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Some Notes on a Really Splendid Receiver and Our Listeners' Circle Feature

With care and skill, and with the assistance of a well-equipped laboratory, it is not difficult for experienced designers to produce first-class designs for home-constructors.

All these things are necessary in combination, however, for the absence of any one may result in mediocrity, and mediocrity spells failure in modern high-pressure radio journalism.

An Outstanding Design

But it is not in order to blow our own trumpet that we make these rather obvious remarks. That Wireless set designs are in fact of a high standard is proved by the number of constructors who follow them.

What we wish to do on this occasion is to draw readers' attention to an outstanding Wireless receiver. Our standard is a high one, and we believe we successfully maintain it; but at intervals the unceasing efforts of our Research and Design Department bear what we can only term as "spectacular" results.

After all, there is nothing very extraordinary about this. The same thing happens in other branches of human endeavour. For example, a noted shipbuilding firm, famous for the excellence of its ships and from the yards of which the cream of the world's vessels emerge almost as a matter of course, may design and build a ship having a performance which has been scientifically predicted.

Yet on the very first trials the vessel exceeds all expectations. Some fortunate chain of circumstances enables it to amaze even her designers. They confidently laid the foundations of a very good sprat, and are, to their delight, rewarded with a whale!

Thus with the "Ferrogang," which is described in this issue. Right from the beginning we knew that this would be a good set, and one which we could with every confidence urge our readers to build.

But it turned out to be considerably better than we anticipated. Expert readers can search for the explanation in an unusually happy coincidence of circuit and components, of valves and components, of the individual components themselves or a congregation of all these factors.

Anyway, it is safe to say that every single thing which bears upon the production of the perfect new design for those who "roll their own" was particularly favourable in this instance.

The "Ferrogang" is a grand set, and all who construct it will bring their listening right on to the brink of the future. We have only one regret, and that is that even if every Wireless reader built it, there would still be at least a few who would not experience the delights obtainable with this golden egg which has been laid by our technicians!

Commercial-Set Details

Again we have enlarged our Listeners' Circle feature in view of its most favourable reception by readers. It is clear that the majority appreciate to the full the policy underlying its presentation. For the sake of the others we will venture a few words of explanation.

The Listeners' Circle is for the guidance of those who buy commercial sets, but that is not all—far from it. Home-constructors, too, are interested in commercial sets, and we feel that the radio journal is incomplete which fails to keep its readers well informed of the progress made and the interesting products of British set factories.

We do not fear comparisons between factory-built sets and our home-constructor designs. On the contrary, we welcome them. There is so much more scope in home-construction than in the mass production of radio receivers that, if comparisons are made, they cannot reflect unfavourably on the home-constructor movement.

On the other hand, we realise that many of our readers have no time nor desire to build their own sets. We sympathise with them, for they miss...
Some Topical Tips

By A. S. CLARK

My notes last month about microphones and pick-up terminals proved rather opportune, judging by the amount of interest evinced just now in the subject of adding a microphone. One letter I have had tells how an enthusiast burnt out the valves in his battery set trying to connect up his "mike" in place of the extension loudspeaker.

Goodness only knows how he managed it, but there you are! If you stick to the pick-up terminals, no matter what you do, you will not run into the danger of doing any harm.

Surprisingly Sensitive

Incidentally, mention of extension loudspeakers in connection with microphones, leads me to enlarge on the subject of make-shift "mikes" which I introduced last month. A loudspeaker is, after all, fundamentally the same thing as a telephone earpiece, and is, after all, fundamentally the same thing as a telephone earpiece, and therefore can be used as a microphone in the same way.

Try connecting your extension loudspeaker across the pick-up terminals of your set, as shown in one of my diagrams. You'll be agreeably surprised at its sensitivity as a "mike".

In fact you may find it better than an ordinary microphone, with the added advantage that no local current or ordinary capacity 60-volt battery will be necessary when using the whole 60 volts, or desirable, to use the whole 60 volts, or desirable, to use the whole 60 volts, but that is a matter for experiment.

A hexagonal shaped knob is used to control the tuning condenser. Then, on three adjacent sides of it, flat springs are arranged so that at least one of them is pressed in when the knob is gripped. The movement of any one of the springs brings two contacts together which control the dial light.

Automatic Light Switching

Dial lights are things we expect on mains receivers, and they are all very well on battery sets when there are ample facilities for frequent recharging of L.T. accumulators. But when the latter can only be done at long intervals for one reason or another, one cannot afford the current to have them burning the whole time the set is on.

The obvious way out of the difficulty is to have a switch specially to control the dial light. But this always seems a somewhat laborious way out to me, especially when automaticism is such a feature of the modern receiver.

There is a lot of scope for the ingenious constructor in providing a more or less automatic dial light which only comes on when the set is being tuned. Here is one way it could be done.

For Television Sets

And now, changing the subject somewhat, but still keeping to battery sets so far as L.T. at least is concerned, here is a point for television enthusiasts. As you know, a big output is not necessary for operating a simple disc-type viewer, and the main reason why sets with a small output often do not give satisfactory results, is not one of insufficient volume.

It is one of insufficient H.T. voltage. This state of affairs can easily exist even with a mains unit in use for high tension. The second diagram on this page shows how to overcome it, and is just as suitable whether the source of H.T. is battery or mains.

Easy to Connect

Normally the neon tube of the television would be simply wired up in place of the loudspeaker, but in this case the connection of the L.S. plus is via an extra H.T. battery. An ordinary capacity 60-volt battery will be ideal, for the periods during which it will be working are short.

Of course, it may not be necessary, or desirable, to use the whole 60 volts, but that is a matter for experiment. Note that the negative of the extra battery is joined to the positive loudspeaker terminal.

The reason why the extra voltage of the battery improves matters is simply that it enables a sufficiently high voltage across the neon tube to be attained for the tube to strike properly. Unless a good glow is obtained before modulation is applied, distortion due to partial rectification may occur.
The cry of every radio listener nowadays is selectivity! More and more selectivity, for the rapid development of high-power stations, and the steady increase in numbers of transmitters is annually making the congestion of the broadcast wavelengths worse and worse.

Not so very long ago it was possible for a small battery set to pick out almost any station that was required without the designer of the receiver having to resort to such things as band-pass tuned filters and several stages of H.F. amplification. Superhets were almost unknown, and were rarely used owing to their bad effects upon the quality of reproduction, and the fact that they were by no means easy to build successfully.

EASY OPERATION AND PLENTY OF POWER

Now all sorts of schemes have had to be developed in order that selection of stations shall be made possible without the attendant disadvantages of high-note loss and difficulty of operation.

This has given the superhet a new lease of life, and it looks as if that type of receiver has come to stay. But there is no need to use a superhet unless you want to get practically every station in Europe with one dial tuning.

Many stations are not worth hearing, and the wise constructor will realise this when he sets out to build himself a set, especially if he has economy as one of his aims and is not able to build a mains receiver.

A Vital Problem

By far the majority of listeners have no electric supply available and have to use batteries, and to these the question of economy, especially in upkeep, becomes a very vital problem. For them a superhet is liable to be a serious drain on their resources, while a set of the more simple variety is often not quite selective enough for their requirements, or if it is, it is too difficult to handle for family use.

There is a great deal of difference between a set that will bring in scores of stations in the hands only of the expert of the household, and one that can be used easily and surely by any who may want a little radio entertainment.

Most households find it rather galling if their sets are dependent upon experienced hands for successful operation. They do not like to be limited to the locals just because the constructor of the set is not there to tune in that foreigner that they require.

The design of a set that will select plenty of foreign stations with simple control, and will give good quality with economy of running is not an easy matter. But it can be done, though its initial cost is necessarily greater than that of a super-selective set that needs plenty of experience for its operation.

I have often used the phrase that "one cannot get something for nothing," and it is true in radio as in every other phase of life. Selectivity costs money, and selectivity with ease of control costs even more.

That sounds rather frightening, perhaps, but it is true, though the "even more" need not be so very much if care is taken in the design of the set, while the extra cost is almost solely limited to the initial cost; there is no need for running expenses to go up by any noticeable extent.

It is a matter of opinion, of course, but I, for one, would rather pay twice...
the amount for a receiver that was a single dial tuning design, and perhaps not capable of getting quite so many stations, as I would for a multi-control job which wanted coaxing on every station, though it might never fail to get the required transmission.

I feel that though the latter set would be a huge delight to the owner it would be a thorn in the flesh of the rest of the family. Firstly, because the owner would always be fiddling with it while the set was fresh, endeavouring to get the utmost out of it, and so preventing the others from hearing a decent programme at any length. And secondly because, as I said before, they could not use the set except on the local without the aid of the owner. Such a set is usually a one-man receiver, and he would find that after a time he would tire of combing the ether for stations, and the set would settle down to a more or less local receiver. At this point he would be better off with a set such as we describe here, a set that any one can use, and which will enable the owner, or any of his family, to tune in at will a goodly selection of stations with reasonable sureness, and with complete absence of fiddling or coaxing.

Easy to Handle

Mind you, I may have summed up the psychology of the average listener and constructor wrongly, but such is my opinion. If you are one who does not hold with the view, then do not build the "Ferrogang" Four. It will be too easy in its handling, and you will become bored with its operation. It will give you no thrill of the pioneer that a more individual receiver will provide, and it will not give you every station in Europe. The "Ferrogang" Four will supply good reception from a very large number of stations, and it will be exceptionally selective in your hands, and in the hands of the rest of the household. But if you want to shine as the wireless wizard of the family you will not like the set, for it will make you out as little or no better than anyone else in the finding of transmissions.

On the other hand, if you want a really good, economical battery set that will give good quality reception of plenty of stations, and will do that whether you are at home or not, so that the wife and friends can use it and enjoy it to the full, then build the "Ferrogang" Four by all means.

It is not difficult to construct, and it is extremely easy to operate. One

**SUITABLE VALVES**

<table>
<thead>
<tr>
<th>CONSOR</th>
<th>1st H.F.</th>
<th>2nd H.F.</th>
<th>Det.</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hivac</td>
<td>220V.S.</td>
<td>V.S.215</td>
<td>H.E.10</td>
<td>Q.P.240</td>
</tr>
<tr>
<td>Mazda</td>
<td>215V.M.</td>
<td>V.S.215</td>
<td>H.L.2</td>
<td>Q.P.21</td>
</tr>
<tr>
<td>Osram</td>
<td>15V.S.</td>
<td>V.S.215</td>
<td>H.L.2</td>
<td>Q.P.21</td>
</tr>
<tr>
<td>Tungsram</td>
<td>V.S.3</td>
<td>V.S.3</td>
<td>H.E.3</td>
<td></td>
</tr>
</tbody>
</table>

Wavelength scale readings are provided by the four-gang condenser, which is made to team up with the inductances of the Ferrogang coil assembly.
knob tuning, with wavelength calibrated dial is provided, with & volume

H.F. valves operating as multi-mu amplifiers so that their anode currents increase on weak stations (when the volume control is “up”) and decrease on the local when less H.F. amplification is required.

These two ends of the set, the H.F. and the output, even things up pretty well as regards H.T. Of course, when weak reception of the local is desired one can economise to a very great extent, for the H.F. volume control will be “back” and the output valve will not be taking much anode current.

Using a Pick-Up

In addition a radiogram switch is incorporated in the set, it is integral with the coil unit design, so that the set can be used for playing of gramophone records as an alternative to radio. During the time when it is used in this way the volume control of the H.F. valves is turned fully back, cutting down the anode and screen currents of these valves almost to zero. A separate volume control for the pick-up is used external to the set.

This control was not included in the set as it was felt that many constructors would not want to use a pick-up, and the inclusion of the added component would be a needless expense. As it is those who do not want to make use of the set for gramophone work will have to purchase nothing extra save the two pick-up terminals, for the radiogram switch is incorporated in the coil unit, as already explained.

No Alterations

Further, if they at any time feel like adding the pick-up side they can do so without any alteration whatever to the set. The construction of the set is carried ‘out on the well-known metallised wood chassis scheme, which enables YOU NEED

<table>
<thead>
<tr>
<th>YOU NEED</th>
<th>Note the four-gang Ferrocart coil assembly which also incorporates pick-up and on-off switching.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Polar Minor 4-gang tuning condenser, each section 0.005 mfd.</td>
<td>1 Dubliler 500-ohm resistance 1-watt type.</td>
</tr>
<tr>
<td>1 Colvern Ferrocart coil unit, types G.10, G.11, G.12, G.13.</td>
<td>1 Graham Farish 0000-mfd. Little reaction condenser.</td>
</tr>
<tr>
<td>1 Clix 7-pin chassis mounting valve holder.</td>
<td>1 Varley 50,000-ohm potentiometer, type C.P.159.</td>
</tr>
<tr>
<td>1 Clix 4-pin chassis mounting valve holders.</td>
<td>1 Peto-Scott “Metaplex” chassis, 10 x 10 in. with 3-in. runners</td>
</tr>
<tr>
<td>1 Wearite H.F. choke, type H.F.P.</td>
<td>1 Peto-Scott 50-mil. panel, 10 x 10 in.</td>
</tr>
<tr>
<td>1 Bulgin Midget screened H.F., type B.P.S.</td>
<td>1 Peto-Scott 5-mil. terminal strip, 10 x 3 in.</td>
</tr>
<tr>
<td>1 Graham Farish Quip Q.P.P. input transformer.</td>
<td>1 Clix accumulator spades.</td>
</tr>
<tr>
<td>T.M.O. Radio 1-mfd. fixed condenser, type 24.</td>
<td>1 Clix wander plugs.</td>
</tr>
<tr>
<td>2 Dubliler 3-mfd. fixed condenser, type 4603.</td>
<td>1 Dubliler 500-ohm resistance 1-watt type.</td>
</tr>
<tr>
<td>2 T.C.C. 1-mfd. fixed condenser, type 253.</td>
<td>1 Dubliler 0003-mfd. fixed condenser, type 34.</td>
</tr>
<tr>
<td>2 Dubliler 001-ohm, fixed condenser, type 670.</td>
<td>1 Dubliler 0005-mfd. fixed condenser, type 24.</td>
</tr>
<tr>
<td>1 T.C.C. 00005-mfd. fixed condenser, type 24.</td>
<td>1 Dubliler 0005-mfd. fixed condenser, type 670.</td>
</tr>
<tr>
<td>1 Dubliler 0003-mfd. fixed condenser, type 630.</td>
<td>1 Dubliler 1-mfd. grid leak 1-watt type.</td>
</tr>
<tr>
<td>2 Dubliler 11-watt Ohmite 100,000-ohm resistances in vertical holders.</td>
<td>2 Graham Farish 11-watt Ohmite 50,000-ohm resistance in vertical holder.</td>
</tr>
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</table>

ACCESSORIES.

BATTERIES

H.T. 120 volts Ever-Ready
L.T. 2 volts Edison
G.B. 9 v. to 18 v. Ever-Ready

LOUDSPEAKER

W.B. “Stentorian” with Q.P.P. tappings on transformer.
compactness and efficiency to be combined. The construction is easy, and
the wiring quite straightforward. No soldering is used, and the fact that
the coil unit has coloured leads coming out from it makes the connections of
this section of the receiver particularly simple. As a matter of fact, many of
the necessary coil connections are already carried out by the makers of
the unit, and only the external leads (to valve holders, earth, and tuning
and reaction condensers) are left for the constructor.

Mounting the Gang Condenser

It will be noted that the variable condenser unit is fixed down by four
bolts and nuts through the chassis, instead of the usual wood screws.

This is to ensure that the top and under surfaces of the chassis are well
and truly bonded, for many of the earth connections of the set are made
via the metallising.

With the set completed, the wiring should be most carefully checked, for
a slip may cause bad or no results, and the whereabouts of the mistake in a
receiver of this calibre is not always easy to discover.

Of the H.T. positive taps, the H.T.+1 is taken to 80 volts H.T. and
the other is placed in the maximum voltage, either 120 or 150 volts. The
former is quite enough for dry battery working, but if a mains unit is em-
ployed the latter will probably be used.

