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

A SHORT-WAVE H.F. AMPLIFIER—By W. L. S.

Popular Wireless & Television Times

THE B.B.C.'s SILENT SERVICE

EVERY WEDNESDAY PRICE 3D

No. 808.
Vol. XXXII.
Nov. 27th, 1937.

POPULAR WIRELESS AND TELEVISION TIMES

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

NO NEIGHBOUR
NEWS IN BRIEF
DESERVED TRIBUTE

RADIO NOTES & NEWS

WARSAW WORRY
NEW STATION
WORM KING

Passing Millions

WITHIN the past few weeks radio has reached a very interesting position in two widely different countries—France and Japan.

In France the recently issued figures of licences in force at the end of September show that the 4,000,000 mark has been passed in great style. The actual figure was 4,018,992.

Japan, while unable to put up figures equal to those of France (and I don't mean what you mean, either!), is nevertheless no meany when it comes to counting licences; for the Japanese Broadcasting Corporation has been delighted to find that its audience of licensees has now topped the 3,000,000 mark, and is still rising.

Children's Hour of Horror

BROADCASTS which were supposed to interest children, but which were fast making them either nervous wrecks or potential murderers, were recently condemned in Washington, D.C.

Shocked parents have complained that bloodcurdling descriptions of outlaws, crooks and ghosts are all too frequent. Some have complained that nightmares which have disturbed the children have been directly traceable to radio. Fascinated young victims, biting their nails and shuddering and yelling with excitement, have presented these parents with some awkward bedtime problems.

As an occasional listener to the U.S. broadcasts to children, I must confess that I am surprised at some of the allegations. The programmes I have heard have seldom been more than ordinarily thrilling, but I have always thought that they compare unfavourably with the children's fare provided by the B.B.C. Choice of items may sometimes puzzle us, but the programmes as a whole are popular with children.

Station Without a Neighbour

ABOUT the time that you are reading these lines a ship will be setting out from Cape Town to visit little Tristan da Cunha, the "world's loneliest isle." And among the equipment carried will be a wireless transmitting station which will connect the island to the rest of the world's communications.

Ever since its discovery and settlement Tristan da Cunha has been isolated except for occasional visits by ships, but now its value as a meteorological outpost is to be investigated.

Film star Elsa Buchanan tunes-in to her favourite programme on a six-valve all-wave superhet. It is a Marconiphone Model 537, costing 16 guineas.

The Colonial Secretary, Mr. Ormsby-Gore, has given permission for the use of the radio call sign Z O E for communication with passing ships and call sign Z D–9–A B for short-wave experimental transmissions.

Daventry to Expand

THE proposed news services in foreign languages, which are the latest addition to B.B.C. responsibilities, will require extra transmitters at the already extensive Empire station at Daventry.

Since the task has been laid on the B.B.C. by the Government it may be assumed that a substantial contribution towards the cost of the new equipment will be handed over by the Exchequer out of the bumper surplus which it now retains from licence fees.

It is only a little while since considerable new plant was installed to handle the regular Empire transmissions; by the time Daventry gets yet another batch of transmitters, for foreign language broadcasting, it will probably be the biggest short-wave centre in the world.

News in Brief

A STREET explosion in Glasgow recently suspended telephonic communication at the Glasgow Marine Police Office for fifteen hours. A police wireless car promptly "took over," and kept the Marine Division in continuous touch with police headquarters by means of its short-wave equipment.

* * *

Sweden started an eighteen-months' radio beginners' course in the English language which proved so popular that the first edition of the text book, 40,000 copies, sold out in advance. Another 30,000 copies were quickly printed, and the demand continues.

* * *

A motorist was recently fined 10s. at Coleshill (Warwickshire) Police Court for having his car wireless set working too loudly. It was stated that he switched on at 11.50 p.m. in a district where there had been complaints of excessive noise.

Tribute to a Friend

THE silent crowds at St. Martin's-in-the-Fields during the lying-in-state of Canon H. R. L. Sheppard were a moving tribute to a great broadcasting

(*Continued overleaf.*)

£2,000 A YEAR FROM CULTIVATED WORMS

personality. Dick Sheppard, as he was affectionately known, officiated at the first service ever transmitted from a public place of worship by the B.B.C., and the important part played in the history of religious broadcasting by St. Martin's was largely due to his courage, magnetism and humanity.

Since taking up broadcasting in 1924 Dick Sheppard had always worked too hard and felt too keenly the troubles of his fellow-men. He was buried in the ancient cloisters of Canterbury Cathedral on November 4th, and the world is a poorer place without him.

A Warsaw Worry

RADIO engineers are used to dealing with a diversity of difficulties, but rather a new snag was struck in Warsaw not long ago. Just before the station was due on the air somebody excitedly rushed up to the engineer in charge, saluted, and reported "Man up the pole, sir!"

Hurriedly ordering everybody to hold everything, the engineer investigated, and found that a total stranger had climbed, unseen, to the top of the aerial mast.

Bad language through a microphone was of no avail, and neither was the threat that he would be electrocuted when the power was switched on. But some wily student of human nature lured the intruder down by telling him to come down and collect the "prize money" which was waiting for him for performing such a climb. Like a flash the intruder descended.

It was found that the poor chap was mentally unbalanced.

"The Same the World Over"

GENTLEMEN of the Customs Service of India sometimes take tea with equally honourable gentlemen of the Indian Post Office to talk over subjects of mutual interest.

A recent discussion happened to turn on radio sets, and one of the Customs men commented on the large number of imported receivers. At this the Post Office men pricked up their ears, for it seemed to them to indicate that there was a greater eagerness to buy sets than to get licences for them.

Investigations were undertaken and, sure enough, set total and licence total were totally different.

As a result officials are now going round asking very searching questions, and some extremely ingenious excuses are being proffered. What is more important, however, is that the licence figures are showing a healthy tendency to bridge the gap between "sets sold" and "licences issued."

New High-Power Station

WITHIN the next week or so—exact time uncertain, but probably about when you get your next hair cut—the new high-powered Czecho-Slovakian station at Melnik will be on the air.

It will operate with a power of 100 kw. on 269·5 metres. The previous holder of that wavelength, Moravska-Ostrava, will move to 249·2 metres, displacing Prague No. 2, who will go into retirement.

Melnik will cater for the German-speaking population, and will shortly be backed up by a lower-powered station which will relay its programmes.

Testing at Melnik will take several weeks, so the station will not be officially opened until early in the New Year.

BROADCASTING BREVITIES

Brent Wood, continuing his series of gramophone record programmes, will "feature" Duke Ellington and his Orchestra on November 30th (Northern programme). Ellington's numerous compositions, which have been hailed as outstanding in the realms of "advanced jazz," are only heard at their best when played by the composer's own band, which, as is admitted even by those who dislike this kind of music, has a remarkable dynamic power. A portrait of these Negro musicians will, therefore, be added to Brent Wood's "Minstrels' Gallery."

* * *

In the West of England feature "Theatres of Variety," on December 1st, a programme will be broadcast from the stage of the Hippodrome, Boscombe. The artists will include Elsie Carlisle (the popular radio star, with her two pianists), Edwin Lawrence, the Three Admirals and the Boscombe Hippodrome Orchestra.

* * *

The second of the resumed "Microphone at Large" series on December 2nd (Midland programme) will be a visit to Wyre Forest. S. P. B. Mais, the novelist, will again be the principal speaker for the description and history of the scene, while local inhabitants will describe their life and experiences. The Wyre Forest begins just west of Bewdley and stretches to the slopes of the Clee Hills. The tanning of bark used to be one of the principal industries. A few of the charcoal burners and besom makers survive. A hundred years ago the Far Foresters included some lawless and defiant people. It is on record that in 1838 three Bewdley Overseers unsuccessfully tried to collect rates. The idea was then prevalent that unless the demand note was served personally on the man, he need not pay.

What's in a Name?

THE manufacturers of wireless sets in France have just been shaken in every nut and bolt by a legal decision which threatens to repercuss for a long time.

It all started with an ingenuous Frenchman who bought an expensive radio set, the dial of which was marked, in the usual way, with station names instead of wavelengths. For a time it was the apple of the eye of the new proprietor, who regarded it as absolutely tops. But suddenly it sunk in his estimation and he refused to pay for it.

Questioned by the judge as to the how-come and why-for, he said that certain station names appeared on the dial which had never emerged from the loudspeaker. The dealer, a bit staggered, admitted that this might be so; and the judge—evidently no set-owner himself—decided that the set was nothing more or less than a liar, and need not therefore be paid for. Unless his decision is upset, the manufacturers are going to be!

Milkman's Matinée

ONE of New York's low-powered stations (W N E W) claims the proud distinction of providing an all-round-the-clock service of twenty-four hours a day.

One of its most unusual features is the Milkman's Matinée, daily between 2 a.m. and breakfast-time. Night workers and sit-up-lates who care to phone or wire the station between these hours are afforded the privilege of choosing their own programmes, for any song will be sung or tune will be played if the appropriate gramophone record is in stock.

Some extraordinary requests have been received in the small hours, but the station always tries to oblige. One chap requested, almost nightly, twelve renderings straight off of "The War March Of The Priests." When asked why he liked it so much and often he explained that he was learning to play it on a tin whistle!

The Microphone in Church

CLERGY all over the country will watch with interest the experiments with low-frequency amplification now being carried out in a Lancashire church.

The Rev. C. W. W. Bramley, vicar of St. Paul's, Longridge, has not only installed "radio bells" in the church tower, but has also fitted microphones as an experimental aid to hearing inside the church.

Apart from their obvious advantages when the preacher is suffering from hoarseness or other complaint that might render him inaudible to many of the congregation, the microphones help the singing. The size of the congregation has tended to increase since the microphones have been in use.

Worming His Way In

WHEN the broadcasting station authorities of San Francisco invited Mr. Richard B. Bilkosky, the "Worm King," of Alhambra, California, to give a talk upon his extraordinary profession he asked the hotel people if they could let him have a private bathroom, as he had several hundred water worms which he wished to keep under close observation.

His main supply of worms—several billions of them—are kept on (or rather under) a five-and-a-half-acres feeding ground on his farm, and given a special food which keeps them happily at home. Lazy fishermen and other worm-fanciers are able to buy as many as they want at 250 for a dollar, and trade is brisk.

Mr. Bilkosky is reputed to make about £2,000 a year out of his ingenious idea.

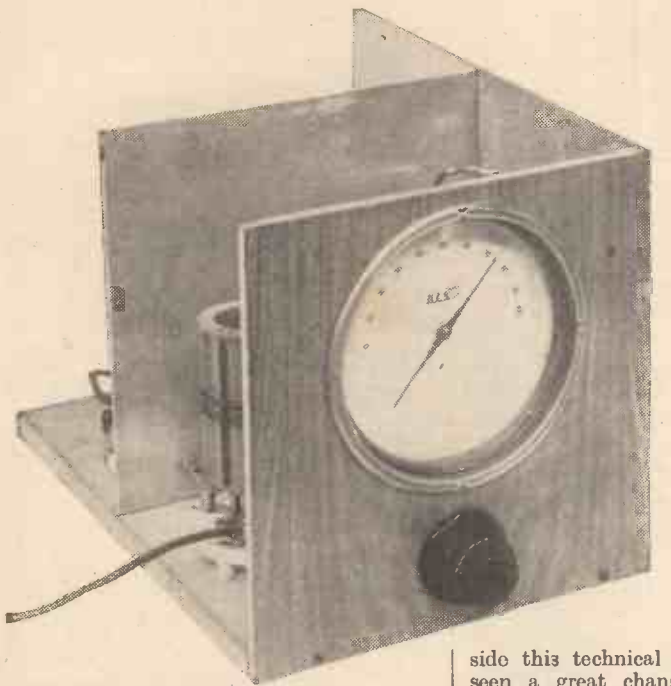
ARIEL

AN H.F. AMPLIFIER FOR SHORT WAVES

By

W. L. S.

Full details for building a two-valve amplifier that will improve the performance of most short-wave receivers whether commercially built or home-constructed.



The unit is small and compact with just one control on the panel for tuning.

IN the old days—not so long ago—the standard plan of campaign for the short-wave listener was to start off with a single-valve receiver. This he would "hot up" and alter around until it seemed to be doing all that a single-valver could—and then he would yearn for a second valve. The main purpose of this second valve was to make the weak signals stronger—and if it made the strong ones stronger still, that was all to the good. Thus the second valve was invariably a stage of L.F. amplification, and not until this was added did the average enthusiast dream of adding H.F.

Until quite recent years it was popularly imagined that the use of H.F. on short waves was not worth while. It was even believed that it was impossible to obtain a measurable amount of H.F. gain below about 30 metres, and as the "peak" wavelength descended lower and lower it seemed that H.F. wasn't worth the trouble.

Nowadays the position is quite different. Special short-wave valves and efficient components of all kinds have solved the problem of obtaining efficient H.F. amplification right down to—and below—the 10-metre band. Alongside this technical development we have seen a great change in conditions; we have the source of supply, and we also have the *demand* for H.F. amplification and the additional selectivity that it brings with it. To-day the selectivity problem is so acute that on certain wave-bands and at certain times and seasons a short-waver without H.F. is of very little use. An amazingly high degree of selectivity can be obtained from a well-planned detector-and-L.F. set, but even that isn't high enough to meet the requirements of, say, the 31-metre band late at night or the 40-metre band on a Sunday morning.

WHAT YOU WILL NEED

2 Eddystone ·0001-mfd. microdensers No. 900/100.
1 Eddystone flexible coupler No. 1009.
1 B.T.S. Aeroplane dial with circular scutcheon, convex glass.
2 Eddystone 4-pin baseboard coil holders No. 949.
2 B.T.S. 4-pin short-wave baseboard valve holders.
1 T.C.C. ·01-mfd. fixed condenser, type 34.
2 T.C.C. ·001-mfd. fixed condensers, type S.
1 T.C.C. ·0001-mfd. fixed condenser, type 34.
1 Wearite 2-pt. push-pull switch.
1 Eddystone S.W. H.F. choke No. 1010.
1 Belling indicating terminal marked "A," type R.
1 Polished wood panel (Metaplex reverse), 7 in. × 7 in. × ¼ in. (Peto-Scott).
1 "Metaplex" baseboard, 10 in. × 7 in. × ⅜ in. (Peto-Scott).
1 Piece 24-gauge aluminium, 10½ × 7⅛ in. (Peto-Scott).
1 Piece 18-gauge aluminium, 7⅞ × 7⅛th in. (Peto-Scott).
1 Terminal strip, 2½ in. × 1½ in. × ⅛th in. (Peto-Scott).
2 Clix wander-plugs.
2 Clix accumulator connectors.
6 ft. 18-gauge T.C. wire.
2 Lengths 1 mm. sleeving, flex, screws, etc.
1 2½ in. bracket with long slot (Peto-Scott).

VALVES

2 Hivac S.G.220 S.W. (4-pin).

Easy To Build And To Operate

There's no reason why readers with good sets of that type should scrap them; and there's no reason why owners of short-wave or all-wave superhets should put up with the crippling effect of poor selectivity. A good pre-selector unit will put things right for them, and it is easy to build and easy to operate.

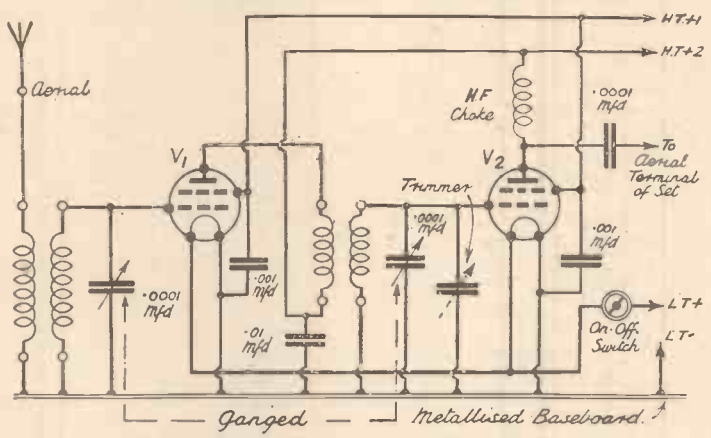
Quite a long time back I started tackling this problem, and I have built up several different units in the course of the last few months. From a critical examination of the performance of each one I have evolved the unit described in this article, which I really believe to be the complete answer to the problem.

It is equally suitable for the man with a single-valver or a two-valver with no H.F., and for the man with a commercially built all-wave superhet. I can say, from personal experience, that it improves the performance of even a single-signal superhet beyond all recognition, and after having tested this unit under strenuous working conditions with my own sets I simply cannot bear to listen without it.

The only argument that anyone can advance against an additional pre-selector unit is that it adds another tuning control to the receiver. This, of course, is perfectly true, but there are tuning controls *and* tuning controls. There are those which interlock neatly with the existing controls and make the tuning-in of a station a combination of fox-hunting and all-in wrestling, and there are those which are just set to the right position and left alone. This unit is one of the latter type, and if it weren't I shouldn't have the slightest use for it.

You can tune-in a signal on your receiver, even if the one tuning control of the pre-selector isn't set to the right wavelength. Having done so, you rotate the dial of the pre-selector, and the signal gradually comes up in volume and sharpness until you reach the maximum tuning position—when you will probably have to slacken off your volume control!

TWO SCREEN-GRID VALVES USED



The circuit is straightforward and employs two special short-wave valves and two tuning condensers ganged together.

Tuning Presents No Difficulty

In practice it is quite easy to keep the receiver tuning control and the pre-selector control rotating roughly in step, and if you are out after phone reception—amateur or broadcast—you will find that you have not really added another "knob" at all, for you will no longer be constantly at work on the reaction control, owing to the vast amount of amplification that the new unit will have given you.

There are two fully-tuned H.F. stages in

(*Continued overleaf.*)

AN H.F. AMPLIFIER FOR SHORT WAVES

(*Continued from previous page.*)

the unit, but their controls are ganged together, and that of the second stage has a small trimmer in parallel with it. Two screened-grid valves of the short-wave type (with the control grid brought out at the top) are used, and leads are provided for connecting to your existing batteries, for it is presumed that most of the readers who build this will be attaching it to a smallish battery-operated receiver.

