The Wireless Constructor

6d

INCORPORATING "MODERN WIRELESS"

Vol. XVIII. JULY, 1934. No. 93

Victor King's 1934 PORTABLE

ALSO THIS MONTH:

HOW TO MAKE AN H.F. ADAPTOR

FROM MY ARMCHAIR

OUT-OF-DOORS RADIO

WIRELESS IN THE GREAT WAR

Etc., Etc.

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THE EDITOR'S CHAT

THE WIRELESS CONSTRUCTOR
INCORPORATING MODERN WIRELESS

A Portable that *is* Portable—An Important Television Merger

To describe a set as portable is very often no more illuminating than to describe a set as movable. Portability is an elastic term. A cannon ball is portable, but nobody in his senses wants to lug around something which weighs as much as a cannon ball! Especially if the weather prophets' forecasts of a really warm summer this year are to be fulfilled.

And when you are going into the country in the summer to spend a week-end, or perhaps only an evening, and you want to take a wireless set with you, you certainly want to take one which does not weigh as much as a large cannon ball or anything like a cannon ball. In other words, a portable set ought to be sufficiently light to enable one to carry it about without any discomfort.

A Light-Weight Success

Mr. Victor King set himself the dual task of designing a portable set which would be portable in the real sense of the word, and which would be capable of sensitive reception and of giving good entertainment value for the money it cost to build.

In building the "1934 Portable" Mr. King succeeded in producing a set which combined portability and sensitivity, in spite of the antagonistic qualities involved.

If you examine the circuit he has chosen and the photographs which illustrate the results of his labours, we think you will agree that he has successfully achieved his objective and has produced a light-weight portable, which we can strongly recommend.

Our readers have probably noticed in their newspapers a much more serious and level-headed attitude towards television. Television is no longer a subject for stunts; it is now, in fact, classed as a serious proposition. Two significant news items about television development appeared in the newspapers recently. One was the announcement by the Postmaster-General that Lord Selsdon (a former P.M.G.) is to preside over the Government Committee set up to inquire into the development of television.

The New Committee

Members of the Committee include Sir John Cadman, Vice-Chairman, who is a notable figure at Birmingham University and Past President of the Institute of Mining Engineers; Colonel A. S. Angwin, Assistant Engineer-in-Chief to the General Post Office; Mr. Noel Ashbridge, Chief Engineer of the B.B.C.; Mr. O. F. Brown, of the Department of Scientific and Industrial Research; Vice-Admiral Sir Charles Carpendale, one of the Controllers of the B.B.C.; and Mr. F. W. Phillips, Assistant Secretary to the G.P.O.

The terms of reference of the Committee are: "To consider the development of television, and to advise the Postmaster-General on the relative merits of the several systems and the conditions under which any public service of television should be provided."

* * *

The other interesting news item about television was the registration of a new television company, the Marconi–E.M.I. Television Company, Ltd.

This new company is the result of an agreement between the Marconi Company and Electrical & Musical Industries, Ltd. The two companies have merged on a fifty-fifty basis, the objective being the development of high-definition television.

Expanding Television Business

At the recent Annual Meeting of the Marconi Wireless Telegraph Co., Lord Inverforth told the shareholders that he believed that, without undue optimism, they could look forward to an expanding television business in the near future. They were in the forefront of television, he said, and the new company would produce those types of television transmitters for which they foresaw the greatest opportunities in the broadcasting services of the world.

"The research laboratories of the Marconi Company and of E.M.I.," continued Lord Inverforth, "will combine in that field of television in which we have agreed to collaborate."

So those who read between the lines will gather that television results will, in due course, be well worth while.

DISCONTENT IN THE WEST COUNTRY

Led by Lady Astor, a deputation of west country M.P.'s and mayors recently visited Broadcasting House to lodge complaints before Sir John Reith concerning wireless programmes in the west of England. In this photograph the deputation is seen at the entrance to Broadcasting House.

WHAT ARE THEIR HOBBIES?

REVEALING THE FAVOURITE PURSUITS, LIKES AND DISLIKES OF SOME PROMINENT RADIO ARTISTES

OUTDOORS —AND IN

***Hugh E. Wright** (above) has a delightful garden in his Hampstead home in which he delights to work. Leonard Henry (on the left), takes no little pleasure in answering all his "fan mail"—on a typewriter which cannot spell!*

DISCUSSING sport in general a few days ago, the question of representative swimming teams cropped up, and I found, rather to my surprise, that broadcasting could show a very fine strength in this sport. Finally the following team was picked out as being likely to make a really good show against all comers. Here it is:

WYNNE AJELLO
VERNON BARTLETT
LAWRENCE BASKCOMB
THE CARLYLE COUSINS
(Cecile, Lilian and Helen)
TESSA DEANE
HEDDLE NASH
RUDY STARITA
ANN TREVOR
and
CAPT. H. B. T. WAKELAM.

Perhaps, one day, this selected team may manage to issue a challenge to swimmers in other branches of entertainment. But, anyhow, it raises the interesting question of how radio artistes spend what little spare time they have.

Golf, of course, claims a very large percentage of well-known radio people, from Hector Abbas, the 45-year-old microphone actor, to Hal Swain, who is Vice-Captain of the Vaudeville Golfing Society, and A. G. Street, who has played for his county, Wilts.

Les Allen, Bert Ambrose and Carroll Gibbons might successfully represent broadcasting dance bands, with Charlie Clapham and Billy Bennett as champions of variety. Charlie, by the way, will tell you that his hobby is "learning golf"—but he plays a good deal better than he likes to admit.

Whenever they have the opportunity, dog shows claim the attention of Jean Allistone, Doris Arnold and Freddie Grisewood, of the Broadcasting House staff, while Les Allen loves dogs as well as golfing.

In Rotten Row you might easily find Betty Bolton and Olive Kavann, while if a spare horse should appear you would have hard work keeping Sydney Kyte out of the saddle!

Mountain Climbing, Too!

