above the heads of the pugilists as the sounds of thudding blows and the grunts of the recipients were collected and transmitted through the ether to the far corners of the earth.

A Precarious Position

Yes, I mean that—for, though the Alexandra Palace television transmitter is supposed to have a service range of about 25 to 30 miles, it has not only been heard and seen at Brighton but heard very well, though not seen, as far away as Johannesburg. A freak result? Possibly, but it has occurred, and no doubt will again—perhaps, as they remarked at "A.P." on the day of my visit—on the night of the boxing match.

I can't say I envied the camera men in their task of televising the match. Telescopic lenses were used so that close-ups could be achieved of the set, stern, sweating faces, and the fixed snarls of the bared teeth. A grand subject for television to record, and provided neither of the camera men fell off the scaffold into the ring a most successful performance.

But how that platform rocked! I am not a light-weight—I suppose my boxing status would be in the very close neighbourhood of heavy-weight—but the springiness of the tubular suspensions certainly gave me the jimmies. I was glad to come down to the drab, dusty floor of the concert hall.

I am glad the television people are making use of the Alexandra Palace itself. It is not a soul-inspiring place, and I take off my hat to the television lads for the enthusiasm which they are able to maintain in such deadly an environment. Just you take a walk around the palace—it's open to the public, and I have seen two of the said public inside it before now—and wander through the vast, empty, apparently

"Early-Victorian stuffed lion heads grin out of their glass cases."

poverty-stricken great hall with its magnificent though silent organ. Wrapping your great-coat well round your ears—for it's very cold there—take a look into the concert hall, with its solitary pin-table, and round the gallery at the side where the early-Victorian stuffed lion heads grin out of their glass cases. Then go back—for you will have seen the "A.P." in all its winter sombreness—and marvel at the spirit of the B.B.C. which overcomes the effects of that apparently lost world.

Yes, I admire them. Rarely do they see life as they did on that day when the boxing was in progress. Normally their existence is among a vast city of the dead, a deserted memorial to a bygone age, when people did actually toil up the long slopes to the palace for their afternoon outings.

But the television section of the B.B.C. is looking ahead. Ask one of the producers. He is one of those responsible for the ballets and musical masques that the television programmes contain every now and then and will contain in the future, and is determined to get his shows over, in spite of the lack of rehearsal time.

"That is the greatest snag," he told me. "We cannot get enough rehearsals. The cast has to learn the words, the music and the actions. They cannot do that in a few minutes.

"A full day's rehearsal of a play in a theatre will never result, even in the hands of the most expert producer, in more than 10 minutes' completed show. Think of it! Eight hours for every ten minutes of show!

"Now consider television with its limited rehearsal space and, what is more, the need for so many different shows per week. How can we get the necessary rehearsals in?

"To do so we are building up a new technique—something between the technique of the theatre and that of the films. This is a young art and for that reason I love the work."

The Future of Rehearsals

The fact that rehearsals have, up to the present, had to be carried out in the transmitting studio while no transmission is in progress does not help matters.

It's all very awkward, but no doubt it will all come out in the wash. Now that only one system is used, more rehearsal space is available. But, though an extra studio is vacant, it is not at all clear where the B.B.C. is to get really sufficient space for all the shows they want to do. And there must of necessity be many hours of rehearsal to each hour of performance.

But perhaps they will eventually take over the rest of the Alexandra Palace from the trustees. Perhaps then, even the ancient moth-eaten lions' heads and the one pin-table would be removed and something more inspiring would take their places.

But before then may I suggest as a historical record of the palace that the B.B.C. televise those snarling heads, just as they are in their old cases along the stone wall of the concert hall gallery. Just do it once—linking up modern science with the unimaginative, stilted Victorian past.

FROM OUR READERS

TWELVE YEARS OF RADIO REPORTING

An old hand gives his views on the topical question of QSL cards and the proportion of successful reports

The Editor, POPULAR WIRELESS.

Dear Sir,—Having read the letter concerning "veri's" (horrid word!) from Mr. T. T. Allan, I hasten to assure him that many listeners will indeed be interested in his experiences, especially since they differ from those of anyone with whom I have discussed this subject.

My experience of DX reporting goes back to 1925, so I regard myself, rightly or wrongly, as a fairly experienced "old timer" at the game. I consider myself lucky to receive one card in return for four sent, and have always found it so. Though any recipient of a card from 2 B I C will confirm that it gives the "good, detailed report" prescribed by Mr. Allan.

Only in exceptional circumstances do I report any station less than five thousand miles distant. This narrows the field considerably. It cuts out the high-power American 'phone stations, from whom thousands of misguided QSL-hunters pray for a card in confirmation of the fact that, with one kilowatt it is possible to put R8 phone across the Pond. Some of us discovered this about ten years ago, but others still find excitement in logging high-power "Yanks."

But when one reports (for example) a station in Manila heard to state that he is using only 50 watts, then I consider one is entitled to think that the report will interest him. But does it? And this is typical. The analysis of my record of cards sent and received is as follows:

	Sent	Received
U.S.A., districts 5, 6, 7	47	13
Canada, districts 4 and 5	12	3
Australia, all districts	49	15
New Zealand, all districts ..	21	5
South Africa, all districts	13	4
Egypt	6	2
Mauritius	4	1
Malaya, Hong Kong, Burma, Ceylon	6	Nil
Brazil	8	1
Argentine	7	Nil
Peru, Guam, Antigua, British Solomons .. .. Philippines, China, Nigeria, French Congo	Several	Nil

and so on. Enclosing reply coupons matters not a jot. Many of the lower forms of life burn your card and use your coupon for their own purposes. This is known as "ham spirit."