Grid-Bias Voltages

G.B.-2 will not be required if a pick-
up is not used, but if the latter is
desired then the plug should go into
1.5 volts of the G.B. battery. The
G.B.-1 should give up to 9 volts and
should be tested in varying voltages
till one is found when the volume
control enables the H.F. valves to be
turned right down to give practically
inaudibility on the local station.

The G.B.-3 will require about 7.5
or 15 volts, this varying somewhat
with the different makes of output
valve. The makers recommendations
should be followed in this respect.

Naturally, the voltage will have to be
increased to about 9 or 15 volts if
150 volts H.T. are used instead of
120 volts.

With valves in position and the
various connections made to aerial,
earth, etc., the operation of trimming
should be carried out. This is quite
easy if you start with the trimmers
screwed right in and then loosened
about one and a half turns.

Trim on a weak station as near the
bottom of the medium waveband as
you can, shifting to another weaker
station if the one you start on becomes
very loud. Keep the volume down by
moderate use of the volume control
and use reaction so that the set is just
not oscillating.

Trimming will be very sharp, and
plenty of time should be taken over
the procedure. It must not be rushed
on any account, for on its accuracy
depends the selectivity and sensi-
tivity of the set.

For use with the " Ferrogang " Four
a loudspeaker with a Q.F.P. tapping
on the transformer must be employed,
and the three loudspeaker terminals
of the set are taken to the three ter-
minals on the transformer, the red
terminal on the set going to the centre
of the three terminals on the loud-
speaker.
A radio set is full of curious and interesting effects. For instance the loudness of an orchestral item or a speaker's voice affects the current supplying the cathodes or heaters. Only to a very small extent, but it does so though I am going to leave readers to figure out the reason why for themselves.

No, I won't even answer letters on the subject!

A Leaky Condenser

But look at the first diagram. This shows a part of a resistance-capacity-coupled amplifier. You all know what an important and vital job is carried out by the coupling condenser. But surely a current of such a low order as four microamps could do no harm? Ah, but wait!

The effect of a leaky coupling condenser can be understood by reference to this diagram.

But do you know how it does this? If you figure out the circuit it would appear that a leak in the coupling condenser would cause a current to flow from the negative terminal of the H.T. battery up through the grid leak, through the coupling condenser and the coupling resistance and so back to the positive terminal of the H.T. battery.

Now the grid-bias battery is so connected that it adds to the flow of this leaking H.T. current to the grid leak.

Normally appreciable current does not flow from the grid-bias battery if the valve is working properly. We will presume that the grid-bias voltage is 4.5.

Our faulty coupling condenser has a resistance of thirty million ohms. That sounds pretty high, but we shall find it not so high that it can't cause trouble.

As the condenser has developed a leak a new circuit for the H.T. current to flow through is formed.

This comprises the grid-bias battery, the grid leak, the coupling condenser and the coupling resistance. The total resistance of this path is 31,100,000 ohms plus the few ohms of the internal resistance of the G.B. battery, and the H.T. battery. (I say "few," and comparatively it would only be a few providing the batteries were fairly well up to scratch.)

Current and Resistance

There is a pressure of 124.5 volts to drive current round this thirty-one million one hundred thousand ohms path. Ohms Law tells you that this would mean a current flow of approximately four millionths of an ampere. In other words four microamps.

But surely a current of such a low order as four microamps could do no harm? Ah, but wait!

The grid leak has a resistance of one-million ohms and if four microamperes flow through it there must be a potential of four volts across its two ends. Ohms Law again. (Let me remind you that Ohms Law states that resistance multiplied by current equals voltage.)

The grid leak is joined across the grid and filament of the valve, so it is clear to see that our faulty coupling condenser has caused a potential of four volts to be applied to the grid.

But it is a positive potential and so opposes the grid bias, which is four and a half volts, although the grid-bias battery helped to produce that current.

Therefore, it cuts the effective bias on the grid down to half a volt. You can think of four volts pushing one way against four and a half volts pushing the other way.

What happens now? The grid bias is a mere half-volt negative, instead of four and a half. When anything of an impulse at all is fed on to the grid of the valve by the broadcast energy the grid tends to go positive.

WHAT HAPPENS?

Does that help the little electrons on their way to the grid and increase the H.T. current? No, the electrons, or a proportion of them are attracted to the grid and accumulate on it. And when a bunch of superfluous electrons get together you have a negative charge.

So the grid becomes negative, too much so, and opposes the electron stream blithely starting off on its way from the filament to the anode.

Grid Choking

The H.T. falls, there is a choking effect, of a periodic type, and there is that curiously soft popping or dying away of signals which follows a grid choking condition.

What a strange train of effects that is, isn't it? A wandering H.T., assisted by the grid bias, plants an unwanted positive potential on the grid of a valve which cuts down the standing grid bias to a low figure, which makes the grid so negative that it chokes! The grid-bias battery helps to cut itself down!

(Please turn to page 140.)
The value obtained in a modern receiver really is amazing. The number of outstanding features that are to be found in any good make of set is nothing short of remarkable, so much so, in fact, that it is impossible to give them all more than a superficial mention in an ordinary review of any one receiver.

But to keep the reader thoroughly up-to-date in all the details of the various receivers available to him is one of the main aims of the Wireless Listeners' Circle, and so we were very busy during the few weeks immediately before Christmas thinking out a scheme that would put before readers a number of excellent designs, and at the same time do full justice to some of the high lights of present-day receiver design.

If you will glance for a moment at some of the titles to the pages subsequent to this article—"Fluid-Light Tuning," "Automatic Noise Suppression," "Universal Mains Operation" and so on—you will get an idea of the features with which we wished to deal. But the problem was how to relate these features directly to various models in which readers were likely to be interested.

Tested by the Public

That we solved the problem you will agree, for the "Circle" this month, besides dealing with eight of the outstanding features of modern sets, also covers in an intimate manner eight complete receivers of different types and makes.

When we say "intimate," we mean that the set reviews are not simply write-ups from catalogues, simply stating facts that anyone can read for themselves in the makers' publications. Neither are they highly technical reports full of figures on overall gain and frequency response.

A special monthly feature devoted entirely to the interests of users of commercially-made receivers.

Rather, we have endeavoured to get at first hand the genuine impressions of quite ordinary listeners. Of course, essential things like the type of circuit, price, etc., of each receiver are given, but for the most part we have confined ourselves to the sort of facts that any prospective purchaser would want to know.

And to ensure that the right point of view is obtained, and not the point of view of the expert alone, we invited eight different listeners to conduct personal tests of one receiver each.

While commenting on the set in general, each listener was asked to keep one particular feature that was ably demonstrated by that set in particular in the fore-front of his mind. Thus the eight points chosen were fully investigated in particular in their relation to modern reception practice, as well as the eight different set designs.

Not Radio Experts

None of the people who were invited to do the tests was in any way connected in a professional capacity with radio; nor had any of them sufficient experience in the practical side of radio, or its theoretical aspects, to be considered in any way expert.

No; they were all just ordinary individuals with a genuine interest in radio. They included amongst their numbers an automobile engineer, insurance inspector, accountant, bank clerk, traveller and...
shipping manager—all people likely to give valuable but unbiased opinions of the receivers.

With these people trying out the receivers, the reader is enabled to obtain an impression of the sets just as though he had tried them out for himself. Each of the people who have kindly co-operated with us in producing this month's "Circle," has had the set with which his report is concerned in his own possession for a period so that he has been able to try it out under true home conditions.

Unbiased Reports

It is largely this aspect of the tests that makes them so useful as a guide to the reader. Those who have tried the receivers have no reason to praise them against their better judgment, and have given genuinely unbiased reports. That they should all be so full of praise for the sets is a high tribute to the consistent quality of the modern commercially produced designs.

And now let's turn to the "special feature" aspect of the tests this month. The features chosen are characteristic of modern receivers in general, and are associated the various items with designs that illustrate them particularly well, and in which they are specially outstanding features.

A Wide Variety

For instance, there is "Automatic Noise Suppression." This is dealt with in connection with an Ekco receiver, and in the particular form in which it is associated with this set, it is an exclusive feature. At the same time, schemes which reduce the noises in between powerful stations are present on quite a large number of modern superhets. True they have not the same range perhaps, nor the flexibility, but the fundamental idea is there.

Then, to take a less particularised item, namely, record reproduction. This has been coupled with the Amplion Radiolux Radiogram. Obviously good record reproduction is not exclusive to this outfit, but at the same time it so ably puts forward all that is best in the electrical playing of records.

While dealing specially with the Amplion Radiolux Radiogram, the advantages of the radiogram type of instrument over an ordinary receiver are emphasised. Thus, once again, the article serves a dual purpose. This dual nature of the eight tests greatly increases their value, and makes for interesting, novel and valuable reading.

Briefly, what we want the reader to understand is that because one special feature is dealt with in the report of each set that is by no means the only fine feature of the design, nor is it necessarily an entirely exclusive feature to that receiver. In demonstrating the various items to those making the tests we simply chose receivers that each ably demonstrated one of the items.

A glance at the group photograph on this page of all the eight sets described shows the variety of types amongst them. Quite a good selection of circuits is also represented.

There is a radiogram, a floor model console, a mains transportable, a selective receiver of the straight circuit type, two battery models and two table consoles.

Almost a Complete Guide

It is an interesting fact that "The Circle" this month is almost a complete guide to a good receiver for almost anyone. The variety of receivers is so wide that there is a type to suit practically any taste and any set of conditions. And
FLUID LIGHT TUNING

Details of a listener's experiences during a week-end test of the H.M.V. Model "442"—the "Superhet Fluid Light Five"—and his impressions of Fluid Light Tuning.

H.M.V. really led the movement that popularised visual tuning indicators with their system of Fluid Light Tuning. Those of us not conversant with the theory or the practical aspects of visual tuning may wonder why it has "caught on so..."

The need for it was greatly accelerated by the introduction into modern receiver parlance of Automatic Volume Control, which, incidentally, is dealt with on another page.

A.V.C. does its best to keep reception at a certain volume the whole time, so that as a station becomes weaker due to de-tuning, the reproduction is kept at a certain volume the whole time, and this is dealt with on another page.

The theory or the practical aspects of visual tuning.

Road, Westminster, explained them to us right into his report.

The trouble is really in the ear, which requires a big change in volume before it can appreciate a difference. But the eye notes the change in a visual indicator immediately that any local conditions, which, of course, upset the eye.

Accurate Adjustment

The problem is really in the ear, which requires a big change in volume before it can appreciate a difference. But the eye notes the change in a visual indicator immediately.

Because of the high degree of selectivity noted these days, the cut-off on either side of the tuning resonance curve of a set must be very sharp. Consequently the hand reception is upset when a station is partly off tune, and quality suffers in consequence.

Those are the facts as we explained them to Mr. L. N. Wood, of 91a, Grosvenor Road, Westminster, when we handed over the H.M.V. "Superhet Fluid Light Five" for him to test out at his leisure.

When we called at a later date to hear how he had got on, we were surprised to be told that the house was lighted by gas. The H.M.V. Model "442" being an all-mains receiver, we were just going to put a puzzled question when Mr. Wood explained.

"I have been spending the week-end with a friend who has electric mains, and took the receiver along with me so that we could give it a thorough try-out together," he said.

And then, with further to-do he plunged right into his report.

"Like a Liquid"

"After your explanation of Fluid Light Tuning, I was very anxious to see it working for myself. At first I was puzzled by the name, but now I know it is very apt, for the green light is just like liquid moving up and down amongst my figures and letters—it's such a fascinating feature."

Mr. Wood is shipping the Superhet Fluid Light Five to a friend who has electric mains, and took the receiver along with me so that we could give it a thorough try-out together.

Mr. Wood turned to his receiver along with me so that we could give it a thorough try-out together.

But he soon set our minds at rest on this point when we queried it.

"A Fascinating Feature"

"You see," he explained, "I took it for granted that I should get a tremendous number of stations on a high-class set like this, and certainly did have to try it out on a rather poor aerial, there were so many stations, powerful and small, near and distant, that I simply did not bother to count them or take a note of them."

"I do appreciate this, as you explained, quality can be affected by static interference, and that is what A.V.C. is all about."

"As you explained, quality can be affected by static interference, and that is what A.V.C. is all about."

"And," he continued, "I think attractive appearance is very important, because everyone who is a prospective purchaser cannot be termed a radio enthusiast at least not until they have handled an H.M.V. set.

"This idea," said Mr. Wood, pulling out the volume control, "is a jolly good one, and a novel method of bringing the static suppression into operation.

Perhaps we had better explain for the benefit of readers what this static suppression feature is."

The volume control knob has two positions, pushed in and pulled out, and in either position it turns backwards and forwards, increasing volume as it is turned in a clockwise direction. When the knob is pulled in, the set is adjusted to maximum sensitivity for the reception of strong stations. When the knob is pushed in, the set is tuned to any station.

But when it is pulled out only the more powerful stations come in, and with the same setting all the static clicks which usually accompany weak stations are cut out. Silent tuning between the stations is achieved.

There is a knob at the back of the set so that the volume at which the station cut-off commences can be varied beforehand to equal the amount of static interference that is being experienced. Thus, the static suppression can be adjusted to suit any local conditions, which, of course, upset the eye.

"When you want something good to listen to," said Mr. Wood, "the static suppressor prevents you from being kept waiting time on stations of no programme value."

So far Mr. Wood had said nothing about the number of stations received, and we wondered if perhaps he had been disappointed in this connection.

"I have been spending the week-end with a friend who has electric mains, and took the receiver along with me so that we could give it a thorough try-out together," he said.

By then it was time for us to depart, and we made our exit to the accompaniment of a final remark from Mr. Wood.

"You know when I'm at work I can see that little green streak of light bobbing up and down amongst my figures and letters—"it's such a fascinating feature." Mr. Wood is shipping manager to a firm of glass manufacturers.

SOME TECHNICAL POINTS OF THE "442"

A five valve (including rectifier) superhet circuit is employed. The receiver is fed by Fluid Light Tuning. The separate tuning scales are calibrated in wave-lengths and a chart is provided. Provision is made for the use of a pick-up and two external loudspeakers. The volume control knob operates both radio receiver and gramophone, and at the same time operates as a stock motor. The price is £131 guineas, or it may be had for a first payment of £5 15s. 6d. and 12 monthly payments of £1 2s. 9d.
February, 1935

**Wireless**

We found Mr. Gordon Laidlaw at Violet Loraine, Acre Lane, Carshalton. This good, old building was once the residence of that great artist, Violet Loraine, and seemed to make an ideal background for a test of a true exponent of modern art—the Ekco "A.C.85."

**Striking Features**

Mr. Laidlaw, who is an Automobile Technical Engineer, had made a thorough job of his test of this eight-stage superhet receiver, and had much to tell us. We did not need to ask questions, but just sat back and listened as he unfolded his impressions.

"Excellent!" was his first comment, followed by a pause, while the match flickered over his favourite briar. And then, "There are three features which struck me most about the set. Selectivity and silent tuning; tone and volume; ease and certainty of operation." He began to explain how soothingly meditatively into the air and then proceeded to enlarge in detail on his impressions.

"The cabinet is a great improvement in my opinion over those of orthodox and conventional design. I think the architect who designed the cabinet deserves considerable credit for his work.

"And then there is the station presence on my scheme. I find that this can be made to pick out the transmissions of programme value automatically."

We must interpose a few remarks here to explain the working of the Station Frequency Suppression Control. This is a tremendous advance in simplified tuning which gives complete silence between stations.

**Reducing Interference**

By adjusting a small knob the strength which individual stations must reach before they can operate the receiver is varied. This applies to both noise pulses as well as programme pulses.

Background noises while tuning between stations can thus be progressively suppressed; so that unless reception from any given one is sufficiently good to be of real "programme value," that station is automatically silenced.

There is one position in which the suppressing effect does not take place, and in which all stations within the range of the set are receivable.

**Automatic Noise Suppression**

A Carshalton listener enjoys himself with the Ekco Model "A.C.85" Superhet, and then tells, for the benefit of readers, what he thinks of it.

"And now I must come to the question of my impressions of the tuning arrangements. Let me make it quite clear right away that I think the dial, with its three positions, enables just that little personal touch to be made which completely suits the tone to individual preferences.