How would you like to spend a holiday in the mountains after singing in opera and concerts? May Busby claims mountaineering as her especial hobby—and she really does climb, not content just to walk up a slope! Even at the top of the Swiss Alps, however, she cannot get away from her reputation, for she is always meeting people who recognise her—or talk about her, not knowing who she is!

Dropping bricks is the avowed occupation of Leslie French (whose statue adorns the entrance to Broadcasting House), while Tyrone Guthrie, author of several well-known radio plays, which include the famous "Squirrels' Cage," competes with him in the matter of strange hobbies with "drawing on the tablecloth"! P. C.

THE STAR OF THE MONTH

OUR BROADCAST CRITIC SELECTS THE OUTSTANDING PROGRAMME PERSONALITY

ALL those who consider that broadcasting should consist entirely of non-stop variety programmes will doubtless disagree with my choice this month. On the other hand, having chosen Professor H. Levy, Professor of Mathematics at Imperial College, I feel perfectly certain that my decision will be endorsed by all who heard him conducting his weekly conversations at the microphone.

Professor Levy was badly served by his presentation. If you look to your radio for entertainment, I do not blame you at all for not tuning in to a weekly item bearing the general title of "The Web of Thought and Action," in reference to which a "Professor of Mathematics" was mentioned.

But if you did not do so, you missed some vastly diverting entertainment which, incidentally, proved thought compelling and instructive.

Professor Levy has a perfect microphone technique. His voice is pitched so exquisitely right that he can be heard and understood even through considerable distortion and extraneous interference, and he has a most attractive charm of manner.

He is absolutely at home in the studio, but neither because of this nor of his obvious wide learning is there the slightest suspicion of condescension.

The "Levy Half-Hours," in which the Professor was engaged in discussions with "thinkers and workers in various spheres of thought and action," were stimulated by wit and controversy, and must surely rank as perfect examples of broadcast talks.

V. G.

No matter where you may be, the neat, compact receiver described below will provide you with plenty of radio entertainment. Good volume and a high degree of sensitivity are outstanding features of Mr. Victor King's latest design.

A PORTABLE that is to be useful in or out of doors must have one or two qualities above all others. In the first place, it must be sufficiently light to enable one to carry it without discomfort perhaps a considerable distance; and, in the second, it must be sensitive, so that even in the worst conditions it will give plenty of entertainment.

This latter feature is one that is often neglected, I am afraid, by set designers, who are so mesmerised by the need for portability that they forget the real purpose of the receiver—namely, to give radio entertainment.

First Considerations

Naturally, the two things, portability and sensitivity, do not go together—in fact, they are opposed to one another; and so, in the design of this set that I am going to use during the coming summer—and they say we shall have another good summer this year—I have been at unusual pains to make sure that both portability and sensitivity have been achieved, in spite, one might say, of their antagonistic attitude to one another.

The first consideration is, of course, the weight and dimensions of the portable, and so I had a good look round, before I began to consider the circuit in detail, for a case that would be suitable for the construction of an accessible set and would not be too bulky to carry easily.

Swing-Panel Simplicity

Of course, I had in mind some idea of the type of circuit that I wanted to use, because I thought it most satisfactory for portable purposes; but the case had to be considered first. And accessibility, too, had to be given careful consideration, for if there is anything I hate in radio it is a set that one cannot get into for adjustments or repairs without dismantling practically everything before coming to the part that one wishes to examine.

I had decided that, if possible, I would have none of the baseboard-and-panel type of construction, but would mount everything on the panel, and would hinge it so that the components on the underside would be easily accessible.

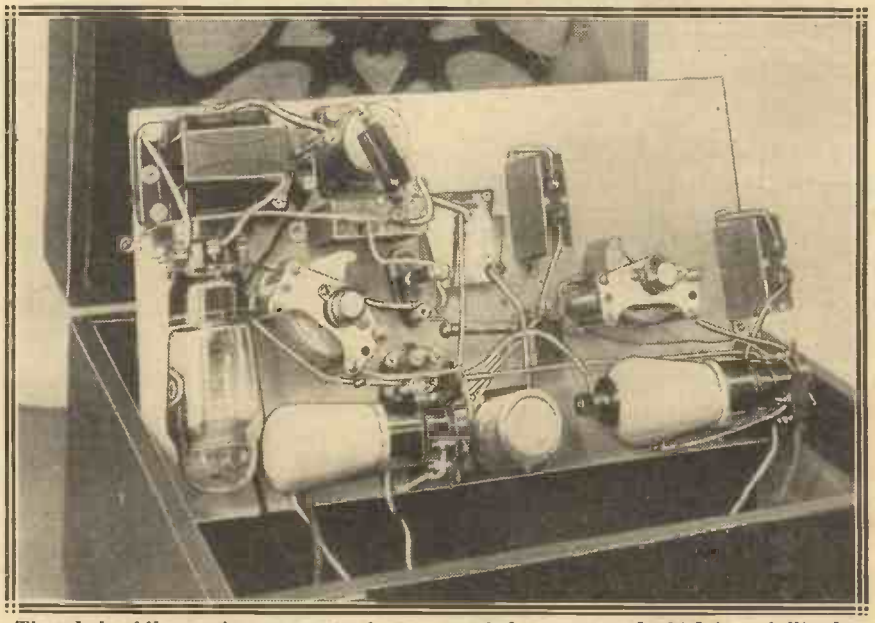
The case I found most convenient for the set was that shown in the illustrations, and it proved to be just the thing, not only for the type of set I wanted to build, but also for the particular circuit that I had in mind.

The frame aerial fits into the lid of the case, and the moving-coil loudspeaker goes there, too. The rest of the set is mounted on a wooden panel with metallised under surface. This is hinged across the case by the simple expedient of a couple of wood screws.

Commencing Construction

This enables the whole of the parts on the panel to be got at without the slightest difficulty and without disconnecting from the batteries, which are housed next to the set in a separate compartment.