Returning to Mr. Allan's letter, I should like to put the following questions: (*a*) What period does his analysis cover? (*b*) Is the high percentage of replies still being maintained? (*c*) Does he include "circular letter" type of verifications from W2XAD, YV2RC, PMN, VK2ME, etc., and if so, why? Without these answers Mr. Allan's letter will give a wrong impression, and the novice who expects similar returns will almost surely be doomed to disappointment.

I do not know if Mr. Allan's cards are natty enough to provoke interest in the recipients. If so, I should like a copy of one for my own use! But otherwise I cannot understand the obvious interest shown to his reports, unless perhaps all this reception was on the five-metre band? But in this case we ought to have heard about it before.

I think I may well say that my views on this subject are those of hundreds of members of the R.S.G.B., and doubtless thousands of other short-wave listeners, who will be "VERI" grateful if Mr. Allan will tell us how it's done.

Yours faithfully,
H. S. CHADWICK, 2 B I C, M.R.S.G.B.
25, Raines Road, Worksop.

A GUINEA PRIZE

Each week an award of one guinea is presented to the reader who sends the letter which, in the opinion of the Editor, is the best one of that particular week's batch. Literary ability and length are no criterion of success, so don't hesitate to drop us a line giving your views or experiences on any radio subject. This week the prize goes to Mr. H. S. Chadwick.

TOO MUCH "POM, POM!"

The Editor, "Popular Wireless."

Dear Sir,—One of the few troubles with mains receivers is the preponderance of bass. No matter what type of orchestra or band is heard, the bass will stick out. I have heard the "pom, pom! boom, boom!" above all other instruments two floors above the receiver as loud as in the same room.

Now, as far as music is concerned, bass is the basis and setting, but, when it predominates to such an extent that it drowns most of the other sounds, it is, to say the least, rather sickly. It just goes to prove that the units employed with such receivers are not very capable of handling very large inputs; that's the fault every time. The receivers are splendid; there's no fault with them. In any case, the old horn speakers used to rattle on the high notes and send you off with a headache, while to-day we have the reverse—a preponderance of bass which, to my mind, is certainly better, regardless of the "pom, pom!" In any case, bass is better than screech, and to those who have a great deal, as long as the neighbours don't complain, it's not so bad.

Nevertheless, it's a great disadvantage, because mains receivers, as a whole, are far superior in every way to the battery model, and are certainly cheaper.

In conclusion, the battery model is far more troublesome; what with accumulators, etc. it's quite a concern. I should advise anyone who intends to purchase a set to get a mains outfit, but to be sure it has a good speaker.

Yours truly,
G. W. CLARKE.
216, Dunstan's Road, East Dulwich, London.

UNDER FALSE PRETENCES?

The Editor, POPULAR WIRELESS.

Dear Sir,—Through meddling about with wireless I have acquired a reputation among relations far from being deserved, as I am not in the least bit technical. However, one relative asked me to repair his set, and as it was an old one I thought I could not do it much harm. Apparently he could not get a squeak out of it. On opening it I found somebody else had been repairing it. Two or three soldered joints that had come loose had been wrapped round with thin wire, and the fuse had gone and a piece of wire connected across it. I soldered all the joints and fitted a new fuse and got the set going.

When I took it back it refused to function, and, after fiddling about for a full ten minutes, I managed to find a place on the accumulator terminal where it worked. On inquiring about this, I was told it was always like that; but as he hadn't been able to connect it this time he was sure something was wrong.

As I was unemployed I took what was offered me, but I have wondered to this day whether it was got under false pretences. I reassure myself by thinking that the soldering alone was worth the money, even if it wasn't the cure.

Yours truly,
E. WRIGHT.
42, Tosson Ter., Heaton, Newcastle-on-Tyne.

GAINED A PAL

The Editor, "Popular Wireless."

Dear Sir,—As an avid reader of W. L. S., whose page I turn to first (after Ariel has cheered me up), I see many requests from time to time for translations of the "shorthand" used by the "hams."

It is obviously impossible to give these readers a comprehensive reply every week, so might I be allowed to suggest that "P.W." publish a sheet giving the Morse code and the more usual contractions? If printed in fairly bold type, readers could mount it on stout cardboard and hang it near the S.W. gear for ready reference. Now that short waves are truly here, it might also be a help to many to learn Morse.

It is a considerable time since I wrote you last, but the publication of my letter gained me a radio pal in England, and many a good discussion we have by letter on radio and "P.W." topics. Thanks, "P.W."!

Wishing the old paper all success
I am, etc.,
ROBT. C. GALLACHER.
"Braefoot," Centenary Avenue, Airdrie, Lanarkshire.

[We hope to be printing something on these lines shortly.—ED.]

NEW ALL-WAVER

This new H.M.V. all-wave receiver is priced at 12 guineas. It employs a six-valve superhet circuit and is designed for A.C. mains.

NEXT WEEK

How to make
A CHARGING BOARD

EDUARD SCHERZ: THE WORLD'S FIRST ANNOUNCER

SOME INTIMATE SIDELIGHTS ON HIS LIFE, BY ONE WHO KNEW HIM WELL

EDUARD SCHERZ, who died recently, was announcer at Budapest from 1907 to 1931. He was given an official burial by the Hungarian Broadcasting Company.

Budapest was one of the first towns in Europe to obtain a system of broadcasting by wire early in the nineties of the last century. Unlike similar systems in other cities, the Budapest Telephon Hirmondo, as it is called, continues its service until this day. It is therefore possible to call Eduard Scherz, who started announcing for the Telefon Hirmondo in 1907, the world's first announcer, as he could look back upon continuity of service when he was taken over by wireless broadcasting in 1925.

