

Wireless

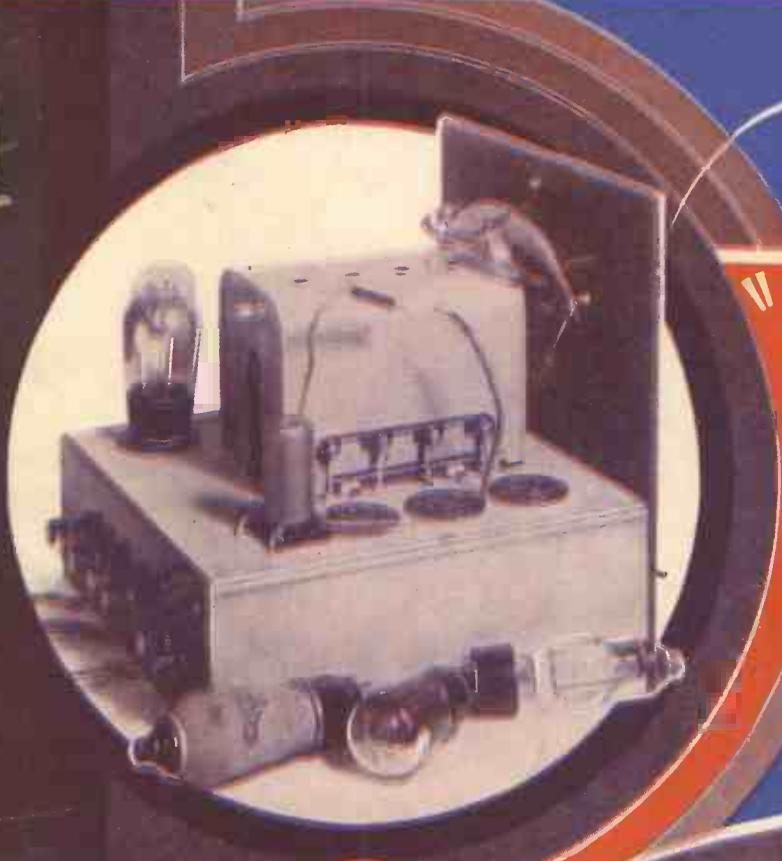
VOL. I.
FEBRUARY

NO. 3
1935

AND TELEVISION REVIEW

PRICE

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The

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and

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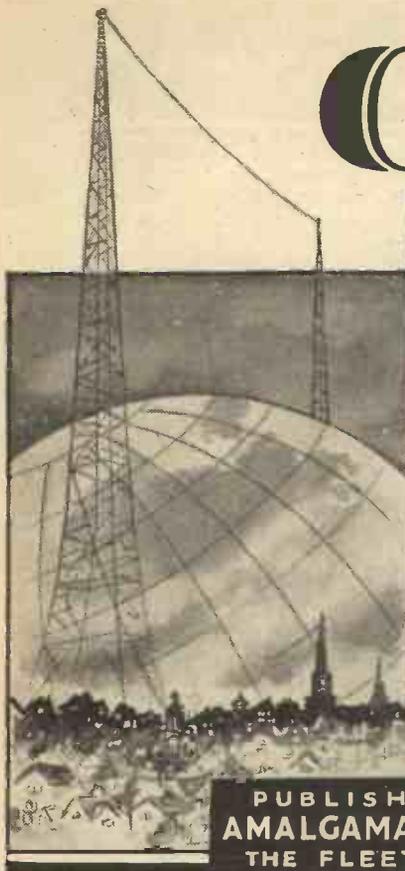


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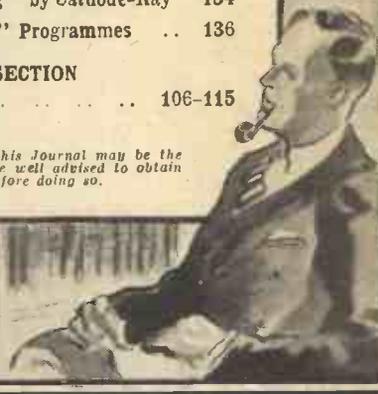


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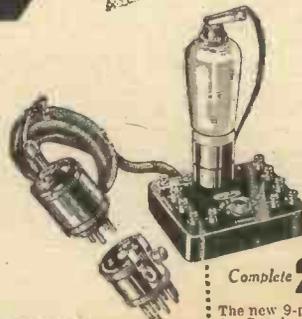
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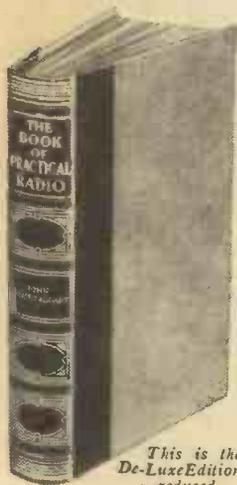
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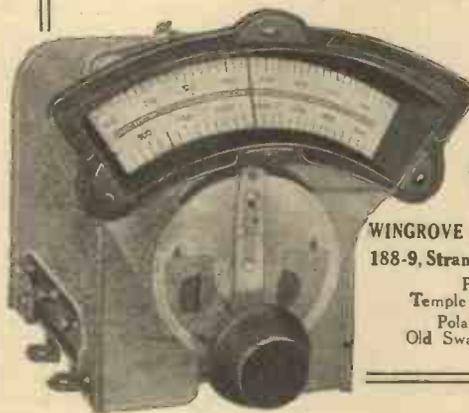
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THE VALVE WITH THE 6 MONTHS' GUARANTEE

The
Editor's
Chat

Wireless

& TELEVISION REVIEW

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

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

(Please turn to page 138)



This is Norman Long, the popular entertainer, during one of his broadcasts in the Saturday evening Music Hall programmes. It is interesting to note that Norman Long was the first entertainer ever to broadcast his performances, dating back to 1922, when the broadcasting studio was in Marconi House.

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

Practical HINTS FOR ALL



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 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 input transformer is needed.

Incidentally, I once made some quite successful records on aluminium discs with the aid of a moving-coil loudspeaker in lieu of a microphone.

Automatic Light Switching

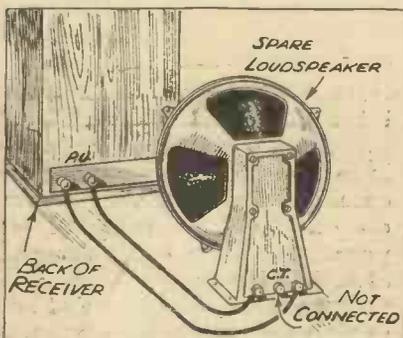
Dial lights are things we expect on mains receivers, and they are all very well on battery sets when there are ample facilities for frequent recharging of L.T. accumulators. But when the latter can only be done at long intervals for one reason or another, one cannot afford the current to have them burning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

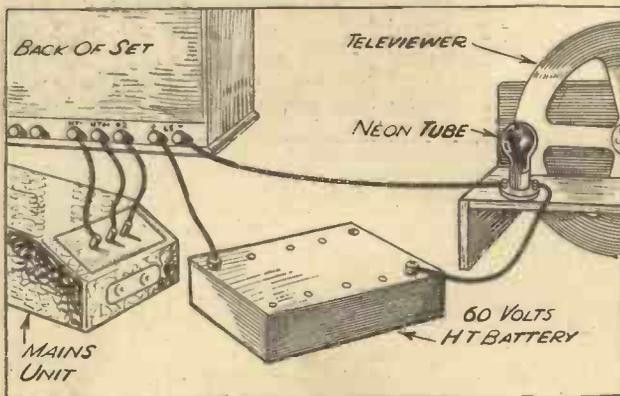
A MOVING-COIL "MIKE"



Considering its effectiveness, this "improvised" microphone is amazingly simple and easy to rig up.

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.

ADDING VOLTS TO THE TUBE



How extra H.T. can be applied to a televisioner to ensure sufficient voltage is obtained across the electrodes of the neon tube.

Those who raise the objection—although I'm not sure that I concede that it is an objection—that the light would go on and off as the grip on the knob was changed, could experiment with a sliding spindle. This could be so arranged that when the knob was pulled out slightly, the light came on.

After tuning, the knob would be pushed back. But I don't like this scheme so much as the previous one. Pushing the knob back might easily cause one to alter the tuning a bit.

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 televiewer 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 FERROGANG FOUR



Here is a battery set that will enable you and your family to range Europe with a certainty of station reception that will astonish you. High selectivity and sensitivity, coupled with outstanding ease of control; make the "Ferrogang" Four ideal for family use. A "Wireless" Research Dept. Production.

Described by K. D. ROGERS

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

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

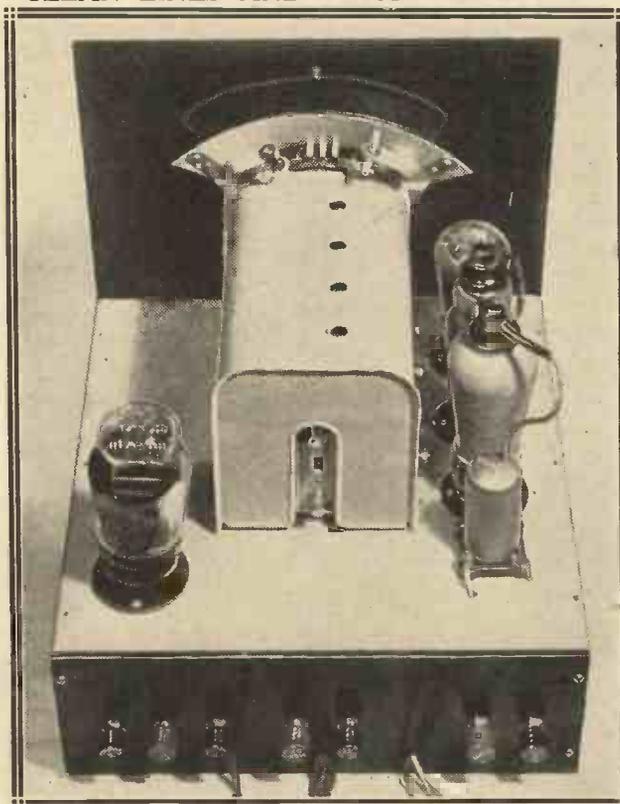
—SELECTIVITY, SENSITIVITY AND ECONOMY

worn 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

CLEAN LINES AND CLEAN RECEPTION



Nearly all the components are mounted below the baseboard, enabling a very clean "deck" to be achieved, and the metallised chassis minimises any direct pick up on the wiring of the receiver itself.