EVERY PART EASILY ACCESSIBLE



The whole of the receiver components are mounted on one panel which is metallised on the underside. This is hinged in the case so that ready access is obtained. The photo illustrates the panel tilted up to show how the valves are situated.

Economical Running—

It does not matter which part of the set is constructed first—the frame aerial and speaker baffle or the panel and its associated components.

I did the set first, as a point of fact, but it really does not matter. The panel is drilled, as shown in the diagram on the last page of this description, and it is cut to the size shown, but filed down round the edges so that it is barely the full size.

This is necessary so that the wood shall not fit too tightly in the case, thus making it difficult to pull it back when the underside is to be examined.

One side of the panel is metallised and the other has a wood finish on it, giving a smart polished surface. As the various components are mounted on the reverse side to this polished surface, care must be taken that the screws used for fixing the parts do not protrude through and break it.

All drilling should be carried out from the polished side towards the metal surface. An insulating washer should be inserted in the mounting of the reaction condenser to keep the spindle from making contact with the metal panel, and a piece of card should be placed between the condenser and the metal surface so that the bases of the terminal shanks shall not touch the surface and cause a short circuit.

Mounting the Panel Parts

The on-off switch is situated in the negative L.T. lead, and can be mounted straight on the panel, its spindle making contact with the metallised surface and thus completing one side of its connections.

The same applies to the variable condensers, which have their moving vanes and the frame earthed automatically by being mounted on the panel without any insulating material between them and the underside.

The rest of the components are mounted on the wood without any peculiarities, with the exception of two home-made copper-foil tags that are placed under the screens of the coil and the H.F. choke and taken underneath to contact with the metallised surface. (See wiring diagram.)

The valve holder for the Q.P.P. output valve must be carefully mounted on a metal bracket that can easily be cut from a piece of old valve screen. The holder should be so fixed that the socket and terminal which form the apex to the arrangement of seven are at the top. That brings the two sockets that are closer together than any other two (the filament terminals) at the foot.

Those Washer Connections

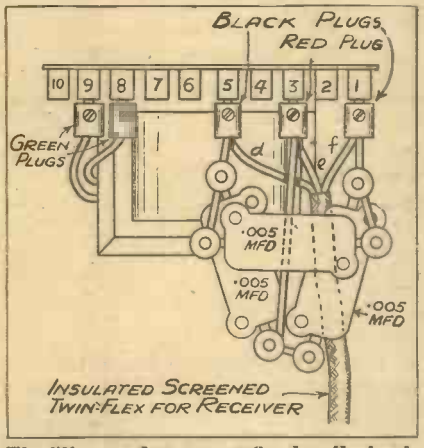
Be careful, when making contact with the metallised baseboard (or rather panel), that the wire does make good connection. A washer should be used above the wire loop when the screw is driven home, to prevent the wire splaying out and coming up over the top of the screw. Naturally, round-headed screws must be employed; it is not satisfactory to try to use counter-sinking types.

The wavechange switch is of the single-break type with two sets of single poles. Thus it is used for the

THE COMPONENTS YOU WILL NEED

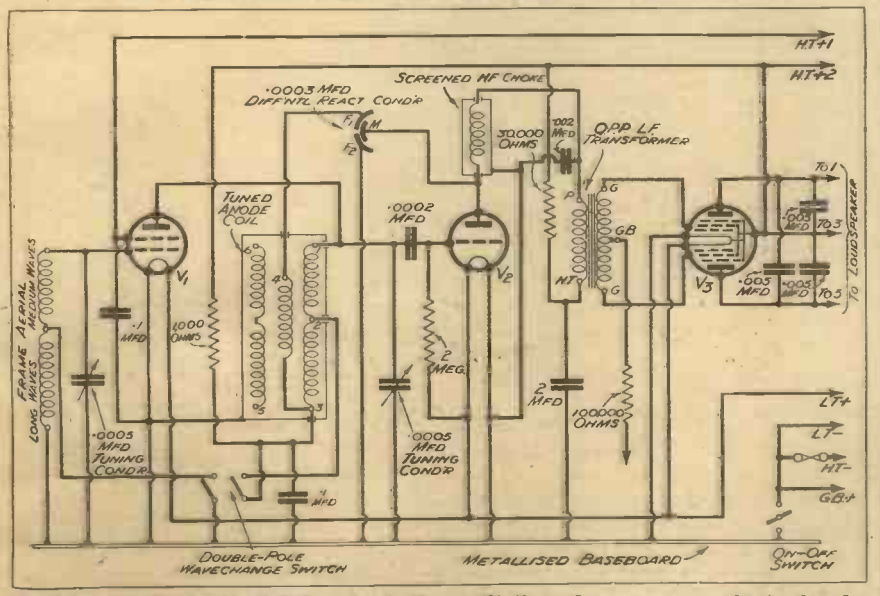
2 Polar ·0005-mfd. tuning condensers, type No. 2 S.M.
1 Telsen screened iron-core coil, type W.349.
2 W.B. universal type vertical mounting valve holders.
1 W.B. seven-pin valve holder.
1 Graham Farish H.M.S. H.F. choke (screened).
1 T.M.C. Hydra 2-mfd. fixed condenser, type 25.
2 T.M.C. Hydra 1-mfd. fixed condensers, type 25.
3 Dubilier ·005-mfd. fixed condensers, type 670.
1 Dubilier ·002-mfd. fixed condenser, type 670.
1 Dubilier ·0002-mfd. fixed condenser, type 665.
1 B.R.G. ·0003-mfd. differential reaction condenser, with insulated bush and spindle.
1 Erie 2-megohm grid leak, 1-watt type.
1 Graham Farish 30,000-ohm resistance (1½-watt type) in vertical holder.
1 Graham Farish 100,000-ohm resistance (1½-watt "Ohmite") in vertical holder.
1 Erie 1,000-ohm resistance, 1-watt type.
1 Ferranti A.F.12c Q.P.P. L.F. transformer.
1 Bulgin D.P.S.T. switch, type S.88.
1 Benjamin on/off, push-pull switch.
1 R. & A. "Multex" Universal P.M. loudspeaker.
1 Peto-Scott "Metaplex" basebcard, polished on reverse side, 14 in. × 8 in. × ⅜ in.
1 coil of Goltone shielded twin-output lead, type R.35/238.
1 coil of Goltone screened twin pick-up lead, type R.35/286.
1 coil of B.R.G. "Quikon" connecting wire.
2 Clix accumulator spades.
4 Clix wander-plugs.
1 Belling-Lee wander-fuse.
2 oz. Peto-Scott 24-S.W.G. D.S.C. wire.
1 oz. Peto-Scott 36-S.W.G. D.S.C. wire.
1 Camco "Riverside" suitcase type case.
1 Clix Anode Connector for V1.
Screws, flex, etc.