The anode of the second valve couples across to the aerial terminal of the existing set, from which the aerial lead is removed and connected, instead, to the aerial terminal on the pre-selector unit. Not very drastic changes, you'll agree—but *what* a change in the performance of the set!

"Staggered" Coils

Constructionally, there's nothing complicated about the unit. You will see from the photographs and the diagram that the two stages are mounted one behind the other. There is a vertical screen between them, and another vertical screen comes between the right-hand side of the unit and the set alongside which it is installed. There is nothing on the front panel of the unit but the one slow-motion control, and the only other control is the on-off switch at the rear.

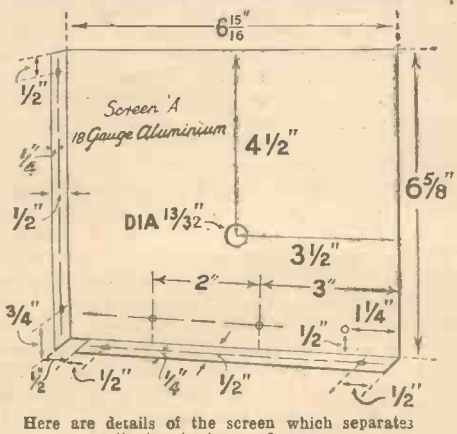
Note some important points about the layout. The coils are so mounted that the good old familiar short connections to the condensers are possible; they are also "staggered" to prevent the possibility of interaction.

Trace the wiring right through from the aerial terminal, referring both to the layout and to the circuit diagram, and you will learn more about the unit than I could explain in a month of Sundays.

The aerial goes to one end of what would normally be the reaction winding on a four-pin coil. The other end of this goes, not necessarily to earth, but to the earthed chassis of the unit, which we will refer to as "earth" hereafter for simplicity.

The other winding on this coil is the grid coil for the first valve, tuned by the rearmost of the two ganged condensers. The screen of that valve gets its H.T. direct from a tapping on the battery, and is bypassed to earth very directly by a ·001-mfd. fixed condenser alongside the valve holder.

THE TRANSVERSE SCREEN



Here are details of the screen which separates the two tuning condensers.

The anode of the same valve goes to positive H.T., through the reaction winding of the second coil, which is really a tuned-grid transformer coupling the first valve to the second. Its grid coil is tuned by the second of the ganged condensers, which has a small trimmer mounted directly across its terminals. More of this later.

The screen of the second valve shares its H.T. with that of the first, and is also bypassed directly to earth. The anode is connected to H.T. through a high-frequency choke, and is also coupled, through a ·0001 condenser, to the aerial terminal of the receiver proper.

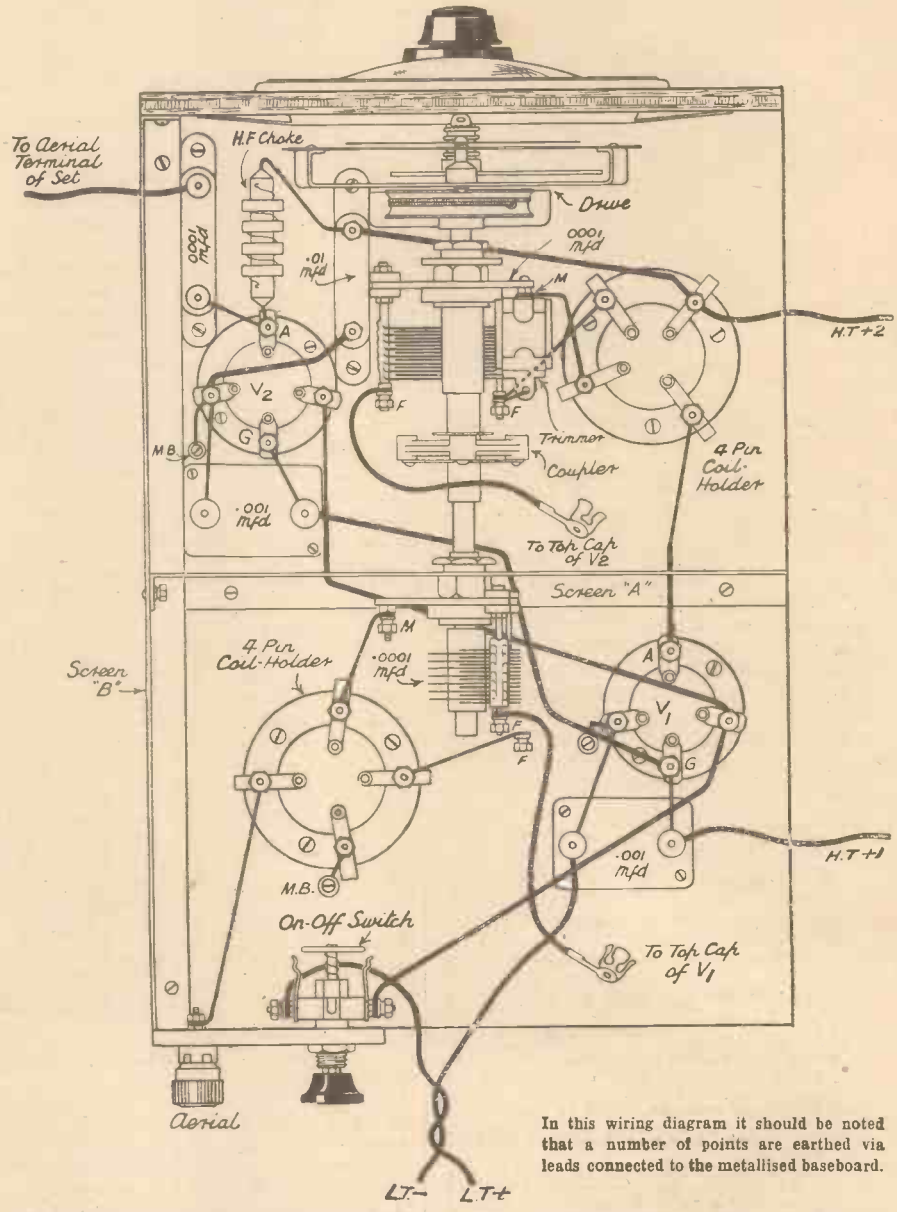
Simplicity itself, I think you'll agree. But not simplicity that has meant leaving anything out; rather that studied simplicity which ensures one that there's nothing to go wrong and not much that could possibly be improved.

The tuning condenser for the first stage is mounted directly on the metal screen, and that for the second on a bracket. The slow-motion dial is rigidly mounted on the baseboard between the second condenser and the front panel, which merely carries the operating knob and the glass window through which one observes the dials.

Nothing else is mounted on either of the screens, although a few holes have to be drilled to take the wiring which goes through. Needless to say, special care is taken over the insulation of the wiring at these points.

Note that the very short lead from the anode of the first valve, through the screen to the appropriate terminal on the second coil holder, is really the only lead belonging to the second stage which isn't in the second compartment. Since there's only about an inch of it, low down and near the baseboard, its presence in the first compartment is perfectly harmless, and there is not the slightest tendency towards instability, even on 10 metres and below.

I have chosen tuning condensers of ·0001 capacity as giving a better spread than the ·00015 type for which the coils were really designed. The ·0001 condensers give a small amount of overlap and ensure that all ranges are covered, but naturally the ranges are somewhat different from those usually associated with the coils used.



In this wiring diagram it should be noted that a number of points are earthed via leads connected to the metallised baseboard.

The smallest covers roughly 8–13 metres and the others 12–23 metres, 22–44 metres, 41–85 metres respectively. With the sole exception of the 10-metre band, the amateur bands are found near the top of the scale, so that a keen amateur-band listener will hardly have to move the dial of his pre-selector unit at all. Simply change coils at the same time as you change those of the receiver itself, and move the condenser a few degrees one way or the other, and there you are—in tune.

Adjusting The Condensers

Trimming is a very simple operation, and I suggest that you should carry it out on these lines. Tune-in a station of fair strength on your receiver first of all. Undo the set-screws of the flexible connection between the two condensers on the pre-selector. Turn the dial (which will then operate the second condenser only) until maximum signal-strength is reached. (Screw the trimmer condenser right out before you do this.)

Now turn the first tuning condenser (the rear one) by hand, which you can easily do by the stubby end of the spindle which protrudes at the rear. Rotate this carefully until maximum signal-strength is reached again. By this time the station, if it was fairly strong at the start, should be fairly knocking your head off. However, you have got everything roughly in tune, so look for a really weak station not more than a few degrees away—tuning it in first, of course, on your *receiver* control. Repeat the procedure—move the dial of the pre-selector first, then adjust the second condenser from the back, and, when you are sure that you are as nearly in tune as you can possibly be, do up the set-screws of the flexible connection so that your two condensers are firmly ganged together.

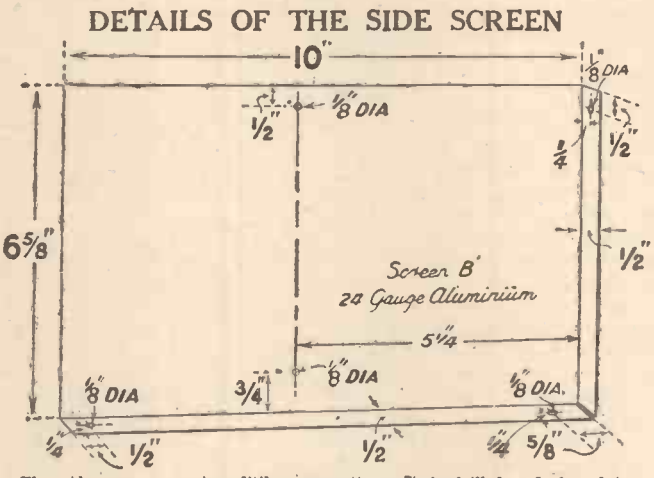
Now try rotating the dial from the front and you should have a really sharp peak when it comes into tune. Furthermore, bringing it into tune should not alter the tuning of the receiver appreciably. It should just bring up the volume of the station with a tremendous whack. As a final adjustment, try a very small alteration in the setting of the trimmer condenser on the H.F. unit.

Once you are in tune on one band, you should find things in order on all the others, if you are using two complete sets of coils *of the same make*. This, of course, is absolutely essential. The important thing is to get these initial adjustments made so that you know you are *more or less* properly ganged. Afterwards, as you change your waveband, you may try slackening off those set-screws and giving the rear condenser a slight movement one way or the other to see that you really have the best adjustment possible.

In some circumstances it may be best *not* to be dead in tune—you may find the selectivity a bit more than you really need, and it may pay you to sacrifice a little of it and to make the tuning a little more flat. Once you've experienced the joys of real high selectivity on short waves, however, I don't expect you will want to put up with any compromises.

Now for possible snags! I hope you won't find any—there's no reason to suspect that you will—but I don't want you to think I'm a complete humbug if your unit doesn't go just like this from the start. Suppose, when you rotate your newly acquired tuning dial, you get a series of squeaks. Well, the unit is unstable and oscillating on its own. I may as well admit that mine did on the first test. The cure? Easy. Take a *direct* connection from the top front corner of the vertical screen "B" to the nearest earthed point on your receiver. If the latter is in a metal box, and the unit stands beside it, this connection will be only an inch or two in length. You *have* a common connection between the two, in any case, but only via the L.T. leads, which may account for some feet of wire.

Another possible cause of instability is a wrong choice of voltage for the screens of the H.F. valves. I find that it goes perfectly well with 60 volts on the screens (H.T.+1) and 120 on the anodes (H.T.+2). (Incidentally — don't laugh here—look at the L.T. switch and make sure that you *have* some L.T. on the preselector! It tunes perfectly well without any, but the amplification isn't exactly impressive under those conditions.)



The side screen requires little preparation. It is drilled and shaped in accordance with this diagram.

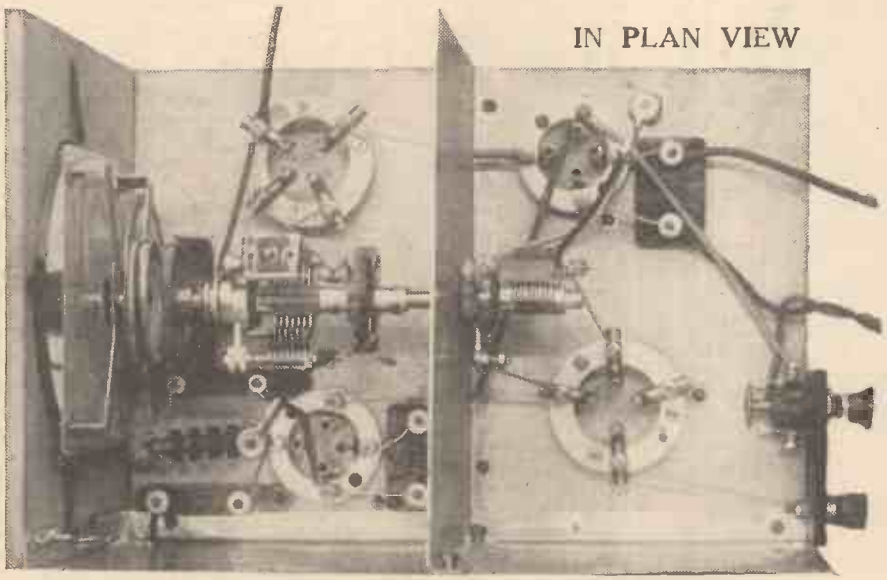
Suppose the tuning of the pre-selector "pulls" your receiver tuning? Well, if it does, strange though it may seem, the fault probably lies in the *receiver*. Your aerial terminal is probably too tightly coupled to the set. You should have a very small capacity between the aerial terminal and your detector grid coil, or else the coupling should be inductive, using a six-pin three-winding coil.

When Using a Mains Set

If you propose to use this unit in front of a mains-operated all-wave set, you will have to invest in a 2-volt accumulator and a 120-volt H.T. battery. Furthermore, you will have to add an extra lead, connecting the negative terminal of the accumulator with the negative end of the high-tension battery. I don't recommend pulling your mains set to pieces to get H.T. for the pre-selector unit out of it; its H.T. requirements are very small indeed, and a 120-volt H.T. battery will last you a very long time. Also, risk of interaction between the unit and the set are reduced to the absolute minimum.

Used in front of a superhet, the unit is an absolute joy, for it doesn't "pull" at all—it can't. A sensitive superhet will bring in a signal even if the H.F. unit is miles out of tune, but when it *is* brought round to the right setting, what a difference! It has the effect of giving an extraordinary improvement in signal–noise ratio, since the signal you're on can be brought up to its accustomed strength with the volume control turned right down. One of the maxims of successful short-wave reception is this: Use as much H.F. and as little L.F. amplification as you can. This unit helps you to do that, as you will find when you try it.

COILS: Those I suggest to cover the wavebands already mentioned are Eddystone types BB, LB, Y, and R or B.T.S. types E1, E2, E3, and E4.



This photograph gives an excellent idea of the general arrangement of the completed amplifier.

THE DIAL REVOLVES

By LESLIE W. ORTON

NEW FLORIDA STATION :: 20-METRE RECEPTION :: ON THE ULTRA-SHORTS

"DOPE!" What visions that word conjures up. To the addict, thoughts of goodness knows what. To the DX-er, red-hot news.

Before me I have a batch of reports and, in one grand news flash, I'm going to let you have them—so get ready for the big bang!

Colombia, we learn, proposes to install all its short-wave transmitters between 55 and 60 metres, whilst H J 6 A B A at Pereira, Colombia, has changed its call to H J 4 A B U. From North America comes equally sensational news. Popular W 2 X E, at Wayne, has been allotted the new wavelength of 31·29 metres, and W 9 X F, Chicago, those of 13·95, 19·83 and 31·39 metres. And now are you ready for the "star" item? Right you are, then, here it is: A new station, W 4 X A D, at Gainsville, Florida, will shortly take the air in the neighbourhood of 49 metres—that's worth knowing, isn't it?

Have You Heard R L L?

Have you heard the new "mystery" station reported by me in these columns a week or so ago? J. Jupp of Manchester has, and his letter reads like a first-rate thriller in consequence!

According to his report the station was heard just after 11 a.m., operating in the vicinity of 30 metres. Signal strength was moderate and, employing the call R L L, the station was heard speaking to a mysterious "Fritz" at station R T L. Now, despite the apparent Russian flavour of the calls, there are no stations listed in the call book as R L L and R T L.

But there is many a slip twixt the cup and the lip, and the "bad" boy of the other announced the time, proving that he resided in our charming frost-bitten country! You can't be too careful, my dear sir!

If these mysteries continue we are going to require some new type of station list. Besides the station just mentioned we have the "Ramona" mongers who may occasionally be heard "jamming" Moscow, the German and Italian Communist stations, and goodness knows what else besides!

On 20 Metres

I wonder which is the most powerfully received 20-metre amateur in your locality? G 8 S B, Middlesex, provides the "star" signal in my locality. During the evenings, often in the mornings, and occasionally in the afternoon, this enthusiastic "ham" greets me with a cheery "Hallo DX"—true enthusiast if ever there was one.

Speaking of 20-metre stations reminds me that I have received a number of reports of "C M 8 A·M." Now "C M," as many of you know, is the prefix of Cuban code stations, and I'm convinced that the station heard was C N 8 A M in French Morocco, for although the operator can't be accused of dropping his "H's," his pronunciation on "N" is inclined to resemble "M" on occasions.

Conditions have been rather erratic, but W 1 C O, W 2 V T, W 3 D H M, W 3 P S, W 3 A M Z, W 4 A C, W 3 F I I and others have been extremely powerful signals on several occasions.

S T 1 D C (Denmark - Casablanca) in Sudan was heard by me at moderate strength at 7.30 a.m. recently, whilst stray DX stations amidst piles of "W's" make a truly appetising dish for the DX-er.

10-Metre Schedules

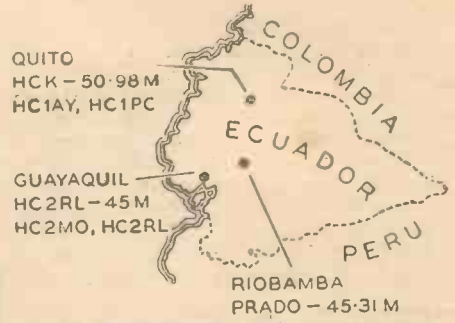
I've been unable to spend as much time as usual on 10 metres, and my "log" has suffered as a consequence.