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

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

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

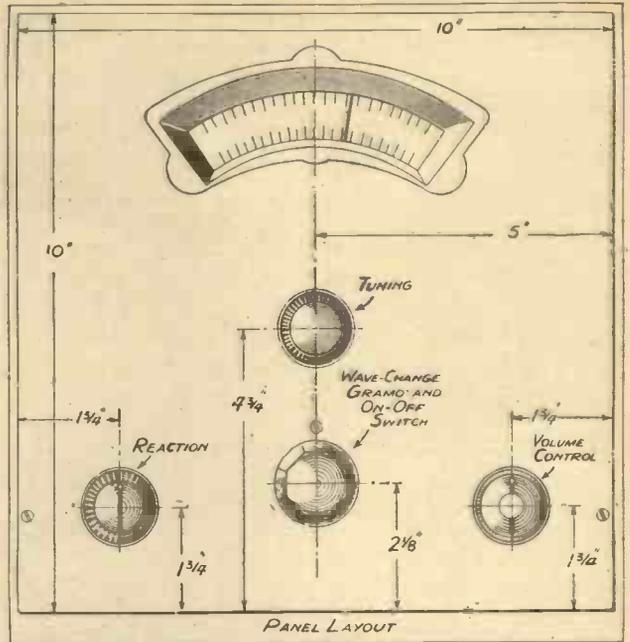
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Marconi	V.S.24	V.S.24	H.L.2	Q.P.21
Mazda	S.215V.M.	S.215V.M.	H.L.2	Q.P.240
Osram	V.S.24	V.S.24	H.L.2	Q.P.21
"362"	V.S.2	V.S.2	H.L.2	—
Tungsram	—	—	H.R.210	—

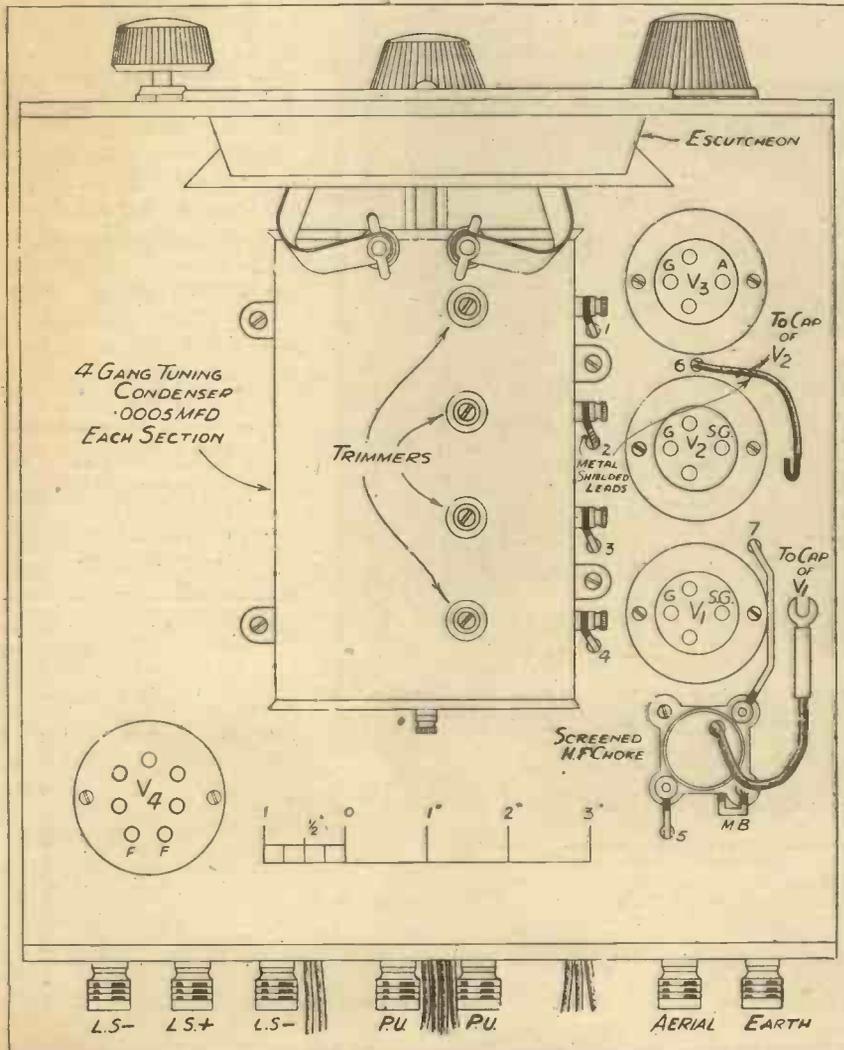
rest of the family. Firstly, because the owner would always be fiddling with it while the set was fresh, endeavouring to get the utmost out of it, and so preventing the others from hearing a decent programme at any length. And secondly because, as I said before,

combining 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



Wavelength scale readings are provided by the four-gang condenser, which is made to team up with the inductances of the Ferrocart coil assembly.



The trimmers are conveniently placed in the top of the gang condenser, and are adjusted by means of a thin screwdriver, or better, a piece of wood sharpened like a screwdriver at one end. V4 is the holder for the Q.P.P. output valve.

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

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 employed 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.

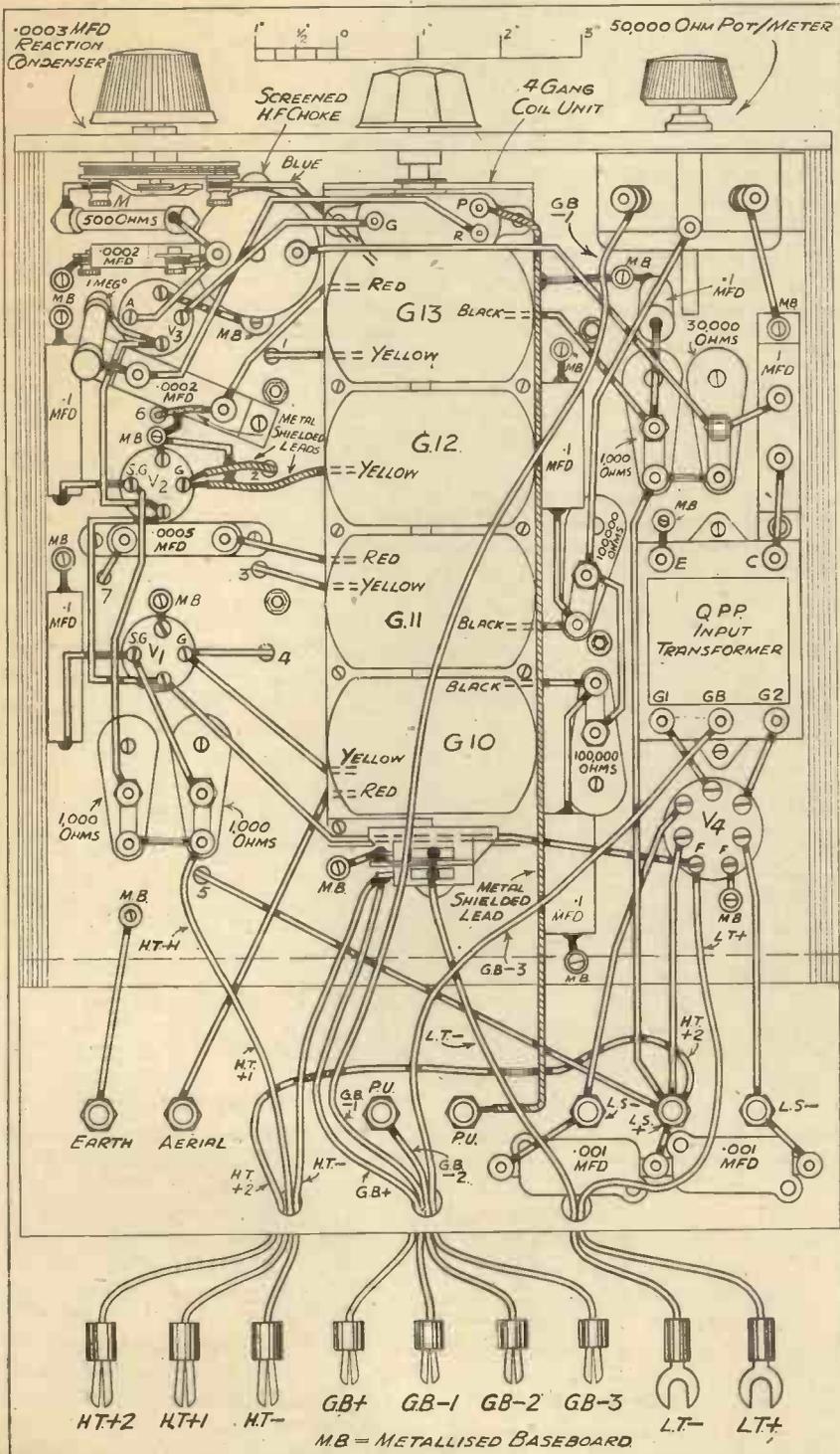
The G.B.-3 will require about 7.5 or 13.5 volts, this varying somewhat with the different makes of output valve. The makers recommendations should be followed in this respect. Naturally, the voltage will have to be increased to about 9 or 15 volts if 150 volts H.T. are used instead of 120 volts.

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 sensitivity of the set.

For use with the "Ferrogang" Four a loudspeaker with a Q.P.P. tapping on the transformer must be employed, and the three loudspeaker terminals of the set are taken to the three terminals on the transformer, the red terminal on the set going to the centre of the three terminals on the loudspeaker.



Nearly all the wires are situated on the underside of the "Metaplex" chassis. A few go through to the upper side, and where these are taken through the baseboard the holes are numbered. The leads from the coil assembly are coloured by the makers and are therefore easily followed.

Some Curious RADIO EFFECTS

BY
VICTOR KING

In this article a couple of very fascinating problems are discussed. The solution of one is explained, but for the best answer to the other, readers are offered a prize of one guinea.

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 do so though I am going to leave readers to figure out the reason why for themselves.