"The sweetness of the controls is remarkable, and the colour code method of indicating on which band the set is working is extremely simple. Then, of course, there is the advantage of the Automatic Noise Suppressor."

"This latter control is without doubt a tremendous feature of the design. The lack of interference and background noises when this control is set to the "strong" position is most impressive.

**The "Local Setting"**

"Although I have had to work on a small indoor aerial, I can honestly say that I have heard practically all the stations which are named on the dial. With an average aerial there should be no difficulty in getting every one of them with certainty.

"Before leaving the question of Automatic Noise Suppression, there is a feature of it that deserves bringing out. By turning the control so that the position of transmitters will be received, namely the local programmes, the set becomes as easy to tune as a simple crystal set. It is, then, a local receiver pure and simple.

"Set in this manner it is ideal for old people to handle, for they can turn to one or the other local programmes without having to read the names on the dial, and one is not muddled up with all the foreign stations that would otherwise come in.

"There is only one adverse criticism that I can make, but it is really rather a minor one, and one from which a great many of today's sets suffer. I think it takes too long to warm up when it is switched on.

"Now let me see, what comes next? Ah yes, volume.

"This is one of the controls that appeal to me, for it is dead silent in operation and feel firm and definite to the touch. Also the Noise Suppressor, unlike some modern sets, is not complicated, and it is easy to gauge how to get the most from it.

"At this point Mr. Laidlaw summed up, saying that he was going to miss the set, as the compact and modern design, very much.

"Thank you ever so much for giving me the opportunity of trying it."

**Automatic Noise Suppression**

1. Pilot light.
2. Mains-voltage adjustment panel.
3. Loudspeaker mounted in cabinet.
4. Rectifier valve.
5. Pentode output valve.
6. L.F. amplifier valve.
7. 2nd detector valve.
8. I.F. amplifier valve.
11. External speaker sockets.
12. Tone control.
13. Second-channel adjustment.
14. Earth socket.
15. Aerial socket.
16. Speaker plug.
17. Internal speaker switch.
18. Serial number.
19. Mains lead.

**The "A.C.85" Chassis Explained**

[Diagram of Ekco "A.C.85" Chassis]

- The circuit is an eight-stage superhet arrangement with band-pass tuning. Full delayed and amplified A.F. is incorporated and provision is made for pick-up and external speaker.

- In commenting on this control, Mr. Laidlaw said, "I consider the fact that it is continuously variable to be a good point, because the opinion of listeners and clarity constitutes a transmission of programme value varies with the individual's taste. The receiver can be set beforehand for any minimum volume desired.

- "Although I like the idea of black and chromium finish in preference to walnut. And I think the unique appearance it imparts to the receiver is well worth the extra half-guineas.

**Automatic Noise Suppression**

- The tone of reproduction would be excellent even without the tone control that is provided. But the little plug at the back of the set, with its three positions, enables just that little personal touch to be made which completely suits the tone to individual preferences.

**Automatic Noise Suppression**

- The "Local Setting" is a tremendous advance in simplified tuning.

**Automatic Noise Suppression**

- The sweetness of the controls is remarkable, and the colour code method of indicating on which band the set is working is extremely simple. Then, of course, there is the advantage of the Automatic Noise Suppressor.

**Automatic Noise Suppression**

- The cabinet is a great improvement in my opinion over those of orthodox and conventional design. I think the architect who designed the cabinet deserves considerable credit for his work.

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The sensitivity of modern mains receivers is usually taken for granted, even by the non-technical. At the same time, the degree of sensitivity attained in receiver design to-day is really phenomenal—something to marvel at, in fact!

**An Impressive Set**

So as to illustrate this feature to its full, we decided that a three-valve battery set would be the most impressive for its demonstration. Economy of high-tension current is essential in an efficient battery receiver, and many people imagine that this must lead to a tremendous curtailment of the stations available.

That this is an entirely erroneous impression could not be better proved than by the Atlas 345 battery receiver. The "ordinary listener" chosen to try out this receiver was Mr. J. Herd, a bank clerk of 60, Mitcham Lane, Streatham.

So impressed was he by the set, and so much had he to say about it, that it is impossible for us to report it verbatim. All we can hope to do is to give, in condensed form, an account of his impressions and the results he obtained.

**Very Economical**

First of all, there is the question of sensitivity. When Mr. Herd learned that the set employed three pentode valves, he immediately wanted to know what the H.T. current consumption was, expecting to find it rather on the high side. But he was very agreeably surprised to find that it was only 7-10 milliamps.

**Sensitivity**

An account of the results obtained by Mr. J. Herd of Streatham, in a test of the Atlas "345" battery receiver.

On switching on and handling the controls, two things struck him immediately. The first was the quality of the foreign stations, and the second was the effectiveness of the trimmer in sharpening up the tuning and in completely isolating the desired station.

He remarked to us in this connection that selectivity was very good.

**MAIN SPECIFICATION**

The Atlas "345" is an economical 3-valve battery receiver employing pentodes throughout. It is provided with a moving-coil speaker, sockets for extra speaker, gramophone pick-up points and exclusive tilting dial. The price without H.T. battery or accumulator is £7 10s. 6d. cash or deferred payments of 15s. down and twelve monthly payments of 13s. 6d.

**Plenty of Alternatives**

As a matter of interest we ran quietly over the medium-wave dial together, counting the number of transmissions that reached programme value with reaction permanently at zero. Ignoring weak stations, and stations which experienced interference from others, we counted eighteen in all—a truly remarkable number of alternative programmes.

And having said sufficient about the sensitivity of the set, we will pass to some of the other points mentioned by Mr. Herd. He considered that quality was excellent, and found that the speaker would take full power without showing any signs of distress.

He explained that if he had not heard this set, he would have been convinced that a three-pentode receiver, taking only seven or so milliamps, would be bound to suffer in regard to quality as a consequence of the economy effected. And while on the question of H.T. he said that he thought it was a distinct advantage that a standard type of high-tension battery could be employed.

**Easy Tuning**

Then he mentioned the tilting dial, which is an exclusive Atlas feature. If the set is arranged at a convenient height for tuning when sitting down, it becomes necessary under normal conditions to stoop considerably to tune while standing.

All this, as Mr. Herd remarked, is obviated by the tilting dial, which ensures comfortable operation no matter what position is adopted.

Altogether Mr. Herd found it a most excellent receiver. "I must have ' played ' with it for hours," he concluded, "tuning in first one station and then another, or listening to some musical item that took my fancy. It is an essentially practical design throughout."
AUTOMATIC VOLUME CONTROL

Some interesting tests conducted with—

Mr. H. Gregory, of 15, Nimrod Road, London, S.W.16, who conducted the "home test" on the G.E.C. "Console Superhet A.V.C.5" receiver, is a traveller in small articles of furniture. It was therefore quite natural that his first comments when we asked him what he thought of the receiver he had been trying out, were in connection with the cabinet.

"It is a most attractive design, and the finish is really first class. Incidentally my fiancée simply fell in love with it immediately, and has decided that she will have one of these sets in our home. And she certainly will not experience any objections from me!"

Impressive Comparisons

"But to get down to more 'radio' aspects of the receiver, you asked me to pay special attention to the question of Automatic Volume Control, and so I will deal with that first.

"My own all-mains receiver is not provided with it, and so I have been able to make some rather impressive comparisons. They have certainly proved to me that its value is inestimable."

"Of course, it cannot be expected to work on very weak stations, but then fading does not matter on these as they can hardly be said to have 'programme value.'"

"Where it is so valuable, is on a powerful station whose programme...

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WHAT A.V.C. DOES

Automatic Volume Control performs two duties. It tends to keep all stations down to one volume, and so avoids "shouting" when passing a local station while tuning, and also it tends to prevent fading effects on distant stations which are loud enough to attenuate "programme value."

To prevent the A.V.C. affecting the set's sensitivity when receiving weak stations, it is delayed. This prevents it coming into operation until a certain strength is reached by the station being received.

In the G.E.C. set described on this page, the A.V.C. is amplified as well as delayed, so as to ensure ample control through a wide variation in the strength of received "signals."

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value is normally spoilt simply because it fades. With A.V.C., such a station becomes another to be added to the list of alternative-programme providers.

"By switching over from such a station that fades on my own set, to the same station on the G.E.C. Console, I was able to appreciate just how much A.V.C. does do. And it's certainly quite a lot!"

"I don't think there is anything more about it that I need say. You see, although it is such an important feature, it does its work so well on this set that there are no 'ifs' or 'buts' to be considered in its connection. Its effect is a simple and straightforward one which nevertheless effects a profound improvement on foreign station reception."

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The Three Sets

At this juncture we remarked that we were surprised to see that Mr. Gregory had two other sets connected up besides the G.E.C. Console.

"Yes," he said. "One is my own and the other is one which a friend has just bought and has lent me to try out. I have got them all connected up, so that they can all be worked together."

"As a matter of fact, this arrangement has led to some interesting comparisons of their quality. Without a doubt, the G.E.C. scores top marks. Its bass response is really terrific."

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Easily Distinguishable

"With two of the three working you can tell immediately whether the G.E.C. is on or not, although it is by no means so easy to distinguish between the other two. You can tell by the added bass as soon as the G.E.C. is switched on."

"But the bass is not like the false bass given by some sets. If there is no bass instrument in the item being broadcast, for all you can tell, the set might not be capable of reproducing bass at all, which I think is a most creditable performance."

"What do you think of the tone control?" we asked Mr. Gregory.

"I find it most effective in removing background noises when they are bad, and it is also quite useful when a station comes in with a whistle on top of it."

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Remarkable Sensitivity

"You mean when two stations are heterodyning one another?" we queried.

"Yes, I believe that is the technical way of putting it," he replied.

"You mentioned background noise just now," we said. "Do you like the effect of the selectivity control?"

"Yes, very much indeed," was the reply. "I think that is one of the chief features of the receiver. And another is the method of illuminating the tuning scales with different coloured light according to the waveband in use."

We had noticed that Mr. Gregory had the aerial unwound and slung up to the picture rail, and asked him if he had tried it wound up on the back of the set.

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THE SET IN BRIEF

The circuit is a band-pass super-heterodyne arrangement of five valves, one being the rectifier. A sensitivity control is provided for obtaining reduced background noise when tuning between stations.

Only the waveband in use is illuminated on the full vision tuning scale, a green light being employed for medium waves and red for long.

A.V.C. is incorporated and sockets for pick-up and extension loudspeaker are provided.

There are four controls in all, namely, tuning, tone, volume and wavechange/promaphone.

The price is 17 guineas, and hire purchase terms are available as follows: Deposit 30/- and 12 monthly payments of 30/-.

"I have, as a matter of fact," he answered, "and I was able to get a surprising number of stations with it like that. I would be ready to back this set against any other present-day set of equivalent design."

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111
The wire on the right-hand side of the set is used to connect the receiver with the mains, and the wire on the left-hand side is used to connect the set with the aerial. The aerial wire is black, whereas the mains wire is red. The receiver is designed so that it can be used with either D.C. or A.C. power, and the model number is 405. The set is compact and easy to transport, making it ideal for use while on holiday or while visiting friends. The receiver is well-screened, and the power supply is designed to be simple and effective. The calibration of the set is accurate, and it is possible to get all the stations that the receiver is programmed to receive printed on the dial.
Mr. J. Critch of 5, Smedley Street, Clapham, describes the Philips 472A, 6-Valve Superinductance Receiver and gives an account of his impressions of it.

"COME and have a drink," was Mr. J. Critch's first remark. "I feel I owe you one for giving me the opportunity of trying out such a thoroughly up-to-date design."

Mr. Critch, who lives at No. 5 Smedley Street, Clapham, and is accoutumated by profession, had been trying out the Philips' Type 472 A 6-valve Superinductance Receiver.

"You know," he said, "what I particularly like about the set is the original lines on which it has been designed. It literally bristles with novel features."

***WHAT THE SET IS***

The Philips Model 472A receiver is a 6-valve set for A.C. mains, the superinductance construction giving exceptionally silent background. Four pentodes are used, and it is provided with A.V.C., provision for gramophone pick-up, and also for an external loud-speaker, with a switch for cutting out the built-in loud-speaker. The Price is 15 guineas, or twelve equal payments of £1 9s. 6d.

And then he gave us an order.

"Make a note of those which particularly pleased me," he instructed, and then continued, "Your readers will want to know, and will then appreciate just how the set "shapes" in the eyes of an ordinary listener."

This, of course, was just what we wanted and so we hastened to produce the necessary pencil and paper.

"Now we go," said Mr. Critch. "First of all there is the circuit. I find it refreshing to find a powerful multi-valve set with a straight circuit instead of a superhet arrangement. Not that the Philips circuit is in any way ordinary. It seems very ingenious to me, and, judging by the results, the superinductance principle must be pretty efficient. But I'll tell you more about that in the results in a minute."

***Mains Safety***

"The next point is the wide range of voltages on which the set will work. These cover from 100 to 260 volts. And I see from the catalogue that although the model I have been trying is for A.C. mains only, there is a universal model available for a guinea extra."

"Then there is the safety mains connections which are automatical when the back of the set is removed. These prevent all possibility of shocks."

"Don't be surprised that I know all about these points," he continued. "I have been studying the set, the instruction card, and the specification details very closely. I think the set is just about as safe as it can be."

Another outstanding feature is the provision of two separate calibrated dial plates, one with nearly all the stations the set will cover from 100 to 260 volts, and the other with those stations of interest which can be expected to come in well at true programme voltages.

"This is the circuit of the 472A, supplied to us by the makers. Note the four tuned superinductance coils, the first two of which form a band-pass arrangement. Incidentally the suppressor grids of the four pentodes are shown on the voice symbols."

This is due, as we pointed out to him, to a special potentiometer coupled up to the tuning control.

"And now," Mr. Critch remarked, "let me see if there are any points which I have not mentioned. Yes, there are one or two. There's the question of quality."

"This is performed in any way of thinking. Of course, different people prefer different toned reproduction, but that's where the tone control comes in. This enables just the degree of top to suit any taste to be obtained in a moment."

"It has an ' important ' look," is how Mr. Critch describes the appearance, which we feel sure readers will agree is a most apt verdict."

And speaking of the controls, so long as the dial charts are correctly inserted, their calibration is very good. I also like the idea of having the wave-change switch knob and tuning knob cored.

***Using a Pick-up***

"There is still one other point about the controls that to me seems important, or, if not actually important, at least attractive. It concerns the volume and tone adjusting knobs."

"Both of these operate on record reproduction when a pick-up is being used with the receiver. In these conditions the tone control is very valuable in adjusting the set to work well with whatever pick-up one wishes to employ."

"On my pick-up I found it best to set the control a little on the 'bright ' side of a t a ' f position."

"And to revert to the radio side of the set. The station identification chart that is supplied with it is a most useful feature."

This chart shows the principle European broadcasting stations in alphabetical order, and gives their wave-lengths, frequencies, powers and geographical positions.

"It Grows on One"

"My report would not be complete without some remarks about the appearance of the receiver. I was not sure whether I liked it or not at first, but it has turned out to be a design that grows on one, and I now like it very much. It has an 'important' look."
"You certainly chose the right person for this test," said Mr. J. Rose, of 10, Fairmile Avenue, Streatham, S.W.16, when we called on him to discuss the Amplion Radiolux Radiogram. "You see, I am a record enthusiast—what the high-brow would call a grammophile. But I'm afraid my tastes are not particularly high-brow.

"Record broadcasts," he continued, "are amongst the items I enjoy most. And the 'gram.' part of my receiver is certainly used as much as the radio.

"So you will understand why I particularly welcomed the opportunity of trying out such an excellent radiogram as the Amplion. And right away I want to say what a fine engineering job it is."

FINE CABINET WORK

Mr. Rose is an engineer himself, although in a different line, and is, therefore, particularly well qualified to comment on this aspect.

"And passing from engineering considerations," he said, "I am just as attracted by the marvellous cabinet work. As a matter of fact it is one of the most handsome-looking radiograms that I have seen.

"Home-Made" Programmes

"Good looks naturally lead one to expect good results, and such expectations are well justified with this outfit, both as regards record reproduction and radio."