His Greatest Moment

I met Eduard Scherz in 1928, and then on many occasions. At the time of our first meeting he proudly showed me round the original Telefon Hirmondo studios which were about to be dismantled, as the broadcasters were removing into new premises. I still saw the 1896 control loudspeaker in its original place—now it is but a relic. At the time Scherz told me some of his early adventures. In 1910 a bad storm tore down the wires shortly before Easter. The whole service would have had to close down if Scherz had not been able to get a gang of workmen together and under his personal leadership got the wires up again within a week.

The greatest moment of his life at the microphone was the time he boldly announced the assassination of the Austrian Archduke in Sarajevo in 1914. He had had the news from a friend, and broadcast it without waiting for official confirmation. Shortly after the broadcast the authorities put him through an hour's strict questioning, but luckily official confirmation of the fateful news arrived, and Scherz was rewarded instead of being put into prison.

A Fluent Linguist

During the War he did his bit like every good Hungarian. After, he returned to the services of the Telefon Hirmondo, this time in the book-keeping department, but returned to the microphone with the advent of wireless broadcasting. His knowledge of French and German, both of which he spoke fluently, stood him in good stead. He continued at the microphone until 1931, when unpleasant throat trouble caused him to consult a doctor. An operation followed, but his voice was gone. A hoarse whisper was all that was left. The broadcasters appointed him librarian, where he worked until shortly before his death.

Scherz was a great favourite with the children. At one time he was chiefly responsible for the children's hour, and "Uncle" Scherz, or Scherz Baczi, the Hungarian expression, got many letters and funny presents from tiny tots. At an exhibition in Budapest the broadcasters had rigged up a studio in a glass-walled hall. During lunch-time "Uncle" Scherz once remained in the studio and gently dozed on a chair. A little girl of six passed with her mother and asked who the gentleman was. On hearing that it was Scherz Baczi she persuaded her mother to buy a box of chocolates, which she deposited on the sleeping Scherz's knee, tip-toeing out of the studio again with her finger to her mouth. She evidently thought that the broadcasters had locked "Uncle" Scherz up in the studio and were letting him starve. An engineer saw the episode from behind his curtained window, otherwise Scherz would never have known how the chocolates came to be on his knee.

In Budapest Eduard Scherz was considered one of the last great Bohemians. He was always perfectly dressed, his buttonhole was never without a flower, his moustache was carefully tended, and he was proud of 800 or more letters from women listeners offering, either directly or indirectly, to become his wife. Thousands of listeners, notably of the older generation, wept at his grave. Tall, elegant and handsome, Eduard Scherz has left us!

A. A. G.

EDUARD SCHERZ

HOW MANY VALVES?

Here is another of those fascinating problems by Louis C. S. Mansfield. What do you make of it? The solution will be given next week.

THE other day I was having a chat with a dealer friend of mine apropos valve replacements.

"Been selling many?" I asked him.

"Yes, quite a lot," said he. "In fact, a lot more than I bargained for. Folks aren't what they used to be. They buy in such funny ways these days. D'you know, that in order to encourage sales I have had to give away a number of bits of valves."

"Come off it!" I replied. "Who wants a bit of a valve? If anyone is so batty as to want some 'dud bottles' I can give him plenty and save him the trouble of carting home broken ones."

"It's true!" he fired back. "I gave away bits of valves to four people, and, what is more, I didn't have to break any to do it."

At first I thought it must be the heat, but then I saw the glimmerings of a little brain teaser, so I asked him to explain further.

"Well," he said, "it's like this. The first chap who came this morning bought half my stock of valves, so I gave him half of one over as a sort of make-weight.

"The next chap who came along bought a third of what I had left, so I gave him a third of a valve extra.

"Then a little later another fellow bought a quarter of what was left, so I decided to give him a quarter of a valve over.

"By this time the whole thing seemed to have developed into a sort of game between the public and me, so I decided that the very next person who turned up I would force to buy a fifth of the remaining stock and that I'd give him a fifth of a valve. Well, somebody came along and I duly landed him.

"With what I've got left after this I'm going to make up thirteen sets with the same number of valves in each."

This description left me panting, but I mustered up sufficient strength to return to the attack.

"Do you really mean to say that you didn't have to break a valve?" I asked him. "And, anyway, how many did you start with?"

"No, I didn't break one," he answered. "You're fond of setting problems for other people, so suppose *you* try to find out how many I started with. All I'll tell is that the number is less than one thousand."

Well, there you are and there I am. I managed to solve it in a very short time (that's what I always tell 'em). Let's see how long it's going to take you.

QUESTIONS AND ANSWERS

By K. D. ROGERS

WHERE DO THE ELECTRONS IN A VALVE COME FROM?

L. P. (Banstead).—*In a battery valve the electrons from the filaments come from the battery, go through the valve and back to the battery. But what happens in the indirectly heated valve? There is no battery or any source of electrons.*

I am afraid you are getting a bit muddled. The battery valve does not get its electrons from the battery as you suggest. The electrons are given off by the heated filament, which in modern valves is coated with special materials which are "rich" in electrons. When these are heated the electrons "come off." They boil off something like steam does from water. The battery is merely the heating device, the heat being provided by passing a current through the filament. If you could get a gas jet under the filament you would get the same results.

In the case of the indirectly heated valve the cathode is a porcelain tube coated with similar materials "rich" in electrons. The cathode is heated by having a small electric fire inside it, a heater element which is made hot by passing A.C. through it from the power transformer or mains current from the mains.

Then when the cathode is hot, off come the electrons. The heating scheme has nothing to do with it other than to supply the heat to make the electrons "boil" off.