ON THE SPEAKER

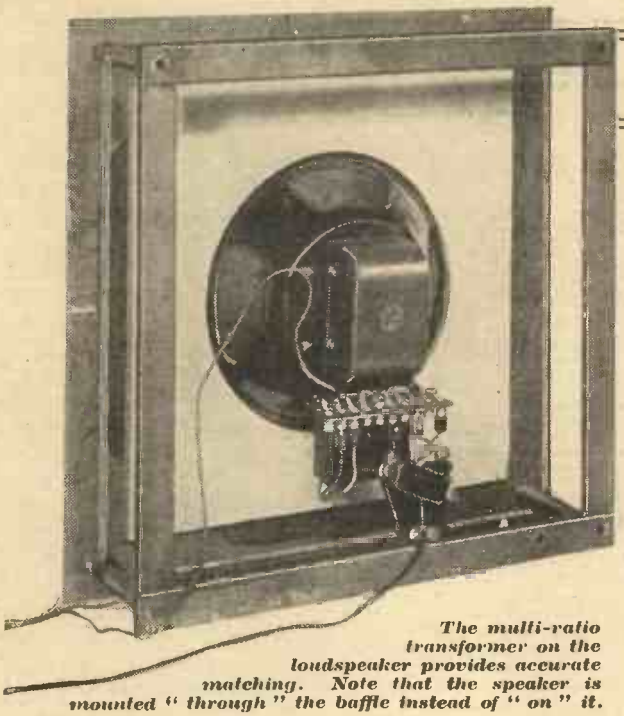


The filter condensers are fixed on the loud-speaker transformer.

AN UP-TO-DATE AND EFFICIENT CIRCUIT



By the use of the double Q.P.P. valve both sensitivity and economy are obtained and a remarkably simple receiver is made possible. Note how straightforward is the circuit.



The multi-ratio transformer on the loudspeaker provides accurate matching. Note that the speaker is mounted "through" the baffle instead of "on" it.

—High Sensitivity

wavechanging of the aerial and for the coil at the same time.

A short glance at the circuit I have chosen will show that sensitivity and a powerful output have been combined with economy of operation —a feature that is of very great importance in a portable receiver.

A screened-grid stage, with tune-anode coupling to the detector, is used, and the latter is coupled through a special transformer to a double Q.P.P. valve containing two Q.P.P. pentodes in one envelope.

Low H.T. and Big Output

This valve is capable of providing something like 1,000 milliwatts at maximum load with 150 volts H.T., and in the set I have built will give nearly two-thirds of this with the H.T. battery of 108 volts. As the Q.P.P. valve takes a very small quiescent current the H.T. battery does not have to be a big-capacity one.

The output from the Q.P.P. valve is taken to the transformer on the loudspeaker, which transformer has a very large number of tappings, enabling practically any type of output valve to be matched with it satisfactorily. I give a special diagram of this transformer and the connections to it to show which ones are used of the terminals, and also the condenser bank that is attached to shunt any H.F. that may have found its way to the speaker.

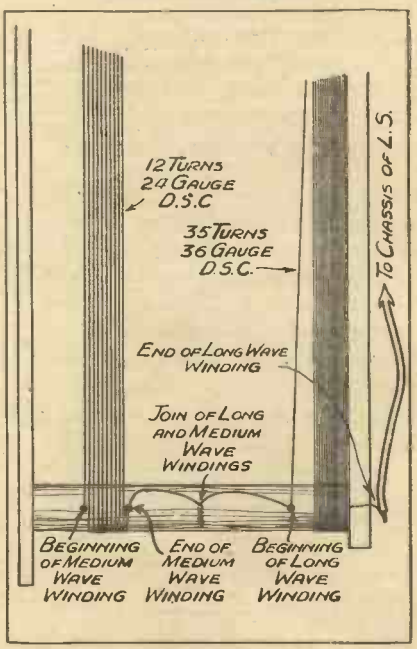
To Prevent Feedback

This H.F., if not dealt with, would cause a great deal of trouble, for it would probably be fed back from the speaker transformer and its wiring to the frame aerial, and complete the vicious circle that causes so much instability in badly designed portable receivers.

The connections to the frame and to the loudspeaker are of interest, for I have made use of screened lead as supplied by Goltone (see component list), using the two leads in each length as the main connections, with the screens as the third lead in each case.

The screen of the loudspeaker leads goes to the centre point of the L.S. transformer connections—the one that is connected to H.T. positive. The screen of the frame-aerial lead is taken to the end of the long-wave frame winding. This is also connected to the frame of the loudspeaker to earth the latter.

SIDE BY SIDE



The disposition and details of the two frame-aerial windings are shown in this sketch.