"Personally," Mr. Rose said, "I can't see why anyone who goes in for a mains radio does not have a radiogram. The addition of facilities for playing records doubles the value of the apparatus, and is well worth the comparatively small extra cost.

"If you have a radiogram and cannot find a programme you like you don't have to switch off and fill in the time writing to the B.B.C.; you simply put on your own favourite programme of records.

"But I won't harangue you with my own private opinions any more. This radiogram has a lot of features that appeal to me. For instance, as a keen record collector, I like to take as great care of my discs as I can, and that means that I always use a new needle for each side. So one of the first things I look at in a radiogram is the pick-up mounting to see how easy needle-changing is.

Simple Volume Control

"And I give the arrangement on here full marks. The pick-up head lifting without the tone-arm is as convenient an arrangement as any I have come across. I also like the nice wide rest for the pick-up.

"I am glad to see that the same volume control is used for record reproduction as for radio. This avoids confusion with the lady-folk of the household, who, incidentally, find the arrangement of the controls ideal.

"The combination of on-off switch with the volume-control knob is a logical arrangement that appeals to me."

"What is your opinion of the actual reproduction?" we asked, at this stage.

"I was just coming to that," replied Mr. Rose. "I think it is excellent. The bass is really powerful, which brings my dance records out to perfection, and a brilliance of top has been achieved without permitting scratch to become in any way obtrusive.

"Then there is the question of volume. Good record reproduction seems to demand bigger reserves of power than radio, and to say the Amplion has sufficient volume to do full justice to any recording without the presence of any distortion, is in no way to exaggerate.

"Finally, I think I had better tell you my impressions of the set on radio. It's 'full' of stations, and each and every one is as simple as A B C to tune in. The neon tuning indicator is both fascinating and very helpful in obtaining accurate settings. Even when working on the mains aerial the set is remarkably sensitive."

Well, there you have the opinion of an ordinary listener of the attractive Amplion Radiolux Radiogram. It now only remains for us to give you a few technical details of the set.

The circuit is a five-valve (including rectifier) superheterodyne arrangement, with eight tuned stages. The output pentode is resistance-capacity coupled to the preceding valve.

Among the special features are: Automatic Volume Control, Neon Light Visual Tuning, Cellulosed Steel Chassis, External Speaker Connections and a switch for cutting out the speaker in the receiver while leaving the external speaker working.

The instrument is 36 inches high, 23 inches wide, and 19 inches deep. The cabinet is veneered walnut and the price is 21 guineas. It can be obtained for a deposit of £2 17s. 9d., after which there are 12 payments of £1 15s. 0d.

YOUR FAVOURITE ITEMS ALWAYS AVAILABLE
WIRELESS

QUALITY AND VOLUME

A test report of the Marconiphone Model "257" battery superheterodyne receiver

The set has a very distinctive appearance, it is neat and attractive and in no way obtrusive.

There is another good feature connected with the L.T. Being a battery set, the designer has not provided an illuminated dial as this would tend to run the L.T. down unnecessarily quickly.

But an illuminated dial always prevents a set being left switched on. To avoid this possibility on the Marconiphone set, a little indicating tab with "ON" in red letters comes into view at the top of the tuning scale when the set is switched on and remains visible until it is switched off again.

"The volume is simply amazing," said Mr. Kayes when we switched on and tuned into a station. "It's every bit as loud as the mains receivers I have heard at my friends' houses."

To give you an idea of the volume we will describe a little test we made. The set was being worked in an upstairs back room, and by leaving the door of this room and also the front door of the house open, it was possible to hear the type of item being broadcast, at a distance of 50 yards up the road. And on a foreign station at that.

"I am at a loss to describe the quality," remarked Mr. Kayes, "it's so wonderful. The powerfulness of bass is only equalled by the excellent brilliance of the top-note response. Like volume, the reproduction is every bit as good as a mains receiver. And there is one point in which this set scores in my opinion over a mains receiver.

WHAT IT COSTS

The price of the instrument with complete equipment is £1 10s. 6d. deposit and 12 monthly payments of £3 3s.

"The complete absence of the clicks which seem to be inseparable from a sensitive all-mains receiver, is what I have in mind. The silent background and absence of any hum whatever is also a point in its favour."

The question of sensitive mains receivers having been raised, we decided to demonstrate the fine sensitivity of the "257." To do this we first disconnected the aerial and the earth, and then attached a piece of flexible wire about eighteen inches long to the aerial terminal.

Marvellous Sensitivity

After this we invited Mr. Hayes to try his hand. A little sceptically he sat down, but soon looked up with surprise for he was able to get several stations at ample volume.

"Why," he said, "it's as good as a transportable. With a few feet of wire attached to the aerial terminal the set could be used in any room."

The only difference to be noticed in the reproduction with the short piece of wire as an aerial and with no earth attached, was a slight background hiss due to the set being worked "full out."

February, 1935

The Circuit

A 4-valve, eight-stage superhet chassis is fitted. It includes A.V.C., a sensitivity switch and H.T. economy arrangements.

Accessible Accumulator

As a matter of fact his first comments were on the excellent method of indicating the correct H.T. battery connections. The various plugs are of distinct colours, and the names of these colours are marked on the lids of the two H.T. batteries against the correct sockets. (Two separate batteries are used, one on either side of the speaker.)

Another feature on which Mr. Kayes commented was the neat compartment provided for the L.T. accumulator to avoid having to take the back of the set off every time the accumulator needed recharging.
I have been asked to keep off the technical side of things this month, and to talk more about the news of the month, the state of the ether, hopes for the future, and all the rest of the short-wave fan's stock conversation.

First of all I want to talk about Short-Wave Clubs. Many readers who have written to me are inquiring about the headquarters of the nearest short-wave club, as if there is one in every big town. Unfortunately that is far from being the case, although there was great activity a year or so ago.

I remember short-wave clubs being formed in Coventry, Birmingham, Bury and several other places, but, as I never hear anything from them, I take it that they are defunct.

The reader who has a leaning towards amateur transmission is, of course, catered for by the Radio Society of Great Britain, which is almost entirely a transmitters' society, but opens its ranks to receiving members and allocs them a "B.R.S." (British Receiving Station) number for use on their correspondence and cards.

Monthly meetings are held in London and the society's journal, "The Bulletin," is circulated to members every month.

As I always try to be quite candid, I may as well say here and now that if you are just interested in the reception of short-wave broadcasting, the R.S.G.B. won't be quite your mark. If, however, you are keen on following the doings of the amateur transmitter, it will.

Two Clubs
If you're purely a short-wave broadcast enthusiast, then you may join either the International DX'ers Alliance, or the International Short-Wave Club.

Membership of either is open to you on payment of a very modest subscription, and both organisations have a London Chapter which holds regular meetings.

The London addresses of the three bodies mentioned are as follows:

I.D.A., Mr. J. Knight, 6, Fleetwood Street, London, N.16.
I.S.W.C., Mr. A. E. Bear, 10, St. Mary's Place, London, S.E.16.

So much for the short-wave clubs. Now for the month's news. Conditions for the fortnight prior to writing this have been extremely bad. So much with our high-power transmitters and high-efficiency receivers, something terrible is going to happen. Only one word is necessary to explain what I mean—interference!

I'm not suggesting that we're going to have 2-watt Japanese stations jamming out the local, but all sorts of strange things are going to happen. Receivers will need re-designing with selectivity more in view than ever before.

I believe, also, that the waveband that we shall need to cover will become even wider than it is now. I predict that American amateurs will be received regularly in this country on the 10-metre waveband this summer. They were last heard in 1930, and their "come-back" is about due as the cycle swings round.

Now if conditions are good enough on "ten" for such moderate-powered stations to get over, what are the broadcasters going to do about it? If they can't manage to obtain a band in that neighbourhood, they will surely make more use of the 13-14-metre wave-band than they are doing at present.

Another point is that as the shorter waves become more useful, year by year, so will the longer ones become less useful. I am not suggesting that in the "peak" year of the cycle (about 1940) it will not be possible to receive America on the 40-metre band; on the contrary, I think it will be about the same as it is now. But the wavelengths above 60 metres will probably be of very little use.

**Average Range**

The weird diagram on this page shows how the reliable ranges of four different wavelengths have changed during the first half of the present eleven-year cycle, finishing right at the "trough." This has been drawn without reference to those fifteen-monthly and 7½-monthly "bursts" of good conditions, believed to be the 9th and 18th harmonics of the 11-year affair. The curve just shows, very roughly, the average reliable range of the four amateur bands, taken over a whole year.

**HOW THE VARIOUS WAVELENGTHS BEHAVE**

![Diagram showing how the reliable ranges of four different wavelengths have changed during the first half of the present eleven-year cycle.](image-url)
February, 1935

From My Armchair

Carlos is "back again" with a vengeance. Not that he is at all upset about anything, but he certainly has a pen that flows very freely. His writings and his "Carlos 600" form a large portion of the famous notes this month. You will find them very fascinating reading.

Here's a long letter from Bermondsey full of praise for my sets. A very ingenious idea has occurred to him. Why not save the designer all the trouble of storing his sets after demonstrations, etc.?

"I am sure," he says, "it would look very nice in my home and it would always remind me of Scott-Taggart—the greatest inventor ever."

This is all very pleasant and friendly. The same idea must have occurred to thousands of others whose British shyness has prevented their writing an equally suggestive letter.

Frequently Used

In fact, however, my sets are never given away. Frequently, I use them! This startling testimonial has apparently never occurred to our friend. A further point is that I need to keep the master set, so to speak, from which thousands are reproduced, so that readers' queries and problems can be tried out on it when necessary.

Thirdly I keep all my sets so that when I am designing a new one I can make comparisons of performance. The S.T.400 was necessary when designing the S.T.600 because the 400 was the hitherto most sensitive and selective set.

Lent to Readers

My A.C. version of the S.T.600 has, however, not yet come home to roost. I could not tell you exactly where it is. The battery 600 has been on several tours, of course, but the A.C. version stayed at home.

This seemed a pity so I have lent the set to interested readers for a few days' trial. This is quite a departure in a designer's policy and when announced resulted in a flood of eager A.C. enthusiasts.

If only every reader could hear my sets first! It would be the ideal—but after all, this is a wireless journal not a wireless manufacturing firm. Perhaps if I ever design a commercial factory-built S.T. set, you'll be able to hear it.

Musical Evenings

Sometimes I get asked what is my ideal receiver. Well, you would have to go far to beat my Super-Gram de Luxe! I wonder how many of you would like a few hours with it? I have thought of giving some musical evenings with it, inviting batches of my readers to come and hear it and work it. I might even run to sandwiches and coffee! I certainly owe you all some hospitality for the kindness I have experienced on my tour—and for the proffered hospitality of hundreds whom I was unable to visit.

Such musical evenings would have no ulterior motives. The number attending would not affect the sales of this journal! Nor would there, at this late date, be any desire to popularise the Super-Gram itself which, on account of its price (about £73), is beyond the average bank balance.

Glorious Quality

But I suppose friendly meetings of this kind are useful for bringing designer and public together. What do you think of the idea? There would be one condition and that is that at least half the time be spent in listening for the joy of listening. The "quality" of this set is so glorious and full-bodied, and so thrilling with its 12 watts output, that just to treat it as an ether bloodhound would be criminal. No, I would insist on a real musical evening.

Record Volume

And we could try some records. The last time I put records on, I aroused the Fleet Street fire-brigade. At the front door three floors beneath, the police and fire-brigade were hammering for dear life. I heard them while changing a record.

Apparently the fire-brigade were being kept awake by the huge volume! I think the straw that broke the camel's back was my playing "We won't go home till morning." That seems to have put the tin hat on it.

Constructors' Designs

I'm rather proud of this radiogram. It is less like a constructor's set than any of my others and I could rather "let myself go." A really good constructor's set should be designed not as an imitation factory-built set, but expressly for the constructor. The S.T.600 is an excellent example of specialised designing, the extra controls raising the overall performance.
far beyond any comparable factory set of the battery type.

But, of course, if I were to design for the general public I should do it quite differently. I should not limit myself as regards valves or cost. I should reduce controls to a minimum.

"Drop Me a Line"

However, to get back to the musical evening idea. If you like the suggestion, drop me a line saying you'd like to come; but please do not expect a reply from me as I am inundated with correspondence and work. I shall write to those I invite, of course. And don't think it would be a waste of time writing "because thousands of others will be writing." They won't—

for the good reason that those thousands will be thinking of thousands—and so probably no one will write at all and I shall have to eat all the sandwiches myself.

* * *

Well, Carlos of Portugal is back again. He is determined to build the S.T.600 and has sent me £5, which I have respectfully returned to him as if I started shopping for Carlos I would be up to the neck in it. For one thing, he's the world's greatest authority on percentages, and thinks nothing of getting stuff at a discount of 50 per cent. when he can. Discounts are meat and drink to Carlos.

He has written several letters and I don't think it matters much in what order I display them. He gives a circuit—the Carlos 600—which I also reproduce. This circuit is very hot—so hot that I wouldn't care to touch it myself, but if he ever gets it going in Setubal (the old home town) the sardine factories will certainly have a half-holiday.

Wait a minute while I rummage through my Carlos file. Ah, here's a postcard dated November 22nd, 934. (Before William the Conqueror, you notice.)

Dear Sir,—Please excuse have asked Messrs. — to hand over to your god-self my credit balance of £1 9s. 5d., for which I should like to remain in debt to you.

He goes on to say that he wants:

"A kit of components to build a short waves adaptor to be used connected with the so anxious awaited S.T.600 and kindly pardon my abusing. I hope to have it here before Xmas, will it?" still in the reign of Ethelred the Unready, or someone.

My Dear Mr. John Scott-Taggart,—I beg to confirm my postcard of yesterday, and hurry to fall to my knees before you, asking to be pardoned.

Well, with you permission, the best is to collect not only this £1 9s. 5d. from Messrs. — but, also and through the

Editors perhaps, the 19s. 6d. from Messrs. —; from these £2 8s. 11d. plus X, you will kindly advise the balance due, before passing, as now for the S.T.600, the order to be forward me by postage a Kit of components of your future Short-waves version, as I learn you are to launch a Imperial Short waves set soon and, as I have by divers occasions let you understood my anxiousness to complete my wireless installation, either with a short waves Adaptor, to connect to the expected S.T.600 or, a three valves variable-mu automatic volume control short waves receiver but, which it may be, has to have the trade mark and, belong to the serie S.T. 1, to be accepted as O.K.

"These Same Affairs".

And, to end this letter I think you will dispense with this letter, discussing these same affairs.

I have noted that your S.T.600 having two variable-mu pentodes, one in the high frequency and the other in the high frequency amplification, these govern a self automatic volume control, consequently no need there is to incorporate a Varley or Wearite A.V.C. components as suggested, please excuse and attribute this to, too much discerning activity.

"Stirring Appeal"

I suppose you will want me to have the kit to the Yuletide but, I am afraid it shall reach in due time, for the parcels post is very slow, there are occasions, more than 25 days have been taken by a delivery, to travel from London to me here in Setubal.

And once more will you Forgive me for all these troubles but, you are in a great deal to blame for your stirring appeal to amuse your readers with kindly sympathetic laughter, upon my misfortune expenses but, through all I remain your undisturbed.

CARLOS.

Well, is that enough or shall we have another go? All right.

Setubal, Nov. 17th, 934.

In the "Wireless etc," you head your "From My Armchair " What has happened to Carlos? What has he done to all that money he got from the corpulente farmer? Well I don't like to put your cotton faced Albions in the bare shirt, it's to cool now in the winter but,
as you ask me for the farmer’s “port-vaneau,” I’ll let you know were and how I have desipated that Gentleman’s cash.

Follows a long list of financial dealings heavily interlarded with percentages and discounts. Only a full session of the Institute of Chartered Accountants, with Einstein as adviser, could really follow the transactions. But apparently old Carlos has spent the money and his “Carlos 600” circuit seems its ultimate metamorphosis.

Photos. from Carlos
Hello, here’s another letter. And with two photographs, one of the very aerial Carlos uses—the one that is 100 foot over the water-navel and connected to his neighbour’s lead roof. This photograph looks as though it had superimposed on it a portrait of the Four Horsemen of the Apocalypse, and had thereafter been used as a saucepan mat.