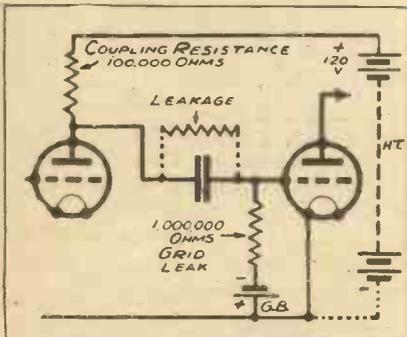
No, I won't even answer letters on the subject!

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.

You also all know, I hope, that the insulation of that coupling condenser must be impeccable, for any leakage through impresses some of the H.T. on the grid of the valve and upsets its working.

AN R.C. PROBLEM



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 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 4½.

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 124½ 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.)

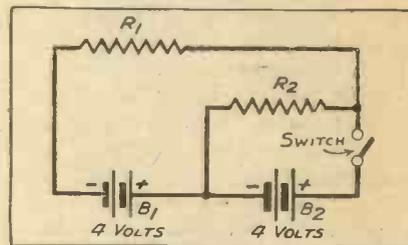
The grid leak is joined across the grid and filament of the valve, so it is clear to see that our faulty coupling condenser has caused a potential of four volts to be applied to the grid.

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?



Answer the problem associated with this diagram and win a guinea.

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 Wireless Listeners' Circle



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

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

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.

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

ITEMS DISCUSSED THIS MONTH

- Fluid Light Tuning
- Automatic Noise-Suppression
- Sensitivity
- Automatic Volume Control
- Universal Mains Operation
- Selectivity
- Record Reproduction
- Quality and Volume

IN THE CIRCLE

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

EIGHT OUTSTANDING FEATURES OF MODERN RECEIVER DESIGN ARE DEALT WITH THIS MONTH. AND EIGHT OUTSTANDING SETS WHICH INCORPORATE THEM ARE DESCRIBED.

.....★ 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

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 consolettes.

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



These are the eight sets described in the following pages. In the bottom row from left to right they are the Amplion Radiogram, H.M.V., Kolster-Brandes, Marconiphone and G.E.C. The three above are, left, Atlas; centre, Philips; and right, Ekco.

not points that are exclusively to be found in the particular models with which they are associated.

Of course, the actual methods in which they are carried out, and the degrees to which they are present, are not the same in all receivers in which they are to be found. We have

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

they are all good and reliable.

But you will be impatient by now to read about the tests to which we have been referring, so we will wind up with a reminder. Don't forget that the reports have all been given by ordinary listeners with no special skill in set operation.

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 who are not conversant with the theory or the practical aspects of visual tuning may wonder why it has "caught on" so rapidly.

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, there is a tendency to boost up the volume from it. The result is that it is not easy to tell just when a strong station is exactly in tune by the sound coming from the loud-speaker.

Accurate Adjustment

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 the smallest change takes place.

It remains but to make clear why it is so necessary for a set to be dead in tune, for the full importance of Fluid Light Tuning to be completely appreciated. The reason is simply this:—

Because of the high degree of selectivity needed these days, the cut-off on either side of the tuning resonance curve of a set must be very sharp. Consequently side-band 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 on being shown in to find 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, without 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 in a narrow tube.

"It certainly is one of the most fascinating things about a set that bristles with good features. Another thing that appealed to me right away was the complete separation of the two tuning scales.

"With one on one side and the other quite isolated from it, there is no possibility of

getting confused between the two of them. And this is increased by the fact that only the range on which one is working is illuminated at the time.

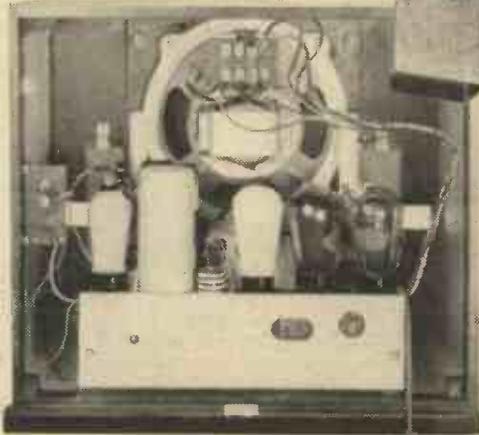
"I had not tuned to many stations before I began to appreciate the excellent quality of the reproduction. I can, with modesty, say that I am musical by nature, and consequently delighted in the fine balance obtained on the various instruments. Incidentally, I seemed to come across a surprising amount of piano-forte music the first night, and that is always a good test.

"While talking about the quality, there are

IT
LOOKS
NEAT
FROM
ALL
ASPECTS



"Neat, compact and attractive," is how Mr. Wood summed up the appearance of the H.M.V. "442" illustrated here. And his words are as true of the internal arrangements of the receiver as of its essentially pleasing exterior.



two other points of which I made a note. First, the tone control. Unlike many such controls, one does not have to imagine the effect with this receiver.

"It produces quite a considerable variation in tone, and I did not simply set it to my liking at the start and leave it at that. I found that I obtained added enjoyment from my listening by adjusting the tone control to suit the particular item to which I was listening.

"The second point concerns the Fluid Light Tuning. This I found most useful on powerful stations, as on the weaker ones it is not so difficult to tell by ear when they are fully in tune.

"As you explained, quality can be affected when a station is off tune, and it was nice to know that the set was adjusted for good quality right away, and not to find that adjustments were needed after the initial tuning."

We asked him what he thought of the appearance of the receiver.

"Neat, compact and attractive," he said, summing it up admirably in the three words.

"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 feature, 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 pushed in, the set is adjusted to maximum sensitivity for the reception of all stations.

But when it is pulled out only the more powerful stations come in, and with the same setting all the static clicks which normally 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, are bound to vary tremendously.

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

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

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 I certainly did. Although we had 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."

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) superheterodyne circuit is employed. The receiver is for A.C. Mains, and has Fluid Light Tuning.

The separate tuning scales are calibrated in wavelengths and a station chart is provided. Provision is made for the use of a pick-up and two external loudspeakers. The volume control knob operates both on radio and gramophone, and at the same time operates as a static suppressor.

The price is 13½ guineas, or it may be had for a first payment of £1 10s. 0d. and 12 monthly payments of £1 2s. 9d.

★.....★

WE FOUND Mr. Gordon Laidlaw at Loraine House, 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 blew a cloud of smoke 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 pre-selection 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 Pre-selection and Noise 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 incoming pulses must reach before they can operate the receiver is varied. This applies to both noise pulses as well as programme pulses.

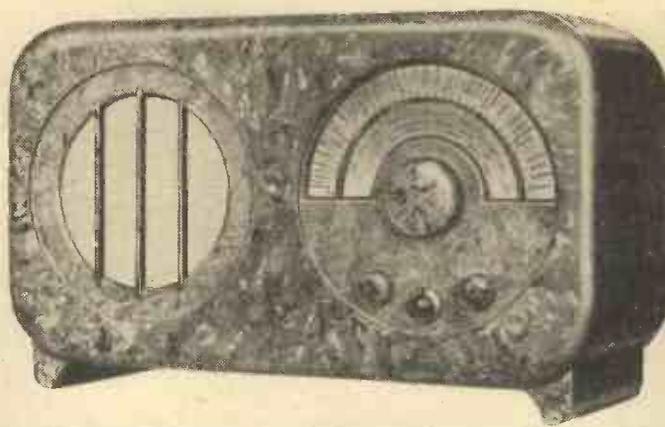
Background noises while tuning between stations can thus be progressively suppressed. The weaker stations are also progressively suppressed, so that unless reception from any given one is sufficiently good to be of real "programme value," that station is automatically silenced.

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.

.....
 * The circuit is an eight-stage superhet arrangement with band-pass tuning. Full delayed and amplified A.V.C. 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 what volume and clarity constitutes a transmission of programme value varies with the individual. With this control reception can be set beforehand for any minimum volume desired.

"Although I know this is only a matter of personal taste, I certainly like the idea of black and chromium finish in preference to walnut. And I think the unique appearance



An unusual but attractive cabinet is a feature of the Ekco "A.C. 85" receiver.

it imparts to the receiver is well worth the extra half-guinea.

"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

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 station names and shadow tuning, ideal.

"The accuracy of the positions of the names 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

triumphant 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 only the strongest of transmissions 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 without getting 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 to-day'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 tremendous, and the set becomes overpowering if turned on fully in an ordinary room. There is such an abundance of power that it is more than one can use comfortably.

Firm, Definite Controls

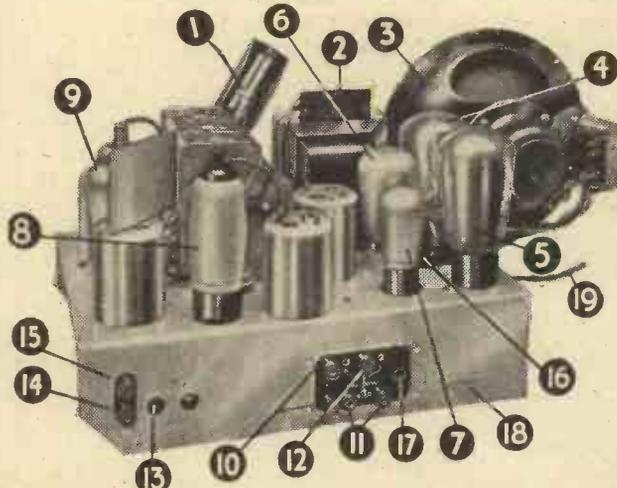
"At the same time, there is no loss in quality when the volume is at its maximum. Similarly the quality is just as good when the volume is toned down.

"And talking about volume I should imagine it possible to run quite a number of extension loudspeakers without finding that sufficient volume for all ordinary purposes was not available.

"Another good point about the extension-speaker arrangements is the switch for cutting out the internal speaker. This would be invaluable in some circumstances.