Peculiarly enough, W 1 C O O, usually the most powerful station on 10 metres, has been eclipsed by a Floridian amateur, W 4 D X L. By the way, the operator of this station is a "super ham," and his list of "ex-transmitters" reads like a miniature call-book! They are W 2 F J D, W 2 F W I and W 3 F F K.

Other stations worth keeping an eye on are W 4 C Y U, W 3 B S V and W 3 G W—all powerful "guys." A flip of the dial brings one to 9.494 metres and disappointment, for the "jumble" has not resolved itself once whilst I have listened to it. Consequently my log for this band is as empty as Mother Hubbard's cupboard.

And now for a few new schedules. W 1 X K A, Boston, is reported to be operating daily (except Sundays) from 11 a.m. to 5 p.m., and on Sundays from 1 p.m. to 5 a.m.; W 1 X A Q, New Bedford relays W N F H from 7 p.m. to 11 p.m., and W 4 X C A, Memphis, relays W M C from 12.30 p.m. to 4 a.m.

Just how long these schedules will be adhered to it's impossible to say, for the stations are experimental, and as such schedules are as uncertain as Britain's weather!



Here are a few Ecuador amateur and broadcast statons worth searching for.

"Yanks" on 40 Metres

Despite the fact that the 10 and 20-metre bands are *the* DX waves, don't imagine that there aren't thrills on 40 metres also.

E. H. G., a 16-year-old Southampton reader, reports that many "Yanks" using "code" may be heard between midnight and 7 a.m., whilst his "bag" includes the following phone stations: C O 2 E O, Havana; T I 2 G P, Costa Rica; O Z 4 I, O Z 5 C N, H B 9 B B, H B 9 C D, L X 1 T W, O E 7 F W, C T 1 P D, C T 1 N B, C T 1 E S, C T 1 P A, C T 1 Z Z and L A 4 A—a really cosmopolitan bunch.

I need hardly add the scores of British amateurs may also be heard, whilst Spanish stations also make interesting listening. With gramophones that sound as if they suffer from shell-shock, they grind out "The Internationale," the Spanish anthem, etc., with relentless monotony throughout the evenings—heard them yet?

Short-Wave Station Identification — By F. A. Beane

NEW STATIONS TO LOG

THIS week we wander hither and thither in search of new stations to conquer and place in the log-book, perhaps for the first time.

No doubt the majority of my readers have heard **C S 2 W A** by now, but if not, there is little excuse since this station has been a grand old man of the ether for years, in fact, it used to be C T 1 A A, a call that must be a household word throughout the short-wave sphere. Of course, C T 1 A A seems very strange in its new guise, but the cuckoo calls and chiming clock are just the same as in the past, while the new call will soon become as well known as the old.

A Venezuelan Newcomer

Writing of new calls reminds me I can never memorise the call-signs of the Venezuelan stations that underwent a change a short while ago. Often I get the impression that I have logged something new, but only to find out eventually that it is really a station whose old and more familiar call has appeared in my records for years. However, when **Y V 6 R C** recently made itself audible on 46·73 m., I knew that it was indeed a newcomer. For identification four full-toned chimes are used at fifteen-minute intervals (very similar to those of its compatriot Y V 4 R B), and the slogan "Radio Bolivar" (phon. Bō-lē-va—not Bol-i-var), followed by the words "Estacion Y V 6 R C en Ciudad Bolivar, Venezuela, America del Sud," and single gong notes between announcements.

The West Indies furnish yet other newcomers to search for; there is a new Dominican on approximately 32·5 m., whose call is thought to be **H I C**, and location Trujillo City, while Cuba is shortly to place **C O C U**, a relay of medium-wave C M C U "de Garcia Serra," on 45·52 m., 6,590 kc., with 400 watts power. This will operate in the mornings (Cuban time) from 07·00 to midnight weekdays, or in G.M.T. 12.00 to 05.00 the next day. On Sundays 12.00 to 24.00.

From Canada we learn that the **C J C B** mentioned recently as operating on 49·9 m. is in reality the 1,000-watt C J C X, short-wave relay of C J C B. Their QSL-card, of not too attractive design, bears the call C J C B in large letters, but fails to give details of schedule, etc.

Listen for H S 8 P J on Thursdays

For those who have failed to log or identify **H S 8 P J**, reviewed some time ago, I suggest that they listen for it on Thursdays between 13.00 and 15.00, when it should be heard at fair strength on a new wavelength of approximately 31·54 m. Next week I hope to have more War stations for you, and, possibly, something new from Latin-America.

ON THE SHORT WAVES

CONVERTER EFFICIENCY

By W. L. S.

LAST week I said a good deal about the ideal qualities of a short-wave converter, and I hope I made clear the sticky bit about second-channel interference and the need for low-loss tuned circuits. I promised that things would be a little more practical this week, so here we are on the question of layout and wiring once again.

Lots of amateurs seem to shy at converters, or else to build only units of the very simplest type, which leave much to be desired in the way of results. Then comes the familiar moan, "Short waves are nothing but a lot of squeaks and interference." Of course they are, if you try to receive them on a combination of apparatus which, taken all in, is really a most inferior type of superhet, and one which would be of little use, even on the medium-wave broadcast band.

Ganging Is Easy

No, if you have a good broadcast receiver, it's worthy of an equally good short-wave converter. The combined outfit will be something that you can be really proud of. And it's not difficult to build a good converter. Perhaps the idea of ganging tuned circuits together puts some people off, but nowadays it's just child's play. Once upon a time it was difficult, but now we have standardised coils and standardised condensers, and all you have to do is to make a few adjustments and then forget that the tuning dial isn't just controlling a single circuit.

With these ganged sets, it's always a good plan to arrange a long, narrow layout —one with more depth than width. If you've got to have three separate condensers side by side on a front panel, then you have to make it a "wide" set—but a good converter will have ganged controls, and therefore "grows" straight back from the panel.

The Three Sections

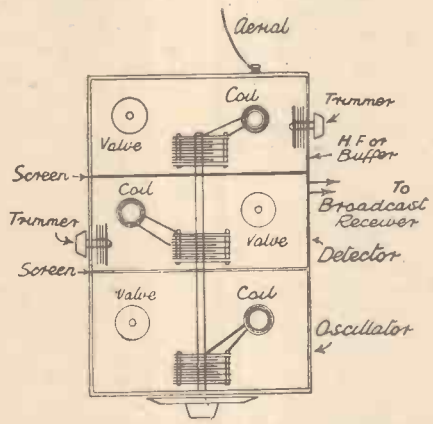
The sketch on this page should give you the idea. You have three sections—oscillator, detector and H.F. stage, working backwards from the front. All are ganged, but the detector and H.F. stage have trimmers as well. The oscillator, of course, is the control that fixes your wavelength for you, and the others are brought into line with it by initial adjustment and subsequent trimming if necessary.

I have assumed that you will use separate valves for your detector and oscillator, simply because that makes the layout easier to follow. You have three sections, three valves and three coils. Note that the coil and valve change places in the middle section, thus separating the fields of the coils and reducing risk of possible interaction.

Each coil is wired to its tuning condenser by the shortest convenient route; and note, also, that the trimmers are so placed that they come near their coils.

If you use a combined valve, such as a triode-hexode, for your frequency-changer (detector-cum-oscillator), it had better be mounted horizontally through the screen which separates the front compartment from the middle one. Then it can be arranged so that the electrodes which form the oscillator section come nearest to their coil and condenser.

"STAGGERED" COILS



W. L. S's suggested layout for a short-wave converter with an H.F. stage, detector and oscillator. Note the "staggered" positions of the coils.

Now a few practical hints about circuit constants and so on: First of all, if you tune both your H.F. stage and your detector (as I have assumed you will in the diagram), you must not try to get *too* much selectivity out of the H.F. stage, or you will find the ganging a bit difficult, and the combined output of the unit will probably be too much for your broadcast receiver, particularly if the latter is a really sensitive set.

Capacity Coupling Preferable

I have had a fair amount of bother with this in my time, and I have found that it is always a good scheme to couple the aerial to the first valve by the capacity method —a small variable or pre-set condenser being interposed between the aerial and the top of the grid coil. If you use the reaction winding on that coil as a separate aerial coupling coil you will get so much selectivity that you won't quite know what to do with it. With the other arrangement you can adjust selectivity to suit your requirements at any moment, and you can even trim your first stage by adjusting the aerial coupling condenser.

I will give a detailed circuit diagram of such a converter as this a little later on, but I think the enthusiasts who want it know enough about the subject to work it out for themselves. It's just a receiver of the H.F., detector and separate oscillator type, except that the oscillator does not carry a reaction control.

The Question of Switches

One disadvantage of the particular type I have shown in the diagram is the coil-changing—three complete sets of coils are needed. But the attitude I take up to that complaint is, "You can't have everything." If you don't care two hoots for efficiency, then you can short-circuit turns and make some sort of wavechange coil unit. If, on the other hand, it's efficiency matters to you, then you must put up with the trouble of shuffling coils about now and then.

Sorry, but there's no way out of that one! And I shan't be far wrong, I suppose, if I assume that readers will be placing efficiency before convenience. Who wouldn't where short waves are concerned?

Coils are sufficiently well built nowadays to make the calibration of a unit of this sort an easy matter. In that way it has an advantage over an ordinary receiver, where reaction control is apt to play havoc with calibration.

The normal ranges of 12–26, 22–47 and 41–94 metres cover the bands nicely, and special coils covering the television sound and the 10-metre band will also be well worth making or buying.

Connection to Receiver

Aerials, earths, and so on don't need special note, and I'm not even concerned with the set on to which you propose to tack the unit. So long as it has a good H.F. side it's all right, and if it's a superhet—that's even better!

When that is the case, however, the whole outfit works as a double superhet. The intermediate-frequency of the broadcast superhet may be 465 kc., so it's no good working on that basis for the first change.

The broadcast receiver should be set to about 200 metres, so that your two frequency changes are, first, to 1,500 kc. and then to 465 kc. If the broadcast set is an all-waver you can try tuning it to about 80 metres. Just find the setting at which the outfit seems to go best, and leave it at that.

ON THE SHORT WAVES—Page 2.

POINTS from the POST-BAG

W. L. S. Replies to Correspondents

R. S. (Bushey) wants me to give the fullest possible details of a good one-valver to which one could add the resistance-coupled L.F. stage described in the issue of October 2nd. He brings up one or two little problems about wiring, such as the question of which wires should be taken direct and which may be "commoned" on to the chassis, and I think I will set aside a page next week for covering the whole thing and talking about a de luxe one-valver once more.

C. G. R. (Paddington), on the other hand, is in the act of adding the L.F. stage to a one-valver, and has got muddled up with the wiring. He wants to know, "Do the terminals from the L.F. stage just connect to existing terminals on detector stage and thence to battery, or do they go direct, or what?"

No H.T. Negative Required

Well, it doesn't much matter. I suggest that the L.T. terminals on the L.F. stage are connected straight to the L.T. terminals on the *valve holder* of the detector, so that the L.T. switch on the detector will also control the L.F. stage. There need not be any H.T. negative connection at all, as this is already connected to L.T. negative in the detector itself. The H.T. positive terminal will probably go to a higher voltage on the battery than is used for the detector H.T., so that's a case for a direct lead.

If you use a pentode in the L.F. stage, no alterations are necessary except to make sure that the screen of the said pentode receives its volts from somewhere. Again, a separate tap on the battery seems the easiest way of doing it.

N. C. (Runcorn) wants to know how you get on when you build an A.C. short-waver and have a power-pack, intended for another set, that is apparently much too big for it. He is concerned because the L.T. winding on his power pack gives 4 volts 4 amps, and the short-waver will only require 2 amps. *That* needn't worry him at all—forget it. But the power pack gives 250 volts H.T., which is, of course, excessive for a short-waver working with headphones. This should be cut down either by a resistance or a potentiometer.

A suitable potentiometer to bring the voltage down to 125 would consist of two 20,000-ohm resistances, preferably of the 5-watt type, connected in series across the output of the power pack. Then, by connecting the short-waver to the negative terminal and to the join between the two resistances, ignoring the positive terminal altogether, you can get your 125 volts.

Phones on Mains Sets

N. C. goes on to say that a friend has told him that he must have an output transformer when using phones on an A.C. set. I regard that as a mistaken impression, but I can see what the friend is driving at, especially if one deals with A.C. units giving 250 volts output. He thinks the plate current of the last valve may be a little on the high side for headphones. If, however, the power pack's output is cut down, I don't see that there's any need to worry. But I *always* prefer choke-filter or transformer output with any set.

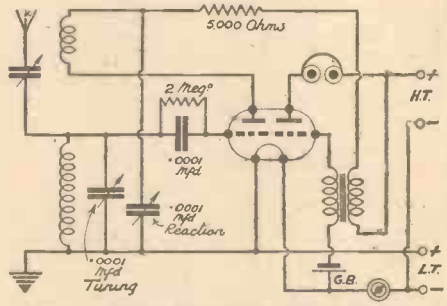
J. S. (Dublin) comments on the number of readers who seem to be having great fun with single-valvers, and wants a complete practical diagram of a nice one. I think the first reply on this page will probably cheer him up. Back to the single-valver for a while—but don't forget that you can always add to it—back *and* front.

A Portable in Winter

Even in the winter a portable is a nice thing to have about the place. One needn't use it for out-of-door exploits, after all; it's jolly useful to have a really compact set that can be moved from room to room or taken to the bedside without everlastingly dragging long leads and piles of batteries about. Again, the size of the set is an important factor.

Bearing all these things in mind, I have recently made for myself a real midget short-waver, the circuit of which is shown

A COMPACT "TWO"



Here is a circuit which lends itself particularly well to portable use, where compactness is essential. The valve is of the Class B type.

on this page. As you will see, it's really a two-valver using one valve (if you get what I mean!) It is a battery Class B valve, and one half of it does duty as detector, the other half being the L.F. stage. The set has no frills about it, such as band-spreading or choke-filter output, and the result is that it's so small that you have to look round for it if you forget where it was last to be found.

Useful for Broadcasters

The front panel is just big enough to take the two condensers, and the baseboard takes the valve holder and coil holder, close up and side by side, with the tiny L.F. transformer stuck on as an afterthought. The volume obtainable from this little set is really surprising, but I wouldn't use it for long bouts of amateur-band or DX listening. As a receiver for the powerful short-wave broadcast stations, though, it is really amazingly good.

"peak," which should mean that next year's conditions will be more like those of last year. Personally, I'm not the least afraid of the "bad period" that is said to be coming. I think a little falling-off in conditions will make things more comfortable for everyone, and it will certainly give an extra impetus to amateur-band work by making it a little less easy. I think things were more interesting five years back than they are now, even if they did show up the rotten receivers.

W. L. S.

AMATEUR BAND NEWS

QUITE a few readers have written to thank me for my hint about the 80-metre band. In some cases they have always been able to receive "eighty," but haven't bothered; in others they have wound coils specially for the job. In every case, however, they have found a good deal of new interest in the wave-band, and intend to listen up there quite regularly in future.

It's certainly an interesting band, particularly after 10.30 p.m. on weekdays and during Sunday mornings and evenings. Most of the stations one hears are Britishers and Continentals, of course; but the locals, as we may as well call them, come in far more nicely up there than they do on 40 metres, and there is not a tenth of the interference.

The "round-table conference" is becoming popular on 80 metres, too, and half-a-dozen Britishers may be heard forming themselves into a "network" and working each other in rotation. Duplex, too, is popular, but seems to prove rather difficult, for some reason, on 80 metres.

Interest on 10 Metres

The other centre of interest—of quite a different kind—is 10 metres, which has once more blossomed out in full strength. The American phone band (28,500 kc. upwards) is just one solid mass of loud phone transmissions, and it is simply futile even to try to log them all. One outstanding station, however, is V E 2 K X, who, being a Canadian, is not compelled to work in the American phone band, and therefore escapes the congestion nicely by working on about 28,400 kc. Most of the European stations are concentrated between the low-frequency end of the band (28,000 kc.) and about 28,300 kc., and the relatively few Americans using C.W. also work in that part of the band.

Readers who want something new to try for should not forget the "Heard All States" idea which I have previously mentioned. But how about "Hearing All States" on 10-metre phone only? That should be quite possible, the only trouble being to hear stations that will QSL and give you the chance of saying that you have *verified* all States.

Twenty-metre enthusiasts should not forget to work at both ends of the clock nowadays. It's hard to say which brings in the more interesting DX—the period between 5 and 8 p.m. or that between 6 and 8 a.m. There's certainly much less interference in the early morning, and the chance of logging some of the lesser-known countries is much greater. It won't be long now before we have to wash out 20 metres from the scheme of affairs in the early evenings, although, with the sunspots as they are at present, I don't suppose we shall have any of those 6 p.m. fade-outs that we used to have 'way back in 1933 and 1934. In those days the band by 8 p.m. was often as dead as a door-nail. Nowadays, even the 10-metre band keeps slightly awake at that time.

This year is believed to see the sunspot

(*Continued at foot of previous col.*)

MY SHORT-WAVE ADVENTURES — By L. CHESTER

"GO DOWN" ON 10 METRES

Some details of the experiences of our contributor in exploring a new waveband

I'VE not only gone down on ten metres—I've fallen down, into the bargain. But as the Editor in his wisdom has ordained that I must honestly record exactly what happens, whether it is success *or* failure, here goes:

Having read so much of 10-metre activity, I felt the time was ripe to try my hand. I find I have to learn a whole new technique. Any complacency I may have gained in ordinary S.W. work has been rudely shattered.

Being constitutionally scared of anything new, I tried the coward's way of buying a set of ultra-short-wave coils. I say tried, because I did not succeed in finding any.

THE CIRCUIT

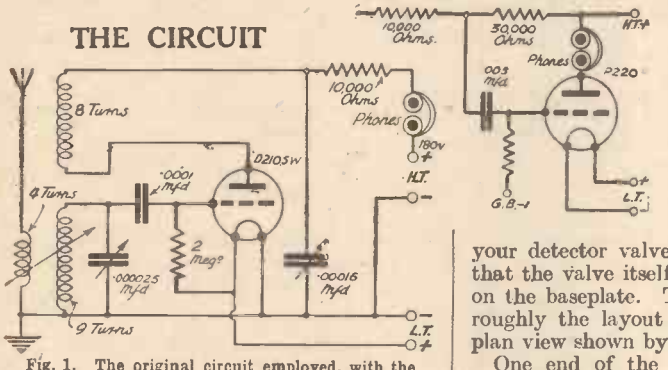


Fig. 1. The original circuit employed, with the extra L.F. stage that had to be added.