The Editor cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication. A stamped, addressed envelope must be sent with every article.

All Editorial communications should be addressed to the Editor, "Popular Wireless," Tallis House, Tallis Street, London, E.C.4.

All inquiries concerning advertising rates, etc., to be addressed to the Advertisement Offices, John Carpenter House, John Carpenter Street, London, E.C.4.

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

SHUNT-FED TRANSFORMERS

P. C. N. (Liverpool).—*Why do people use shunt-fed transformers?*

Quite a straight question that, but I have to suppose that you understand what inductance is in the answering of it.

You know that a transformer has inductance. That the inductance decreases when a current is passed through the primary windings. I say primary only because we do not pass any current through the secondary except in the case of the Class B transformer.

That primary current comes from the anode circuit of the valve—it is the anode current.

Now, the higher the inductance of the transformer primary the better the reproduction of the bass notes. That, I am afraid, you must take as a fact without explanation. It is wrapped up with frequency and inductance, but you can take it that the lower the note to be reproduced the higher must be the inductance.

That sounds easy; but it is not. To get high inductance you need a good core—preferably one of the nickel iron cores—and you need plenty of wire, so that you can have a large number of turns.

That last fact is a pity, for the more the wire the greater the self-capacity of the winding, and self-capacity means loss of high notes. A bit awkward, 'sn't it?

Thus the makers of transformers are set the problem of getting high inductance with as small amount of wire as they can. To do this they use the special core materials, and they succeed very well.

But the special core materials will not stand much in the way of magnetic lines of force set up by current passing through the windings, without being saturated. That is, they will not carry many lines of force before they are "full up."

You probably know that the whole operation of a transformer is to transfer the magnetic wobblings in one winding (caused by the A.C. speech currents) to the other winding. And to do that we let the wobblings be induced into the iron core, from which the effect is transferred to the secondary. Those wobblings are set up in the steady anode current of the L.F. valve, and go *with* the anode current through the primary of the transformer. That's quite easy. But you cannot get an iron core to vary its magnetism (as it must if it is to carry wobblings of magnetic lines, or, in other words, rapid increases and decreases of their number *in accordance with the strength of the speech currents in the primary*) unless it can carry *all* the lines required *without being saturated.*

As soon as it is saturated and cannot carry any more lines, obviously any increase in the number of lines will have no effect, though a decrease will have its due effect.

Thus we get distortion. It simply means that the part of the speech impulses which have the effect of increasing the anode current of the valve (which is flowing through the primary of the transformer) will have no effect on the magnetism of the core, and therefore no effect on the voltage induced in the secondary, while the other part of the impulses (they are A.C. in form, remember) will decrease the anode current and duly decrease the number of lines of force in the transformer core. A nasty state of affairs.

What's to be done? Keep the anode current down so that the core does not get saturated? No. That would reduce the amplification of the valve. What else can be done?

Shunt-feed the transformer. In other words, let the anode current go off on another path and just feed the fluctuating A.C. impulses through the primary of the transformer. That will allow full scope for the speech currents or voltages without any danger of saturating the core of the transformer and causing distortion.

IS IT NORMAL?

Here's a lovely short one from a Scottish reader. His initials are K. McG., and he lives in Glasgow. He says: "I have tried the effect of reversing the connections between the reaction coil and the reaction condenser, and I find that in one position I get reaction and in the other I get no reaction, but a cutting down of strength. Is this normal?

I could go into a long treatise on the subject of reaction, what it is and how it works, but I will spare you. But the effect noticed by K. McG. is quite normal. All he has done is to apply reverse reaction in one position. That is, he is applying through the reaction condenser H.F. impulses, which, by virtue of the way he has connected the coil, are opposing the H.F. impulses in the tuning coil. Therefore he is reducing reception efficiency.

With reaction properly connected the H.F. impulses applied by the condenser and coil to the tuning coil are in step with the impulses in that coil and they "help" them.

ANOTHER S O S

Owners of blue prints and constructional details of the old "Cosmic" Three, forward, please. Mr. H. C. Venison, 42, Princes Avenue, Greenford, Middlesex, *has the parts for the set, but no working details. Will be pleased to defray any expenses if someone will let him have the necessary. He will be glad to reciprocate in any way he can.*

There you are. Rally to the call, readers. And don't forget—post-cards first, PLEASE. Don't flood the poor chap with prints and books. Let him choose the source of his supply from the post-card offers. And here again, do not be offended if your card is not answered. One will be chosen: the others must satisfy themselves that they have done a good deed in offering, and not expect any answer. They may get a letter of thanks, I don't know; it depends on how many cards Mr. Venison receives. So, let's go. Do your best.

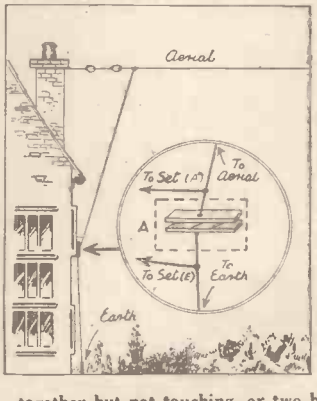
A SAD MESSAGE

Here is a short letter I have received, full of disappointment. "I had much pleasure in building the S.T.800. It works fine, but I get a very strong whistle."—L. W. (Tooting).

Really, I cannot say what is the matter. It may be umpteen things. But cheer up, L. W., we will find it out in the end. First of all, does the whistle alter when you use reaction? Does it alter when you change wavelength? Does it change when you tune the set? Take out one valve after another, starting at the H.F. end, and note which removal stops the whistle. Mind you don't blow up anything by letting wires drop on to other wires in this process. Does the whistle stop if you take off the wires from the reaction condenser? Let me know the answers to these questions and send me your full address. Perhaps we can get down to things then. At the moment the information is too slight to allow us to diagnose the trouble at all.