"The sweetness of the controls appeal to me, for they are dead silent in operation and feel firm and definite to the touch. Also the Noise Suppressor, unlike some modern set features, is not

THE "A.C.85" CHASSIS EXPLAINED



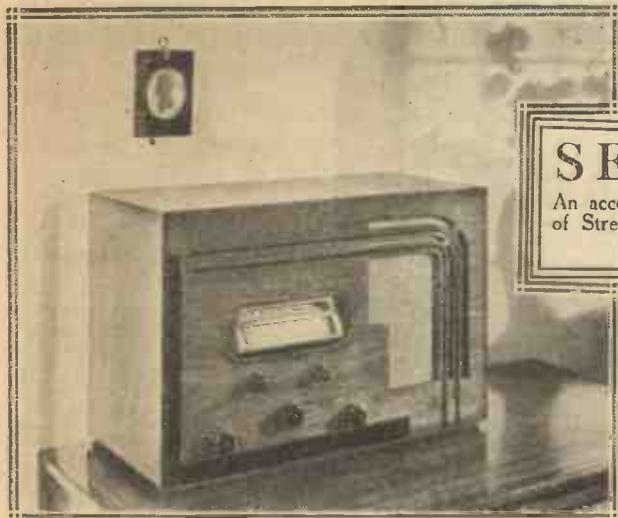
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|------------------------------------|--------------------------------|
| 1. Pilot light. | 10. Pick-up sockets. |
| 2. Mains-voltage adjustment panel. | 11. External speaker sockets. |
| 3. Loudspeaker mounted in cabinet. | 12. Tone-control sockets. |
| 4. Rectifier valve. | 13. Second-channel adjustment. |
| 5. Pentode output valve. | 14. Earth socket. |
| 6. L.F. amplifier valve. | 15. Aerial socket. |
| 7. 2nd detector valve. | 16. Speaker plug. |
| 8. I.F. amplifier valve. | 17. Internal speaker switch. |
| 9. Detector-oscillator valve. | 18. Serial number. |
| | 19. Mains lead. |

.....
 * In figured walnut case the set costs 12½ guineas or 13 guineas in black and chromium. The set can be obtained for an initial payment of £1 2s. 6d. and 12 monthly payments of £1 2s. 6d.

complicated, and it is easy to grasp how to get the best from it."

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

"Thank you ever so much for giving me the opportunity of trying the set. It's going to make me very dissatisfied with my present receiver, and I used to think that was pretty good!" he exclaimed as he rammed a new plug of tobacco into his pipe before bidding us good-night.



A pleasingly modern effect is given to the cabinet by the continuation of the speaker fret design by means of beading.

agreeably surprised to find that it was only 7-10 milliamps.

strength—the strength at which the locals came in.

The aerial used, he told us, was quite an average one, but the earth was everything an earth should not be—it was a thin wire joined to a gas-pipe. And yet the set was used most of the time with reaction turned to zero, as it appeared to be necessary only on weak foreigners.

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 one 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,

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

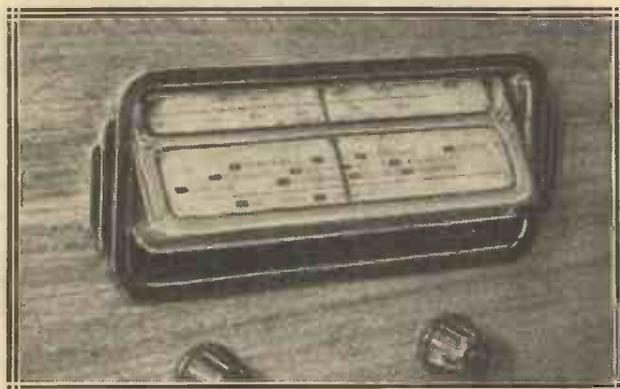
First of all, there is the question of sensitivity. When Mr. Herd learned that the set employed three pentode valves, he immediately wanted to know what the H.T. current consumption was, expecting to find it rather on the high side. But he was very

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. 0d. cash or deferred payments of 15s. down and twelve monthly payments of 13s. 6d.

and speech, even from foreigners, noticeably clear. One point that particularly impressed Mr. Herd was the excellent reception he obtained of Fécamp, a station which of late he has been entirely unable to receive on his S.G. three-valver.

HOW THE DIAL TILTS



The tilting dial ensures comfortable operation no matter what position is adopted by the person tuning the receiver.

"There seem to be hundreds of stations," he said, and he commented on the fact that all the powerful foreigners seemed to reach a standard

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—

—The G.E.C. Console Superhet A.V.C.5

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!

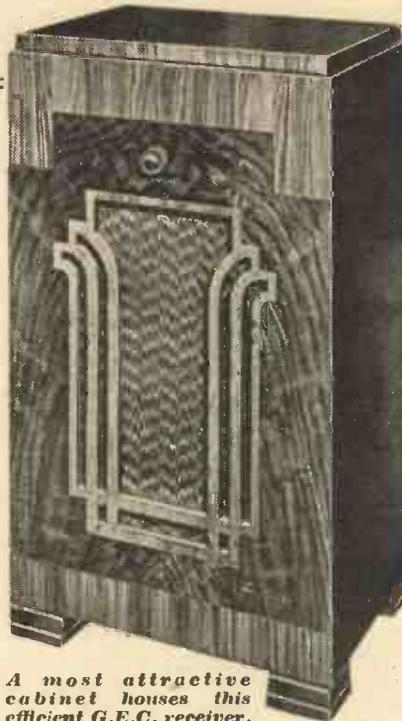
Impressive Comparisons

"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



A most attractive cabinet houses this efficient G.E.C. receiver.

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."

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.

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."

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.

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 attain "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."

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 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/gramophone.

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"



The speaker-fret gauze is in a colour which contrasts pleasingly with the cabinet work.

WE called on Mr. Thomas R. Menzies, of 22a, Barons Court Road, West Kensington, with the idea of asking him some questions in connection with the Kolster Brandes Model "405" receiver which he had been testing, but came away after having answered a lot of questions put by him!

Having been asked to try out this set so that he could give his impressions of it for the benefit of readers, he was very anxious that he should thoroughly understand the various points in question. We very much appreciated his conscientious attitude, and willingly answered the queries he raised.

As readers will appreciate from this report the questions showed a careful consideration of the items from all their various aspects—as was only natural really, since Mr. Menzies is an insurance inspector by profession.

The Power Supply

"I understand," he said, "that in this test report you particularly wish to stress the advantages of Universal Mains Operation. Tell me, what exactly does that mean?"

Briefly we explained that not only could the K.B. "405" be used on mains with voltages varying between 195 and 255 volts, but that it was immaterial whether they were of D.C. type or A.C. as in the case of mains supplied by the grid system.

To which he replied, "But surely, since one's mains do not change in type or voltage, this is only an advantage from the makers' point of view in that it enables them to make only one model whereas otherwise they would have to produce two."

Naturally we agreed it was an advantage to the manufacturer but pointed out that that was by no means the beginning and end of the matter. For instance, we explained there was the case of people who were expecting to have their mains changed over from D.C. to A.C. at any time.

There was no need for them to delay purchase, quite a big point, because often the "any time" wandered on for month after month before anything was done.

"Yes, that's quite true," agreed Mr. Menzies, "and anyone who is fortunate in

★.....★
THE CIRCUIT EMPLOYED

A six-valve super-heterodyne arrangement is used which incorporates an H.F. stage of amplification and a full-wave push-pull detector. There is delayed A.V.C. and a pentode feeds the moving-coil speaker.

★.....★

UNIVERSAL MAINS OPERATION

No aerial is necessary; no earth is necessary; it will work simply by plugging into the mains—these are but some of the advantages of the Kolster Brandes Model 405 Super-heterodyne Transportable Receiver described on this page.

possessing a car can take the set with him on holiday or on a visit to a friend without having to bother what the type of mains are at his destination."

"And that," we added, "is quite a big point with this K.B. model since it is of the transportable type and does not need an aerial and earth."

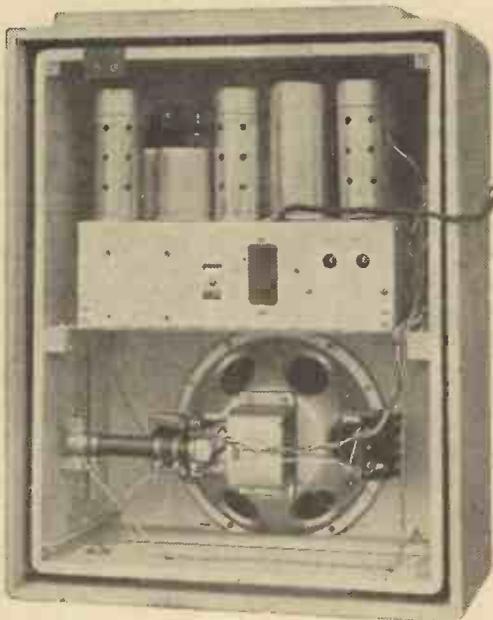
"I like the idea of no aerial or earth being necessary, although I see you can add them if you like," continued Mr. Menzies. "By the way, I take it that the turntable fixed to the bottom of the set is to enable full use to be made of the directional effect of the aerial. Is that right?"

The "Extra" Stations

"Yes, quite correct," we replied, "but as you will have noticed, the set is not critical in this way by any means."

"The station calibrated dial is a good point," Mr. Menzies said, "but I was a little surprised to find stations coming in where there were no names. At first I thought

WELL SCREENED



The cans with holes in them are valve screens, the holes being to provide ventilation. Note the adjustable mains resistance mounted to the left in the bottom compartment of the set.

perhaps the calibration was a bit out, but I proved afterwards that this was not the case, in fact the calibration is very accurate. Is it usual to get stations other than those mentioned?"

"With a really sensitive set such as this K.B." we explained, "it is impossible to get all the stations that it will receive printed on the dial, so only the more important ones and those which come in easiest, are given."

"I follow," was the reply, and Mr. Menzies continued. "This point on the long-wave

dial marked 'Aircraft' is a very interesting one. I have heard both powerful and weak telephony here. Is it possible that the latter came from aeroplanes actually in flight?"

"Most certainly. You have an extremely sensitive set here you must remember," we said.

"I thought they must be aeroplanes, but I have never heard one before. I think it is an added attraction for the set to go down to that wavelength."

★.....★

"In spite of the compact design of the set, there is nothing boxy about the reproduction, even when the volume is turned up very loud."

★.....★

And having covered the more technical ground, the questions became fewer, but Mr. Menzies continued to describe the features which appealed to him, and why they did so.