THE THREE VALVES EMPLOYED

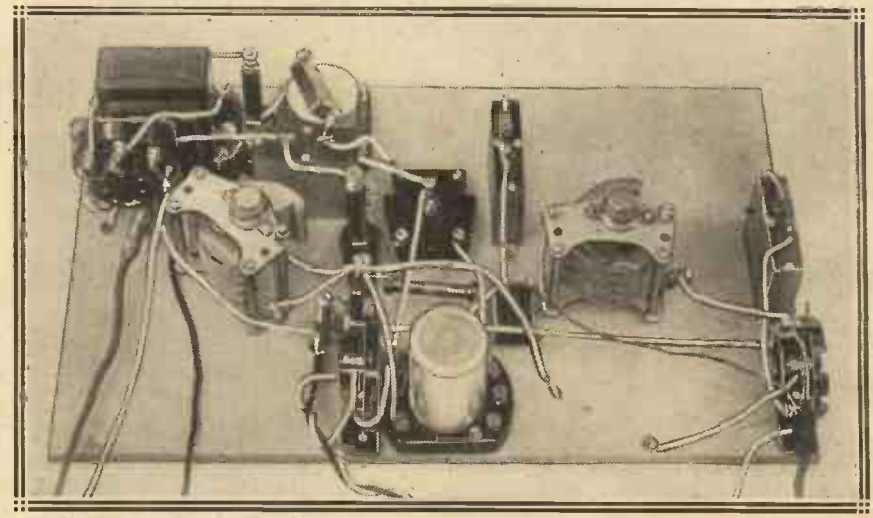
Make.	S.G.*	Detector	Output
Cossor	220 S.G.	210 H.F.	—
Mullard	P.M.12A	P.M.1 H.L.	—
Mazda	S.215 B	H.L.2	—
Marconi	S.24	H.L.2	Q.P.21
Osram	S.24	H.L.2	Q.P.21
Dario	—	T.B.282	—
Tungsram	—	H.R.210	—
Hivac	—	H.210	—

* Note.—S.G. valve metallised.

ACCESSORIES

BATTERIES.—Ever Ready 108-volt H.T., type Portable 3. Exide 2-volt accumulator, type P.C.3. Ever Ready 9-volt grid bias.

THE PANEL REMOVED FROM THE CASE



With the exception of the frame aerial and condensers on the speaker all the components are mounted on the panel and can be seen in this photograph.

Plenty of Stations at Good Strength

The frame is wound on the framework specially made for it by the makers of the case, and consists of two separate windings kept well apart. The "medium" winding has 12 turns of 24 D.S.C. wire on it, and the long-wave frame takes 35 turns of 36 double silk. The frames are wound in the same direction, and the end of the medium is joined to the beginning of the long-wave winding. A separate sketch shows clearly how the two windings are carried out.

L.S. Mounting

The loudspeaker is mounted in a way that is unusual, even in a portable receiver, where unconventional things are often necessary. Owing to the depth of the speaker there is not room to mount it on the baffle in the usual way, so it is mounted *in* the baffle, as it were.

H.T. and G.B. Voltages

The magnet of the speaker is passed through the hole in the wood, and the frame of the instrument is screwed to the wood from the front, instead of the back, as is more usual. This allows a full-blooded moving-coil speaker to be used, with its advantages in reproduction.

Two H.T.+ tappings are required for my portable. One is for the screen of the H.F. valve, and should be placed in at about 75 volts, while the H.T. +2 takes the full maximum. The grid-bias-positive connection is made to the end of the L.T. negative wire, and to this is also made the H.T. negative connection. It is best, I always think, to use a wander-fuse for this latter, in case anything goes wrong with the battery leads or there is any chance of shorting the H.T. battery while testing the set or rearranging the leads.

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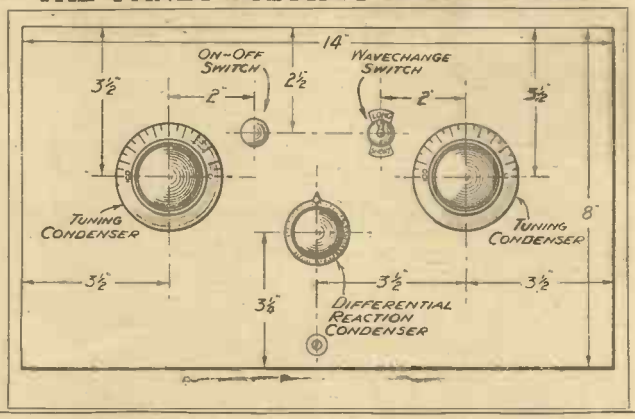
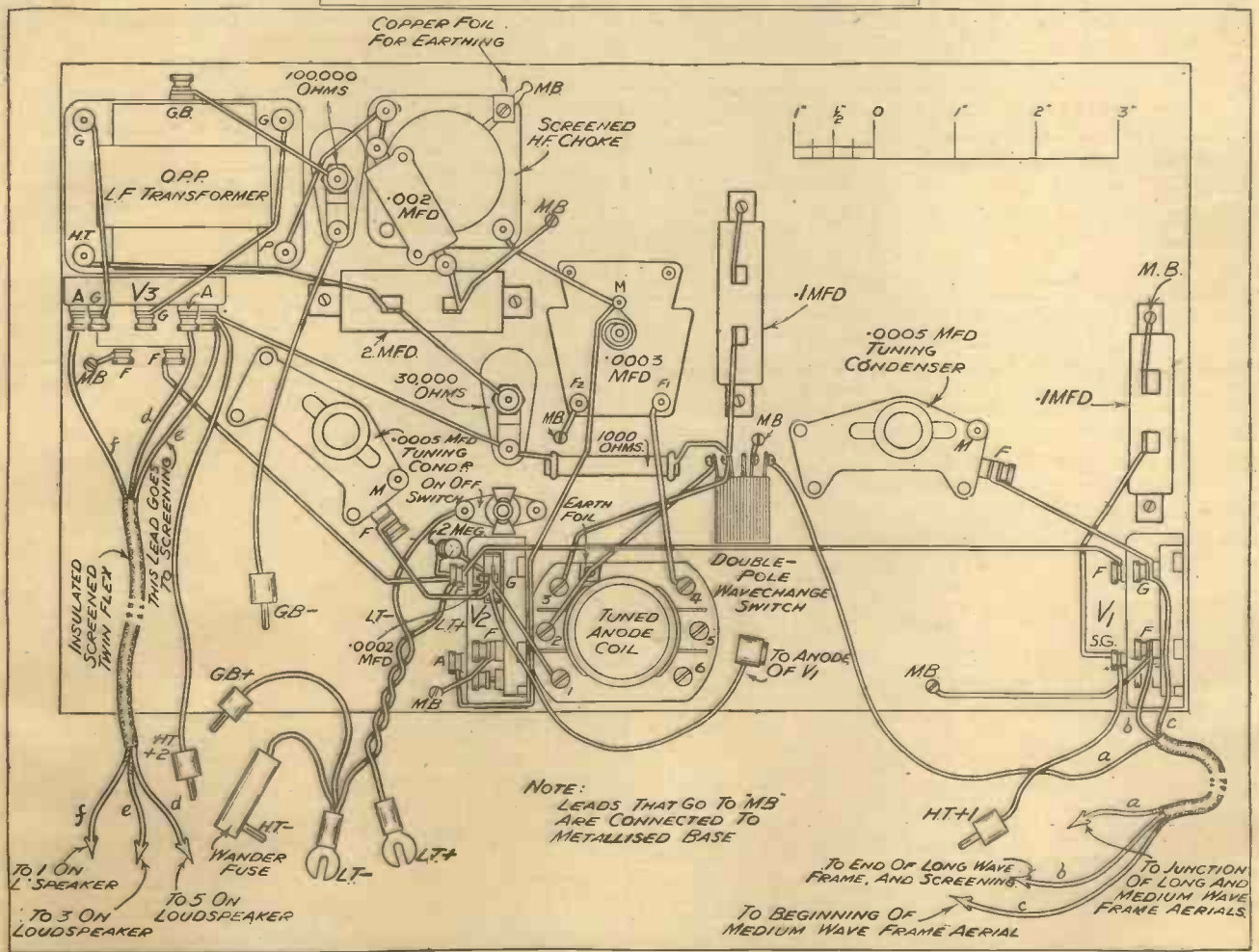
THE PANEL DRILLING AND LAYOUT