TECHNICALITIES EXPLAINED—No. 45

LIGHTNING-ARRESTER



What is an arrester? Does it arrest lightning? The answer to the last question is wrapped up in that to the first. The name is really rather misleading. It does not arrest lightning in the sense that it stops it altogether, but it does stop it (and electric charges in the aerial in general) going through the set.

High voltage electricity is funny stuff. It hates corners and loathes any sort of obstruction. It would often rather jump across a bend in the wire to a nearby earth than run on down the wire to earth round all sorts of bends and corners. And it would by far rather jump across a small gap of air than work its way through a coil, fighting every inch of the way against impedance.

And that is what a lightning-arrester does; it provides an easy path for the electricity charges on the aerial. Those charges that are of too low a voltage to do any damage to coils and condensers in the set are also too small to jump across a small air gap. Those that will do damage are big enough to jump a gap in preference to fighting through the coil (the aerial coil) of the set.

So a small gadget with two plates of metal placed close together but not touching, or two blunt metal points similarly placed is made and connected as shown at "A" in the diagram; between aerial and earth and outside the house. A waterproof cover is made so that the arrester shall not leak and provide a damp path for signals to travel down instead of going through the set.

It will be obvious that signal voltages are too small to enable the current to jump the gap of the arrester, and they go on down the coil as usual. Static charges on the aerial, however, when they become big, will jump the gap and escape to earth without damaging the set.

There are other forms of arrester, gas-filled gadgets and so forth, but the fundamental is a couple of plates as shown, very close together but not touching, and kept free of moisture or dust by a cover.

"HERE IS AN SOS MESSAGE..."

Some of the poignant stories behind those dramatic messages which every listener hears over the radio

SLOWLY, almost imperceptibly, the pulsating rhythmic music of the late night radio dance band dies away till even the staccato drum-beats fade into stillness, like some distant tom-tom.

Listeners dancing to the tune halt and look wonderingly towards their radio sets. A moment passes. Then the resonant voice of an announcer speaks.

"Here is an S O S message——"

Once again the B.B.C. is giving the power of radio to the cause of humanity. Once again, broadcasting is playing a last dramatic part in what has been a hopeless search, perhaps for the parents of a child dying, the victim of a road accident; maybe helping to save a life.

B.B.C. Always Ready To Help

Since the days of 2 L O many thousands of these messages have been broadcast and a large, mounting percentage have been successful. To listeners generally, however, there must be some element of mystery behind these nightly human dramas. "How do the B.B.C. get the requests to issue an S O S?" "Who decides whether an S O S shall be radiated?" "How many go out in the course of a year?" are questions that could be answered by demonstration almost any night at Broadcasting House.

Few hours pass without a call from some distracted person appealing to the B.B.C. to help trace, say, the brother, sister, mother, or father of someone who is dying. Obviously, though the B.B.C. is always ready to help, certain formalities are necessary in order to guard against such a thing as a grim jest by some practical joker. But the formalities are brief and can usually be dealt with expeditiously. Two vital questions have to be answered satisfactorily—first: Has every other means of communication failed? And second: Where is confirmation (preferably telephone confirmation) of the facts available?

Obtaining Confirmation

In the case of dangerous illness the hospital or family doctor can usually readily answer both questions. Perhaps only a few minutes may pass between the receipt of the original request for help and the transmission of an urgent message. Where possible, S O S's immediately precede the News Bulletins, but sometimes it is necessary to interrupt a programme rather than wait even half an hour.

Only quite recently an urgent message caused the interruption of an afternoon musical programme when persons living in the neighbourhood of Saltburn, East Yorkshire, were asked to inform coastguards and life-saving authorities that a vessel was in distress in the North Sea.

There have been many such cases.

In fact, the earliest S O S call broadcast in this country caused a programme from Birmingham—it was 5 G B then—to be broken on a Sunday night in the Spring of 1923. A man was dying in a London hospital. The only relative near London was living in a Bedfordshire hamlet which, on Sundays, had no means of rapid communication with the outside world. The only hope of getting in touch with the relative was by radio—a message that might be heard by someone in the district, someone who would realise the gravity of the situation and tell the relative without loss of time.

There lived in the village a man who had built a crystal set and who, while listening, was amazed to hear a request for the help which he of all people was able to give. For the dying man's relative lived next door.

Not long ago the B.B.C. broadcast an S O S message because a man lay acutely ill in an East End hospital, stricken with the virulent germ tetanus.

His condition was precarious. The only possible hope of saving his life was to get in touch with an eminent doctor, believed to be at Oxford, an authority on anti-tetanic serums.

So the broadcast went out. Someone living in London heard it and, with a fair knowledge of Oxford, telephoned to those places in the university city at one of which he knew the doctor would almost certainly be. Ten minutes after the broadcast he was speaking to the doctor who, though he had not heard the broadcast, abandoned the party that he was attending and drove through the night to London. He reached the bedside of the dying man in the early morning, and there began a six-hour fight to save his life. Unfortunately, the germ won, but the very presence of the Oxford doctor paid tribute to the usefulness of the S O S

On one occasion the wife of a lighthouse keeper lay dying. Her husband was on duty; surging seas made it impossible for boats to put out from the shore. There was no other means of communication.

Then someone thought of the B.B.C. Yes, the lighthouse had a wireless receiving set and there was a hope that although no boat could reach him he might be able to navigate a boat from the lighthouse to the shore. Luckily, the lighthouse keeper heard the message that went out. He scrambled down to his boat and gallantly rowed it to the shore. Twenty minutes later he was by the bedside of his wife.