The other photograph is an excellent one of the “peasantry” who bought Carlos’ S.T.400 to scare the birds off his farm. Carlos’ S.T.400 figures in the photograph. The gentleman on the left is the farmer’s son.

Those who think Carlos is an imaginary figure created by a fertile brain should by now realise that Carlos is very much alive and with one great ambition: to hook up as many modern developments as possible in one outfit. Only a television set is missing and if he could get one for 95 per cent. discount (and 5 per cent. for cash), I’m sure he’d get it like a shot.

More Proof
However, let Carlos tell his own story from Setubal, the 29th, September, 934.

Dear Mr. John Scott-Taggart,—
Confirming my last letters with some photos, I beg to came back to-day with more proofs that I am a living creature, which dode upon this world, on one you can compare the height of my present aerial, to the sea level, the mast seen is 17 feet high over the chimney, the second show you the S.T.400 and the Speaker in possession of its new proprietor, his wife, son, dotter-in-law and grandsons. The country-man of course is that with the large typical straw hat and pipe.

You state in the Wireless Constructor that I have sold the apparatus with great profits; well for the two principal parts seen on the photo, delivered free of any expenses at his country home, I received thirteen guineas, all desboursements of transportation from England, Custom House Duties here, erection of both the set and the two cases, properly polished, remain on my shoulders, was it to much asked from the ex-sergent?

I have further same more photos to send you but they are not ready yet, so I’ll let you have them by a future letter from me.

“An Exaggerate Judge”
The Electron Aerial have offer me they new and special Globe aerial, what do you think of its practical merits?—I have present a Superial, having 70 feet horizontally placed and the remain 30 feet as leading down to the window, from this to the set I have a Goltone 30/RZ/500 screened lead. The Aerial is directed to the North.

I am going to write them again and, if they are willing to allow me 30 per cent. + 20 per cent discounts perhaps I should give it a try, down here and you know yourself by experience, I am an exagerate judge.

I have in this meantime worked out a Charge-Unit, which enable me to load not only my H. and L.T.’s accumulators at home but also my friend ez-sergent, very economically, I am going to send you also a photo of it, supposing you will be interested to have a look on my work, it has only a valve, the rectifier and resistances, metallics, both for the H. as well the L.T.’s and, which are variable, of course I don’t need to tell you, that all components are genuine British.

My detector and output valves apparatus is behaving itself admirable, exciting the two P.M.M.C. Speakers perfectly, the Nyorolode eight yards placed from the set and, the Equilode thirty yards away on my mother’s saloon, to the astonishment of every one, not only for the strength but, for the excellence of its exquisite natural spontaneity.

I have a cousin, who came from Lisbon now and then, to hear my wireless prodigy.

Sorrily I could not assist to the “Queen Mary” birth but, hope to be able to hear again, as last year, the Empire Broadcast around the world, with the King’s broadcast, in the celebration programme, on the afternoon of Christmas day, one of the most curiously I have been with in the wireless wonders.

Let me now your good advice in regard the Electron Globe Aerial, will you, please?

yours most faithfully
CARLOS.

Well, that’s enough of Carlos for to-day, chicks.

Mr. R. B. Macleod of Cather- ham-on-the-Hill waxes gently sarcastic over my Spot-on dial for the S.T.600. He writes:

The prospect that I am really looking forward to, however, is separating stations on a common wavelength. Three pairs of these are marked on your dial and they are not bracketted like Bourn-Plym. To mention one pair, Tronholg and Lisbon.

These are each given a different compartment indicating, of course, that they will be received at two different settings of the tuning condenser.

This is undoubtedly a remarkable achievement and I doubt whether any other wireless set can give a different reading for the same wavelength, just because the programmes are different and coming from two separate places. I feel I shall now be able to compete with a friend of mine who often tells me he can separate a singer from the piano accompaniment. You must tell Carlos.

In case any other reader wonders whether I have slipped-up, I ought to explain. Bourn-Plym were bracketted because they were both small relays

(Please turn to page 198.)
And the answer,—
John Scott-Taggart's answer is:—

THE ONE-POINT-FIVE
A magnificent receiver of paramount interest to home constructors, and of particular appeal to all S.T.400 owners

THIS LATEST ACHIEVEMENT OF THE WORLD’S GREATEST SET DESIGNER WILL APPEAR EXCLUSIVELY IN THE MARCH ISSUE OF

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WIRELESS AND TELEVISION REVIEW.

ON SALE FEBRUARY 15th.

PRICE 6d. AS USUAL.
The Western Front in 1917; an aeroplane flying fairly low over the Ypres salient. Beneath, the town of Ypres, its famous Cloth Hall a shattered fragment. To the southward the famous Hill 60, while Passchendaele, of bitter memory, is over to the northwest. Other landmarks, well-drenched with English blood, stand out clearly after the morning rain, for the summer of 1917 was the wettest in the War.

"Spotting" for Guns
This particular aeroplane, a two-seater, is flying up and down a rectangular course over the front line, a sure sign that it is an artillery observation machine ("Art. Obs. bus," for short). That is to say it is reporting by wireless to the gunners on the ground beneath the accuracy of their fire on the enemy target.

The pilot, as well as flying the machine, is doing the spotting for the guns, and holding the control-stick in his left hand, is using his right to tap out the messages on the Morse key. These messages are picked up at the battery receiving station on the ground and the aim of the guns corrected accordingly.

The observer in the second seat of the machine is gazing carefully round the sky. He is doing this systematically, starting from one particular point on the horizon and searching round the whole sky slowly and thoroughly. Only too well he realises the need for care; it is far more difficult to spot anything in the vast medium of the sky than on the ground.

Suddenly the observer hurriedly taps the pilot on the shoulder, at the same time pointing in the direction of Passchendaele. A black speck, hardly definable, appears to be diving straight towards them.

An Enemy 'Plane?
Very soon the speck develops wings, but, owing to the method of approach, it is not yet possible to see the markings on the strange machine. Will they be the coloured circles of the Allies or the iron cross of Germany? Obviously, however, it is a single-seater fighter and undoubtedly a hostile machine, for only a foe would engage in such a fighting dive.

Ready for the Fray
The pilot of the English machine pulls the control-stick towards him in order to gain height, for height is everything in an aerial combat, and to dive away is almost certain death. The observer is loosening his gun mounting and swinging his Lewis machine gun in the direction of the oncoming aircraft. He fires a few rounds to see that the gun has not jammed, for machine guns of those days had a habit of going faulty at critical moments.

The pilot, who controls two fixed machine guns pointing ahead of the machine, also fires a short burst to test his guns. He turns in his seat and by shouts and signs indicates to the observer that the latter is to engage the enemy with his machine gun while he, the pilot, endeavours to maneuvre the machine for more height.

Split seconds fly by. It is an enemy
A typical scene on the aerodrome of an artillery "spotting" squadron. The reports of pilots and observers are being examined on the return of planes from the line. The photograph was taken near Albert, on March 25th, 1915.
Questions I am Asked

Q. 119. Can Class B be used on the S.T.600?

A. This question keeps arising, and my reply is that it cannot be employed unless you add the Class B to the existing four valves, making the set a five-valve set.

The last two valves of S.T.500 should be used in place of the last valve of the S.T.600. I have not tried the arrangement, but it should work all right on batteries.

Q. 120. I have experienced a peculiarly low throbbing sort of noise on my set, which is worked off all right on batteries. The noise is on my set, which is worked off all right on batteries.

The cause may be wrong connections to the mains unit. Try taking separate tapping from the unit to the various H.T. terminals of the set. An old type of mains unit or a cheap one is particularly prone to motor-boating, and the more efficient the receiver the more likely is it to motor-boating.

The cures for motor-boating are principally:
(a) Experiment with tapping on the unit; if possible give the detector, first L.F. and output valves separate connections to the unit. Try different values of the tapped voltages; units often have high, low and medium tappings.
(b) Increase the decoupling where it is used. This is done by increasing the decoupling condenser capacity, e.g., by adding another 2 mfd. in parallel, or by increasing the decoupling resistance, e.g., from 20,000 ohms to 30,000 ohms.

Altering the condenser can do no harm, but increasing the resistance will cut down the voltage on the anode of that valve often reducing its effectiveness of operation.
(c) Parallel-feeding the loudspeaker, an output choke being used. This is a costly remedy and is in the nature of a "last resort." Even this will not cure all cases.

(d) Reversing the connections to one set of windings of an L.F. transformer.

(e) Substituting another—probably cheaper—transformer.

These last two remedies are in the nature of technical "wangles." They dodge the problem. But they are only bad practice if they seriously affect the low-note reproduction of the set.

Provided you have the receiver well decoupled, any motor-boating will probably be at a very low frequency. In fact, it may be simply a fluttering noise or a throbbing.

Even with violent motor-boating at these frequencies the sound is often feeble. The loudspeaker can probably not produce such a frequency adequately, and the ear certainly cannot respond well to it.

In other words, if we prevented such notes from appearing in the receiver due to incoming music, we should not miss them. If violent motor-boating only produces a fluttering noise, it is unlikely that weak momentary musical notes would be heard at all.

Therefore we can be ruthless. We can use an L.F. transformer which, while satisfactory for most notes, will not pass on those of very low frequency.

Another way is to retain the very good transformer (the better the transformer the worse the motor-boating!) but to reverse the connections to a winding. You can reverse either the leads to the primary or those to the secondary. You must never reverse both, or you are back where you started as regards motor-boating.

A reversal of winding means that instead of L.F. reaction (which is the cause of motor-boating) we get reverse reaction, which makes the set ultra-stable. In fact the very low notes of music will be repressed, but this is assumed not to matter as they would not be properly heard, anyway.

There is a great tendency to condemn the reversal of a winding, but the adverse effect is exaggerated because it is forgotten that as the frequency rises the reverse reaction virtually disappears because the ordinary decoupling apparatus becomes effective and will dispel reverse reaction just as well as ordinary reaction.

On very low notes decoupling fails to cure, because these low notes are not "short-circuited" by the decoupling condenser (usually of 2 mfd.). The reactance of the condenser rises as the frequency falls, and so the low frequencies are not shunted to "earth."

A combination of the various remedies for motor-boating are sometimes found necessary; on the S.T.600, using a very good make of L.F. transformer and a cheap mains unit, I found it necessary to double the pentode detector screen decoupling condenser capacity and to reverse a winding of the L.F. transformer.

Q. 121. How can I tell if a preset has "stuck"?

A. Connect it in series with the aerial lead if its capacity is 0003 mfd. or less. By setting the preset to different adjustments you should vary the signal strength of a station. If altering the preset makes no difference to anything except your temper, this is prima facie evidence that it has "stuck."
HOW THEY BEGAN

It is always of interest to know how our microphone favourites commenced their careers. Here are some stories of old and new stars that you can hear on the gramophone or by radio.

Of the most interesting forms of dance music that has grown up during the last few years is the female trio harmony act. Created by the American "team" the Boswell Sisters, it has been more or less successfully taken up by various groups in America and Great Britain.

One of the very best combinations is that of the popular Carlyle Cousins, who record for Decca, and who are responsible for the recently published "America Calling" record that I mentioned last month.

The Result of a Film

Like many other musical acts the Cousins started more or less on impulse. "Trissie" Thornton, whose stage name was Cecile Petrie, happened to drop into a cinema some four years ago and saw and heard a film in which the Bronx Sisters were crooning.

There was nothing like that form of singing this side of the Atlantic so Cecile decided that there was a good future for that sort of act. How good that future was to become I doubt if she then realised.

Trained as a singer, Cecile Petrie was in touch with the musical world, and she teamed up with another Royal Academy of Music student, Pauline Lister, and they started a double act, singing popular songs in harmony on the stage.

Things went well, but they felt that something was lacking, and finally decided that they required a third to make the act really good. Again the R.A. of Music supplied the artist in the person of a "straight" pianist who had leanings towards syncopated music, though she also had ambitions as a ballad singer. Lilian Taylor joined the show and the Carlyle Cousins were born.

Joe Loss' Vocalist

After a time Pauline had to go to India, and Helen Thornton, Cecile's sister, was co-opted, and has been in the trio ever since.

And talking about crooners, I wonder who will be the gramophone company to feature the newcomer to Joe Loss' band, Annette Keith. She is no sudden arrival to the footlights, for both her parents were vaudeville artists, I believe.

As a matter of fact, Annette made her first stage appearance at the age of a few months when she was carried on by her parents in a sketch they were doing. At two and a half she was a surprisingly accomplished tap dancer, and at thirteen left school and struck out on her own in a touring company.

A fall from the stage into the orchestra pit put an end to Annette Keith's dancing career, and now at the age of 24 she often sings with the Kit Cat band when it is on the halls.

Miss Annette Keith, who has joined Joe Loss' band as "Petronella." Joe Loss records for "Oetencos."

Joe Loss' latest recordings, by the way, include no vocalist.

Annette is, I believe, married to Tommy Green, the variety artist.

I expect most of my readers will by now be thoroughly familiar with the latest "hit," "Smoke gets in your Eyes." The various dance bands and the recording companies are seeking to that in no uncertain fashion. And so many records have been made of the number that it is almost an impossible task to recommend one as being better than any other.

My favourite is that of Turner Layton singing the number as a straight song, with a piano interlude. It is a composition that calls for something of the ballad singer, in the same way as did "Trees," and Turner Layton's tenor voice and style are admirable. The record is a Columbia, of course.

Turner Layton is the piano section of the famous duet combination Layton and Johnstone, though besides being a pianist he has a fine voice. He was born in Washington and studied for some time with private teachers. He has been church organist, choir boy, and composer of light songs and musical plays.

A Horror of Organs

He has, so they say, a horror of organs, due possibly to punishment being inflicted when a pupil for not putting in the requisite practice time. His expiation of the crime took the form of extra practice on an antiquated and wheezy instrument kept in the attic.

Later he formed a partnership with Clarence Johnstone and so started the act we know so well.

LISTEN TO THESE

Some recently released records you ought to hear.

VOCAL
Cobbler's Song (Chin Chin Chow), Malcolm McEachern. Otherwise Mr. Jetaum. Gives good scope for his deep bass notes. Col. DX596.
I Saw Stars, Les Allen. Will please the many hundreds of fans of this popular Canadian, who was one-time crooner with Henry Hall. Col. DB1469.
Smoke Gets In Your Eyes. Turner Layton. Very fine piece of singing of a number that is sweeping the country. Col. DB1472.
Medley, Paul Roberson. His second selection of his ten favourite. H.M.V. C6708.
Love In Bloom. Gecie Fields at her best. Also hear her Isle of Capri, which is also very fine. H.M.V. DB524 and DB552.
0 Sole Mio. Beniamino Gigli. The second Caruso is one of the finest recorders the world has known. I never miss any of his records if I can help it. H.M.V. DA1373.

ORCHESTRAL AND INSTRUMENTAL
Light Cavalry Overture, B.B.C. Symphony Orchestra, Excellent. Col. DB1362.
Blue Danube. Vienna Philharmonic Orchestra. One of the finest renderings I have heard of the world-beloved waltz. H.M.V. C6686.
Two Cigarettes in the Dark. Organ solo by Harold Hansey. No more need be said. Parlophone R1972.

DANCE NUMBERS
He Didn't Even Say Good-bye. Henry Hall. The B.B.C. dance orchestra to the life. Columbia. CB1700.
Sons. Roy Fox. One of the best of this number. Decca F5219.

K.D.R
February, 1935

WIRELESS

There is Still Time to Secure This Superb PRESENTATION VOLUME

Have you applied for your copy of The BOOK OF PRACTICAL RADIO yet? Time is drawing short, if you want to take advantage of this splendid offer you must start collecting your tokens at once. The BOOK OF PRACTICAL RADIO has been acclaimed as the finest all-round book on radio yet offered to the public.

Every radio enthusiast needs this book; it is a sure guide to knowledge and success in everything connected with the practical side of wireless, written by a man whose qualifications are unrivalled, the greatest living expert in set designing to-day.

Over 800,000 copies of John Scott-Taggart's books have been bought by the wireless public!

JOHN SCOTT-TAGGART'S BOOK OF PRACTICAL RADIO

"THE BOOK OF PRACTICAL RADIO" represents the essence of the author's 22 years of practical radio experience as applied to radio receivers.