The small diagram gives details of the panel layout, while the larger one shows the reverse side of the panel and the wiring. A piece of thin card should be placed under the reaction condenser to obviate the rivets shorting on the metal board.

QUESTIONS I AM ASKED by JOHN SCOTT-TAGGART

Q. 87. Why did you put up such a good argument for anode-bend detection in the S.T.400, and now, in your latest sets (500 and 300 Star), drop it again? Did you find you were wrong? Let's have the truth—just between you and me.

A. Well, strictly between ourselves, the reasons were these: To get good results with "anode bend" you have to adhere to the designer's valve recommendation for the detector.

This is partly because the detector efficiency (sharpness of the bend and other things) varies with different types. But an even more important factor is the quite large variations in the amount of reaction current obtained when operating at the bottom bend of different valves.

The valve being worked at or around the bend is like a variable-mu valve, and amplifies the H.F. currents according to the degree of slope.

Now come closer, and I'll tell you something.

Many S.T.400 builders had valves already and preferred to use them. The result was that some of them found that, when operating the set as I advised, they could not get full reaction under those extreme adjustments which required a lot of reaction current, e.g. with anode coupler at zero.

By using a grid condenser in the S.T.500 and S.T.300 Star I was catering for those whom one cannot trust to build and operate the set as instructed. In other words, since the detector would be working all the time on the steep slope of its curve, there would be no danger of a shortage of reaction juice even if the wrong valve were used.

Grid-leak rectification is more foolproof; but, between ourselves, there is a further reason which would have made me use a grid condenser, even if I had known that every builder of the set would go to heaven.

And it is this: The S.T.500, although capable, on an adequate signal, of giving a greater output volume than the S.T.400, is rather less sensitive on a weak signal.

Grid-condenser rectification is more sensitive than anode bend, so I used it. The same applies to the S.T.300 Star, but more so. But on the S.T.400, which has two excellent stages of L.F., I could afford to sacrifice a little detector efficiency and go all out for selectivity.

But do not forget that I have used a most unusually low value of grid condenser (·00005 mfd.) in the later sets, and this has given us much greater selectivity than ordinary grid detection.

All readers will find much to interest them in these technical queries selected from S.T.'s post-bag, and in the lucid replies given by our contributor, whose forceful explanations contain many valuable practical hints.

Well, that's my story, and I'm sticking to it.

Q. 88. Why are non-inductive fixed condensers used? Can a person find out whether his 1 mfd. is non-inductive?

A. The ordinary person can't, won't—and doesn't. Incidentally, when the non-inductive vogue caught some firms unprepared, many condensers were rubber-stamped "non-inductive." They had suddenly realised their condensers were immaculate, endowed with a quality which hitherto had no sales value. It is technically known as "intuitive non-inductance."

Non-inductive condensers have no inductance, but as half an inch of straight wire possesses inductance we are up against the definition of non-inductance.

An inductance offers reactance or opposition to alternating currents. The result is that if an alternating current "passes" through a condenser possessing some inductance, then we get across the terminals alternating voltages, partly due to the reactance of the inductance and partly due to the capacity.

Now in a wireless set we use large condensers for decoupling. We use large ones to short-circuit alternating currents to earth (actually the filament or cathode). By making the condensers large the currents, in passing through, will set up only insignificant voltages (compare a D.C. current passing through a small resistance).

If, however, the condenser possesses considerable inductance the current will set up considerable alternating voltages across it. The purely capacitative part of the condenser will thus be partially defeated.

The importance of the inductive element depends upon the frequency of the alternating currents. If these are of L.F. the reactance or opposition of the inductance is negligible and the merit of a non-inductive condenser is small or non-existent.

For radio-frequencies the inductance will produce larger voltages, especially when working on very short wavelengths.