S O S's To Fishing Vessels

Once or even twice a week during the winter months a message is flashed out from the B.B.C. transmitters to one of the many fishing vessels around the coasts. Every listener knows their phraseology; how they appeal to husbands and brothers to return home where wives, sisters, sons or daughters are dangerously ill, calling for them.

In some of these cases the success of the message depends upon the comradeship of the men who sail the seas. Often the smaller trawlers carry no wireless set, and it is then a task for the nearest boat with a radio receiver to get in touch with the smaller vessel.

(*Continued on next page.*)

BEBE DANIELS and her husband BEN LYON making a record at the H.M.V. studios. The record is entitled "There's a small hotel" from "On Your Toes."

THE DETAILS REQUIRED BY THE B.B.C.

THIS IS THE USUAL QUESTIONNAIRE WHICH S O S APPLICANTS ARE ASKED TO ANSWER

1. Full name of person it is desired to find.
2. How long ago and in what district was this person last heard of?
3. Have you tried all other means of tracing this person, for instance, through Police, or Post Office?
4. Full name of the patient.
5. Address at which the patient is lying dangerously ill.
6. What is the relationship between the person it is desired to find and the patient?
7. Is the patient asking to see this relative?
8. Name and address of the doctor attending the patient.
9. Are you a relative of the patient?
10. Your full name and address.

"HERE IS AN SOS MESSAGE"

(Continued from previous page.)

There was a time when the B.B.C. was less stringent in its regulations governing S O S messages. But when listeners began requesting an early S O S for Tibby, the family cat, who had not been home for several nights and was feared to have met with material damage—well, something had to be done about it.

Nowadays, however, besides the S O S for relatives, messages are frequently radiated at the request of the police. Missing persons generally cannot be the subject of an S O S but, now and again in the public interest, radio does help in cases where, for instance, foul play has not been ruled out.

The Poison Pills

Missing drugs and disease-laden swabs that have vanished from doctors' cars, dangerous explosives that have mysteriously disappeared. unknown witnesses of fatal accidents—all these are more or less regular causes of S O S broadcasts.

Some time ago a chemist realised only too late that he had served a woman customer—a stranger to the district—with the wrong kind of pills. She had taken some which were poisonous. The B.B.C. were asked to help. There was just a chance—a slender chance—that the woman might be listening. The B.B.C. thought the chance was worth taking.

Among the millions of homes into which this curious S O S flashed its way was that in which the mystery woman was listening. A glass of water in one hand, one of the pills of poison in the other, she had paused a moment to hear the S O S.

That is why time is such a vital factor; why none is ever wasted; why programmes are faded out for the few seconds that an S O S message takes to speak.

There was a broadcast S O S at 10.30 one morning recently, when another chemist discovered to his horror that he had sold the wrong powders to the parent of a sick child.

High Percentage of Successes

Other urgent S O S messages that have been transmitted since the beginning of the year have included one requesting shepherds and farm-workers in the Western Highlands of Scotland to keep a sharp look-out for the Fleet Street aeroplane that was missing (and afterwards found to have crashed) on a flight to Speke Aerodrome, and another which led directly to the recapture and shooting of the wolves that escaped from Oxford Zoo, though it was transmitted in the form of a news item after having been received from Scotland Yard.

Last year a record number of 1,120 S O S and police messages were broadcast. The percentage of successes was 53·75.

It is safe to say that 6,000 more requests for S O S were rejected because they did not, or could not, comply with the essential regulations. As an example, one young woman writing anonymously from a northern city, begged the B.B.C. to broadcast "a little message for me,"—a message for a young man, asking him "please to get in touch with his girl friend immediately"!

TECHNICAL JOTTINGS

(Continued from page 52.)

So far from a larger output valve being an advantage it is sometimes a disadvantage, and the general rule is that you should use a valve of the correct rating for the power which has to be handled.

A Question of Amplification Factor

Let us suppose, for example, that the input to the last valve is sufficient to load a valve of one watt undistorted power, then such a valve will be much better in the output stage than one capable of dealing with perhaps two or three watts. There are several reasons for this, and one of them is that with larger output valves the amplification is as a rule rather smaller. A valve designed for an undistorted output of one watt, for example, may have an amplification factor of 10, whilst a valve designed for twice the power output will probably have a much smaller amplification factor, perhaps only 3 or 4. You can easily see from this the disadvantage of using an unnecessarily large output valve.

Undistorted Output and Loud Passages

Another point which you want to bear in mind, and which people often overlook, is that the maximum undistorted output specified for a valve refers generally to the loud passages, that is, to the maximum load which is going to be thrown upon the valve. It is obvious that for most of its time the valve will be working at much less pressure than this, and this is a still further reason for not overdoing it in the way of power-rating of the valve. I think most people tend to err in the direction of using too high an output rating, rather than too low.

* * *

Importance of Screening

You know how very important it is to screen any conductors carrying alternating current. The science the art of screening, which has been brought to such a pitch during the past few years, is what has made possible the modern compact and highly sensitive radio receiver. But the precautions we ordinarily take, even with a very sensitive set, are nothing compared with those which have to be taken in some types of very delicate experimental work in other fields. I have just received a very interesting account of some work by Dr. W. E. Boyd, the well-known radiologist, of Glasgow, in which he was experimenting with the biophysical properties of the human body, and using apparatus so delicate that it was affected by the alternating "electrostatic" field due to direct-current conductors, even when no current was flowing.

Electrostatic Fields

You may wonder how this could be and perhaps I should say right away that the interference was due to the fluctuating field radiated from the D.C. conductors owing to the ripple superimposed on the line. You can see how this is if you regard these conductors simply as the "electrified bodies" of your early text-books.