If you obtain this book it will be like having John Scott-Taggart at your side, showing you how to get the most out of your set, how to construct a design and how to put right a set which does not work correctly.

Huge quantities are being printed, but the demand will be tremendous. Over 50,000 copies of the author's "Manual of Modern Radio" were completely sold out, and there are thousands who cannot now obtain the book through delaying to accept our offer of last year.

Although this book is absolutely self-contained, no one who already has the "Manual of Modern Radio" will want to miss this new book. It is beautifully bound in green cloth and printed in clear type, and gives practical information and advice which every person interested in radio requires.

Incidentally, there is a special section dealing with all the S.T. sets, so that, if you possess one or intend to do so, this book will be invaluable.

There is a wealth of "how-to-do" sketches and photographs, and the whole atmosphere of the book is intensely practical.

There are 384 pages with 63 art plates; sketches and diagrams accompany the text.

The BOOK OF PRACTICAL RADIO can only be supplied to readers who complete the necessary Gift Vouchers.

It is regretted that overseas readers are not eligible under this scheme.

Irish Free State readers can only be supplied with the Standard Edition, and will be liable for any import duty imposed.

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Sunday Morning Service

I have taken the trouble to investigate the spate of rumours about impending extensions of and changes in the Sunday programmes of the B.B.C. And when I got down to facts I found that all that was even contemplated was the introduction of a morning religious service on Sundays. There has been a growing demand for this, and it will be welcome. But while the B.B.C. is improving; it remains to get the transmissions levelled out.

Regional Broadcasting

The improved status conferred on Regions during 1934 is now reflected in the programmes up and down the country. The local transmissions are much more characteristic of the areas concerned than they were. There is still, however, rather a lot of compulsory "S.B." that is, of programmes which London orders to be taken on "S.B." or all regionals.

Tale of Two Cities

The Columbia Broadcasting System of the United States, which is ably represented in London by Mr. Cesar Saercinger, is in constant friendly rivalry with the National Broadcasting Company through its equally able London representative, Mr. Fred Bate. Each side has to its credit a formidable list of "scoops" and successes.

Mr. Saercinger recently had a brain-wave, conceiving the idea of a neat trans-ocean dialogue between the Mayor of New York and the Chairman of the London County Council, Mr. Herbert Morrison. Now the speakers were quite agreeable to the idea, but the B.B.C. was so sticky about it that the plan was held up.

The B.B.C. did not give any reason for its reluctance but I can make a shrewd guess that, remembering the bother over the Municipal Elections, it is anxious to steer clear of anything even remotely connected with local politics.

The Silent Fellowship

More than a million signatures are claimed for the petitions that are to be presented shortly to the B.B.C. to ask for the restoration of the Silent Fellowship that was knocked out of the programmes with other autumn changes. The grip on the public of Mr. Appleton's personality was quite remarkable. But somehow I do not see Broadcasting House yielding to the demand for restoration. Mr. Iremonger, the new Director of Religion, is pretty firmly in the chair, and has his Advisory Committees behind him. However, we shall see. While it is
not true that either the Epilogue or the Early Week-Day services are to be dropped, it is quite possible that the B.B.C. religion will tend to become slightly more impersonal.

Good News for Listeners
I am able to announce with full official authority that the Regional Nationals have been reprieved and will be retained for some years at least. This is the result of much thought and planning at the "Big House." It will come as welcome news to listeners in London and other crowded centres where the Droitwich signal is anything but adequate. But it means a change in the plans for the subsidiary stations and transmitters in Newcastle and in the Highlands of Scotland. These will have to be synchronised with one of the nationals operating in an established region.

B.B.C. Official for India
The B.B.C. has now accepted an invitation from the Government of India to find among its staff an expert who will be willing to direct organisation of a new broadcasting service in the sub-Continent. I understand that the post will be for five years only. A number of B.B.C. officials are considering whether to put in for the job.

Mr. Woodruff Joins the B.B.C.
Mr. Douglas Woodruff, the brilliant classical scholar, and former President of the Oxford Union Society, is the latest recruit to the staff of the B.B.C. Mr. Woodruff is engaged on a lecture tour, and is also doing a good deal of writing for various departments at the "Big House." This reminds me that there are still jobs going in the B.B.C., despite reluctance to admit the fact.

Television Activity
Although at the time of writing I have not seen the Report of Lord Seldon's Committee, I still discern signs of unwonted activity at Broadcasting House, Not long after the appointment of Mr. Whitworth from Manchester to be assistant to Captain Eustace Robb, the Television Director, inquiries were put in hand to enable several alternative plans of equipment and accommodation to be prepared and costed. This task was undertaken in circumstances of the greatest secrecy. Now staff development schemes are being reviewed. It is clear, therefore, that the B.B.C. expects to handle television, and as two of the members of the Committee are from the B.B.C. staff, there would not be the present expenditure of effort and money if the main decision were to be unfavourable to the B.B.C.

Political Broadcasters
"The Week in Parliament" series of Saturday morning talks by Members of Parliament has become the object of much personal and political rivalry.

The B.B.C. works on a panel of private members chosen so as to cover the House. The talks are not supposed to be contentious, and for the most part this regulation is scrupulously observed before the censor's services are due to be exercised. Captain Cunningham Reid, the sitting member for St. Marylebone, the constituency in which Broadcasting House is situated, is one of the most likely of the newcomers. Captain Cunningham Reid has gone to great trouble to practice at home on recording apparatus, and the result has justified the pains.

George Garay and his Hungarian Gipsy Band. This band was "on the air" for the first time last month.

One hears a lot about the various uses of the "Electric Eye," as light sensitive cells are picturesquely called. They are used in all manner of ways in commerce, such as for counting parcels or grading materials by colour, but the American station W.L.W has found a new use for a photo-electric cell— and a radio one, too.

At this station there is a mast 831 ft. high, and when electrical storms are about, the aerial naturally collects a considerable charge. When this jumps the safety gap the space between the points becomes conductive and tends to short the 500 kilowatts used by this station. To prevent this a photo-electric cell is mounted near the gap so that it will be affected as soon as the spark caused by the static jumps the gap. As soon as this happens the cell operates a relay to which it is wired, and this automatically controlled

A beam of light falling on a photo-electric cell was so arranged that when the operator reached out to the Morse key his hand interrupted the beam. The current passing through the cell was thus affected and by means of relays the transmitter was automatically switched on. Similarly it was turned off with the removal of the operator's hand.

A. S. C.
NEW APPARATUS TESTED

As We Find Them

WIRELESS
February, 1935

Interesting reviews of the latest products submitted by radio manufacturers and traders for examination and test in our laboratories.

The AvoMinor

MULTIPLE-RANGE testing instruments are coming into their own, as well they ought. This month it falls to our lot to say a few words about another excellent example of this type of measuring apparatus. The instrument in question is the AvoMinor, a younger brother of the well-known Avometer.

The keynote of the AvoMinor is accuracy, and to ensure this the makers have taken as their basis a thoroughly efficient moving-coil movement with a 2½-inch scale. The instrument is extremely compact in its physical dimensions—it measures a mere 4 ins. × 3 ins. × 1½ ins.—yet, for all that, it forms a very complete radio-testing unit of incalculable value to all service men and constructors.

Three current ranges are available, viz. 0-6, 0-30, and 0-120 milliamps, while with the simple movement of a plug one can read voltages of 0-6, 0-120, and 0-300. But this is not all. Resistances can also be measured, the ranges available being 0-10,000 ohms, 0-60,000 ohms, 0-1,200,000 ohms, and 0-3 megohms.

Every AvoMinor is supplied complete with a pair of leads having interchangeable crocodile clips and testing prods. The price is 40s.

We ourselves can vouch for the accuracy and practical utility of the AvoMinor. It is a very fine instrument.

Graham Farish Pick-Up

Graham Farish have recently added a gramophone pick-up to their component range. There are several very practical features about this new pick-up. For example, the arm lifts up into a practically vertical position, and stays there with the aid of a simple clip device, so that needle changing can be easily and rapidly carried out.

The arm swings very smoothly, and the head is scientifically offset to ensure good tracking. Also the base of the bakelite pillar supporting the arm has a niche to enable the connecting leads to be carried along the top of the motor-board if desired.

On test we were very favourably impressed with the results given by this new pick-up. The response is excellent and there are no noticeable resonances. Direct sound from the pick-up is of low intensity and the general performance is of a high order.

The appearance is likewise good, moulded bakelite being largely used in the construction.

Perhaps the most attractive feature of all, bearing in mind the excellent results, is the price. This is only 14s. 6d. and represents splendid value.

Dubilier Condensers

The name Dubilier is indelibly linked with first-class condensers, and this reputation for quality is the result of long and arduous research, coupled with exceptional care in manufacture.

There is a Dubilier condenser for every purpose, and the photograph on this page shows three samples we have had the opportunity of putting to extensive tests.

On the left is the B.775 mica condenser designed for 250 volts working, retailing at 3s. for the -01-mfd. size. It is ideal for R.C.C. circuits, where high insulation is absolutely essential. There is also the type 620 (on the right), which can stand up to 500 volts working and is a particularly suitable component for all H.F. uses. It is available with grid-leak clips which fit on to the terminals.

Then there is the popular wire-end non-inducting paper type, which is able to stand up to voltages of no less than 400, and is made in a wide range of values ranging from -001 mfd. to -5 mfd.

IN ALL TYPES
By the time these Notes are in print it is possible that we shall be many steps forward in Television. Everything is waiting, now, for the report of the Government Committee, set up by the Postmaster-General. The Committee has sent sub-committees of its members to America and to Germany to study television progress in those countries, before coming to final decisions as to the details of its Report.

A Wise Policy

Personally, I think this is a very wise policy. Great responsibility rests upon this Committee, and their findings will undoubtedly have a very far-reaching influence upon the operation and development of television in this country.

In fact, the whole purpose of setting up the Committee was to bring order out of chaos and, as far as possible, to ensure that television should be put upon a sound and practical footing, with as few mistakes as possible—to be subsequently undone—and with as good a chance of all-round success as could be given to it.

In these circumstances, then, it is only right that the Committee should, in the well-known political phrase, "explore every avenue and leave no stone unturned." From my official meetings with the Committee I can tell you that they are taking their task very conscientiously and that they believe that it may become even more important, at any rate from certain points of view.

Caution Needed

As you probably know, television has been proceeding along somewhat different lines in America and Germany from those followed here. It is not necessarily that their systems are any better than ours, but in a new science like this, where there is so little—scarce any—previous experience to go upon, we should be open to learn anything we can from whatever source.

But it goes without saying that in preparing to inaugurate an important service like television broadcasting, we should proceed with the utmost caution. It is no exaggeration to say that the television service may in time become as important as sound-broadcasting is to-day. Some people believe that it may become even more important, at any rate from c certain points of view.

A complete cathode-ray television receiver and viewer that is made by the Fernseh A-G. Company in Germany, where high definition transmissions are in favour.

There are at least three large manufacturing concerns in this country, only waiting for the word "Go," and ready almost immediately to turn out television receivers in large numbers.

One of the most important points upon which information is still awaited—and this will appear from the Report of the Committee—is whether the low-definition or the high-definition system is to be used.

It may be taken as practically certain that a change will be made from the present 30-line system, but what number of lines will be recommended remains to be seen. Some people are talking of 180 lines, but I think that is putting it too high. It seems most probable that some intermediate degree of definition will be decided upon eventually.

Using Ultra-Short Waves

The question of the definition involves also that of the wavelength on which transmissions are to be effected. It is practically certain that ultra-short waves will have to be used, and that a number of small relay stations—for actual transmission—will have to be set up in various parts of the country, owing to the relatively limited area which each can serve on these wavelengths.

There is no doubt that when television comes properly it will mean a great increase in employment for artists and technicians and some sort of a boom in the radio trade. I anticipate that there will be a great demand for components and sets of parts for constructors, just as there was in the early days of broadcasting.

I don’t know whether you know, but there is not nearly so much home-construction of radio sets now as there was a few years back. It is difficult to assign the reason for this, but possibly it is because really reliable manufactured receivers can now be obtained so cheaply and to suit every purpose.

A Great Revival

But when television comes I think you will find that there will be a great revival in home-construction. There will, of course, be a big demand for ready-made television sets as well.

An interesting sidelight on this television question is its probable
effect upon theatre and cinema attendances. Many people in the entertainment business are already fearing that box-office receipts will fall off heavily. Personally I do not believe this.

The same sort of thing was said when broadcasting first started and we all remember the antagonism that existed for a time between the entertainment business and the B.B.C. Experience soon showed, however, that broadcasting only whetted people's appetites and made them more "theatre conscious," and I believe it is right to say that the theatres were never better attended than they are to-day.

A Word of Warning

In my opinion the same sort of thing will happen with television. It will serve, I believe, to increase still further the interest of the public in entertainment and will prompt them to a desire to see the real thing. If that proves to be the result, it will be satisfactory all round and nobody will have cause to grumble.

Just a final word of warning. Don't expect too much of television at first. It is not going to give you pictures on a very large scale, and the quality of the picture is not going to be comparable to those you see in a present-day cinema.

It will definitely not be possible to "sit by your own fireside and see the Derby in full detail or the Test Match in Australia." So if you don't expect these things you will not embarrass the sponsors of television and incidentally you will not be disappointed.

A very great increase in amateur television has resulted from the Saturday afternoon television transmission. I have had a great many letters from readers asking for information on various points connected with amateur transmission and reception of television.

Amateur Transmission

As regards transmission, perhaps some of my readers may not be aware that the P.M.G. has now arranged for applications from those seeking permission to engage in amateur television transmission to be considered by the Post Office. You need to hold an ordinary experimenter's transmitting licence, of course, but beyond that you are very likely to get permission to experiment in television transmission.

I think it is a very wise move by the P.M.G. because, in the first place, there is no serious reason why those desiring to experiment in television

THE EVERLASTING FILM SYSTEM

should not do so, and in the second place, we all know perfectly well that in the early days of wireless telegraphy and telephony, the experiments of amateur transmitters contributed very materially to progress rapidly made.

The Allotted Wavebands

In view of the valuable pioneer work done by amateurs in radio telephony and to the fact that, as experience has shown, they keep conscientiously to their allotted wavelengths, the P.M.G. has decided to extend the amateur frequency bands for ordinary telephony transmissions.

For amateur television transmissions the bands have been fixed at 9.38 to 10 metres for vision and 10.02 to 10.71 metres for the sound or control signal accompanying it.

The scanning of a small object is much easier than a large one; a head and shoulders, for example, is simple compared to a whole room, and an indoor scene is easier than an outdoor one. In fact, the pick-up of a distant scene (such as the Derby) represents pretty well the most difficult task confronting television engineers.

Televising Films

If, however, a film of such scenes is taken, it becomes a relatively simple matter to televise the film, because here you only have to scan each small picture. It is for this reason that the transmission of films has gone ahead rather in advance of the transmission of direct objects. Of course, this is not "true," or "instantaneous" television. Obviously the events are seen upon the reproducing screen some time after they happened.

If the film is developed in the ordinary way, this delay or "lag" may be several hours. But a German invention has recently been perfected whereby this delay is reduced to a matter of a few seconds. The film passes through the camera and then straight on into developing, fixing, washing and drying tanks, passing through the whole process in a period of some ten seconds.

It emerges as a finished negative, and passes on through the television transmitter, where a special arrangement is used to reverse the negative effect and produce the result of a positive.

Very Ingenious

If all this is not ingenious enough, the inventors have gone one better, and the film, after television, passes on through a machine that strips off the coating, re-coats it, and so prepares it for another voyage of adventure. Only a short length of strip is necessary for the whole business and this is joined up into an endless band, which keeps on passing through the camera and television indefinitely.

This greatly simplifies the actual televising, since it is a small film picture that is being televised, not an original scene and, since the delay is only a few seconds, it can almost be called "true" television.

The recording of sound signals is such a familiar process—every gramophone record is an example of it—that people have naturally turned to the corresponding question of storing television impulses, so that these can at any subsequent time be reproduced through a televier and the image reconstituted.