For decoupling H.F. currents, as in anode, grid and screen circuits, a non-inductive condenser is best used. For L.F. decoupling the quality of non-inductiveness is non-important unless the condensers are very bad. One reputable firm has, with rare common sense, pointed out that the connection of two or three inches of ordinary wire to the terminals of their non-inductive condensers robs them of any advantage over their ordinary condensers. Those who like to take their farads neat should nevertheless avoid straining at a microhenry.

(*Please turn to page* 144)

IN BETWEEN THE PROGRAMMES

HOW SOME OF THE MOST POPULAR EUROPEAN BROADCASTING STATIONS FILL IN THE INTERVALS

The interval signal bell used at Lyons la Doua.

WHEN one of the programme features finishes a few minutes before its time, what is the best way to fill in the interval before sending the next item?

The B.B.C. at present favours the "Bow Bells" interval signal. And this tuneful reiteration is much more tolerable than the "tick-tick" at one-second intervals which was formerly used to hold British listeners' attention.

On the Continent dozens of different ideas have been tried out. But in the end most stations arrive at the same conclusion that the B.B.C. has reached, and use an easily recognised melody associated with the place in question.

The Danish Folk-Song

The Danish stations, for example, use an old folk-song which is known to every Dane from childhood. It may be heard from Kalundborg, from Copenhagen, or from their short-wave relay at Skamlebaek.

The Germans, with their love of folk-lore, have adopted the same idea for the Deutschlandsender, on 1,571 metres.

And it was a German station director who put on the air the very distinctive blast of a steamer's siren as interval signal.

Apart from its primary purpose of engaging the listener's attention during a programme pause, the interval signal can do useful duty as an "announcement" of the identity of the station.

And this is particularly applicable where one transmitter is fed from several different studios.

Avoiding Confusion

The famous Swiss station at Beromünster, for example, derives its programmes not from the village of Beromünster itself, but from one of the neighbouring cities—Berne, Basle or Zurich.

And by employing a different interval signal for each city the listener knows, when switching on, where his programme originates.

Thus, if you tune to Beromünster on 539·6 metres, and hear a musical box tunefully tootling away, you are listening to the Berne studio. While a carillon from the same station denotes that the Zurich studio is connected to the transmitter.

If, however, you hear an interval signal in the form of Westminster chimes, you can safely infer that these are from Basle.

And thus the particular studio which is linked with the transmitter is unobtrusively announced to the Beromünster audience. Thus there can be no confusion.

IMPRESSIONS OF THE TELEVISION STUDIO

A RECTANGLE of flickering light, faintly revealing the form of a fair dancer, was all I could discern in the B.B.C. Television Studio after the dazzling sunshine outside.

It was like going into a cinema—I could not even see the person beside me. It was rather warm, too.

As I became accustomed to the dull light I found quite a number of people in the bare studio, all intent on the rehearsal. But I could not find the orchestra that was playing the dance measure until I spotted a crack of light between two dark curtains that reached from the ceiling to the floor.

The rays illuminating the performers shone like a searchlight through a glass window in one of the walls, and apart from this, and the stands for the microphones and light-sensitive cells, there was none of the futuristic, scientific apparatus one might well expect.

The "Searchlight Room"

This was rather puzzling, and as the producer clapped his hands and the rehearsal came to a standstill, I took the opportunity of the momentary lull to slip through a doorway into the "searchlight room."

Here it was quite a different story—here one saw television transmission from quite a different angle. There was the same dull light, the same concentration by all concerned, but there was also machinery.

I seemed to have stepped into the laboratory of some futuristic film. Motors hummed, an arc-lamp spluttered, and a smell of "ozone" from the latter permeated the room.

Framed on the screen of a television reproducer was the programme being enacted on the other side of the glass partition, and from the headphones which everyone was wearing came a thin, ghostlike rendering of the performer's song and its accompaniment.

And so the rehearsal proceeded through to its end, when the engineers turned the knobs on the control panels back to zero, the curtains were drawn to let in a flood of daylight, and we all went out to lunch and everyday realities.

A. S. C.

The "K" Class Valve

AN OUTSTANDING SUCCESSOR TO THE CATKIN

"SMALL, but good" can well be applied to the latest battery valves produced by those eminent manufacturers, Marconi and Osram. Their mains Catkins, introduced last year, created a great deal of attention, and now they have produced a series of battery valves based on the same remarkable and unorthodox construction.

These are to be known as the "K" class, and the size of the valves is very much less than that of the normal battery types with which we are familiar, as can be seen from the photograph of one of them taken alongside an ordinary Yale key.

So far three types in the new range of valves have been produced—a multi-mu screen grid (VS24/K), a detector (HL2/K), and a pentode (PT2/K). They have glass envelopes, unlike the large Catkins, for there is no need to provide atmospheric cooling in small valves of this nature, but in other respects their construction follows the famous Catkin method.

Electrode rigidity and low interelectrode capacity are strong points, and of particular importance is the fact that the special mica spacing at the top enables accurate assembly to be achieved with consequent constancy in characteristic standardisation.

As regards characteristics the valves follow closely the normal for battery valves of the same class, the screen-grid model having a controllable mutual conductance from 1·5 to ·016 ma/volt, while the HL2/K has a mutual conductance of 1·5 ma/volt and an impedance of 18,000 ohms.

The pentode is a very useful little valve, capable of giving up to 400 milliwatts undistorted output, and having a mutual conductance of 2·5 ma/volt. All the valves take up to 150 volts maximum H.T. on the anodes and 2 volts on the filaments.

It is interesting to add that the pentode can be biased down for "economy running" to a high-tension current of 8 milliamps total, with the maximum voltage on the screen and anode. Naturally, less current is taken if the voltage is reduced, as it can quite well be, the valve working excellently with as low as 120 on the anode and 100 volts on the screen. At such a setting the H.T. consumption is only about 5 milliamps, so that the valve can be used with every confidence with a quite small H.T. battery.