So I have been forced to introduce what seems to me to be an uncertain element by making my own.

Thanks to the "Professor"—meaning our old friend W. L. S., of course—I had by me a rough idea of the sort of thing I wanted. He gave details last summer for 5-metre working, for winding coils to tune up to the television signals on 7 metres. So I added a bit for luck and wound some coils for 10 metres. I hope!

I had some No. 14-gauge tinned copper wire by me, so I stretched a length and began to wind on this rather stiff wire with a perfectly ordinary sort of pencil as my former. I put on nine turns for tuning—and then hopefully tried to make the turns "spring out" to half an inch diameter. But they just stayed put!

No "Springing Out"

Thinking perhaps I was wrong to stretch the wire beforehand, I put on eight turns for reaction purposes without preliminary stretching, but again no "springing out" occurred. So perhaps I am using too soft a sort of wire.

Anyway, there I was with a couple of windings of eight and nine turns, with a diameter of about $\frac{3}{8}$ in. I had left 3 in. at each end of these windings for connections.

The next job was to solder my nine-turn coil ends to the tags on the tuning condenser. The wire is certainly very rigid, but thick enough to need rather a hot iron to solder on to anything. I used a ·000025-mfd. condenser—mainly because I could not manage to buy anything smaller.

Before I could get down to the question of layout I had to decide on my circuit. Needless to say, I chose the very simplest arrangement I could find. (See Fig. 1.) The only difference between this ultra-short-wave circuit and one for ordinary short waves is the use of a resistance instead of a choke in the anode lead. More on that later.

It seemed to me that I had better fix the tuning condenser with its soldered coil in position, and then build up round that. So out came the old metal chassis and the ·000025 mfd. condenser was fitted on the left-hand side.

Obviously, things had to be arranged so that the reaction coil could be at one and the same time held in position by its soldered ends and adjacently coupled to the tuning winding. This sounds ridiculously easy—until you come to do it.

But the solution seems to be to mount your detector valve holder on its side, so that the valve itself when inserted lies flat on the baseplate. This is what I did, and roughly the layout can be seen from the plan view shown by Fig. 2.

One end of the reaction winding goes down to the anode terminal of the valve holder, while the other end goes to the terminal tag of the reaction condenser's fixed plates.

This brings tuning and reaction windings to within $\frac{1}{2}$ in. of one another, and both are quite rigid when properly soldered. I must say the metal chassis seems ideal for this sort of thing, but I know everyone does not agree with me.

One or two more points of explanation, perhaps. The terminal of the valve holder hidden by the plan view goes on to the metal chassis, forming low-tension negative. The high- and low-tension negative leads are both fastened under a bolt at the back of the metal chassis.

And that 10,000 ohms anode resistance you see on the right of the reaction condenser is soldered by its wire ends between the fixed plates tag and one phones terminal. I think that makes the whole thing as clear as it is to me as I sit looking at the actual job.

Well, now, what happened? Blessed is he who expects nothing, for verily he shall not be disappointed! Yet, although I steeled myself to failure, I *was* a trifle downcast when things began to happen the wrong way.

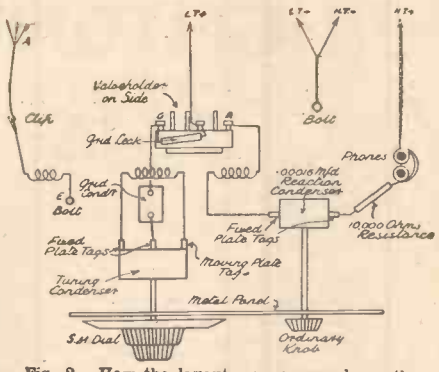


Fig. 2. How the layout was arranged on the metal chassis.

First trouble—no oscillation. That, at least, I anticipated. It always does seem a miracle to me when a short-wave set oscillates easily! Mind you, I was testing without any aerial or earth, so things looked bad. But that resistance in the anode lead seemed the obvious snake in the grass, and up went my high-tension positive from 120 to 180 volts.

Threshold Howling

That did the trick. It released the oscillations rather better than I bargained for. I experienced the worst form of threshold howling ever heard in my phones. Really wicked, it was.

What would you have done, I wonder? Tried everything, as I did, no doubt. I took away that anode resistance and inserted in its place a natty little ultra-short-wave H.F. choke. No difference, except that I was able to get the D210 valve oscillating with the usual 120 volts. But the howl remained.

And so I waited a day or two until my new D210 S.W. valve turned up—a Hivac "bottle" having a low-loss base and the grid taken out to the top of the bulb. I regret to say that when I changed over the results were precisely the same—as bad, that is.

Still that ghastly shriek whenever I got near oscillation. I began to get really hot under the collar, wild about the left eye, and all that. What *could* it be? I tried all values of grid leak, from 5 megohms down to a mere half a megohm.

Anyone who has actually done this seemingly simple thing of changing grid leaks knows what a tedious time it takes—unlashing two wires every time and screwing up two terminals for the new value. But it was all unavailing—no difference at all.

I suspected the grid condenser, a perfectly good ·0001 wire-ended type; so out came that and in went a more old-fashioned type with terminals. Again, no difference to that howl!

Well, there was nothing else that could be changed except the phones, which worked perfectly on another set. I was beaten—and, for that matter, still am.

(*Please turn to page* 301.)

BRIGHTON'S POLICE RADIO SYSTEM

Some interesting facts concerning the pocket wireless sets used by this go-ahead force

WITH the aid of a police officer in uniform the Chief Constable of Brighton (Captain W. J. Hutchinson) recently explained to the Brighton Rotary Club how the police pocket wireless system is operated.

The inception of the pocket system, he said, was due to the initiative of his predecessor, Mr. Charles Griffin. It was while receiving the wireless programme as he carried his set from one room to another that Mr. Griffin realised the advantage which would accrue to a police force if constables performing ordinary patrol duty could receive from headquarters wireless messages by means of an instrument so light in weight and so small in size as to permit of its being carried in the breast pocket of his patrol jacket.

Several years elapsed before a suitable instrument could be designed, for not only had it to be constructed with due consideration for size and weight, but it was necessary that it should have an effective calling device. Eventually the scheme was brought into operation on September 14th, 1933.

One-Valve Receiver

The pocket set was of the one-valve type, consisting of two pieces of apparatus—the receiver proper and the earphone. The former contained the dry battery (high-tension) and the accumulator (low tension), while the latter incorporated the calling device, a plug to which was attached a length of cable connecting the earphone with the receiver. The total weight was a trifle under two pounds. The receiver was carried in one pocket and the earphone in another, both inside the tunic, the cable falling across the chest.

The bell on the earphone rang when the transmitter was switched on, and taking the earphone from the pocket the constable pressed a small knob at the side and listened for the voice of the operator. This

(*Please turn to page* 301.)

S.T.900: "READERS AMAZED AND DELIGHTED"

"No matter how thrilling results were yesterday, I find there will be ones more thrilling to-day."

ANOTHER DETAILED WEEKLY REPORT By LESLIE PERRINS (BIRMINGHAM)

Oct. 31st–Nov. 7th.

Dear Sir,—After another week of enjoyable listening on this wonderful set, my enthusiasm is not weakened in the slightest degree. It is, on the other hand, increased. No matter how thrilling the results were yesterday, I find there will be ones more thrilling to-day.

The strength of some of the amateur stations and small-powered programme broadcasters has to be heard to be believed. V P 3 M R Georgetown (British Guiana) is an outstanding example. Although this station uses only 150 watts on 49·44 m., I can bring him in here at a good R7 or R8 almost every evening at 22.00. Some nights, when reception is extra good, he will attain an R9 standard. The transmissions are mainly dance music sponsored by cigarette, jam, etc., manufacturers.

Another feature is the stability of the set. Even on 10 metres the reaction is delightfully smooth, making reception on this band extremely simple. The tuning is particularly free from noise, no crackles or bangs being heard in the speaker as one turns either the main tuner or balancer. One gentleman to whom I demonstrated this set was particularly impressed by the silent background, especially as I am working off a D.C. eliminator. There is no trace of mains hum, and even with such distant stations as Tokio background noise is negligible. I have begun to realise the full beauty of the bias on the H.F. valve. Previously, Jeloy L K C and Zeesen D J N on 31 m. have been a source of trouble to me, due to them being only 10 kc. apart, and I always have had the other in the background while listening to one. Now, however, all that is changed. I apply the bias and increase my aerial reaction, and I can enjoy either Jeloy or Zeesen with no trace of the other. This applies to all such combinations of stations close together, as on the medium band Toulouse and Hamburg, here in Birmingham, have always been a source of trouble. But now, on the ST900, it is a thing of the past.

Now I will tell of the delightful programmes I have enjoyed from all parts of the world this week. I started on :

Sunday, Oct. 31st, with W 2 X A D Schenectady at a full R9, giving variety at 19.30. At 20.00 and until 20.30 "The Energene Newsreel," which brings people who have had their names in headlines of newspapers to the "mike." Amongst these was Mrs. Matthews (I think this was the name), a friend of the Duchess of Windsor, who told all about the duchess' old home. She said that it is now a museum, and that she is in charge, and told of some of the valuable relics which it now contains. I listened to this station until 22.00 without a break.

Monday, Nov. 1st (07.00)—G S D, 25 m., R99 ; "In Town To-night" and the Orch. at 07.30.

19.00—G S D, R9 : "Monday at Seven." 20.00—Tokio J Z K, R8 : News, call, etc. Talk on International Policy.

22.30—W 2 X A D Schenectady, R7 : Jack Armstrong, the "All-American Boy," is on the air in person for Wheaties.

Tuesday, Nov. 2nd.—07.15, G S D, 25 m., R99 : variety with Clapham and Dwyer (and I laughed heartily over my breakfast while listening to these two).

19.00.—Gave a demonstration to two "P.W." readers who were highly delighted with the set. Among the stations heard were 25 m. O L R 4 A Podebrady, R99—Call and Bells. D J D, R9 : "Deutschland Echo." G S D, R7 : Music. 19 m.—W 2 X A D Schenectady, R9 : Daily Music Lesson. G S I, R99 : Music. J Z K Tokio, R7 : Call. 16 m.—G S G, R99 : Talk. 20 m.—S V 1 W A, R7. 25 m.—J Z J Tokio, R9 : Announcing that from Nov. 10th J Z K, 19 m., will be replaced by J Z I, 31·46 m. 31 m.—O L R 3 A Podebrady, R99 : Bells and opening call. G S B, R9 : Scots dances. O Z F, R9 : Play. P C J, R8 : Dance music. Several medium and long-wave stations, as requested by demonstrators.

Wednesday, Nov. 3rd.—07.30, G S D, R9 : Talk, "World Affairs," and B.B.C. Empire Orch., Beethoven's Symphony. 20.00—Listened to G S D, R8 : Symphony concert from Queen's Hall.

Thursday, Nov. 4th.—Gave demonstration to four more "P.W." readers. Went all round long and medium bands, picking up stations at readers' request. At 20.00, 19 m., J Z K Tokio, R7 : Call and announcement of change of station. 25 m.—J Z J Tokio, R9. Also heard W I X A L Boston, R8 ; W 2 X A D Schenectady, R8 ; and on 20 m., W I H A V, R8 ; W 9 B V P, R7 ; and Z B I H Malta, R8.

On *Friday* I went to a friend's house who is the proud owner of a well-known make of six-valve superhet radiogram. He attempted to get some of the results that I get on the 900, but hopelessly failed. Tokio was only about R5 on 25 m., and the 19-m. station could not be found. W 2 X A D was only R6.

Saturday, Nov. 6th.—16.00—Made an hour's tour of 10 metres, and I heard practically every State of U.S.A.—V E 1 A W, R7 ; G 6 D L, R99 ; W 8 H F C, R7 ; W 7 E M P ; W 6 N L S, R8 ; G 5 V M, R9 ; W 3 A I K Princeton, R8 (said the weather was dull and chilly) ; W 4 C Y U, R8. 16.35—G 6 Y U R, R7 ; W 1 A D M Mass., R8 ; G 5 S A, R7. 17.00—16 m., W 3 X A L Bound Brook, R9 : News, including reports on Japanese question and concert.

18.00—G 5 B M, R7 ; W 6 E R T R6, on 10 metres.

20.00—J Z K Tokio, R7 : Call and news, and report on Italian agreement and tennis match. 20.30—Nat. programme, variety.

21.45—16 m., W 3 X A L Bound Brook, R8 : Organ solos and announcements in German, "Apple Blossom Time in Normandy," "With A Song In My Heart." 22.00—News in German.

22.10—20 m., W 2 O J, R7 ; W 2 I X Y Long Island, R7 ; C O 2 R A Havana, Cuba, R9.

23.30—20 m., W 9 U A, R9 ; W 9 A N I, R8 ; W 2 G I Z Elizabeth, N.J., R99 ; G 8 M G, R7 ; G 5 P T R, R8 ; W 9 K M Chicago, R7 ; W 3 M B, R99 : Talking about poking the fire, which he did, and then he was on about some fellow's teeth clicking.

Sunday, Nov. 7th.—10.30—20 m., G M 8 K R, R9 ; G 8 V C, Birmingham, R8 ; P A 4 A D, R8 : "What Will I Tell My Heart" ; G I 5 J M, R7 ; G 8 I D, R8 ; G M 2 U U, R7.

11.00—W 2 H S New York, R8 ; G 5 H K, R7 ; O N 3 S S, R99 ; G 6 B C, R8 Cornwall ; G M 8 K R, R8 ; W 6 W T, R7.

12.00—L K C Jeloy, R99 : Service ; D J N, R8 ; and D J A, R99 : Concert of light music.

13.00—Went right up the S2 band from 13–31 m. 25 m.—T P A 4 Radio Colonial: R8/9 : "Caravan" Dance Orch. I 2 R O 4, R8 (Rome) : Dance music ; R N E Moscow, R7 ; Talk.

13.15—16 m., D J E, R99 : News. G S G, R8 : Theatre Orch., "I'll See You Again."

13 m.—G S J, R9, and G S H, R7 : "Heykens Serenade" ; W 2 X E Wayne, R8/9 : Organ—"Laugh Clown Laugh."

19 m.—Zeesen D J R, R99 ; D J L, R99 ; and D J Q, R9.

Thus, on this S2 coil alone one could hear at full L.S. 11 stations with seven entirely different programmes and numerous 20 m. amateurs.

My 900 is installed in the room where the family spends most of its time, and so all that I receive has to be of programme value, to cater for anyone who happens to be at home. All the readers who have visited me for demonstrations are amazed and delighted with the set's performance, and do not consider the plug-in coils a handicap. I will say more about this point next week, when I have a few more opinions thereon.

LESLIE A. PERRINS,
101, Sycamore Road, Aston, Birmingham 6.

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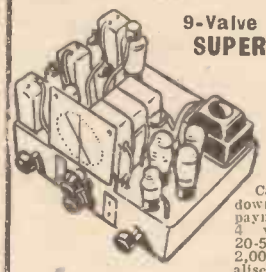

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SHORT WAVES FROM CATHODE RAYS

In describing this new application of the cathode-ray tube, J. C. Jevons shows that there is a marked similarity between the ordinary valve and the cathode-ray tube

AT first sight there does not seem to be much resemblance between the ordinary valve and a cathode-ray tube. Both of them certainly utilise an electron stream, but the valve uses it to detect or amplify wireless signals, whilst the C.R. tube produces a long "beam" and applies it to scan a fluorescent screen.

Yet the two are, in a sense, "birds of a feather," and in the light of recent developments are showing signs of merging together. In fact, there may come a time when it will be rather difficult to distinguish "t'other from which."

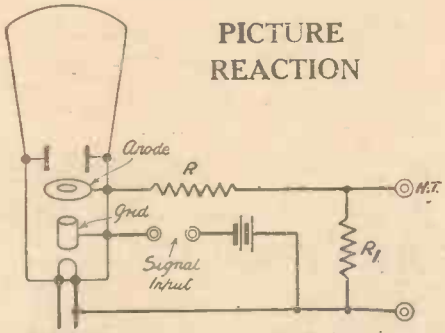


Fig. 1. How reaction may be applied to a cathode-ray tube.

For instance, there is a new type of valve in which the electrodes, instead of being packed close together, as usual, are spaced apart so that the electrons are drawn out into a long stream between cathode and anode. The place of the grid is taken by one or more control electrodes which are set parallel with the path of the stream and serve to deflect it from side to side.

In this "beam" valve, as it is called, wireless signals are detected or amplified by bending the electron stream towards or away from the anode. This is quite distinct from the usual plan of "throttling" the stream by placing a grid directly across its path, and forms an interesting example of the way in which valve design is moving in the direction of the C.R. tube.

Qualities of the Valve

On the other hand, the C.R. tube is beginning to take on some of the qualities of the valve. Even from the point of view of size alone, the new midget C.R. tubes are coming down fairly close to the dimensions of the modern pentode.

In the ordinary way one does not associate the use of reaction with the C.R. tube, nor does one think of the tube as being used to generate sustained oscillations. Both these new applications illustrate how the C.R. tube is developing the habits of the valve.

The current in the anode circuit of a cathode-ray tube is proportional to the strength of the electron stream, as determined by the signal voltage applied to the control grid or Wehnelt cylinder. It is therefore possible to use the voltage variations in the anode circuit to strengthen the effect of the incoming signals in much the same way as in a back-coupled valve.

A Feed-back Circuit

For instance, as shown in Fig. 1, a resistance R is inserted in the lead from the anode to the positive H.T. supply, and a second resistance R_1 is connected directly across the anode and cathode. Variations in the incoming signals (which are applied to the control grid G (as shown) create corresponding variations, but of greater amplitude in the resistance R. When the current is large the drop across R is also large, so that the potential difference between the anode and grid decreases. In other words, the grid voltage rises relatively to the cathode and causes still more emission to occur. For a fall in the value of the electron stream the reverse action takes place, and the emission is cut down. The effect is therefore similar to that of reaction in a valve.