For instance, there was the question of appearance, of which he said: "I think it is one of the finest looking small receivers that I have seen. The idea of using a material behind the speaker fret of a colour that contrasts with the cabinet finish is very effective. And the finish on the cabinet is absolutely first class.

"Another 'quality' point about the set is the tone of reproduction. In spite of the compact design of the set, there is nothing boxy about the reproduction, even when the volume is turned up very loud.

Easy to Control

"To tell you the truth I thought the speaker must be of the twin-cone type, the balance of the reproduction was so good. I was quite surprised to find it was not when I removed the back of the set. I knew this may seem a bit silly to you, but the question of there not being room for a twin speaker never occurred to me.

"Another point which I want to praise is the simplicity of the set in use. There is really only the tuning and volume controls to be handled.

"Incidentally, I made an interesting experiment with these two. I set the volume to zero, adjusted the tuning to Toulouse, and then turned up the volume again. There was Toulouse at excellent strength and no adjustment to the tuning improved it."

For a few moments Mr. Menzies silently studied the receiver, which was on the table in front of us, and then remarked, "You know, I think the absence of an aerial and earth is an even greater advantage than I first realised—there are no ugly wires about when they are dispensed with."

His final remarks as we left were, "I like the set very much, and must certainly see if I cannot possibly manage to get one somehow or other."

★.....★

WHAT THE SET COSTS

In a cabinet of rich-toned walnut, the receiver costs 15 guineas, or it may be obtained for a first payment of 33/- (including 3/- insurance and 12 monthly payments of 26/-.

★.....★

SELECTIVITY

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 an accountant by profession, had been trying out the Philips' Type 472A 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 extra loudspeaker, with a switch for cutting out the built-in loudspeaker. 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, off 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 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 automatically broken 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 deserves such close attention.

"Another outstanding feature is the provision of two separate calibrated dial plates, one with nearly all the stations the set will receive marked by name, and the other with the names of just those stations which can be expected to come in well at true programme value. And there are a large number of them.

"Other unusual but appreciable points

include a waveband indicator marked in actual metres, an H.F. filter circuit in series with the mains supply, and a consumption of only 56 watts.

"And now for selectivity," said Mr. Critch. "You asked me to take particular note of this in view of its importance in relation to modern reception practice.

Exceptionally Quiet Background

"The Philips 472A seems to me to be as selective as any receiver need be to-day, and that's saying something. I think nearly every station in each waveband comes in, and there is not one that is not properly separated from its neighbours.

"The only cases of stations interfering have been where they are working closer together than they should, or in the cases of common waves, which is also 'saying something.'"

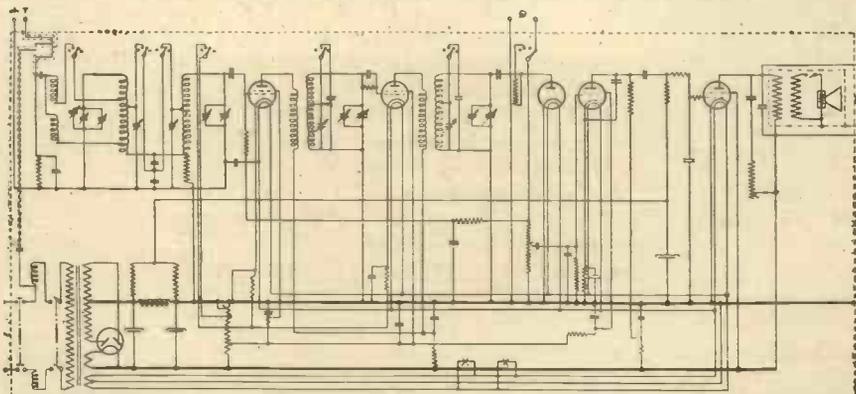
"You certainly have achieved remarkable results then," we said. "Of course, the fact that there are four fully tuned radio-frequency circuits in the set is the reason for its excellent selectivity.

"Incidentally, silent background is claimed by the makers as being one of the chief attributes of their system of obtaining selectivity. What did you think about the background?" we asked.

"It's perfect," was the reply. "Whatever the makers' claims in connection with silent background is fully justified. Except for a few clicks, due no doubt to electric light switches or similar causes, my reception has been entirely without background noises.

"A point that did strike me," Mr. Critch remarked, "was the evenness of sensitivity all round the dial."

THE CIRCUIT EMPLOYED IN THE 472A



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 not shown on the valve 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 items I have not mentioned. Yes, there are one or two. There's the question of quality.

"This is perfect to my 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 concentric.

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 half-way position.

"But to revert to the radio side of the set. The station identification chart that is supplied with it, is a good feature."

This chart shows the principle European broadcasting stations in alphabetical order, and gives their wavelengths, 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.'

And with that we felt it our duty to return Mr. Critch's kindness and offer him a drink. Which we did.

To tell you the truth, personally, we had been rather taken back by the efficiency and thoroughness with which the test had been conducted, although we knew Mr. Critch to be an enthusiast. But after all the Philips 472A is a receiver which demands attention, by reason of its attributes, in no uncertain manner. No one, we feel, could hear it and turn away uninterested.

"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 gramophile. 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



"It is one of the most handsome-looking radiograms that I have seen."

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

RECORD REPRODUCTION

Read this genuine unbiased report of the Amplion Radiolux Radiogram by an enthusiast who tried it out in his own home.

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.

★.....★
"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."
 ★.....★

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



JUST as with sensitivity and mains receivers, so it is with power and quality. These features are taken for granted where there is an ample supply of current available. But this should not be!

The volume and excellent reproduction given by modern receivers is quite an outstanding achievement. A battery set "with the volume of a mains receiver" was once a mythical ideal, and not so long ago either.

But you can have all the volume you want, and with the finest quality as well, from even a battery set these days. We chose volume and quality as the feature to be represented by the Marconiphone Model "257," because this receiver excels so in both of them.

The test of this receiver by Mr. B. Kayes, of 3, Cromer Road, Tooting, took the form of comments on a demonstration given by us. But Mr. Kayes, who is an insurance clerk, con-

QUALITY AND VOLUME

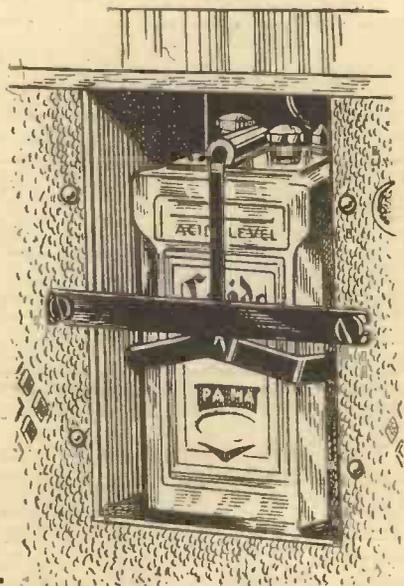
A test report of the Marconiphone Model "257" battery superheterodyne receiver



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.



An excellent feature of the design. The special, conveniently accessible compartment at the back of the set for the accumulator. It is only necessary to slacken the two screws and remove the metal strap in order to get the accumulator out for recharging.

"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 the 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 11 guineas, or £1 10s. 0d. deposit and 12 monthly payments of 18s. 3d.

"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."

THE CIRCUIT

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

firming his impressions over and over again while the set was in his possession.

The reason he asked us to demonstrate the receiver was because his experience of radio receivers has been limited to more simple battery sets, and he was afraid the Marconiphone "257" Superheterodyne would be rather complicated for him. But he agreed with us, after he had seen it connected up and had handled the controls for himself, that this was quite a wrong impression.

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 allots 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 :

R.S.G.B., 53, Victoria Street, London, S.W.1.

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 wave-band 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 wave-band 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

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 get bands, taken over a whole year.



SHORT WAVE NOTES

Our short wave expert, W.L.S., has something to say about radio clubs, and also concerning the present reception conditions and future possibilities of the ultra-high frequencies.

so, in fact, that the chances are that they are bound to be fairly good by the time these notes are in print.

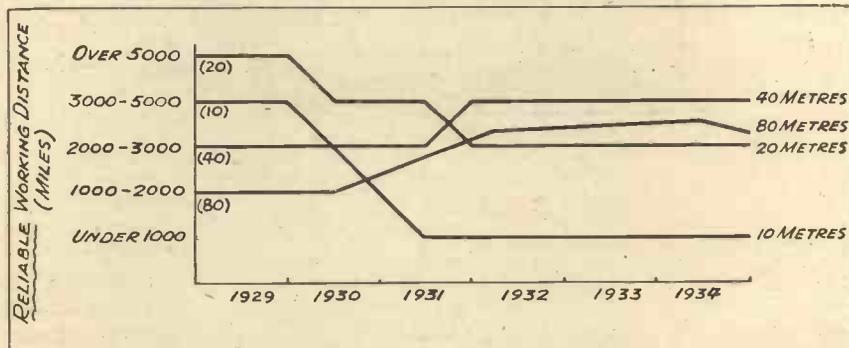
Naturally there is some little "time-lag" between the time of writing and the time of reading, but I can only say that conditions can't keep on as they are, or we shall all give up short waves!

Improvement is Due

We are due for a pretty good year of short-wave work, and as conditions improve with the "climb" of the eleven-year cycle we shall probably be doing miraculous feats of reception.

When you consider that we started short-wave work under pretty good conditions, which have been getting steadily worse ever since up to this year, you will agree that receiving and

HOW THE VARIOUS WAVELENGTHS BEHAVE



The diagram shows how the reliable ranges of four different wavelengths have changed during the first half of the present eleven-year cycle.

transmitting technique must have improved enormously. For, when all is said and done, we haven't noticed such a terrible dropping-off, taken on the whole.

Now, of course, the fun is due to start. We're soaring up the other side of the cycle, and conditions should get better and better for some years.



From My Armchair

by
S.T.

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

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



As explained in these notes Carlos, our enthusiastic follower and constructor, has sent this photograph, together with that on page 110. Above we see the "peasantry" who bought Carlos' "S.T.400" to scare the birds on his farm. Carlos' "S.T.400" figures in the photograph. The gentleman on the left is the farmer's son.

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

as you ask me for the farmer's "port-manteau," 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 per centages 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-avel and connected to his neighbour's lead roof. This photograph looks as though it had 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 come back to-day with more proofs that I am a living creature, which dōdge 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 proprietary, 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

SCARING THE BIRDS WITH RADIO

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-sargent?