A Method with Advantages

You might say that it would be simpler to take a record of events on a cinema film. So it is, for some purposes, but there are, curiously enough, advantages in storing the television impulses: one advantage is the saving of space and material.

Various inventors have had a go at this problem, with varying degrees of success, and I have often seen it stated that the problem has never been solved. This is far from being the case, however, for I can tell you that I have seen a machine, during the past few days, which reproduces both sound and sight from the impulses optically recorded on a length of photographic film.
"Very curious," remarked the Professor, "to notice how reception in Mudbury Wallow has gone off during the past month or two. Take this set—"

"My dear fellow," I said, putting it under my arm and reaching for my hat, "this is really too kind of you."

I had nearly reached the front door when the Professor, who has recently taken up lasso-throwing as a hobby, caught me neatly round the right ankle with a loop of flex.

If providence hadn't been kind enough to send Poddleby, who is admirably upholstered, in through the door at that instant I should have had a nasty fall on the cold, hard tiles of Professor Goop's hall. I have Poddleby's assurance that they are cold and hard. Personally I rather enjoyed the experience, for falling on to Poddleby is rather like taking a flying leap on to a feather bed.

The set, too, struck one of the best cushioned parts of his anatomy and wasn't damaged in the least. Altogether a very fortunate sequence of events, as I explained to Poddleby, though strangely enough I couldn't make him see it. Some fellows are so unreasonable.

The Professor and I picked him up and proceeded to render first aid to the bump on the back of his head. This we rubbed with what we thought at first was embrocation, though we subsequently discovered on examining the label that it was actually Worcester Sauce. As we had shaken the bottle thoroughly and the cayenne got into a place where the skin had been slightly broken Poddleby very soon revived.

A Wonderful Remedy

Make a note that Worcester Sauce well shaken and applied externally is one of the readiest means of revivifying the apparently dead. Once restored to life, Poddleby began to talk nineteen to the dozen. "This set," continued the Professor, "is a ten-valve Super-Blimperyde with plane-polarised reaction, a squiggle stage, a de-bobbler, and two counter-balanced stages of Blenkinsop-Wotherspoon negative amplification. In the ordinary way it is capable of bringing in dim and distant foreigners such as the 2-kilowatt Nastikoff in Yogotolazia at wake-the-baby strength on the loudspeaker. Today it is completely silent."

One Little Valve

I rose from my seat, getting in my hand-off to the Professor's face before he was ready with his. Removing the back of the cabinet, I peered inside for a moment. Then I picked up a valve which was lying on the table, inserted it into a holder that looked kind of lonely without one, and switched on. The room was filled with a positive welter of sound.

"That one little valve," smiled the Professor, "has certainly made a difference, but believe me this set is not what it was. Now let us be candid one with another. Are you obtaining quite the reception that you were, Wayfarer?"

"No," I said after a little thought. "No00, I can't say that I am."

"And what do you think has happened to your set?"

"I was bidden," I explained, "to dine three nights ago with Sir K. N. Pepper and it so happened that an uncle of mine had my evening clothes in his keeping. In order to obtain their timely release I had to deposit with him my wireless set, and when I say my wireless set I should, to be strictly accurate, say the set which I borrowed from Primpleson the day after he had left for winter sports in Switzerland. As Tootle was at home when I went round to his place to see about providing myself with another..."
I am at the moment completely without wireless receiving apparatus."

With a sigh the Professor turned to Poddleby, who agreed that he had noticed a distinct falling off both in the volume of the local station and in the number of foreigners receivable.

"There you are," said the Professor, turning to me. "Just what I said. How do you account for it?"

"I suppose," I returned, "that Poddleby hadn't finished paying his instalments before the rectifier valve began to 'fluff out.' That's the worst of these three-year hire-purchase schemes."

Due to Drought

Poddleby embarked upon a torrent of words to the effect that he never bought things by instalments, but when I mentioned alligators again he quickly relapsed into silence.

"And now, my dear friends," said the Professor, "I'll give you my explanation. In Mudbury Wallow we are suffering from the effects of drought."

"We are indeed," I sighed. "In fact, owing to the exactions of the uncle of whom I have told you, nothing better than a half pint has passed my lips for weeks and weeks."

"I was thinking," remarked the Professor, "of the effect of drought upon our earth connections. Parched soil cannot possibly enable the earth plate or earth tube to work effectively."

"Nor parched anything else," I said, pressing the bell.

The Age of Chivalry

Belinda, the Professor's handmaiden, barged in and, seeing me, barged out again without a word. She returned a little later with three glasses and three bottles of brain lubricant on a tray before the rectifier valve began to 'fluff out.' That's the worst of these three-year hire-purchase schemes."

PARCHED SOIL AND THROATS

time. Though she has a beautiful set she can barely receive the programmes of the London Regional, and the dear lady is almost distracted. Now I suggest that we three sally forth in the morning to render first aid."

The age of chivalry is not dead you will agree, when I tell you that we responded with alacrity to Professor Goop's call. Woman, not lovely, but angular, was in distress; three men volunteered as one to go to the rescue. Like all the best men I loathe the work, but if there is a chance of getting my own back on Miss Worple there's hardly anything that I wouldn't do.

On the following morning the trio, suitably garbed, reported at the "Microfarads," and then proceeded to Miss Worple's residence. I was elected foreman, and in case you don't know how to be elected foreman of a gang, let me tell you that a big stick and a thoroughly truculent appearance help quite a bit.

A Good Position

There are lots of good things about being a foreman. First of all, the others take off their coats whilst you don't. This means that your supply of cigarettes is practically unlimited. Secondly, when a maid bears out a tray of refreshments the foreman has first go and, if he has any sense at all, last go as well.

Making sure that the Professor and Poddleby were provided with spades and things, I set them to work at digging up Miss Worple's existing earth. They were pretty slack, or rather, they would have been pretty slack if they hadn't had a jolly good foreman; by threatening to consume all the elevenses myself if they didn't get on with it a bit better I kept them pretty well to their task.

I will say this for Miss Worple, she had done her best to have the original earth made pretty good. It had been a biscuit tin of the seven-pound size, with all the straws of a 7/22 cable soldered to it separately. We—or rather they—had to go down nearly five feet before they reached it.

When they got there they found merely the rim of the tin and a lot of red rust kind of stuff. Poddleby, who had already lost several pounds, began to talk about half-past-elevenses, but as there was still one whole bottle left, and I had got that well hidden, I ordered him back to his work.

When twelveses arrived, owing to the excellent staffwork of the foreman the diggers were some eight feet down, and still hadn't reached the requisite stratum of heavy sub-soil. As they were now so far beneath the surface of the ground I was able to persuade them that only one bottle had been supplied between the pair of them.

It seemed that we might go pretty well through to Australia without striking the desired clay soil if they continued downwards in a straight line.

The "Subterranean Spring"

I therefore directed them to tunnel northwards in the hope of striking a vein of clay.

At about three o'clock, when they were faint but still pursuing, the Professor clambered up to the surface.

"Don't you think," he queried, "that we have done all that we can?"

With my stout stick applied to the top of his bald head I waved him back into the excavations.

"Ply your pickaxes, my men!" I cried, waving the last of the foreman's three-o'clocks.

An instant later things happened. Poddleby, who was nearly done, gave one last despairing blow with his pick.

"I WAS FOREMAN"

There came a sudden deluge of water, which nearly drowned both him and the Professor.

"Hooray! " yelled Professor Goop. "We've struck a subterranean spring!"

The foreman descended to verify.

"Idiots! " he cried, "you've stuck a pick into the water main. If I may suggest it, the best thing is for us all to beat it quickly. As the old proverb has it, 'Absence of body is vastly better than presence of mind in crises.'"

We beat it. I regret—or do I—to say that Miss Worple was fined fifteen pounds for wasting water. Water she may have wasted, but I can assure you that her elevenses, twelves, orises, twoses, and threeses went to exactly the right spot, though the Professor and Poddleby may have a different tale to tell.
"362" VALVES
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We have received a selection of "362" valves for test—a range of 2-volt battery types and also of A.C. valves. Incidentally, these two ranges, full as they are of types, do not by any means exhaust the scope of the latest "362" valve lists. Four- and six-volt battery valves are available, and universal valves are also included.

High Efficiency
Inexpensiveness is the keynote of the whole range of "362's," but low cost has not been obtained by reduction of efficiency, as the following typical figures will indicate.

For instance, the 2-volt detector HL2 costs but 3s. 6d., yet it has a mutual conductance of 1.5 MA/V, with an impedance of 16,000 ohms. The 500 milliwatt output 2-volter costs 4s., and has an impedance of 5,000 ohms and an amplification factor of 15. Nothing better than that for a high-efficiency power valve could be desired, could it?

Where a "larger" battery valve is desired we have the P2, with its 800 milliwatt output and its mutual conductance of 3 (the same as the LP2) and impedance of 3,000 ohms. This costs 4s. 6d.

The battery pentode is the ME2, giving 1,000 milliwatts at 200 volts anode potential with a mutual conductance of 2 MA/V and an anode current of 15 milliamps. The cost of the valve is 10s. Nine shillings secures a Class B valve (BA2) with a 1.5 watt output, or alternatively the BX2 which provides 3 watts.

Mains Types
The mains valves show similar high efficiency and low cost, the ACHL4 costs 7s. 6d., and has a mutual conductance of 3.3—4.0, according to anode voltage, the super-power valve has a mutual conductance of 4, and an output power of 2.5 watts—it costs 9s., and is called the ACBX4. A 3-watt pentode costs 10s., and has a mutual conductance of 2—8. It is called the ACME4.

And so we could go on. All the samples of valves of the ranges we have tested have acted up to their reputation; and as far as we can see, readers who use "362" valves should experience efficiency and economy in no small measure.

MOST REMARKABLE REPRODUCTION
you will thank me for recommending the 'STENTORIAN'
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"... in brief, no words of mine can express my feelings about this masterpiece of loudspeaker art and I can only say that from beneath J. W. Stentorian is my mouth, and I am proud of it."—A. H. K., Breathen Hill.
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"Steering" By Cathode-Ray

An explanation of how directional radio may be used to give a visual indication of when a ship is on its true course, and also to control the steering gear.

By J. C. JEVONS

One of the most interesting side-shows at the 1934 Radio Exhibition was the "Radio Weather House," staged under the direction of the Radio Research Board to illustrate the work done in exploring those mysterious upper parts of the atmosphere known as the Stratosphere, Ozonosphere and Ionosphere. They are the home of the Heaviside and Appleton Layers, which make it possible for us to transmit wireless waves over long distances and, incidentally, inflict a certain amount of fading in transit.

Utilising the Cathode-Ray Tube

It is obviously important that we should get to know as much as possible of the constitution—and location—of these regions, since they play so large a part in the mechanism of transmission; and for much of our present knowledge we have to thank the cathode-ray tube.

In fact, one of the striking features of this section of the Exhibition was the way in which it demonstrated the all-round utility of the cathode-ray tube. Not only was it shown in use for measuring the actual height of the reflecting layers, but it definitely proved its merits in other ingenious applications.

Most of us are inclined to think of the cathode-ray tube in connection with television, or possibly as a useful aid in tuning our wireless sets; but it is now rapidly developing into a general purpose instrument capable of being used in all sorts of ways.

Those who visited the "Radio Weather House" will, no doubt, remember the ingenious system employed to prevent collisions between fog-bound ships at sea. An "animated diagram" shows how a navigator on the bridge, by watching the cathode-ray indicator, can tell whether or not he must alter his course to avoid a nearby vessel which, although completely hidden by fog, is coming across his track.

In another example a cathode-ray tube is used to warn the navigator directly a ship or an aeroplane deviates from the course marked out for it by a radio beam. An "amber" lamp remains lit so long as the craft keeps to its proper track, but as soon as it falls off to port the "amber" turns to "red," or to "green" if the deviation is to starboard.

A Valuable Aid to Navigation

This valuable aid to navigation is a development of Mr. Watson Watts' method of using a cathode-ray tube for direction-finding, so that it gives a visual indication of the direction of the incoming signals. For instance, the two frame aerials A, B (Fig. 1) are set at right-angles, as in the ordinary type of direction-finder; but, instead of being connected to headphones, the signal voltage is applied to the opposite sides of the two pairs of control electrodes a, b of a cathode-ray tube. The result is that the spot of light on the fluorescent screen... (Continued on next page.)
"STEERING" BY CATHODE-RAY

continued from previous page.

When a ship or aeroplane is "homing" or steering straight on to a radio beacon, the spot of light remains steady in the centre of the screen so long as the vessel keeps to its course.

In order to give a more definite indication of any deviation, the fluorescent screen is replaced by a "split" anode A, B, as shown in Fig. 2. If the ship moves off its course, the spot C will shift from the centre gap, marked G, over, say, to either of the plates marked A or B, as in Fig. 2. The segment A is connected to one amplifier, whilst the segment B is connected to a second amplifier B1. The output from A1 passes through the coil A2 of a differential relay R, the second segment B2 of which is fed from the amplifier B1.

The contact arm R will then move either up or down in response to the particular coil A2 or B2 which carries the greater current, and in doing so will energise one or other of the two field-windings of the motor M through a battery K. The motor is in this way driven either forward or in reverse, according to whether the cathode-ray "spot" C drifts towards the electrode A or B. So long as it remains dead on the central gap nothing happens.

**Rotatable Base-Plate**

Instead of being held fixed, the cathode-ray tube is mounted on a rotatable base-plate P, which is geared up to the steering mechanism. The cathode-ray tube T is fitted with a circular anode split into two halves A, B, as in Fig. 2. The segment A is connected to one amplifier A1, whilst the segment B is connected to a second amplifier B1. The output from A1 passes through the coil A2 of a differential relay R, the second segment B2 of which is fed from the amplifier B1.

The contact arm R will then move either up or down in response to the particular coil A2 or B2 which carries the greater current, and in doing so will energise one or other of the two field-windings of the motor M through a battery K. The motor is in this way driven either forward or in reverse, according to whether the cathode-ray "spot" C drifts towards the electrode A or B. So long as it remains dead on the central gap nothing happens.

### Automatic Control

**Fig. 4:** A simplified diagrammatic representation of how direct control of the rudder is achieved. The cathode-ray tube is mounted on a rotatable base-plate which is geared up to the steering mechanism.

AN ALTERNATIVE METHOD

But directly the spot C moves bodily over to one of the plates A, B it passes a definite current to one amplifier and none at all to the other. The unbalanced current is then used to light up the red or green "warning lamp," as the case may be, and the amber light is switched out.

Instead of using a split metal plate, the end screen of the cathode-ray tube can be adapted to serve the same purpose, as shown in Fig. 3. Here the ordinary fluorescent screen is divided into two halves S, S1 by a centre strip of non-luminous material K. Outside the glass bulb are two photo-sensitive cells marked C and C1, which are separated from each other by an opaque wall W.

So long as the cathode-ray "spot" keeps on the strip K, the navigator knows that he is on his proper course and all is well, but should the vessel "yaw" to one side or other, the spot will follow suit and fall on to one of the fluorescent sections S or S1. This at once produces a luminous effect which excites the corresponding photo-electric cell C or C1, and so lights up the warning lamp.

But it is possible to go further than this. Instead of merely showing when a vessel is going off its proper course, the cathode-ray tube can be used to bring it back again automatically, so that a ship or aeroplane will steer itself along the track of a radio beacon without requiring any human aid.

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EST. 1919.
In the early days of broadcasting it would have been considered a sacrilege both by broadcasters and by listeners to transmit an entire programme from records, always excepting, of course, the bona fide so-called gramophone concerts, which were not unpopular.

But, if the broadcasting station had dared to broadcast the running commentary on the Derby from records some hours after the event, with the plea that large numbers of listeners are unable to switch on in the afternoon, there would have been a storm of protest.

A Changed Outlook

Nowadays the outlook has changed entirely. In certain countries in Europe it has become a regular practice to make records of certain programme items and broadcast them later in the day, or even weeks afterwards. Recording, or rather “canning” programmes has become the order of the day.