Fig. 2 shows how a cathode-ray tube can be used to generate continuous oscillations. The electrons liberated from the cathode are first passed in the ordinary way through a slot in an accelerating anode A.

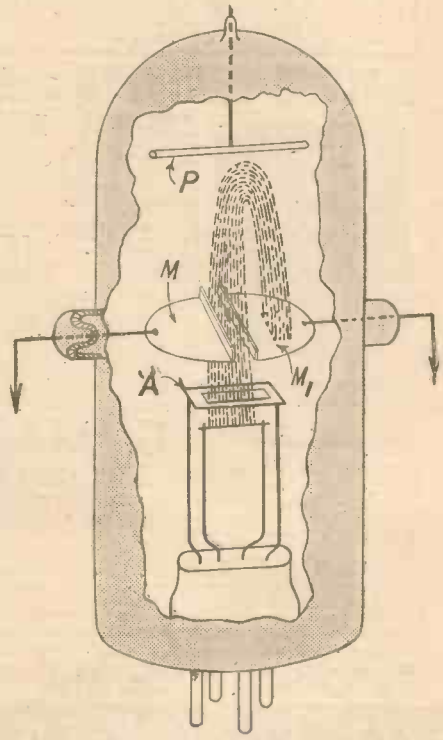


Fig. 2. How a cathode-ray tube may be used to produce short-wave oscillations.

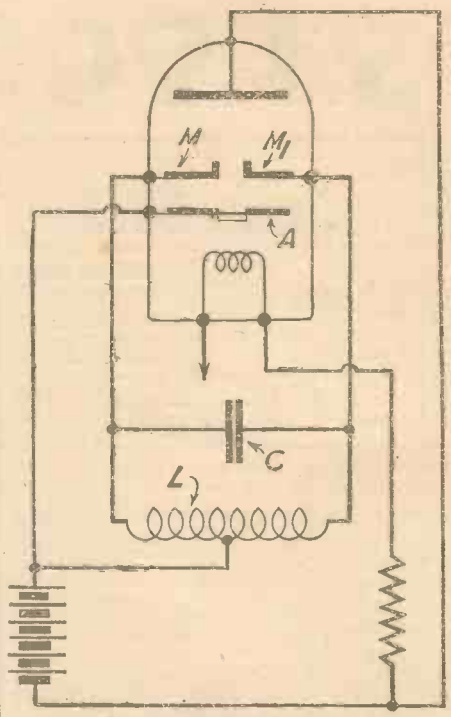


Fig. 3. The external circuit used with the tube of Fig. 2.

Immediately above the anode is a pair of semicircular plates marked M, M_1 which are connected at their outer ends to an external circuit L C, as shown in Fig. 3. This circuit is tuned to the frequency to be produced. The inner ends of the two semicircular plates are brought close together, and the edges are turned up into lips, as shown, so that they form a narrow slot through which the electron stream can pass into the main body of the tube.

In the upper part of the tube is an electrode P in the shape of a bar. This carries a negative bias, so that it repels the electron stream, as it comes near, and forces it back towards the two plates M, M_1, which accordingly act as collecting anodes for the down-coming electrons.

Method of Operation

The anode A and both the semicircular plates M, M_1 are initially at the same voltage. The spacing between the semicircular plates and the bar electrode P is such that the time required for the electron stream to reach the top of its travel, and to return, is exactly one-half the period of the oscillation to be generated.

On the return journey the stream will not divide itself equally between the two plates. More electrons are bound to fall on one plate, say M_1, than the other. This plate therefore acquires a negative charge, whilst the other plate develops an equal and opposite positive charge.

The upturned lips of the two plates now begin to act as deflecting electrodes, the negatively charged one repelling the stream and the positively charged one attracting it. In consequence the whole of the descending stream will be thrown over from the right-hand plate M_1 to the left-hand plate M.

As soon, however, as this transfer has taken place, the plate M, in turn, becomes negatively charged, owing to the electrons it collects, whilst the plate M_1 becomes

(*Please turn to page* 301.)

SEEN ON THE AIR

News and Views on the Television Programmes by Our Special Radio-Screen Correspondent

L. MARSLAND GANDER

ARMISTICE DAY, 1937—a memorable day in television. In the morning I watched the broadcast of the whole Cenotaph ceremony, a sequence of the clearest besides the most moving and artistic pictures ever broadcast.

The camera positions commanded a perfect view. Telephoto lenses brought into close-up the King and all the principal figures; we saw the steps of the Home Office, down which all the chief participants in the service passed, as if they were only a few feet from the camera. How well-defined the pictures were may be judged when I say that at one point twenty choristers were on the small screen together, and I could have recognised familiar faces among them.

The main view showed a plane tree almost bare of leaves in the foreground, behind the white monument of the Cenotaph, and all around the motionless square of troops. After we had seen the King (who occupied the whole screen in a full-length picture) placing his wreath upon the Cenotaph and saluting, the picture slowly dissolved into a view of Big Ben silhouetted black against the November skyline.

Slowly as Big Ben chimed the last stroke of eleven the picture returned to the general view of the scene round the Cenotaph.

The Interruption

Then abruptly shattering the perfect stillness came the hysterical interruption which has figured so prominently in the Press. I heard a man's voice shouting wildly, incoherently, his cries growing louder and louder. The ranks of the naval guards at one corner of the square bulged forward and were broken; there was a confused mass of tiny figures. Then the cries gradually grew fainter, a mounted constable wheeled his horse across the screen. As suddenly as it had been broken silence was restored and the ranks were re-formed. The whole affair was over in twenty or thirty seconds. Through it all I saw the King standing motionless while the scuffle went on a few yards away.

Some people in the room with me said they thought they heard the word "hypocrisy" and some allusion to "war." Personally I could distinguish nothing, and a colleague who was in Whitehall only ten yards away agrees that the words were unintelligible.

To me, as a newspaper man, the significance of topical television is greater when an incident of obvious news interest occurs. History was in the making again when on November 11th, 1937, I sat in my office writing of what I had seen in Whitehall within two minutes of the occurrence!

The excellence of these Armistice Day pictures—animated art photographs—partially eclipsed the success of the Lord Mayor's Show transmission two days before. For me the Lord Mayor's Show broadcast suffered slightly from the fact that I had seen the whole marching pageant in the flesh passing down Fleet Street an hour or two before. Robbed of colour, reduced in size and speeded-up on the little screen, the televised procession was only a shadow. But a word of commendation must be given to the television flying-squad for their organisation which worked without a hitch, and the pictures as regards brightness and definition set a standard well maintained in the Cenotaph transmission.

It happened, in my opinion, to be the best Lord Mayor's Show for years. In the marching columns of our new Territorial Army and the ranks of those fine-limbed Keep Fit girls there was as good a subject for television as can be found in London streets. But, by the way, Mr. Freddy Grisewood's commentary did not always coincide with the pictures.

Then "Journey's End." I shall not apologise for confining my remarks this week almost exclusively to past programmes. Truth to tell, the week under review has produced the best crop of programmes of any week since Alexandra Palace opened, —and somebody ought to say so.

"Journey's End" convinced me on a number of points and raised doubts on others. I am certain that there is a wonderful future for the televised drama, which is able to combine flesh-and-blood acting with film sequences. Film and dramatic critics will probably be horrified at the notion of such hybrid production. But the conviction is strong in me and was strengthened by "Journey's End," though momentarily shaken because I thought the rats had been too obviously torn from a film-study of rodent life.

Film excerpts and models were able to take us out of the officers' dug-out in which the main action was played into "No Man's Land," and even into the German trenches. One day film will be shot specially for the purpose, and the results will be much more effective; in the meantime, these are days of experiment—and promising experiment at that.

Sometimes producers at Alexandra Palace are despondent when they contrast the prodigious effort of these pioneer days with the smallness of the audience. Let them take comfort in the knowledge of the intense appreciation among the few thousand televiewers when the programme is worthy.

I know from telephone calls and conversations that "Journey's End" made a profound impression.

Longer Items

The production lasted an hour and 20 minutes, and the principal doubt raised in my mind was not as to the wisdom of devoting such a long period to one type of entertainment, but whether the present general policy of bits and pieces, of endless snippets, is not wrong. It is generally admitted that expense and general practicability will preclude the B.B.C. from pouring out an endless stream of programmes.

Two or three hours in the evening will be as much as anybody will want, it is thought. For once I will be dogmatic and say that "Journey's End" showed drama to be the strongest suit of television. An hour or even two hours in an evening devoted to one play should not be too much. From now on it should bulk large in the B.B.C.'s calculations. The excerpts such as we have had from various London stage productions whet the appetite but do not satisfy.

I cannot agree with a fellow critic who thought that "Journey's End" suffered seriously in the compression. I should not have cared to be the "sub-editor" who had to make the cuts; nevertheless, this was very skilfully done. The atmosphere of the play was preserved and the production remained faithful to the author's intentions.

LANCE SIEVEKING

Lance Sieveking, well-known B.B.C. producer and playwright, with the musical box which provides the signature tune to most of his radio plays.

RANDOM RADIO REFLECTIONS

By VICTOR KING

A VISITOR FROM INDIA :: WAVES AND MATTER—A FANTASY

Joe Loss, famous dance-band leader and broadcaster, and his fiancée, Miss Mildred Rose. They are to be married on February 27. Miss Rose is private secretary to a well-known radio manufacturer.

ONE OF THESE DAYS——

MR. HARPER, of Little Hadham, Herts, returns to the attack in an exceptionally good letter. I may not agree with his views, but I certainly elevate my bowler to his forceful pen. The "we know what you want" brigade have a grand advocate in our Little Hadham friend. Read what he says:

"After reading your reply to my letter in 'P.W.' I suppose I should consider myself severely ticked-off. Be that as it may, you are in for another packet.

"The position seems to be this: You believe in individualism in design: that the individual conception of beauty, however haphazard and irrational the forces which produced it, should be allowed full play. That, you say, is the way to happiness. If one fellow wants to stick up a rickety-looking mock-Tudor affair with bogus oak beams and a roof of dirty straw, and the man who buys the next plot of land puts up a flat-roofed reinforced concrete, all-electric building, let 'em get on with it—they've each got what they think is beautiful.

"But have they? A man sees as much of the house next door as he does of his own, as far as the outside is concerned, and the modern place may look as hideous to the owner of the 'Olde Worlde' shack as the latter does to the modern-minded man.

"Individualism in design may have been O.K. in the Middle Ages, when, anyway, tastes varied little and people had not thought of being dishonest in the matter of design. If design was honest then and is largely dishonest to-day, are we to go on suffering a hideous incongruity of unnecessarily elaborate architecture. Because individualism worked once (or appeared to work) there is no reason for us to go on accepting it when co-operation is obviously necessary.

"Every person is educated in some way, either rightly or wrongly. The education takes place partly by haphazard, evolutionary, natural means, and partly by organised man-made control. According to you the former of these is the more praiseworthy—it is something to be proud of if you are undisciplined in a civilisation which depends largely on discipline for its success.

"'Thank goodness,' you say, 'I am not one of those little weeds whose opinions are based on scientific reasoning and organised common sense.'

"The choice in education lies between uncontrolled natural forces and intelligently directed human forces. The former have shown themselves to be disastrous again and again. The latter, by your creed, are something we ought to be vaccinated against. If there were no control over ideas other than that provided by Nature, the result would be a hopeless tangle of conflicting 'well-defined ideas' of 'taste'—in plain English, dogged, sentiment-born prejudices.

"We know it is futile to try to make people put up with what they do not want by telling them that they ought to want it, but why on earth should the means by which people have come to like certain things in any way affect the degree of their enjoyment of those things?

"Referring to your last paragraph: quite apart from the fact that the most brilliant surgeon or writer may not know the first thing about intelligence and beauty in design, isn't this buying up of antiques by Yanks rather beside the point. One of the commonest human fallacies is the belief that when a lot of people do anything it must be right. Some hundreds of years ago the human race to a man believed that the earth was flat: it proved nothing. If all the millionaires in the U.S.A. came over to our little island and went back armed to the teeth with four-posters and Queen Anne sideboards it would prove nothing. It might go to show that if Americans have learnt all there is to learn about making cars, short-wave stations and money, they have still a lot to learn about design in everyday things."

Now, Mr. Harper, for some further observations from me. I certainly do believe in "the individual conception of beauty." Why shouldn't I? It is as true to-day as ever it was that "beauty is in the eye of the beholder." I do not think that there can be arbitrary laws governing such an abstract thing. Now and then it happens that large numbers of people agree in their assessment of art values, but to me it is an awful thought that one day we might all hold exactly the same opinions about everything. And this we certainly should do if the "we know" brigade had their way.

Mr. Bertram and his followers, among whom we obviously must number Mr. Harper, are so sure that they are right in all their ideas. One can agree with much of this new-design cult, it is obviously right, but I resent the suggestion that "individual taste" is necessarily wrong merely because it does not conform with the tenets of self-styled experts.

Mind you, complete individualism is anarchy, and I'm holding no brief for that, but I'll fight like a tiger against anyone endeavouring to pull me body and soul into a complete imprisoning standardisation of life and thought.

There is too great a tendency for that sort of thing these days for my peace of mind. Why, only the other day Professor Morrison of Aberdeen University said:

"The time is not far away when we shall institute a new type of tribunal. This tribunal will consider whether our days of usefulness are over and whether or not we should be committed to the lethal chamber."

So besides not being allowed to think for ourselves, we are not even to be allowed to live if the "experts" will it so!

AN INTERESTING PERSONALITY

I MET a very interesting man recently, Mr. G. C. Motwane, who owns the Eastern Electric and Engineering Co. and the Chicago Telephone and Radio Co. of India.

Mr. Motwane started business in 1909 with a capital of about only twenty pounds, but his interests now spread over the whole of his continent.

Besides doing an enormous business in radio he handles talkie equipment, telephones and general electrical plant.

During our long conversation I offered him a cigarette. "No, thank you," he smiled, "I don't smoke. You see, my mother told me when I was a small boy that if I didn't smoke I should have a gold ring every year." That, seemingly, is the Indian equivalent to our "you won't grow if you smoke."

Mr. Motwane showed me a number of photographs, leaflets and what-not illustrating the activities of his firms, and I was amazed at their enterprise and modernity. Showrooms as good as anything in London, public-address vans, river-craft displays, stage presentations and other such things well abreast, if not ahead, of the livest and best-equipped American concerns.

But what intrigued me most was the man behind it, Mr. Motwane the Hindu, a really cultured, kindly soul whose success has obviously not been achieved by anything else but hard work and straight-shooting.

NOTHING BUT WAVES

THERE seems to be more and more scientific backing for the theory that the ultimate construction of matter is waves. And why not? If you think in terms of "solid" matter, like chunks of wood and iron, it may sound fantastic, but you readers of "P.W." ought to know that even iron is composed, like everything else, of atoms, and that every atom is divisible into electrons.

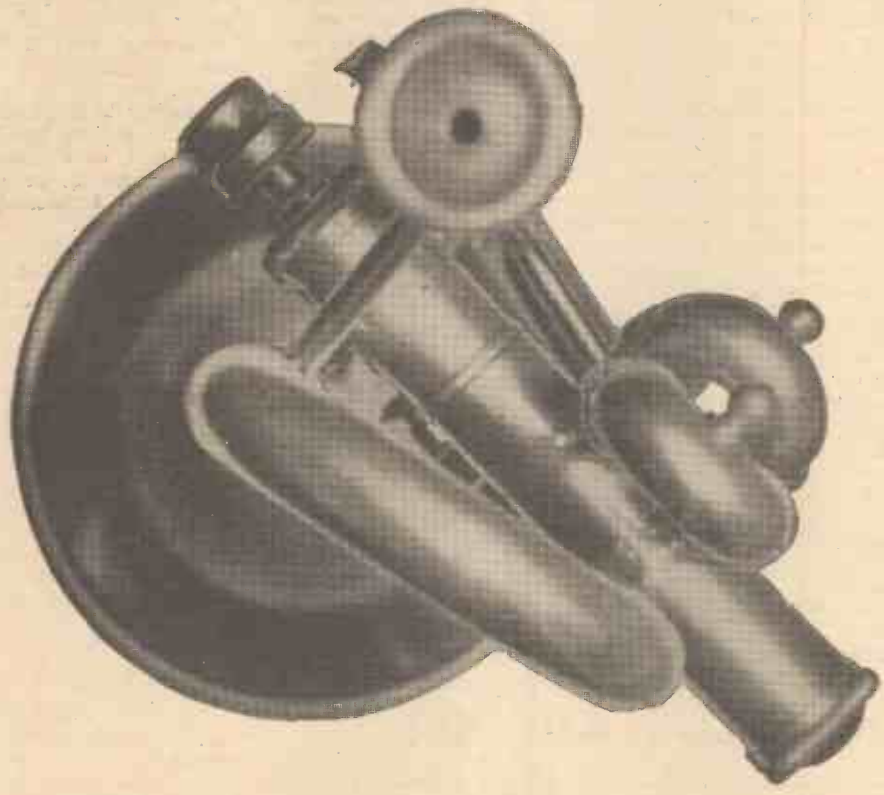
Once the mind can comprehend that one further step that the electrons of an atom are small particles of electricity separated from each other by comparatively considerable distances, then one is easily able to assimilate the notion that these particles may be minute packets of wave-motion and nothing else.

From thence we move into sheer fantasy. Into realms where the possibility of being able to duplicate anything at a distance by merely projecting waves becomes almost credible.

Picture a scientist of the future at the Central Broadcasting Station operating a weird transmitter designed to reconstruct loaves of bread in the homes of all citizens equipped with receivers capable of receiving the appropriate wavelength, and producing the desired output.

Visualise another bespectacled gentleman in white plus-fours at the dials of a milk transmitter. And woe betide the poor wretch whose set unexpectedly breaks down just as they are sending out the evening sugar supply!

Make a noise like this



What — can't recognise it? Can't see it's a trumpet? If you have as much difficulty in recognising a trumpet on your radio as you have here, it's high time you did something about your batteries. Get an Exide.

R.15

Exide

BATTERIES FOR RADIO

'Still keep going when the rest have stopped'

EXIDE 'HYCAP' BATTERY (*High Capacity L.T. Battery*)
For modern multi-valve sets—lasts longer on one charge. For small sets use the Exide 'D' Type. Both have the Exide Charge Indicator. Your dealer will tell you which to use. For High Tension use Drydex.