In order to carry out his work successfully, the doctor had to design a *completely screened laboratory*. The walls and roof

(Continued overleaf.)

TECHNICAL JOTTINGS

(Continued from previous page.)

were completely covered with phosphor-bronze gauze of close mesh, the roof being woven in one piece and the walls in another piece. All joints were covered by brass strip and the walls were soldered to a solid copper floor, completely welded. The doors were covered with phosphor-bronze, and elaborate precautions were taken so that when the doors were closed there was a good contact between the covering of the doors and the covering of the rest of the room.

Radio Receiver Silenced

Some very interesting experiments were then carried out, in order to see how effectively screening of this very careful character would protect on a large scale against static interference. Some remarkable results were obtained which showed that, without any iron screening, the effect of electro-magnetic waves was greatly diminished. A well-known and very sensitive four-valve set was *completely silenced*, and could not be re-tuned unless put on the floor, when there was then a very faint pick-up, presumably from eddy currents in the metal flooring.

Even a Superhet!

When the Glasgow radio station was radiating a mile away a seven-valve superhet with large frame aerial was only able to give weak loudspeaker effects; but if the aerial was screened by a further inside cage even this was silenced. By using internal gauze cages to screen delicate apparatus inside the metal laboratory electro-magnetic effects were entirely prevented from interfering.

Occasionally, however, an electric plug would be left exposed, with a switch on and a line lying out, and interference was then produced, even though there was no current flowing in the line. The character of this interference was definitely periodic, and was apparently caused by minute surges in the line from the positive D.C. main.

The Nature of the Field

There has been a good deal of discussion as to the nature of the electric field which could be produced in this way, and some observers consider it to be a true "static" electric field, but periodically produced—which, in a sense, is a contradiction in terms—yet the nature of the screening effects and the response of the instruments used suggest this, rather than a true electro-magnetic radiation or ordinary induction.

Those of you who may, for special reasons, want more details of these extra screening methods, which I have not the space to go into further here, should consult a paper in the last issue of the British Radio Annual.

MEDIUM-WAVE TELEVISION

(Continued from page 60.)

the intensity of light falling upon the photo-electric cell operates a relay which moves a sensitive film exposed to the light source X by one step, and also moves a further sensitive film exposed to a further light source Y by one step. The light source Y is exposed continuously and is of constant intensity, while the light source X is exposed only momentarily when the film is moved forward.

In this manner two records, one of the relative light and shade values of different parts of the "action" picture, and the other of the length of these light and shade areas, are obtained (see diagram).

Light source Y, operating continuously, causes an exposure dependent upon the length of time between each operation of the relay. The two films, after development, are scanned by two scanners synchronously coupled together, and each controlling a separate transmitter.

May Offer Practical Difficulties

The preparation of the "action" film may be omitted, but I have included it in my description of the invention in order to avoid obscurity.

The television scheme described in the article has not been tested in practice, and it may offer certain practical difficulties. Nevertheless, the "germ" idea may be capable of development.

Although three transmission channels are required, the amount of detail thereby obtained is very much greater than that which could be obtained by other systems using three medium-wave channels. Further, three transmitters could supply the whole of the British Isles with a television service, whereas with ultra-short-wave television a very large number of transmitters would be required.

This system of television offers long-range television free from amplification difficulties and "blind spots," but limits the scope of the television programmes. Which is of greater importance?

Up-to-the-minute news concerning the radio industry

MARCONI'S WIRELESS TELEGRAPH COMPANY are trying out a very interesting experiment, namely, a scheme for enabling the head office staff to obtain a fuller insight into the Company's activities.

Every member of the London staff has been invited to visit the Company's works and Research Laboratories at Chelmsford.

Many of the London staff, of which there are more than 400, have never previously had the opportunity of seeing the Company's technical organisation. Now a party will visit Chelmsford every week, spending a morning in the workshops and test rooms and the afternoon in the Research Laboratories at Writtle.

The Marconi works, incidentally, have just been enlarged by nearly 50 per cent., and there are more than thirty countries using broadcast transmitters designed and constructed by this enterprising company.

(Continued on next page.)

THE RADIO BULLETIN

(Continued from previous page.)

ARTIFICIAL WEATHER

Few listeners are aware of the stringent laboratory tests which their sets undergo so as to ensure that they are fit for all conditions of service. For example, every kind of weather condition is provided artificially in the **Philco** laboratories at Perivale for testing all-wave sets. Humidifiers, ovens and refrigerators are used to imitate the worst weather Mother Nature produces. Cabinets and chassis are subjected to humidities of 96 per cent. and temperatures of 100 degrees.

Other tests are for extreme heat and aridity. Special refrigerators imitate the sudden shifting of low temperatures, dipping as low as 40 degrees below zero. The conditions produced in these tests are, of course, far worse than anything a set could meet in actual use.

* * *

NEW RECEIVERS

And now for the latest set releases: there are four this week, three of which are **Marconiphone** models.

The least expensive of the Marconiphone additions to their existing range is the model 314, which is a **three-valve battery set**, covering the medium and long waves. It costs 7½ guineas and has very low running costs, the H.T. consumption being only 8½ milliamps.

There is also a **six-valve all-wave table grand superhet** for A.C. mains operation, which is priced at 12 guineas. This set is listed as model 557, and on its short waveband covers wavelengths from 16·5 to 52 metres. An elliptical cone moving-coil speaker of new design is fitted and the undistorted output is three watts.

There is also a **radiogram version** of the same chassis selling at 22 guineas.