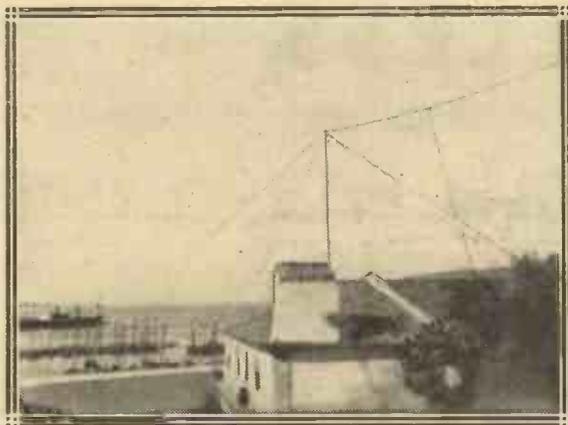
I have further same more photos to send you but they are not ready yet, so I'll let you have them by a future letter from me.

"An Exaggerate Judge"

The Electron Works have offer me they new and special Globe aerial, what do you think of its practical merits?— I have at present a Superial, having 70 feet horizontaly placed and the remain 30 feet as leading-down to the window, from this to the set I have a Goltone 35/RZ/509 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

IN SUNNY PORTUGAL



One hundred feet "over the water-avel" is the aerial on this house, where Carlos lives—and experiments. A very fine situation for long distance reception it appears to be too. The mast is 17 feet above the chimney so Carlos ought to get good results.

should give it a try, down here and you know yourself by experience, I am an exaggerate 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 ex-sargent, 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 Nycrolode 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 spontanety.

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 curiosity 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 Caterham-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, Trondelag 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 138.)

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 \end{array}$$

And the answer,—
John Scott-Taggart's
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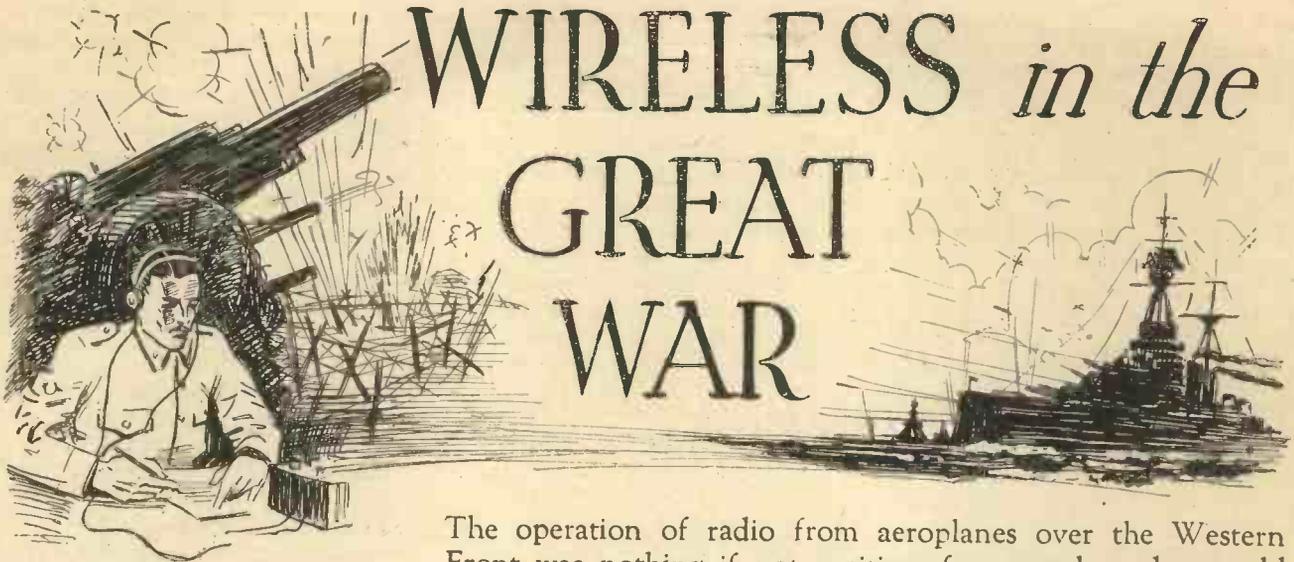
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WIRELESS *in the* GREAT WAR

The operation of radio from aeroplanes over the Western Front was nothing if not exciting, for scarcely a day would pass when there was not an attack by the enemy fighters on the wireless machines. Here is a pen-picture of an aspect of the war that is full of action and adventure.

By "Radiat"

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 north-west. 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 manœuvre the machine for more height.

Split seconds fly by. It is an enemy

SAFELY HOME FROM THE LINES



(Imperial War Museum Photo)
The R.E.S., a standard type of British Artillery Observation aeroplane used during the period 1917-1918. The engine was the 150 h.p. Government designed Royal Aircraft Factory, Raf 2a, and was air cooled.

machine all right, the dark square sign of the iron cross is clearly obvious now on the lower wings. Five hundred yards, three hundred, two. The rattle of the enemy machine gun is heard above the din of the engine. Short, sharp bursts at first, then a continuous rattle. Still the English observer holds his fire. Bullet holes appear at various points in wings and fusilage of his 'bus, but so far no shot has hit anything vital.

The British 'Plane Replies

The enemy pilot zooms over his antagonist, half-turning as he does so and exposing the under part of his machine to the Englishman. This is the moment the observer has been waiting for. Rat-tat-tat! rattles his machine gun and his shooting is good, for the tell-tale holes appear in the enemy's fusilage. But not good enough, for the enemy climbs again and a few seconds later is once more diving at the English plane.

German bullets bespatter the upper wings of the "art. obs. 'bus," the English pilot skilfully twists this way and that and once again manages to give his observer the chance to fire at the underside of the fighter machine, and the observer presses the trigger.

Jammed!

There is a sharp snap, but nothing happens; the gun has jammed! The English pilot glances round quickly, realises what has happened and endeavours to swing his machine round so that his own guns are pointing at the enemy.

The two machines pass so close to each other that the antagonists can see each other's face beneath the goggles. The English pilot catches a momentary glimpse of the German's jaw relaxing into a triumphant smile. A glance has appraised the latter of the jammed gun, and the comparative helplessness of the English machine. In any case the German machine is faster than its adversary, and now the German turns his machine almost leisurely for the final coup-de-grâce dive on the English-

SAVED AT THE LAST MOMENT

man—a shower of lead, a cloud of smoke, eager flames and one more 'plane crashing towards the earth.

Unexpected Succour

Seeing his fate in the German's face and movements, desperately the English pilot banks his machine in an effort to meet the enemy face to face, but realising that there is not much hope for his "old wagon." Forward goes the German's "stick," pushing the machine into the "death dive." Suddenly he sees, to his amazement, those dreaded little holes—bullet holes—sweeping along his wing towards him. Before he has realised what has happened there is that choking puff of smoke, the licking flames, and in a moment the whole machine is enveloped in smoke and flames, and hurtling its tortured way earthward.

The English pilot and observer gaze around in amazement; the enemy

frequent in the wireless aeroplanes over the Western Front, and often the wireless man had to drop the Morse key for the machine gun.

From the very beginning it had been realised that wireless must enhance the value of aircraft in war-time tremendously. The primary duty of aircraft was reconnaissance, spotting the movements of the enemy and reporting these observations to Army headquarters as early as possible. Obviously the most efficient method of carrying out this reporting was by wireless, and a wireless section accompanied the early Royal Flying Corps squadrons in France in 1914.

No Reception

In the early days of the war valves were hardly known, and, as a result, reception in aircraft was regarded as impossible. Aeroplanes, therefore, were fitted with transmitters only.

One of the earliest transmitters on aircraft consisted of a small induction coil made by Messrs. Sterling, complete with key and tuned circuit, and worked from accumulators. The aerial was unwound from a reel, and the earth or counter-poise consisted of the engine and other metal parts of the machine. The set was tuned by means of the aerial, the latter being unwound until a maximum reading was attained on the aerial ammeter.

Richthofen!

As indicated above, wireless operating from aeroplanes over the Western Front was nothing if not exciting, for scarcely a day would pass when there was not an attack by the enemy fighters on their wireless machines. Earlier

in this year 1917, while endeavouring to keep the enemy away from wireless and photograph machines, seventy-five British machines had been destroyed by the Germans in five days. This success was largely due to the German ace, Richthofen, who made a speciality of attacking "art. obs." machines, and, in fact, built up his reputation on the destruction of radio-equipped 'planes.

(Please turn to page 139.)

WHEN THE PATROL WAS OVER



(Imperial War Museum photo)

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, 1918.

has met the fate which they themselves expected. The explanation is simple, for the air is full of wings—wings painted with the coloured circles of the Allies. A formation of British scouts has appeared at the critical moment. So here's to the next time. Out goes the aerial again, and once more the pilot becomes a wireless man and carries on with artillery observation. Such experiences as this were

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 an eliminator. It is hardly audible when signals are not received, but it completely mangles reception when signals come in. The set is fully decoupled and uses only the best components throughout. My local dealer says it cannot be stopped. What about it ?

A. This is pretty obviously a case of motor-boating, the frequency of the "pops" being so low that a throbbing sound is heard.

The cause may be wrong connections to the mains unit. Try taking separate tappings 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 tappings 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



The questions dealt with on this page are from those raised by readers, the queries published being chosen for their general interest. The answer to the query concerning motor-boating should be read very carefully, for it should be of great assistance to many constructors troubled with this prevalent complaint.

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 not 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.

ONE 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 as a singer 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 "croonette." Joe Loss records for "Octacros."

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 seeing 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 (Chu Chin Chow). Malcolm McEachern. Otherwise Mr. Jetsam. Gives good scope for his deep bass notes. Col. DX598.

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 Robeson. His second selection of Robeson favourites. H.M.V. C2708.

Love In Bloom. Gracie Fields at her best. Also hear her *Isle of Capri*, which is also very fine. H.M.V. B8243 and B8232.

O Sole Mio. Beniamino Gigli. The second Caruso is one of the finest recordings 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. Melodious composition, well played. H.M.V. DB2362.

Smoke Gets In Your Eyes. Salon Orchestra. An admirable recording. H.M.V. B8240.