From reputable dealers and Exide Service Stations. Exide Service Stations give service on every *make of battery.*
Exide Batteries, Exide Works, Clifton Junction, near Manchester. Also at London, Manchester, Birmingham, Bristol, Glasgow, Dublin and Belfast.

GETTING THE BEST FROM THE SHORT WAVES

SOME HINTS FOR OWNERS OF ALL-WAVE RECEIVERS

EACH month—each week, almost—sees many additions to the ranks of short-wave listeners. Many of them are proud owners of all-wave receivers; some of them have specialised short-wave jobs. All of them have one thing in common—the desire to get the greatest possible enjoyment out of their radio listening.

There's never a shortage of things to listen to on the short waves. The trouble is rather to know *what* to listen to and what to pass over. Much depends upon your own inclinations, and on whether you are a "programme listener" or a "thrill merchant."

Getting In Between

Just for the moment I want to leave the "programme listener" to his own devices and to point out to the rest of you how many other things there are to explore. Take any one of the short-wave broadcast bands. How many of the stations that your set brings in can you really identify? Look at 19 metres, for example. If you have done any listening at all you know W2XAD, W2XE and W8XK. In between them, doubtless, are various carrier-waves of different strengths. Some of them belong to Daventry and to Zeesen, no doubt. But there are many times when those stations are off the air, and the stray carriers that you pass over may easily belong to some long-distance stations that you have never really heard.

You should get into the habit of "snooping round" on each of the broadcast bands and carefully logging the settings of the "known" stations; that's the only way to pick up the "unknowns."

Take amateur-band reception. Have you ever tried following the entire transmission of one amateur and then getting the reply from the station he is working with? That's the way to pick up real DX, very often. Suppose you've never heard an Indian station, for example; then one day you hear a strong American amateur say "This is W2XXX standing by for VU2CQ in Bombay, India." Surely that's the time to make sure of your Indian? You know he's on the air; you know *someone's* getting him. It's only a matter of looking round the band with a little patience to stand a good chance of getting him yourself.

And don't stick to the amateur bands. On roughly 18, 24 and 36 metres are the shipping bands, where you will often hear telephone communications and special transmissions from ocean-going liners which are equipped with radio-telephony. If your set goes below 10 metres you can derive endless amusement from the tactics of the "speed-cop" cars in New York, Boston, and other American cities. Below 10 metres, too, are some of the American "hi-fidelity" broadcast stations which relay the various broadcasting networks, and, when conditions are good, come over at even better strength than the better-known broadcasting stations on the regulation bands.

Hearing the Unexpected

In between the broadcast bands and the amateur bands, I admit, the population is mostly commercial stations sending Morse, but every now and then you come across something or other, even if it's only a "bootleg" broadcaster who refuses to work in the band allotted.

Short waves offer a tremendous expanse of dial to be scrutinised, and you will be well rewarded if you cover the whole of it with a fair amount of care every time you listen. It's always the unexpected that's interesting—but you don't hear it by sticking to the same old stations every time you switch on.

W. L. S.

A GRAND ALL-WAVE SET

One of the new season's range, this fine Ekco receiver covers the television sound wavelength in addition to the normal short, medium and long wavebands

IT'S an absurd thing to say, as many do who ought to know better, that the design of radio receiving sets has stood still during the past few years. That if you have even a 1935 set you possess the last word that can be spoken by the radio industry.

One evening touring the ether with the new Ekco AW88 would convince you that this is entirely wrong. From any point of view that the instrument is regarded it is a distinct advance.

Its appearance alone reveals marked progress. There are no knobs on it at all. All the controls are "built in" and the result is a sleeky modern effect that must command the admiration of everyone—even the addict of period styles. After all, the "period" of radio is to-day and the Ekco AW88 expresses that honestly and artistically.

New-Design Controls

The "Spin-wheel" tuning is a complete success. You can cover the dial either quickly or with precision slowness. There is no compromise whatever between the need for rapid changes to distant points on the dial and the necessity for slow motion in short-wave tuning. You have both at once in this remarkably ingenious Ekco innovation.

We also like very much the application of the principle to volume controlling. It makes the smoothest and most effective adjustment of this type which we have handled and is mightily different from the stiff little rotary movements all too often associated with it.

And much of the same ease and efficiency

The Ekco model AW88 is provided with "Spin-wheel" tuning, the firm's latest achievement.

are present in the tone control and wave-change. Full marks go to the Ekco AW88 for its controls. In our opinion they do definitely constitute a big step forward.

This twelve and a half guinea all-wave A.C. set takes in the television sound programme. And if you are within range of Alexandra Palace you can switch over to it as easily as if it were an ordinary broadcaster. The reception is first-class, for the frequency band is wide, and the response of the Ekco set does it full justice.

There is a new thrill awaiting those who purchase the AW88 and hear the A.P. with its grand "top" and absence of background. And all this on the same aerial as is used for the other stations. There is no need to fix up a special one. In our tests we used a small indoor aerial comprising a few yards of ordinary bell-wire, and this was adequate at a distance of twelve miles to produce more than enough volume.

Scores of Stations

The performance of the AW88 on medium and long waves is exceptionally good, and the same can be said of the short-wave reception. Within an hour or two we were able to tune-in scores of stations at full programme strength. In sensitivity, selectivity and response it is well above its price range as judged by normal standards.

The technical specification is as follows:

AW88 eight-stage superhet for A.C. 200-250 v., 40-100-cycle mains; triode-hexode, pentode, double-diode-triode, pentode, rectifier; compensated inverse feedback; "Spin-wheel" tuning; built-in controls; television "sound" on 7 metres; all-wave operation—long, medium and short-wave bands (s.-w. range covers 16-50 metres, 19.0-6.0 mc.); panoramic floodlit scale, with megacycles, metres and station names; tone-compensated volume-control; elliptical moving-coil speaker; extra speaker and pick-up sockets.

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

"TELEFRAMES"

Items of general interest

ABOUT THE EMITRON

TWO interesting facts about the Emitron camera were contained in the recent speech by Mr. Alfred Clark, chairman of E.M.I., Ltd., at that firm's annual company meeting.

First of these was that the television camera being installed in the Eiffel Tower high-power television station is an Emitron, and with its associated equipment was supplied by E.M.I.

The other point is that the sensitivity of the latest Emitron is such that the ordinary lighting of a normal theatre is ample for it. The new camera was used outdoors for the first time to televise the Cenotaph Ceremony on November 11th.

* * *

LOOK OUT FOR——

The Habima Hebrew players from Palestine, tomorrow afternoon (November 25th). They will be performing "The Dybbuk," the play with which they opened their four weeks' London season at the Savoy Theatre on November 15th.

* * *

"The Pride o' the Green" in the evening programme on November 27th. It is an opera by Rae Elrick with music arranged by Ian Whyte, the B.B.C. Music Director for Scotland.

* * *

LOOKING-IN FOR CRIME

Our go-ahead police, according to report, are already taking account of the possibilities of television in crime detection. In the case of outdoor events that are televised it is quite possible that a careful watcher might spot a pickpocket at work or some other crime taking place.

* * *

AERIAL AS REFLECTOR

An interesting effect was recently noticed by a dealer who had two different television receivers working off separate aerials. As soon as the second set was switched on, the picture from the first became much brighter. The reason turned out to be that the two aerials were just a quarter-wave apart, that for the second set being on the opposite side of the first aerial to Alexandra Palace.

By putting the second set into use, the effect of the feeder to the second aerial was overcome and thus the second aerial was able to act as a reflector.

* * *

POOR INTERLACING

A fault which can occur in a television receiver, but which is not always apparent unless looked for very closely, is poor interlacing. Instead of interlacing, the lines may come on top of one another, or may shift position and become a number of close parallel lines.

The effect on the picture is simply to spoil the sharpness of definition without the reason for this being obvious. The cause is usually poor synchronisation of the frame time-base.

* * *

INTERESTING VALVES

When paraphase push-pull amplified gas-discharge time-bases first became popular for television purposes, it was quite common to use ordinary small triode power valves such as the A.C./P. But the special requirements of the circuits and the high voltages often concerned made the need for specially designed valves for the job rather urgent.

It has, of course, now been met, and among the special valves produced the Mazda A.C./P.4 is particularly interesting.

This valve has a very steep characteristic, and will take up to 600 volts on its anode. The valves are graded to facilitate adjustment of the paraphase tapping. They are branded Q., R. and S. Grade R. is the average, while Q. has a slightly lower amplification factor and S. slightly higher.

* * *

AND WHY NOT?

There are those who scorn all thoughts of miniature television pictures. True, they may not hold much attraction for those interested simply from the entertainment point of view, but for the true experimenter who has rather limited funds available it is nearly as good fun to get good pictures about 3 inches across as 12 inches across, and there's all the difference in the world between the two costs.

* * *

BRIGHTER TUBES

A suggestion in a recent patent for obtaining brighter pictures on the screen of a cathode-ray tube is to have several cathodes at angles to each other and all projecting their beams on the same spot on the screen. The electron beams are in effect all in parallel.

NOTING THE ADVANCE

THE following experience brings home in a most remarkable way the tremendous amount which television reproduction has improved in a year, an improvement which is sometimes difficult to gauge because it has been so gradual and steady.

The day after the Armistice Anniversary, a photographic agency's representative walked into the office with a bunch of photos. Amongst those picked out as possibilities for use in POPULAR WIRELESS was one showing patients at a hospital looking-in to the Cenotaph scenes.

Nothing very special about that. Not at first glance, at least. But what did closer inspection reveal? The photo was about 9½ in. by 7½ in., and the screen of the television receiver about $\frac{15}{16}$ in. by $\frac{3}{8}$ in. And yet it was possible to see clearly the Cenotaph on the screen, the row of flags at its base, and to pick out the separate figures of a row of people!

Good photography? Most certainly! But what excellent television to make such photography possible.

After the first surprise at seeing so much on the screen, some fake was imagined. But close inspection ruled this possibility out.

It could not have been done on the negative. If it had been a reduction of another photo stuck on the picture and the whole rephotographed, something in the nature of a sharp edge to the screen would have given it away. No, the picture on the screen blended too well with the surrounding cabinet for any such possibilities.

Having thus had our interest aroused, we investigated to find out the set and the locality. The latter proved most surprisingly to be as far off as the Southend General Hospital. And the set—as you have probably guessed from the locality—was an Ekco.

(For those who may wonder about the point, we would add that by the time the photograph was reduced to a suitable size for publication the size of the screen on the television set would be so small that it would hardly be discernible when dealt with by the process necessary for the reproduction of photographs by printing.)

AMERICAN PROJECTION TUBE

A view of the latest American television receiving cathode-ray tube, which, like sets that have already been demonstrated in this country, produces pictures up to two or three feet in size by means of optical projection on to a screen from the very bright picture produced on the end of the tube.

THE B.B.C.'s SILENT SERVICE

Some interesting facts about the Outside Broadcast Department

Thirty years ago Jack Hylton earned his first pennies in his native town of Stalybridge in Lancashire, playing an old piano in a public house. Recently he returned with the band he has taken all over the world to give a free show at a local theatre in aid of holidays for the town's poor children. There was a civic reception by the Mayor and Corporation to welcome him back. Here you see him playing the piano on which he earned his first pennies. With him are his father and mother and sister Dolly.

THEY have been called the silent service of radio—the engineers who make outside broadcasts possible. It is an apt description.

For their work lies only in the shadows cast by the glare of publicity which they create, their reward in the fact that listeners know nothing of them.

But apart altogether from the more spectacular outside broadcasts, such as the Coronation ceremony, their day-to-day work is an important factor in the process by which radio is forever widening the horizon of national life; upon their skill depends the technical success of a broadcast from any place other than a studio.

Adaptability and ingenuity, plus the intimate knowledge of the expert, are their stock-in-trade, for they are continually breaking fresh ground, arranging the lay-out of apparatus that will convey to listeners all over the country sound pictures of events and places as varied as the Eton Wall Game and a London sewer; a gipsy encampment and the Royal Mint; a "haunted house" and an important dog show; a lambing pen on the Wiltshire Downs and the maiden voyage of the Queen Mary.

Organisation of O.B. Department

Even late-night dance music, mid-week religious services, as well as big sporting events, depend for their technical arrangements upon the installations made by the Outside Broadcast Department of the Corporation.

Mr. H. H. Thompson is Superintendent of "O. B's," no matter from what part of the country they may come. With Mr. R. H. Wood, Engineer in Charge, Outside Broadcasts (London), he, in close co-operation with Mr. S. J. de Lotbinière, Director of Outside Broadcasts, and with Mr. Gerald Cock, the former Director of Outside Broadcasts, has enabled the B.B.C. to achieve some notable scoops within the last few years.

Suggestions for every broadcast emanate from the Programme Department, but even when they are nothing more than ideas engineers are consulted so that the lines may be tested, acoustics checked, and other technical investigations made. Although arrangements are normally completed a fortnight before a broadcast, flexible regulations easily allow for last-minute changes in plan.

The organisation of the London Outside Broadcast Department consists of the engineer in charge with his assistant, two supervisory engineers and ten sections each comprising a senior and a junior engineer.

In the provinces the local staffs are responsible for outside broadcasts in their area, which are arranged by the engineer in charge of the particular Region. Rather a feature is made of music-hall broadcasts—some of the best known are those from the Argyle Theatre, Birkenhead. Over the moors, into the highlands, the heights and vales of the Lake District, through tortuous crevices of eerie caves the engineers go, sometimes for several days at a time, to arrange transmissions of broadcasts from obscure and interesting places. Each man knows his duty a week in advance, and a typical day's work in the Metropolis invariably begins with the collection of the apparatus used either for a late broadcast the night before or for an early morning transmission to the Empire. Every piece of it is returned to the service room at headquarters, where microphones, amplifiers, headphones, mixers, signal lights, switching units, and lots of other "gadgets" are thoroughly tested before being passed, for re-issue, to stores. Not a solitary piece of apparatus is used more than once without undergoing a stringent examination.

A common belief exists that once apparatus has been installed at an hotel, restaurant or church, it remains there to do yeoman duty at least once a week for an indefinite time; on the contrary, it is dismantled and returned to Broadcasting House after each programme.

Duplication of Apparatus

Modern equipment is speedily installed, and it is nearly always in position at least an hour before an outside broadcast is due to begin. Tests then take place with the London Control Room, and, no matter how insignificant the event may be, or how brief the broadcast, every piece of apparatus is duplicated so that in the event of a fault occurring, perhaps only a fraction of a second before transmission begins, no delay occurs.

For the majority of outside broadcasts two microphones are always used nowadays—one for effects—it can also be used as a "stand-by"—the other for commentator or observer. But for the purpose of broadcasting excerpts from theatrical shows as many as eight may be required. Four will be hidden in the footlights so that listeners can follow, in sound, the movement on the stage; one will be concealed in the orchestra pit; another will pick up the applause of the audience, and there are at times one each for the commentator and vocalist.

During the broadcasts on Coronation Day—the biggest of their kind—a record number of some seventy microphones was in use for the main programme from 10 a.m. till 5 p.m. A large control room was specially installed inside Westminster Abbey, and through it engineers piloted the output of each microphone for transmission to home listeners—a task involving more than three hundred rapidly made mixtures of sound from different parts of the Abbey and the processional route. A control room for foreign observers was built in nearby Middlesex Guildhall to deal with the commentaries which were transmitted to more than a dozen foreign countries.

The microphone which enabled listeners to hear the King taking the Oath at the Coronation ceremony was concealed in a faldstool six or eight feet away from the spot at which His Majesty spoke.

When Princess Marina married the Duke of Kent, listeners who heard her say "I will" little knew that the microphone which carried her words to them was fifteen feet away from her.

On occasions like that the sound picked up by the microphone is so minute that it must be amplified many times so that it is properly audible. And it is always a critical moment for the engineer when he has to fade in "long distance" microphones such as these. If he is a little too early he may very well pick up a casual aside; if too late he may miss the vital words.

O. B. engineers sometimes have queer jobs to do. During the Tidworth Tattoo one of them had to dress in a green smock, a monk's cowl covering his head, so that without spoiling the picture of pageantry he could march in front of the massed bands, holding aloft the microphone that was picking up the music.

QUESTIONS AND ANSWERS

By K. D. ROGERS

TWO TUNING POINTS ON THE LOCAL STATION!

Perhaps you have noticed this on your own set and wondered why. If so, you will be interested in the simple explanation given below

IT CHOKES

"Why, when I am tuning the local station in do I get two tuning points? They are not there on distant stations. Moreover, the volume goes quite faint in between the two points and is distorted as it comes from faintness to loudness."—L. T. (York).

That has puzzled many readers from time to time. What is happening is that the detector (and possibly the H.F. valves) are being choked by the strength of the station when it is fully tuned-in. Thus in the centre, or peak of the tuning point, choking occurs, making the reproduction very weak.

When the tuning is taken a bit "off tune" the strength is not so great, and the grid of the valve clears and full rectification takes place again with consequent increase of signal strength.

That increase may now be sufficient to overload the L.F. valves—or the detector may be overloaded, but not so seriously to cause it to choke. In that case distortion occurs. It is only when the tuning gets so far away from the peak point that the volume reaches a degree where overloading is absent and no choking is taking place.

That state of affairs takes place on either "side" of the tuning point, and gives rise to the double-tune effect you have mentioned.

The choking of the valve is due to excess of grid voltage from the signal, causing a piling up of negative voltage on it.

The leak cannot allow it to "leak away" because it is too much for it to "carry" sufficiently quickly, and so a strong negative potential remains on the grid, thereby cutting down the number of electrons flowing through the valve, and therefore reducing the anode current and therefore the output.

In addition you have the fact that the strong negative bias forced on the grid by the accumulated signal input throws the grid out of the bias point that is conducive to efficient rectification.

In a battery valve that point is just a little positive. In a mains valve it may be at zero bias. But the signal-inflicted negative bias will upset the apple cart and the valve will not rectify properly.

There is another aspect, too. With the valve well negative and choked so that the charge cannot leak away it cannot become properly positive at all, and so the grid voltage swing will not correspond with the signal voltage swing that is being applied.

This results in distortion as well as a cut-down of signal output from the valve. You will be able to hear that distortion if you listen carefully—even though the valve is choked.