* * *

The fourth set hails from the **Kolster-Brandes'** factory and is a **three-valve all-wave battery receiver** covering on the short waves wavelengths from 18·5 to 52 metres.

It has a full-vision dial marked with station names and metres in distinctive colours for each wave range, and a composite slow-motion tuning control and wave-range switch.

A sensitivity control and "local distant" switch are also fitted. The price is 8 guineas.

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All communications should be addressed to Advertisement Department, "Popular Wireless," John Carpenter House, John Carpenter Street, London, E.C.4.

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COILS.—Telsen Iron Core, W. 349 (Midget size), 4/-, Type W.478 (Twin), 9/- pair. Type W.477 (triple), 16/- per set. Type W.476 (triple Superhet, Selector and Oscillator), 16/- per set. All ganged coils complete on base with switch. Telsen I.F. Transformer Coils. 110 kc., 5/-. Telsen Dual Range Coils, with aerial series condenser incorporated, type W.76, 4/-. Telsen Aerial condensers with shorting switch, 2/-. All Telsen components Brand New in sealed cartons.

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REGENTONE ELIMINATORS, A.C., 200/250 volts type W.5a, with trickle charger, 37/6.

SOUTHERN RADIO. Branches at 271-275, High Road, Willesden Green, N.W.10: 46, Lisle Street, London, W.C.2. All mail orders to 323, Euston Road, London, N.W.1.

SOUTHERN RADIO, 323, Euston Road, London, N.W.1 (Near Warren St. Tube). 'Phone: Euston 3775.

HEADPHONES. Brown, G.E.C., B.T.H., Ericsson, Brandes, Siemens, etc., 2,000 ohms, 2/6. 4,000, 5/-. Postage 6d. Guaranteed.

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RECEIVERS, COMPONENTS AND ACCESSORIES

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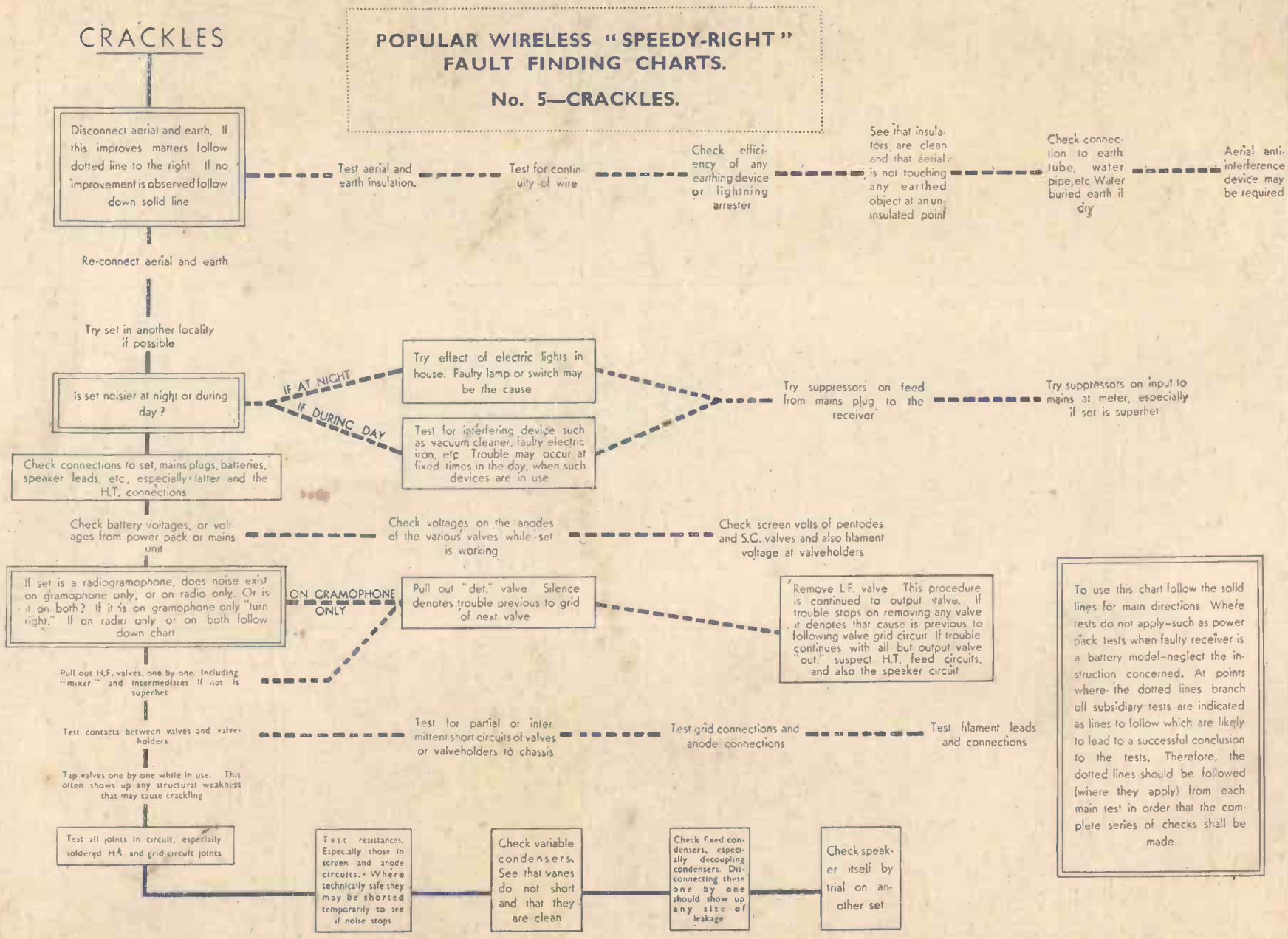

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