Blue Danube. Vienna Philharmonic Orchestra. One of the finest renderings I have heard of the world-beloved waltz. H.M.V. C2686.

Where The Rainbow Ends. Selection on the organ by Sidney Torch. Col. DX647.

Two Cigarettes in the Dark. Organ solo by Harold Ramsay. No more need be said. Parlophone R1972.

DANCE NUMBERS

Stars Fell On Alabama. Guy Lombardo and his Royal Canadians. I always like the neat orchestrations used by this band. Bruns. O1907.

Lost In a Fog. The D'Orsay Bros. Bruns. O1900.

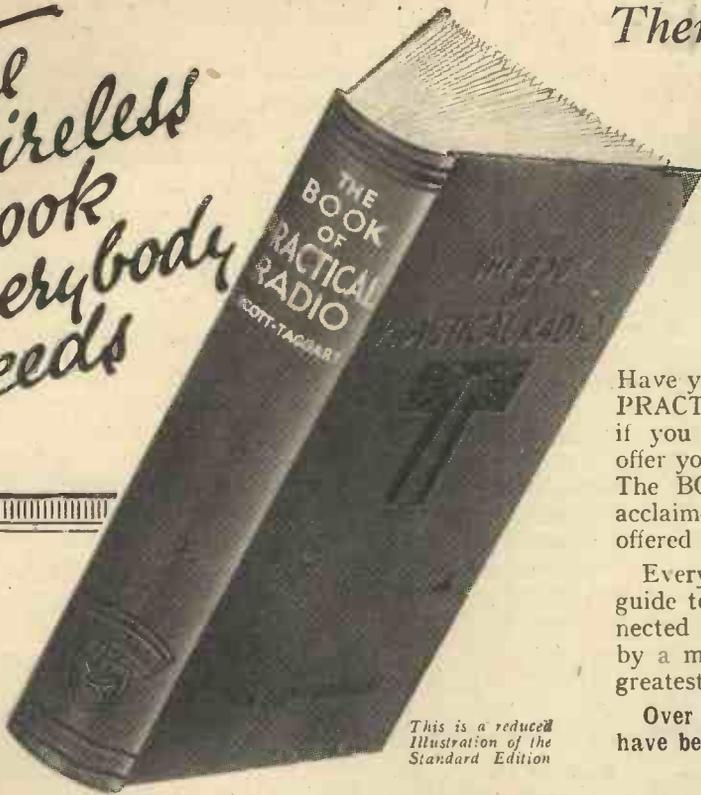
He Didn't Even Say Good-bye. Henry Hall. The B.B.C. dance orchestra to the life. Col. CB799.

Just a-Wearyin' For You. Jack Jackson. A good record. H.M.V. B6541.

Who Made Little Boy Blue? Ambrose and His Orchestra. An excellent disc. Decca F5284.

Soon. Roy Fox. One of the best of this number. Decca F5213. K.D.R

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B.B.C. NEWS

Reviews to be Revived on the Radio—Improving Regional Broadcasting—Religion and the B.C.C.

By Our Special Correspondent

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.

This is yet another sign of the "going gay" tendency of the B.B.C. Last year saw a big increase of the proportion of light to heavy programme matter. This year is to see the process developed. All of which is good news for the listener.

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 for all regions.

being improved; it remains to get the transmissions levelled out.

Tale of Two Cities

The Columbia Broadcasting System of the United States, which is ably represented in London by Mr. Cesar Saeringer, 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. Saeringer recently had a brain-wave, conceiving the idea of a neat trans-oceanic 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.

RADIO GANGSTER



"Lollipops," is not his cry, he's singing into a microphone as the "Singing Chocolate Boy," which is the latest find.

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.

Mr. Edgar, the able senior director of the B.B.C., keeps his eye on the adjustment of relations between London and the Regions and he can be counted on to make further moves this year. Broadcasting conditions are rapidly

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 relieved 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 Selsdon'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,

MEDIUM-WAVE NATIONALS NOT TO SHUT DOWN

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 Hungaria Gipsy Band. This band was "on the air" for the first time last month.

ONE hears a lot about the various uses of the

A USE FOR STATIC

How photo-electric cells are used to control transmitters.

"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

relay momentarily disconnects the station's aerial from

the transmitter and so prevents the shorting of the aerial current to earth.

Thus the station is able to maintain normal working even when quite violent electric storms abound.

Photo-electric cells have also been used in other ingenious ways in connection with transmitters. For instance, an amateur adopted the following scheme.

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.

As We Find Them



NEW APPARATUS TESTED

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



The AvoMinor is a precision instrument of the multiple-range type, with a good moving-coil movement. It is supplied complete with two flexible leads having interchangeable crocodile clips and testing prods.

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.

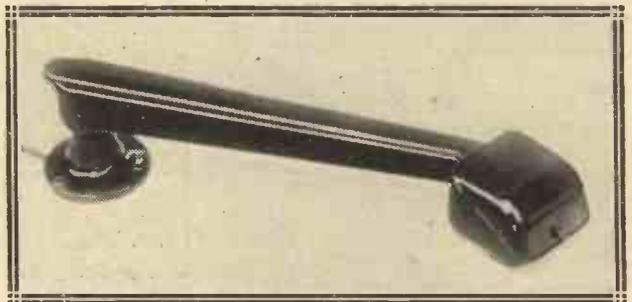
Every AvoMinor is supplied complete with a pair of leads having interchangeable crocodile clips and testing prods. The price is 40s.

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

The new Graham Farish pick-up which sells for 14s 6d. Particular care has been taken in the design to provide for easy and rapid needle changing.



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.

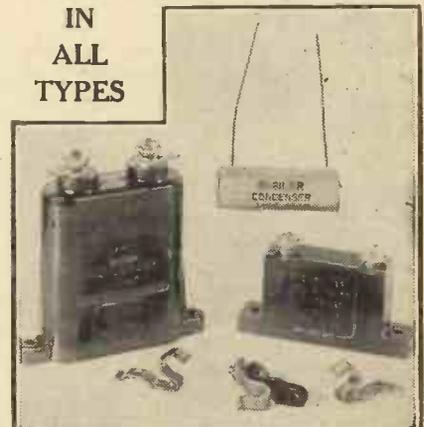
There is a Dubilier condenser for every purpose, and the photograph on this page shows three samples we have had the opportunity of putting to extensive tests.

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

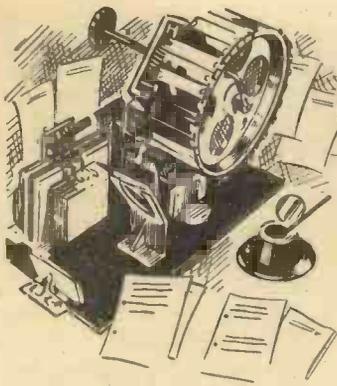
available with grid-leak clips which fit on to the terminals.

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



Three types of fixed condensers from the famous Dubilier factory. The grid-leak clips in the foreground are used in conjunction with the condenser on the right.



Notes on Television

by DR. J. H. T. ROBERTS F. Inst. P.

Our Scientific Adviser discusses the various points that have to be settled in regard to television, and the work of the Committee whose report is expected almost at any moment.

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.

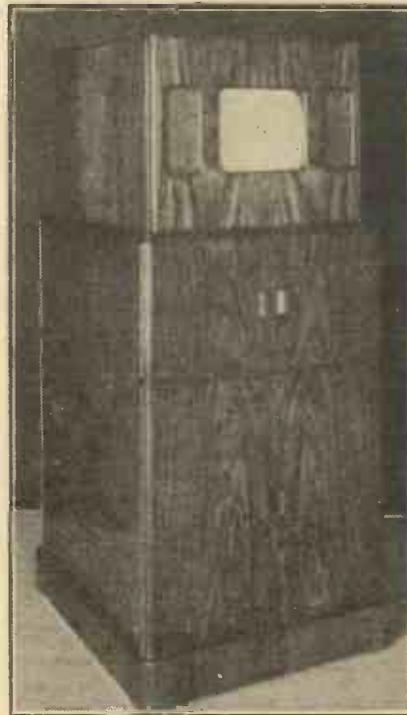
In these circumstances, then, it is only right that the Committee should, in the well-known political phrase, "explore every avenue and leave no stone unturned." From my official meetings with the Committee I can tell you that they are taking their task very conscientiously and that they fully realise the importance of what they have been charged to do.

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—scarcely 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 certain points of view.

HIGH DEFINITION



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

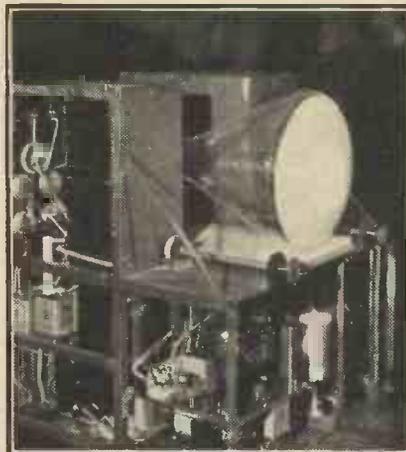
should *not* do so, and in the second place, we all know perfectly well that in the early days of wireless telegraphy and telephony, the experiments of amateur transmitters contributed very materially to progress rapidly made.

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

THE "HARD" TUBE



The chassis of a Telefunken cathode-ray tube combined sight and sound receiver. A "hard" tube is incorporated, an innovation where television is concerned.

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" tele-

vision. 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 televiewer 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 televiewer 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.

IN LIGHTER VEIN

Tom Sisson.



PROFESSOR GOOP "GETS DOWN TO IT"

"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.

Saved by Providence

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.

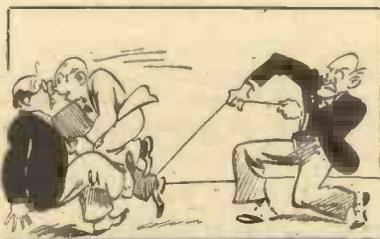
"Be quiet, my good chap," cooed the Professor.

Poddleby went on talking.

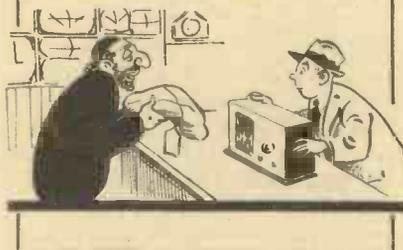
"Shurrup, Poddleby," I bellowed.