THE FERRO-POWER

I have had a letter from A. J. Limebeer, Church Lane, Owslebury, Hants, *concerning the Ferro-Power*, 1936. *He says that he has the copies of "P.W." required, and will gladly LOAN them to anyone willing to pay the postage. That fact may be of assistance to* Mr. A. Crocker, of Portsmouth, *who wants details of the set.*

CAN ANYONE HELP?

W. J. Milne, 121, Perry Vale, Forest Hill, London, S.E.23, *would be glad to get hold of a copy of "P.W." dated November 3rd*, 1934.

It contains the "further" operation details of the S.T.600. Will some reader please oblige and get in touch with Mr. Milne? Thank you.

THE GRID LEAK

H. L. K. (Sittingbourne).—*Why does the grid leak of the detector of a battery set always go to the positive side of the filament? I have tried it on the negative side and found that the results are not so good, so assume that there is some good reason why the positive side is chosen.*

Boy—you've said it! There *is* a good reason.

As you have noted, the results are better and that, my dear sir, *is* the reason.

Within that reason is another—or rather a cause. This is it. The best grid-leak rectification takes place when the grid of the valve is passing grid current. Moreover, it occurs when the grid-current curve has a kink in it. That kink usually occurs somewhere between zero and 1 volt positive bias in conditions of normal H.T., and in the case of the 2-volt battery valve.

So obviously the best thing to do is to arrange the circuit so that the grid is biased to the required positive voltage to produce that kink.

This can be done by using a potentiometer across the filament and connecting the grid leak to that. But it is a clumsy method and quite unnecessary. You see, that kink is not a nice sharp one which would delight the heart of every radio theorist.

In practice it is just a decision of the curve to change direction more or less suddenly, and it occurs with comparative flatness between the zero and 1 volt positive bias on the grid.

So we connect the grid leak to the positive side of the filament which gives it a positive bias of 2 volts in regard to the negative end.

"Too much," you shout, delightedly jumping up and tearing the paper.

But wait a minute. When you connect the grid of a valve to a positive bias with respect to its cathode (filament) you start a nice current flowing between grid and cathode. That current in this case has to flow along the high resistance of the grid leak, and in doing so it causes a voltage drop across that leak.

So, my dear sir, we do not get the full 2 volts positive "on" the grid at all. We get a good bit less than that, for across that grid leak there is a nice big voltage drop, dependent upon the amount of current flowing through it.

That current is only a matter of a micro-amp, of course, but with a resistance value of 2,000,000 ohms (as many grid leaks are) you will get a pretty good voltage drop with even that small current. As a matter of fact, 1 micro-amp through 2,000,000 ohms would result in a fall of potential of 2 volts. That would bring us to zero bias on the grid. But, of course, as is the way of things, as soon as the bias dropped to zero on the grid the micro-amp would fall to much less—and the voltage would rise again. So in actual practice we have probably just a nice, convenient fraction of a volt positive on that grid—bringing us to the kink in the curve which gives best rectification.

WHY?

Why do they call it a condenser? writes one reader from Ireland.

I don't propose to go into the matter fully, but the obvious answer is that it IS a condenser.

So is a balloon, or a gas-holder. In some sort of way so is the tin that contains condensed milk.

An electrical condenser is not the sort of thing that the steam condenser is. It does not change electricity from one form to another in quite that fashion, but it does condense it in the fashion that it allows it to be compressed into a small space. In other words, given the pressure (or voltage) you can ram more and more electricity into a condenser. The more the voltage the more you can ram in—until something "busts." In other words, until the pressure in the "can" of condensed electricity is so great that it bursts or breaks down.

You can ram a lot of electrons into a condenser and then disconnect it and put it in storage, or send it by post. Then—provided the "can" does not leak—it can be "opened" by connecting the wires to it again and the electricity or electrons allowed to "come out."

That is a very rough analogy to the condensed milk can or the gas-holder, I know, but it is near enough. The condenser is a peculiar "can" in that it stores its electrons on one side or in one section of it, so to speak, and when the little beggars are released by external connection they rush round and even themselves up equally on both sides or in both sections.

But in doing so they "come out" of the can and go through the wire.

WHAT VOLTAGE?

"I have a valve that should take 2 milliamps when it has a voltage of 80 on it. It is in a circuit with resistance-coupling and decoupling. What voltage must I give that valve circuit from the battery in order to get the right voltage on the anode? The resistances are 30,000 for the anode and 25,000 for the decoupling."

So writes G. D. W. (Rhyl).

You will want 190 volts.

This is how you get the answer: Those resistances will drop 1 volt for each milliamp in each 1,000 ohms. That is if 1 milliamp is flowing they will drop 55 volts. Therefore, for 2 milliamps they will drop 110 volts. In order to get 80 volts left after that you must obviously apply 190 volts.

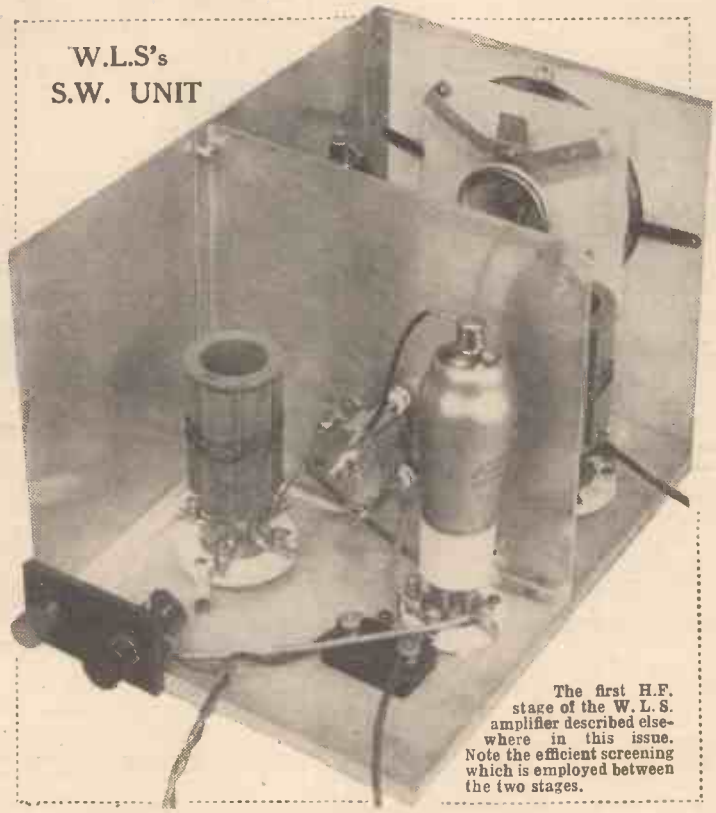
If you want a formula, here you are. Just Ohm's Law once more:

Voltage = Current × Resistance in amps and ohms. So we have E, (volts dropped across resistance) equal to 2/1,000ths of an amp × 55,000 ohms.

$$E = \frac{2}{1{,}000} \times 55{,}000 = 2 \times 55 = 110.$$

In other words the voltage drop is 110. That leaves you with another 80 to add to it to get your required voltage "on" the anode of the valve.

I know the fact that you are dealing with milliamps instead of amps worries a lot of you. But in radio work we more often than not have to work with resistance values of thousands of ohms and then the thousands of ohms and the milliamps will "cancel each other out."



W.L.S's S.W. UNIT

The first H.F. stage of the W. L. S. amplifier described elsewhere in this issue. Note the efficient screening which is employed between the two stages.

BRIGHTON'S POLICE RADIO SYSTEM

(*Continued from page 290.*)

calling-up device was really the important feature of the set. It acted just like a telephone. The sets were capable of receiving messages at a distance of about six to seven miles from headquarters.

In the principal police telephone boxes there were compartments for holding charged and discharged accumulators. The delivery of charged and the collection of discharged accumulators took place daily. When new, the accumulators could be used for 48 hours, but later they lasted for only twelve.

"The pocket sets," said Captain Hutchinson, "are not intended solely for use in cases where the constable is required to go to the scene of a serious crime or to stop a criminal travelling by motor vehicle. They are available for all occasions when officers at headquarters find it necessary to communicate with patrol constables on any matter of police duty."

Among the number of instances in which pocket wireless had been of immense value, quoted by Captain Hutchinson, was one in which a householder found a man in his study at 12.45 a.m. He telephoned to police headquarters from a police box. At 1.5 a.m. a wireless message giving a brief description of the wanted man was transmitted. At 1.15 the man was arrested. A few hours later he appeared before the magistrates and was committed for trial, and the same day was brought up at Quarter Sessions and sentenced to three years' penal servitude.

Inquiries respecting the pocket sets, Captain Hutchinson said, had been received from all parts of the world, and representatives of a number of forces at home and abroad, who had visited Brighton to witness demonstrations, had expressed surprise at the clearness of the reception of messages. So far as he knew, the pocket system was not used elsewhere in this country, the reason being that shortage of wavelengths had caused police wireless to be developed regionally. In other forces where radio communication was utilised the sets were carried in motor vehicles. In some places these were fitted with the two-way system, enabling the occupants to send messages to the transmitting station while the vehicle was in motion.

The tendency was towards the establishment of regional police wireless stations, so that several forces might share the facilities of the system. "There is no doubt," said Captain Hutchinson, "that in due time the police forces of the country will be linked together in this way. At present there are regional stations at Brighton, London, Nottingham, Liverpool, Manchester, Wakefield, Newcastle, Glasgow, Edinburgh and Aberdeen. Experiments in short wavelength transmission are being carried out to get messages to a greater number of recipients, and our experience in Brighton may have helped to that end."

—Extracts from Sussex Daily News.

MY SHORT-WAVE ADVENTURES

(*Continued from page 289.*)

But as a last resort I hooked on a resistance capacity coupled power valve—and, as a two-valver, the howl went like magic.

Oscillation was perfectly smooth all round the 180-degree slow-motion dial, too. So I hastened to couple-up an aerial, which I did by using a four-turn pencil former coil with one end bolted to the chassis and the other end nipped by a crocodile clip taking the aerial lead.

And at this point (space being up) I must leave you while I make up my two-valver into a more compact and more rigid form.

Near the bottom of the scale I have picked up—and, by the skin of my teeth, held—the "Ally Pally" signals. But where all these 10-metre amateurs are I don't know. Friends with expensive all-wave sets tell me they can make nothing at all of the ultra-short-wave band provided. Why should I expect to on my "junk" outfit?

Well, I know it can be done because dozens of reports prove it has been done. And I shan't rest until I can report good reception with two valves on 10 metres.

SHORT WAVES FROM CATHODE RAYS

(*Continued from page 292.*)

positive by induction. This, of course, deflects the stream back into its original position, where, after a short interval, it is again thrown over to the opposite side for the same reason as before.

And so the process goes on, continuously. The electron stream, falling alternately on the two plates, impulses first one side and then the other of the tuned oscillatory circuit L C, shown in Fig. 3, thus building up sustained oscillations, which can be transferred to a short-wave transmitting aerial, or to any other load.

The frequency of the waves so generated can be varied either by adjusting the voltage between the cathode and the oscillating anode A, or by regulating the negative bias on the upper electrode P.

THE RADIO TIME MACHINE

Shall we ever be able to control Time by means of radio? The possibilities of such a feat are dealt with briefly in the following thought-compelling article.

By J. F. STIRLING

WELL has mankind represented Time as the stern and unrelenting figure of an old man who plods a lonely and unloved way through the mysterious expanse of Existence, ever heedless of the many appeals which rise up around him.

The allegorical figure of the bent old man, with his eternal scythe and his running out hour-glass, is symbolical of man's utter failure to influence Time in the slightest degree. Like magnetism and gravitation, Time is uncontrollable. In nature, also, Time is as mysterious as the force of gravitation, if, indeed, not more so. One cannot insulate Time like we can electricity. We cannot impede the flow of Time. There is nothing known which will hasten Time up or slow it down. Nor, strictly speaking, can we record Time, or store it up in some form of accumulator, or change it into something else in a manner similar to analogous control processes which we are able to operate in the realm of electrical and other forms of energy.

Unapproached and Uncontrolled

The apparent complete subordination of everything to the dominion of Time has not infrequently raised a sense of rebellion in the minds of thinking men. The forces of Nature are mighty, but the brain of man is equal to most of them. Why, therefore, should that common friend and enemy, Father Time, be allowed to remain so unapproachable, so utterly uncontrollable as he has hitherto proved to be?

Mr. H. G. Wells, that master of the scientific novel, in his "The Time Machine," has given us a vivid picture of what would happen if it were possible to travel in Time. Mr. Wells' story is, of course, quite a fantastic one. Nevertheless much of the happenings he describes would be possible were we able to devise some means of travelling backwards and forwards in Time.

The time-traveller, for instance, could, at his mere wish, go back to the days of the Roman Conquest of Britain or to the times when the Egyptian Pharaohs were masters of the world. Alternatively the voyager in Time, were such a thing as a "Time Machine" a practical possibility, could travel forward into the future. He would be in a position to predict coming events, having, indeed, actually witnessed them!

The possibilities of travelling in Time are, indeed, truly enormous. Will, however, such an ability ever come the way of mankind and, with it, other means of controlling and/or modifying the present universal mastery of Time?

So far as one can tell, the only possible way of interfering with the properties of Time would seem to be through the agency of some radio process.

In some inexplicable way Time seems to be bound up with the speed of light and also, of course, with the velocity of radio waves, since light waves and radio waves travel at the same rate. If by any means we could evolve a radio wave which travelled with a velocity exceeding that of the speed of light, i.e., 186,000 miles per second, then, and only then, we should have "got on top of" Time and have provided ourselves with at least one means of defying him.

It is a moot question whether any of the radio waves which are generated from the countless broadcasting and other wireless stations on the earth's surface ever get completely free of our planet. If, however, wireless waves do manage to get themselves flung off the earth, it is pretty certain that they must travel into the depths of outer space with the velocity of light. It is also fairly equally certain that such radio waves must never die away completely. They travel onwards and onwards ceaselessly, apparently eternally. Somewhere, far out in the depths of Space and in the neighbourhood of white-hot star-clusters, the energy of those earth-flung radio waves may be changed, dissipated or profoundly modified in some form; but for all that it seems to be quite certain that a radio wave travelling in Space is as imperishable as a light wave speeding away through the same supposedly Ether-filled medium.

Many of the light waves which we receive in some of our great telescopes on earth have taken 25,000 years or more to reach our earth. If a bright star, for instance, which is situated 25,000 light-years from the earth were suddenly extinguished, we would not be made aware of that fact until 25,000 years had elapsed, for the last rays of light emitted by that star just previous to its extinguishment would take that time to reach our earth.

The subject is rather a complex one, but after thinking about the matter contained in the foregoing paragraph it will be plain to the reader that there is no great all-pervading "now" in the Universe. An event which seems "now" to us on earth may have been "now" upon some distant star 25,000 years ago, and, conversely, what is "now" to us cannot be "now" to some of our stellar neighbours until the elapse of some considerable time interval.

As Others See Us

Consider, by way of example, the astronomers on a planet which is revolving around one of the big stars situated at nearly 2,000 light-years distance from the earth. If they had super-efficient telescopes they might be able to witness actual scenes upon our earth.

But what would these imaginary beings witness when they trained their telescopes upon the earth at our present "now"? They would see not modern London and all the amenities of up-to-date civilisation, but the landing of the Romans in Britain, the conquest of the Gauls and other events which are to us merely historic.

There is probably a record in Ether waves of everything which has happened on the earth since the latter was first formed, a record which is flying outwards and outwards into Space with a constant velocity of 186,000 miles per second. It is possible, in fact, mathematically to calculate the exact distance out in Space at which the light waves carrying the record of Julius Cæsar's landing in Britain are at what is to us the "present" moment. If, now, it were possible by some almost super-human means for us to fly outwards *instantaneously* to that point in Space we should actually

(*Continued on next page.*)

(Continued from previous page.)

witness the affairs of the great Julius. We should, in a way, have overtaken Time in his eternal flight.

Although it will always be impossible for us to project ourselves instantaneously into Space, it is, nevertheless, on the cards that some electrical genius of the future might be able to discover ways and means of projecting radio waves into Space with a velocity many thousands or even millions of times greater than the speed of light.

Such imaginary waves would require to possess the property of travelling outwards to a fixed point and of being, as it were, "modulated" by the normal light waves or radio waves which they had overtaken.

If, now, it were also possible to arrange for these "modulated" *super-speed* waves to be selectively returned to the earth by some yet undiscovered attractional force, they would come back with all their acquired modulations and we should be able to witness on our television instruments an exact picture of events of the past.

The Roman landing in Britain, for instance, would be presented to our eyes in all its detail. The world at its beginning would be unfolded before us. The Present would have brought back the Past. The radio Time-Machine would have effected the first conquest of Man's great Master.

TECHNICAL JOTTINGS

Items from an expert's notebook.

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

Television Receivers.

THOSE of you who have television receivers, or have watched television receivers in operation, know how sensitive these are to certain types of interference from outside sources. A television receiver is much more sensitive to interference than even an ordinary short-wave radio receiver.

The type of interference which is the most serious is, of course, that which produces very short-wave radiation, and amongst the sources of this the ignition system of a motor-car is a common offender. All of us who have radio sets in our cars know how much has been done in the way of suppressing interference from the ignition system to prevent it upsetting radio reception, but it is not commonly known how seriously the motor-car engine will upset television reception.

Effect of Interference

Some demonstrations on this point were given recently at the laboratory of the British Electrical and Allied Industries Research Association in Middlesex. A special television programme was arranged from the Alexandra Palace, and this was received on a television receiver at the Middlesex laboratory in the presence of a number of experts, including representatives of the B.B.C., the Home Office, the Ministry of Transport, the Post Office, and the Society of Motor Manufacturers and Traders.

The television was excellently received until the engine on a motor-car about 15 yards away was started up. As soon as this happened the television picture was interfered with so as to be practically valueless. A cure for this was then demonstrated, and it was shown that when the electrical parts of the motor-car chassis were arranged in a special way the interference was greatly reduced, whilst if suitable suppressors were fitted to the ignition leads and other parts of the electrical equipment of the car the interference was relatively unimportant.

I understand that a movement is on foot to secure the fitting of suitable suppressors on all motor vehicles, in course of time, so as to prevent this interference which, in the case of television, at any rate, would be so serious as practically to put it out of court altogether.