A TAPE MACHINE

There is great scope for the international exchange of programmes by means of recording, and in this article the various systems available are discussed

By A. A. Gulliland

Even those sticklers for realism, the producers of radio drama, are at present playing with the idea of first recording the entire performance and then broadcasting it after a certain amount of cutting, such as is done in film work. Quality has increased considerably and it has become well-nigh impossible to discern a broadcasted off wax from the original.

The increasing use of “canned” programmes makes it necessary to look at the question from an international point of view. Standardisation becomes imperative if we want to exchange our programmes. The talkie film complies to internationally agreed standards, but our “canned” broadcasting programmes at present do not.

The B.B.C. in London makes use of the Blattnephone very extensively, as well as gramophone records. The German broadcasting company use the gramophone record nearly exclusively. In Austria again, next to gramophone records, another system is employed. It would therefore be difficult at the present moment to make an exchange of programmes, although the advantages over the present direct link by telephone cable for concerts are obvious. It would be less expensive and quality would be better, while programmes could be fitted in more easily.

At the meeting of the Broadcasting Union in Geneva some time ago the German Broadcasting Company therefore made suggestions regarding an international standardisation for gramophone records for broadcasting.

Many of my readers will say: “Why standardise something which is already standardised?” For, of course, gramophone records all over the world are more or less the same. But my readers forget that for broadcasting there are special requirements which have to be met and which it is necessary to observe to obtain the highest possible quality.

But, next to the gramophone system, there are various other means of recording, and it will therefore be necessary to decide very shortly which is to be used primarily.

The Different Methods

There is no doubt about it that, as far as quality, transportability and storage, as well as universality of reproduction are concerned, the gramophone record stands first.

But let us consider the various means which we have at our disposal:

First of all and least expensive of all there is the steel-tape method used by the B.B.C. in form of the Blattnephone. The advantages are obvious.

The same tape can be used many hundreds of times, in fact thousands of times over and over again—quality, if one exercises great care, is good.

But the disadvantages are equally apparent; you cannot store miles of steel tape with any great practicability, nor can you cut parts of the programme out and piece the remaining portions together. It is very difficult to send one record from one place to another; they are heavy and cumbersome.

(Continued on next page.)
"POTTED" PROGRAMMES

(Continued from previous page.)

The second possibility is recording on cinematograph film. This, at the present moment, seems expensive. On the other hand, it has all the advantages of the steel-tape method as far as continuity, insensibility to shock, etc., are concerned, but without its disadvantages of weight and impossibility to cut and piece together.

Using a Film

On the other hand, film has to be developed; but here again it is only a question of making use of apparatus for rapidly developing the film so that a few minutes after the recording process has been completed the programme can be transmitted. As far as expense is concerned, the use of narrow film, 4 mm. in width, diminishes the cost very considerably. As far as quality is concerned, the film is generally better than steel-tape.

The third method is recording on gramophone discs. The advantages are: super-quality, easy storage and transportation. The disadvantages: lack of continuity and the necessity for perfectly steady surroundings during the recording process.

For International Exchange

As far as existing apparatus are concerned and for purposes of international programme exchange it would seem wise to stick to the gramophone method. On the other hand, for radio drama and for running commentary out of a moving car cinema film seems best, while the steel tape is undoubtedly ideal for rehearsal and for cases where it is not necessary to store the programme for further use.

KNOWLEDGE COUNTS

Some notes on the valuable radio training given by The Technical and Commercial Radio College.

There must be hundreds of readers of Wireless who, having become interested in the technical side of radio, wish to obtain a thorough knowledge of the subject. Perhaps they wish to enter the radio industry, or to qualify for radio as a profession. It may be that they wish to make money in their spare time, or simply that they wish to get the utmost from radio as a hobby.

No matter what the reason for their desire to know more about radio, we have a word of advice for them, and it is advice which we offer with the greatest of confidence.

It is this: Get a copy of the prospectus from The Technical and Commercial Radio College. When you have perused this, you will be as confident as we are, that a course of their training is just what you want.

The training is not just theory—every bit of it is as intensely practical as a heavy overcoat when the thermometer is down to zero, and from the perusal we have made of some of the lessons, very easy to understand. In fact, the course can be undertaken with confidence by a complete beginner in radio.

There are two courses available according to the ground which the student desires to cover. There is the Technical Course, the Technical and Service Course, and the Technical, Service and Commercial Course.

Manufacturers’ Praise

Leading manufacturers, in writing of their difficulty in obtaining suitable qualified men for their staffs, have praised the work of the college in training men for the openings that offer. And that they carry this opinion into practice is amply proved by the many letters received by the College from pupils who have obtained good positions.

The avowed objects of the College are two-fold. One is to give the student a thorough knowledge of radio; the other is to teach him how to turn his knowledge to practical, money-earning advantage.

Individual Attention

We asked Mr. Bradley, the principal of the College, whether students who started by knowing nothing about radio experienced any difficulty in mastering the advanced subjects. The answer was a most emphatic “No.”

Mr. Bradley explained that the lessons are carefully graded so that the student advances from the elementary theory to the advanced subjects without the slightest difficulty, and that a feature of the training is that every student is treated individually.

And we can assure readers that their objects are attained in no uncertain manner. We are satisfied that the training by correspondence given by the College is satisfactory in every way, and more than good value for money.


A. S. C.
FROM MY ARMCHAIR
—continued from page 110.

and both mouths. Other pairs were given separate compartments because their names did not look well abbreviated, e.g. MAD.

Common waves may not be highly thought of at Caterham-on-the-Hill. From this lofty perch they may be looked down upon. But in various parts of the country one wave may drown the other. In any case, it frequently happens that one of the stations is an excellent programme when the other is closed down.

Actually the dots under two common-wave names will be in line, corresponding, of course, to the same setting of the pointer. The fact that the names are slightly staggered makes no difference, since it's the dot that matters.

Another reader wants me to finance a scheme for communicating with Mars. He says "it is bound to work." Being short of money he wants the help of someone who can make use of it and improve on it.

But I don't want to communicate with Mars. The telegraph has been described as an apparatus for hearing with Mars. I cannot promise the great tuning simplicity of the S.T.600, but I can do undertake to provide an enormous improvement in selectivity and sensitivity over the S.T.400. And the operation will be somewhat simpler than the S.T.400.

The performance improvement is not small; it is really tremendous and the extra cost will be so modest that it will tempt thousands to spend an hour or two bringing their S.T.400's bang up to date.

The S.T.600 is definitely my big set this season, but those who, for one reason or another, have resolved to let it pass them by, will undoubtedly build their new receiver, especially if they already have the S.T.400. Their set will be more than half-built. Please tell all S.T.400 owners you know to look out for the next number of Wireless.

Mr. SCOTT-TAGGART TELLS YOU ABOUT HIS NEW SET

I have a new set for Wireless readers. It is a new four-valve set, not in competition with the S.T.600, but borrowing a very large portion of S.T.400 components and incorporating some S.T.600 features. There are vast numbers of S.T.400's giving such excellent service that their owners are not all willing to buy the considerable amount of new apparatus and valves necessitated by the S.T.600.

I cannot promise the great tuning simplicity of the S.T.600, but I can and do undertake to provide an enormous improvement in selectivity and sensitivity over the S.T.400. And the operation will be somewhat simpler than the S.T.400.

The performance improvement is not small; it is really tremendous and the extra cost will be so modest that it will tempt thousands to spend an hour or two bringing their S.T.400's bang up to date. The S.T.600 is definitely my big set this season, but those who, for one reason or another, have resolved to let it pass them by, will undoubtedly build their new receiver, especially if they already have the S.T.400. Their set will be more than half-built. Please tell all S.T.400 owners you know to look out for the next number of Wireless.

J. S.-T.

I'm afraid Carlos has written most of this Armchair dose. Incidentally, I asked him to write an article on "My Ideal Set," but he says he does not feel level with it. And I offered to pay him for it, with as much discount as he likes. I hope, Carlos, when you read this you will change your mind. The "Carlos 600," I know, is but a very modest outfit, and that in the secret recesses of your Portuguese heart you nourish and tend circuitual dreams that only your unquenchable ambition for prodigies could conjure up.

J. S.-T.

THE EDITOR'S CHAT
—continued from page 90.

there are some very fine commercial sets for them to choose from, and we regard it as part of our job to tell them all about them.

There is also this important point. Home constructors have friends who regard them as wireless experts, but it

Mr. Scott-Taggart tells you about his new set

I have a new set for Wireless readers. It is a new four-valve set, not in competition with the S.T.600, but borrowing a very large portion of S.T.400 components and incorporating some S.T.600 features.

There are vast numbers of S.T.400's giving such excellent service that their owners are not all willing to buy the considerable amount of new apparatus and valves necessitated by the S.T.600.

I cannot promise the great tuning simplicity of the S.T.600, but I can and do undertake to provide an enormous improvement in selectivity and sensitivity over the S.T.400. And the operation will be somewhat simpler than the S.T.400.

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J. S.-T.

help of someone who can make use of it and improve on it.

But I don't want to communicate with Mars. The telegraph has been described as an apparatus for hearing more quickly something that you don't want to hear at all. And my correspondence is getting beyond my capabilities as it is.

I must absolutely refuse to have anything to do with Mars—except perhaps to eat it.

would be a poor kind of a wireless expert who knew nothing about the dozens of commercial sets which exist.

So Wireless, to be the complete radio magazine, and to serve its readers well, must describe the outstanding factor products, and having adhered to this as a vital part of our policy, we have done our best to make these pages which are devoted to this aspect of radio fully comprehensive, useful, interesting and novel in their presentation.

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J. S.-T.
In April, however, Richthofen had been killed, so now things were considerably easier.

But all's fair in war, and, if anything, the war in the air was carried on in a more sporting spirit than elsewhere. There was an intense and peculiar exhilaration in this new form of fighting far above the earth; to see the enemy machines only a few yards away, to see clearly the face of the enemy pilot—usually a youngster like oneself—the keen, staring eyes behind the goggles, sometimes as alarmed, as startled as one's own must be, sometimes grim and hard.

No Time for Thought

But there was no time for pity, as there was no time for fear, during the actual aerial combat, only before the fight or in the brief "afterwards" when the smoke was choking and the flames licking round the sheepskin boots, was there time for thought. In the air in the war action was mercifully quicker than thought; the dimension of time was foreshortened.

On the Western Front the work of the artillery was mainly to engage and destroy enemy guns, and in order to direct the fire of the batteries engaged on this work there was a wireless-equipped aeroplane for every thousand yards of front.

This work was made more difficult by the art of camouflage, for so well were the enemy guns concealed that only by the momentary flash of the guns was it possible to spot the position of the enemy batteries.

Patrolling up and down his sector of the Front, the wireless man, who might be the pilot or observer, or both, plus gunner and aerial photographer as well, would wait for this flash indicating the hidden enemy guns.

On spotting, it he would draw imaginary and ever widening circles round the target, each circle having a range of from ten to four hundred yards, the target being the centre of the smallest circle.

Placing the "Hits"

Each circle was considered as a clock face and numbered clock fashion from one to twelve o'clock. Each circle was also given a letter.

Thus when our artillery opened fire on the enemy gun position the wireless machine would send back to the battery some such signal as D.6., for example. This would mean that the last shell had exploded in circle D at 6 o'clock. The next burst might bring the message B.7., which would indicate that the shell had fallen in circle B at 7 o'clock. This was known as the clock code.

Fire from the Ground

These machines had to contend not only with attacks from enemy aircraft, but also from anti-aircraft on the ground, and as the machines were flying on a regular course they presented a fairly easy target to the enemy.

It was soon realised that the anti-aircraft fire was most accurate when there was a high layer of cloud and no blue sky or sun. On a perfectly fine sunny day with a haze, the danger of being hit by anti-aircraft guns was fairly remote, provided sufficient height was maintained.

The chief drawback of fighting in a wireless machine was on account of the trailing aerial which hung some hundreds of feet below the machine. This seriously interfered with the manoeuvrability of the aeroplane.

At first, special cutters were fitted to the aerial reeds, but, as is the way with such things, these would not cut when required. Pliers were then tried, but would get lost or else stowed in some inaccessible pocket, and there was no time to get them out when death was diving down at a colossal speed.

Rapidly Released

Eventually a cartridge type of aerial was invented which, as it was merely hooked to the wireless set, could be released by a flip of the finger. In this case no aerial red was used, as the aerial was contained in a hollow lead cartridge and automatically unwound itself when a seal was broken. This cartridge aerial was particularly useful in fighting machines equipped with wireless; but had its drawbacks, inasmuch that it was liable to jam and become entangled.

As the war progressed all pilots and observers were trained in wireless, and many famous British flying aces were expert wireless men and had done much wireless work in the air.

Captain Ball, V.C., credited with bringing down forty-three enemy machines, carried out considerable artillery observation work with wireless, and even when in a comparatively slow "art. obs." machine was regarded with great respect by the Germans. He was a dead shot, and one burst from his machine gun was usually enough.

(Continued on next page.)
Wireless

Wireless in the Great War—Continued from previous page.

Captain McCudden, V.C., another ace, also highly experienced in wireless work, accounted for fifty-four machines. Captain Bishop, who gained his V.C. by practically wiping out an enemy aerodrome, complete with machines, was first of all trained as an observer and carried on a great deal of "art. obs." patrols with wireless aeroplanes. All these and many others were as skilful at wireless as they were at fighting.

With famous flying stars (perhaps it would be more correct to call them "shooting" stars) such as Bishop, Mannock, McCudden, Barker, and others to protect them, the wireless machines did better work, and results from a wireless point of view vastly improved after the death of the "art. obs." destroyer Richtofen.

In the last year of the war wireless was looked upon as essential in practically all forms of aircraft, and with the coming of valves, reception; even through the noise of the engines, became possible. Wireless telephony automatically followed telegraphy, and altogether wireless may be said to be largely responsible for the success of Britain's first war in the air.

Some Curious Radio Effects—Continued from page 105.

But if you know your Ohm's Law and remember that where there are the most electrons that is a point of negative potential it isn't hard to dig out.

Quite recently I had a rather nice problem placed before me. It is illustrated in my second diagram.

There were two four-volt accumulators wired up in series so that their full eight volts should be available for working a certain piece of apparatus, which is marked R1 in the diagram. Certain other pieces of apparatus required only four volts, so they were connected across only one of the four-volt accumulators. These are jointly denoted by the resistance R2.

Effect of the Switch:

There was a switch which was intended for switching off all the "juice." But as you can see it did not do this.

When the switch is closed current flowed through both R1 and R2. But when the switch was opened a current in the opposite direction flowed through R2 from battery B1.

There was a reversal of current flow through R2 on the operation of the switch, though that current flowing from the B1 battery, when the switch was opened was dropped to some extent by the resistance of R1.

It should be mentioned that the resistances of R1 and R2 were about equal. A matter of one or two ohms in each case.

Now this is the problem. What effect if any does the battery B1 have on the current flowing through R2 when the switch is closed, and what would be the effect of lowering or raising its voltage?

You will appreciate that there is a current flowing from B2 battery through R2. Well, there must also be a current flowing through it from battery B1, because, after all, it forms a series circuit with R1.

A rather tricky problem, isn't it? And I intend to leave it at that. Try your hand at working it out. Let's make a little competition of it. For the best description of exactly what happens in three hundred or so words the Editor has authorised me to offer a prize of one guinea.

Address your letters to me at Tallis House, Tallis Street, London, E.C.4, and may the best disciple of Ohm's useful Law win! Now to be quite fair I must mention that I have not considered the internal resistances of the accumulators to be negligible.

Easy Figures to Handle

I reckon them to be a matter of—well, for the sake of our little competition let us state some definite values. R1 and R2 can be two ohms each and the internal resistances of the accumulators—one-tenth of an ohm per cell, with a flat two volts pressure per cell. They are, at any rate, easy figures to handle. And so please don't write and argue the point about them!

I say that, because I remember writing an article a long while ago on some interesting aspect concerning H.T. voltages. "But who cares whether a half volt or so is lost from the H.T.?" observed a reader in a letter to me afterwards.

Quite so, I rejoined in a polite answer, but if you can understand and appreciate the interesting effects underlying that lost half volt you will be in a better position to cope with vital practical points which do matter very much.

And that isn't a bad moral with which to end my present article, I think!

February, 1935
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