"You've a mouth on you like an infernal alligator."

Poddleby subsided and the three of us returned to the Professor's den to



PROFESSOR GOOP LEADS A DISCUSSION ON THE POOR RADIO RESULTS BEING OBTAINED IN MUDBURY WALLOW, BUT THE DISCUSSION ITSELF LEADS TO SOMEWHAT DIRE RESULTS



discuss the momentous question of deteriorating reception.

"I was just saying," explained the Professor, "before your assault on poor Wayfarer that reception in Mudbury Wallow is not what it was a month or two ago. Now take this set—"

Poddleby half rose from his seat and stretched forth clutching hands. The Professor pushed him back with a Rugger hand-off and remarked that he was speaking metaphorically.

"This set," continued the Professor, "is a ten-valve Super-Blimperdyne 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 Yugotoblazia at wake-the-baby strength on the loudspeaker. To-day 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. "Nooo, I can't say that I am."

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

"I don't think; I know."

"Well, what is it?"

In Safe Keeping

"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 Pimpleson 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

THIRSTY WORK



She returned with three glasses and three bottles of brain lubricant.

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 and after that the discussion became much more animated. If ever it showed signs of flagging I merely pressed the bell and the beneficial effects of moisture on efficiency were speedily demonstrated.

"Poor Miss Worple," said the Professor at length, "is having a *very* bad

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 he-men volunteered as one to go to the rescue. Like all the best men I loathe 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 strands 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. This left two for the foreman, which is what the broadcasting johnnies call a fair division of labour.

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'clockses.

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

"I WAS FOREMAN"



There are lots of good things about being 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 umpteen pounds for wasting water. Water she may have wasted, but I can assure you that her elevenses, twelveses, oneses, twoses, and threeses went to exactly the right spot, though the Professor and Poddleby may have a different tale to tell.

"362" VALVES

A Comprehensive Range of Inexpensive Battery and Mains Valves.

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 ACPX4. A 3-watt pentode costs 13s., 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'"

says Dr. J. H. T. Roberts, D.Sc., F.Inst.P.

in "WIRELESS"

WHAT OTHER EXPERTS SAY:—

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"POPULAR WIRELESS":—"Eclipses previous standards" and "A valuable contribution to better broadcasting."

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Make no mistake—this revolutionary speaker, almost conventional in appearance, embodies these distinct and exclusive improvements in design. Its startling performance has amazed experts everywhere.

The unique Whiteley Speech Coil is bringing to thousands a new conception of realism in radio. The exclusive new magnet (prov. pat.) is giving to users a majestic volume of which they never thought their sets capable.

Whatever your set, a W.B. "Stentorian" will match it accurately as principal or extension speaker. Hear one to-day, and marvel at the astonishing difference it makes.

WHAT PRIVATE USERS SAY:—

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"In fact, no words of mine can express my feelings about this masterpiece of loudspeaker art and I can only say that from henceforth W.B. Stentorian is my motto, and I am proud of it."—A. H. K., Brierley Hill.

"I cannot speak too highly of this marvellous instrument."—E. H. N., Ayrincham.

"Thank you for the opportunity to hear radio so perfectly."—R. C., Swindon.

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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

(Continued on next page.)

THE PRINCIPLE

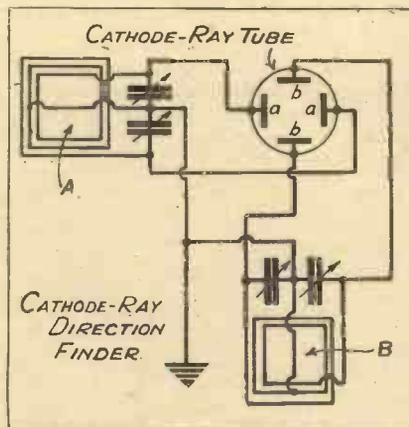


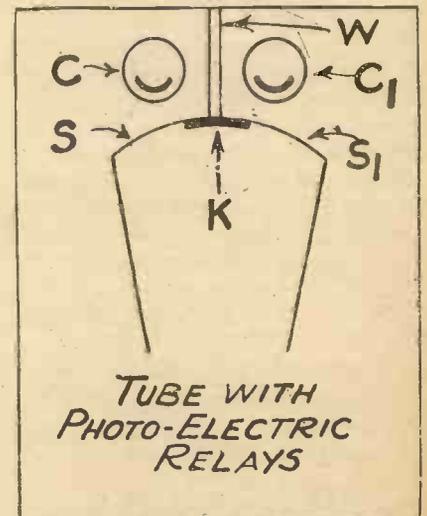
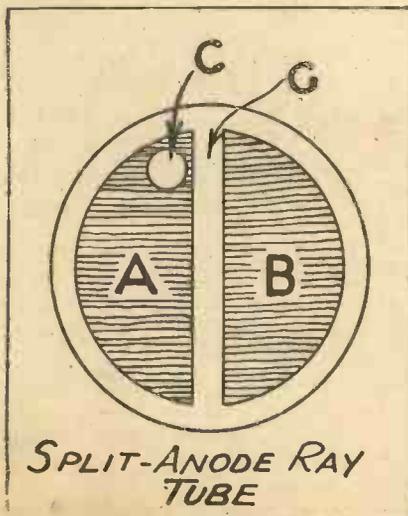
Fig. 1, above, illustrates how the two directional frame windings are connected up to the control electrodes of the cathode-ray tube.

* * *

To the left is Fig. 2, which shows the end of a "split" cathode-ray tube. When the spot C is in the centre gap G, the ship is dead on its course.

* * *

On the right (Fig. 3) is an alternative method of indicating whether a ship or aeroplane is on its proper course. In this case two photo-electric cells C and C₁ control the warning lights.



"STEERING" BY CATHODE-RAY

—continued from previous page.

screen is deflected to one side or other of the centre of the screen.

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.

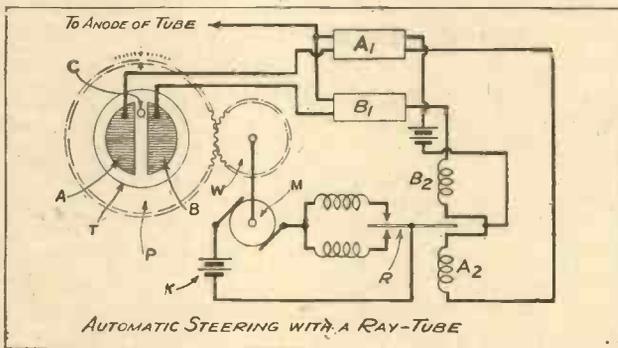
In order to give a more definite indication of any deviation, the

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.

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.



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 the plate marked A. Of course, if the ship "yaws" in the other direction the spot invades the plate marked B.

Now imagine that the two plates A, B are each connected to a separate amplifier. So long as the spot "stays put" on the centre gap, it either feeds no current at all to either of the amplifiers, or else it passes a very small current of equal strength to each.

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

Fig. 4 shows how this is done. 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 coil B2 of which is fed from the amplifier B.

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. Any deviation to port or starboard produces a displacement of the cathode-ray "spot." This is at once followed by a flow of current through one or other of the coils A2, B2, and a corresponding movement of the relay arm R which in turn energises the motor and causes the base plate P to rotate so as to bring the craft back on its proper course.

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Potted Programmes

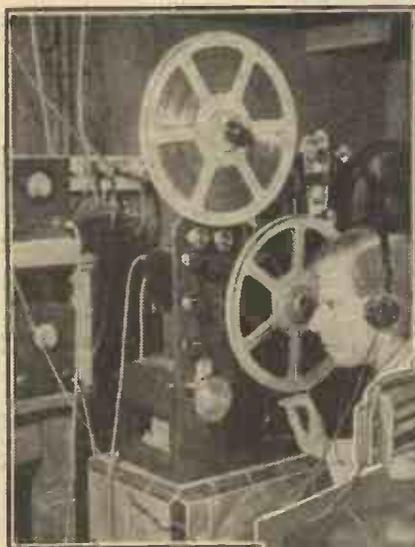
IN the early days of broadcasting it would have been considered a sacrilege both by broadcasters and by listeners to transmit an entire programme from records, always excepting, of course, the bona fide so-called gramophone concerts, which were not unpopular.

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



Above is a special portable recording outfit which employs a steel tape for taking the "impression."

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 broadcast 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 Blattnerphone 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 stand-

ardisation 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 Blattnerphone. 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 practicality, 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.)

★.....★

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

★.....★

SOFT-WAX RECORDING

This apparatus below is used in Germany for topical items. Two impressions are made so that one can be played back as soon as desired.



"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 three 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.

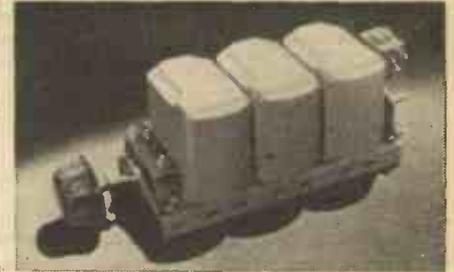
Individual Attention

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. The address of the Technical and Commercial Radio College is Cromwell House, High Holborn, London, W.C.1.

A. S. C.

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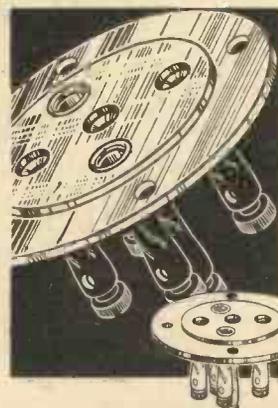
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FROM MY ARMCHAIR

—continued from page 119.

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

My correspondent says: "Do not let the Press know anything."
O.K. Mum's the word.

* * *

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 circuital dreams that only your unquenchable ambition for prodigies could conjure up.
J. S.-T.

THE EDITOR'S CHAT

—continued from page 99.

much; but 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 proportion 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 this 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.

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 those pages which are devoted to this aspect of radio fully comprehensive, useful, interesting and novel in their presentation.

WIRELESS IN THE GREAT WAR

—continued from page 122.

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 war in the air 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 reels, 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 reel 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.)

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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, Mannoek, 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 Richthofen.

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

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!

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

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