A Useful Light-Meter

I was saying something the other day about the increasing applications of the photo-electric cell. Another and very interesting example comes to hand in the shape of the new "Avo" light-meter, which is a simple instrument, looking for all the world like an ordinary ammeter or voltmeter, which gives you a direct reading on a dial of the illumination from a source of light in foot-candles. The instrument is roughly 2½ inches square by 1 inch in depth, and weighs 6 ounces.

The scale of the meter is calibrated up to 50 foot-candles, whilst a multiplier gives a full range of 0–500 foot-candles. The meter is supplied complete with a table of illuminations recommended for different classes of work. It is claimed by the makers that eyestrain and other optical troubles are becoming more and more prevalent every year, and that a good light-meter shows that the majority of consumers are using insufficient lighting.

Exposure Meters

An adaptation of the same principle is used in the "Avo" exposure-meter for photographic purposes. This is of the same size as the light-meter mentioned above and gives a direct reading of the exposure needed according to the light prevailing at the actual moment of taking a photograph. The meter is not influenced by extraneous light and is sensitive to even the weak light of dull interiors. It indicates the light-strength corresponding to photographic exposures of from 60 seconds down to 1/2,000th of a second.

These two instruments are made by the Avo people, the Automatic Coil Winder and Electrical Equipment Company, Ltd., of Douglas Street, London, S.W.1, who will be pleased to give you any information you require. I need hardly say that these are the same people who make the "Avo" universal electrical measuring instruments and various other types of electrical instruments.

(Continued overleaf.)

FILM FUN ANNUAL

ALL the fun of the films is to be found in FILM FUN ANNUAL, price 3/6, now on sale. All the most uproarious characters of the screen are featured in side-splitting adventures—Joe E. Brown, Wheeler and Woolsey, Schnozzle, Sydney Howard, Harold Lloyd, are all here. There are also some exciting film yarns that boys and girls will enjoy.

REVERSED VALVES

Some unorthodox arrangements which will, nevertheless, give quite good results. Those with an experimental turn of mind will find them worth trying

IT is not generally known that many valves can be used in positions and circuits other than that for which they were originally intended.

The most common and perhaps the best-known example of this is when a triode is used as a diode by connecting the grid

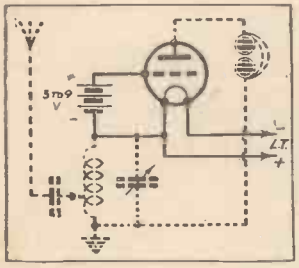


Fig. 1. In this arrangement the grid is given a small positive potential to overcome the space charge effect.

and plate together and using them as an anode. Then again a pentode (either H.F. or L.F., but generally the former) can be used as a detector, giving increased sensitivity to the set.

Rather better results can be obtained from a triode operating as a diode by employing the circuit shown in Fig. 1. In this case the anode is the output electrode, the grid being given a slight positive potential in order to overcome the space-charge effect. This circuit is scarcely likely to be used, however, since the coming of double-diode-triode valves solves the problem in a much more efficient manner. The circuit can be used as a sort of high tensionless affair for local listening, however, and only the filament current will be needed. The only drawback is that the results are weak—about the same as a crystal, in fact. Of course, there is the 9-volt grid-bias battery to be considered, but the current drawn from this is very small, and it will last a long time.

If you are keen on running a valve with no more H.T. voltage than is given by a 9-volt grid-bias battery you can try the

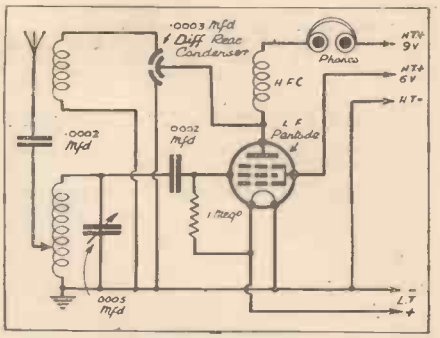


Fig. 2. A novel single-valver which works with an H.T. as low as 9 volts.

circuit shown in Fig. 2. A pentode valve is used, with the electrode arrangements displaced as shown; that is, the auxiliary grid becomes the control grid, whilst the control grid is given a positive potential of about 6 volts. You will find an L.F. pentode best for this job.

While most readers will be familiar with a Class B valve used as a detector and L.F. amplifier, some may not be acquainted with the fact that a driver plus Class B valve makes an efficient combination when used in a rather uncommon way. This is to make the driver portion of the valve function as a detector, the Class B part operating in the normal way as an amplifier. In this manner it is possible to work a loud-speaker on one valve on quite a number of stations. Fig. 3 shows the circuit. It will be observed that a special driver transformer is used.

W. N.

A COMPACT DET. AND L.F.

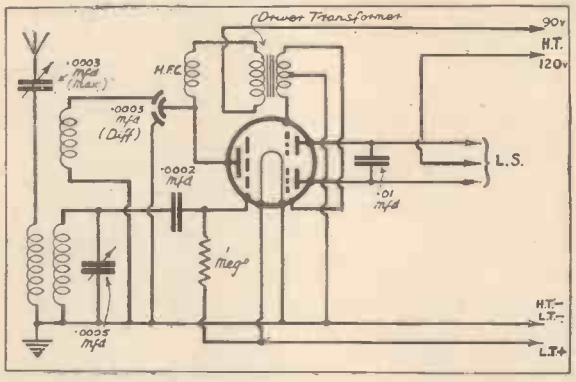


Fig. 3. A driver-plus-Class B valve may be employed as shown here and forms a compact det. and L.F. circuit.

TECHNICAL JOTTINGS

(*Continued from previous page.*)

Frame Aerials

A frame aerial is not nearly so sensitive as a decent-sized wire or extended line aerial, but it has the great advantage of compactness, and is for this reason often employed in portable types of receivers.

Utilising Directional Properties

A further important feature of the frame aerial is that it has a pronounced directional property, the strength of reception on the frame aerial depending upon the way the plane of the frame is facing in relation to the incoming radio waves. This directional effect is so pronounced that no designer incorporating a frame aerial in a set would be likely to ignore the effect and, in fact, you can take it for certain that any designer specifying a frame aerial will have allowed for the selectivity obtainable from the frame in his calculations. In other words, the circuit itself will not need to be so selective when designed for use with a frame aerial as when designed to be used with a line aerial.

Distortion of Waves

Bearing this in mind you should not expect a frame aerial set to give specified results unless you take care to utilise the selectivity of the frame aerial to the full extent, by rotating the frame or the whole set—usually the set—to the best position. This will not only give you the strongest signals of the station you want to receive, but will also help to cut out adjacent unwanted stations. You will find that the best position is when the frame is pointing towards the wanted station, or perhaps I should say is pointing along the direction in which the desired radio waves are arriving at the set. You may think this latter is a distinction without a difference, but it is not. Suppose you happen to know the bearing of the transmitting station and you point your frame aerial towards it, you will not necessarily get the best results; in fact, it is more than likely that a greater or less deviation from this position will give you the best results, the reason being that the incoming waves are deviated by iron girders and other conductors, so that when they arrive at the set they are travelling in a different direction from what we may call the "average" direction.

Magnetic Illustration

You can visualise the state of affairs in the ether by thinking of a number of small magnets lying in an otherwise uniform magnetic field; you will realise that in the immediate vicinity of any of these magnets the direction of the lines of force may be quite different from what it would be if the small magnets were entirely removed out of the field.

At any rate, these theoretical considerations are not of any great importance because all you have to do is to rotate the set until you get the best results, and it doesn't really matter to you in what direction the waves are coming. It is important to try the frame turned in different directions because you may go searching about with the tuner and entirely fail to pick up the station you are looking for if the frame is not pointing in the right direction.

Applications to Superhet

Once you have got the frame in the best position and the set properly tuned, you will be able to get the maximum volume of reception with the minimum interference and overlapping of other stations.

Some people affect to despise the selectivity aid which is given by the frame aerial, but this is really quite the wrong way to regard it. The frame aerial is a most useful adjunct to some kinds of receiver notably, of course, to the superheterodyne, and when such an aerial is used with a superhet, the combination may achieve remarkably fine powers of selectivity.

Tuned Stages

Talking about the selectivity of a superhet, this depends also upon the number of tuned stages. It is no uncommon thing for a superhet to have as many as seven tuned stages, all of which need careful trimming. As regards the latter, if the set is a commercially-built model, trimming instructions will be supplied with it, whilst if it is built from a published circuit design, it is certain that trimming instructions will be given with the specification.

SILVERING MIRRORS

An article which will prove valuable to experimenters in light-rays, photo-cells, television, or any subject where special shaped mirrors may be required

THE television experimenter and the man engaged in the construction of experimental apparatus concerned with the manipulation of light-rays may, at times, desire to make use of mirrors of shapes and dimensions which are difficult to procure. Large mirrors, of course, particularly when they may be procured cheaply, may be cut up by the skilled glass-worker, but, often enough, the amateur will find that it will pay him better to prepare his own mirrors by the process of chemically depositing metallic silver in lustrous mirror form upon plain glass sheets of the necessary size.

It is not a difficult matter to silver glass satisfactorily, particularly after a little practice has been acquired in the art. There are several methods of glass-silvering, but the one described in the instructions given here is, for all-round purposes, the best mode of procedure. The amateur is, of course, advised to experiment with the method on a few odd pieces of glass before adapting it to the silvering task proper.

Two solutions are required for the glass silvering: the *reducing* solution and the *silver* solution.

The reducing solution is made up according to the formula given below:

Silver nitrate	1 gram
Rochelle salt	1 gram
Water	500 ccs.

The silver solution must be made up in two parts, viz.:

Silver Solution A.

Silver nitrate	5 grams
Water	50 ccs.

Silver Solution B.

Silver nitrate	1·5 grams
Water	15 ccs.

To the silver solution A add strong ammonia *drop by drop* until the brownish precipitate of silver hydroxide which is at first formed, is dissolved and the solution becomes clear after shaking. After this, add to the ammoniacal silver solution A silver solution B, drop by drop, shaking the solution vigorously between the additions of the drops until the solution becomes *just slightly cloudy*. Now dilute the prepared solution with water to 500 ccs. We will call this latter solution "Silver Solution C."

All the above solutions should be kept in amber-coloured bottles, in which containers they will keep indefinitely.

The glass to be silvered must be made scrupulously clean; upon this essential degree of cleanliness depends the entire success of the silvering operation. The dishes used in the silvering process must also be similarly clean.

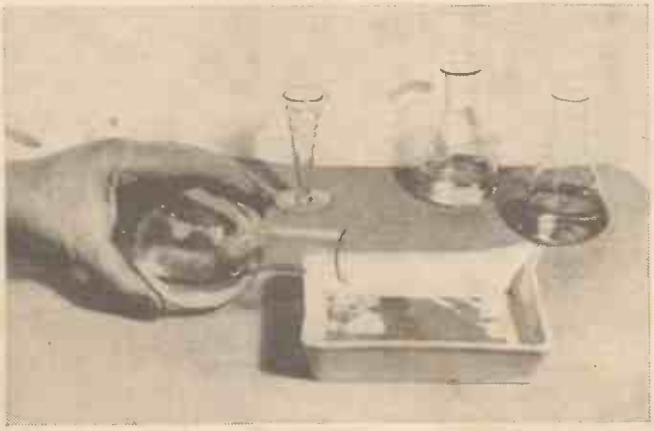
In order to clean the glasses and dishes, it is best to wash them with soap and water and then to scour them with a little whiting mixed with warm water. Rinsing away the whiting, it is advisable to immerse the glasses in dilute nitric acid for a few minutes. They are then rinsed and transferred to a perfectly clean dish containing water, under the surface of which liquid they are kept until the actual silvering is commenced.

Before silvering the cleaned glass sheet, some operators immerse it for a minute in a moderately strong solution of stannous chloride and then commence the silvering operation after further rinsing of the glass. This is not essential, although there is no doubt that it aids the subsequent adherence of the silver to the glass.

The glass to be silvered is laid face upwards in a perfectly clean dish—preferably a shallow one of only slightly larger size than the glass sheet itself. Equal quantities of the Reducing solution and of Silver solution C are mixed and are immediately poured over the sheet of glass. The mixed solutions will at once turn turbid and a deposit of shiny white silver will immediately begin to "grow" upon the glass surface. At the same time a black deposit will be formed in the solution, and it is essential to rock the dish gently in order to prevent the black particles from adhering to the silvered surface.

When the silvered surface seems bright enough, the glass should be removed from the liquid, rinsed in cold water and then allowed to dry. Do not touch the silvered surface whilst it is in a moist condition, for it is extremely delicate at this stage. Finally, apply a light layer of varnish or paint over the silvered surface and the mirror will be complete.

CLEANLINESS IS ESSENTIAL



The process is simple and very effective provided care is taken over the details.

29 36 37 27.

"P.W." LIST OF SHORT-WAVERS

BROADCASTING STATIONS TO SEARCH FOR ON YOUR SHORT-WAVE SET

Wave-length	Station	Call-Sign	Power	Wave-length	Station	Call-Sign	Power
13·92	Daventry	GST	10–50	25·60	Radio Colonial, Paris	TPA4	12
13·93	Pittsburgh	W8XK	40	28·99	Buenos Aires	LSX	12
13·93	Daventry	GSJ	10–50	29·04	Ruysselede, Belgium	ORK	9
13·94	Wayne, New Jersey	W2XE	10	30·43	Madrid	EAQ	20
13·97	Daventry	GSH	10–50	31·09	Lisbon	CS2WA	2
15·51	Bandoeng, Java	PMA	40	31·26	Moscow	RAN	20
15·77	Bangkok	HS8PJ	5	31·27	Radio Nations	HBL	20
15·93	Bandoeng, Java	PLE	60	31·28	Philadelphia, Pa.	W3XAU	10
16·56	Buenos Aires	—	12	31·28	Sydney	VK2ME	20
16·86	Daventry	GSG	10–50	31·28	Huizen	PCJ	20
16·87	Bound Brook	W3XAL	35	31·32	Daventry	GSC	10–50
16·88	Huizen	PHI	23	31·32	Lyndhurst, Australia	VK3LR	1
16·89	Zeesen	DJE	5–40	31·35	Millis, Mass.	W1XK	10
16·89	Wayne, New Jersey	W2XE	10	31·37	Lima	OAX4T	10
16·90	Hong Kong	ZBW5	2	31·38	Zeesen	DJA	5–40
19·52	Budapest	HAS3	20	31·41	Podebrady	OLR3A	30
19·57	Schenectady	W2XAD	18	31·45	Zeesen	DJN	5–40
19·60	Daventry	GSP	10–50	31·46	Tokio	JZI	—
19·62	Buenos Aires	LRU	5	31·46	Suva	VPD2	2
19·63	Zeesen	DJQ	5–40	31·48	Jeloy	LKC	1
19·65	Wayne, New Jersey	W2XE	10	31·48	Schenectady, New York	W2XAF	25
19·66	Daventry	GSI	10–50	31·51	Skamlebaek, Denmark	OZF	6
19·67	Boston, Mass.	W1XAL	20	31·58	Melbourne, Australia	VK3ME	1·5
19·68	Radio Colonial, Paris	TPA2	12	31·58	Daventry	GSB	10–50
19·70	Podebrady, Prague	OLR5A	30	31·58	Rio de Janeiro	PRF5	12
19·71	Huizen	PCJ	20	31·63	Madrid	EAR	20
19·72	Pittsburgh	W8XK	40	31·8	Havana, Cuba	COCH	10
19·74	Zeesen	DJB	5–40	32·88	Budapest	HAT4	5
19·75	Hong Kong	ZBW4	2	38·48	Radio Nations	HBP	20
19·76	Daventry	GSO	10	48·78	Winnipeg	CJRO	2
19·82	Daventry	GSF	10–50	48·86	Pittsburgh	W8XK	40
19·84	Vatican City	HVJ	10	49·10	Daventry	GSL	10–50
19·85	Zeesen	DJL	5–40	49·18	Chicago, Ill.	W9XF	10
19·95	Moscow	RKI	25	49·18	Bound Brook	W3XAL	35
22·00	Warsaw	SPW	10	49·20	Johannesburg	ZTJ	5
24·52	Reykjavik	TFJ	7·5	49·26	Hong Kong	ZBW2	2
25·00	Moscow	RNE	20	49·31	Nairobi	BQ7LO	·5
25·23	Radio Colonial, Paris	TPA3	12	49·33	Lima	OAX4Z	15
25·27	Pittsburgh	W8XK	40	49·50	Philadelphia, Pa.	W3XAU	10
25·29	Daventry	GSE	10–50	49·50	Cincinnati	W8XAL	10
25·31	Zeesen	DJP	5–40	49·59	Daventry	GSA	10–50
25·34	Podebrady	OLR4A	30	49·67	Miami	W4XB	2·5
25·36	Lisbon	CS2WA	2	49·67	Boston, Mass.	W1XAL	20
25·38	Daventry	GSN	10–50	49·83	Zeesen	DJC	5–40
25·40	Rome	I2RO4	25	49·92	Podebrady, Prague	OLR2A	30
25·42	Tokio	JZJ	50	49·96	Montreal, Canada	CFCX	6
25·45	Boston, Mass.	W1XAL	20	50·00	Mexico City	XEBT	1
25·49	Zeesen	DJD	5–40	50·26	Vatican City	HVJ	10
25·53	Daventry	GSD	10–50	51·28	Maracaibo, Venezuela	YV1RB	·25
25·57	Huizen	PHI	20	51·72	Caracas, Venezuela	YV5RC	1
25·60	Winnipeg	CJRX	2	70·20	Kharbarovsk	RW15	20

Printed in England and published every Wednesday by the Proprietors, THE AMALGAMATED PRESS, LTD., The Fleetway House, Farringdon Street, London, E.C.4. Advertisement Offices: Tallis House, Tallis Street, London, E.C.4. Registered for transmission by Canadian Magazine Post. Subscription Rates: Inland and Canada, 17/4 per annum. Abroad (except Canada), 19/6 per annum. Sole Agents for Australia and New Zealand: Messrs. Gordon & Gotch, Ltd.: and for South Africa: Central News Agency, Ltd. Saturday, November 27th, 1937.

S.S.