A New LOUDSPEAKER MOUNTING

The use of dual loudspeakers in small receivers has not received much attention from set designers. The problems of using such reproducers in a restricted space and their solution are here discussed in fascinating style

By C. W. SHEFFIELD.

IT is now quite common practice to use two loudspeakers for really good radio reproduction. These normally take the form of a dual-balanced pair of speakers in which the resonance peaks are carefully adjusted so as to cancel out and secure a reasonably uniform curve.

The difficulty of providing sufficient

THE FIRST ATTEMPT

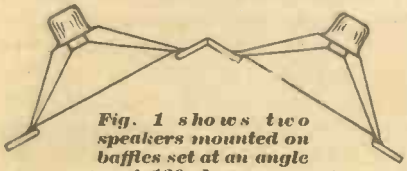


Fig. 1 shows two speakers mounted on baffles set at an angle of 120 degrees.

space for the size of baffleboard required for such a mounting prevents wider adoption of the scheme. Even if the cabinet type of mounting is used, it is not possible to make a good job of the system unless a large box is used; and if the receiver is to be included in the same housing, the whole thing is going to be of radio-gramophone dimensions.

Right-Angle Reproduction

There is also the well-known effect of unpleasant-sounding reproduction which you get with moving-coil loud-

RESTRICTED SOUND

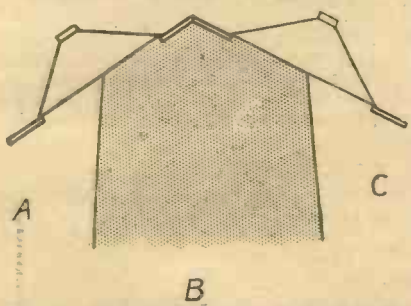


Fig. 2. The shaded area indicates the space over which both loudspeakers are effective.

speakers when you are at right-angles to the axis of the cone.

With a view to overcoming some of these difficulties, and at the same time securing the undoubted advantages of the dual-loudspeaker system for the table-console type of receiver, the size of which does not exceed overall dimensions of 15 by 9 by 18 in., the writer did an amount of experimental work.

Importance of Position

The first rather obvious solution was to mount the two speakers at an angle to each other as shown in Fig. 1,

HOW IT OPERATES

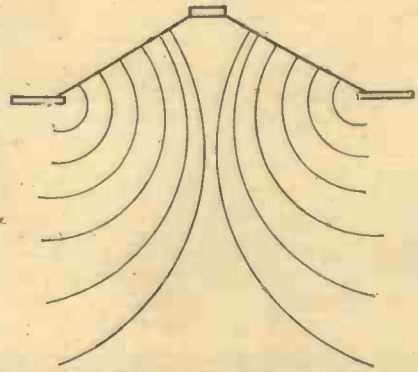


Fig. 3. Sound radiation from one speaker follows lines similar to those shown here. The high notes come off the cone in comparatively straight lines.

which at first sight seemed to solve most of the problems it was wished to solve. A trial, however, showed that the size problem might be solved, but a fresh lot of problems had been produced, and that instead of the stereophonic effect usually claimed for two loudspeakers, the quality and nature of the reproduction varied enormously with the position of the listener.

The Microphone Check

A check with a microphone proved that the area in which both loud-speakers were audible was really quite small, and is shown in Fig. 2. The reasons for this are linked up with the fundamental theory of the action of the moving-coil loudspeaker.

It has been shown by Dr. Mclachlan

A PECULIAR EFFECT

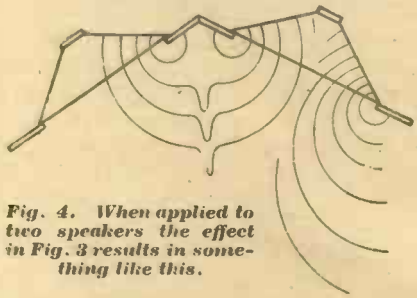


Fig. 4. When applied to two speakers the effect in Fig. 3 results in something like this.

that the various frequencies radiate from the cone in curves, and that they also radiate from various points on the cone according to their frequency, the lower the frequency the nearer the periphery of the cone it emanates and also the sharper the curve of its emanation.

NOT SATISFACTORY

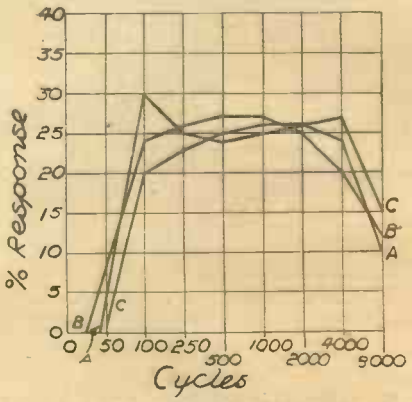


Fig. 5 gives response curves for the microphone positions A B and C in Fig. 2. Note that the speaker resonances do not completely cancel out.

Remarkably Free from Resonance Peaks

This is, of course, the effect that makes the use of a baffle board essential to prevent refraction of the lower frequencies, and many readers of this journal have doubtless proved this for

TOO MUCH ROOM

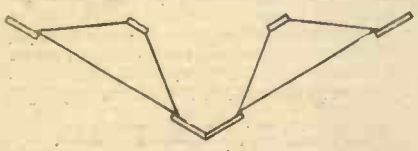


Fig. 6. For reasons of space the placing of speakers back to back had to be rejected.

themselves. Fig. 3 shows this action and Fig. 4 shows it applied to the assembly shown in Fig. 1.

It can been seen that for half the effective surface of each cone there is no free radiation of sound, and that certain frequencies are meeting each other midway between the two speakers. This would not be harmful so much if the two speakers were the same as regards their response characteristic, but they are not, and some very real distortion of the sound output takes place as a result of this mixing effect.

Approaching a Solution

Unfortunately, the writer was unable to secure a completely non-resonant room for testing the exact effect, but some curves of the response of the arrangement are shown. These were

REFLECTED WAVES

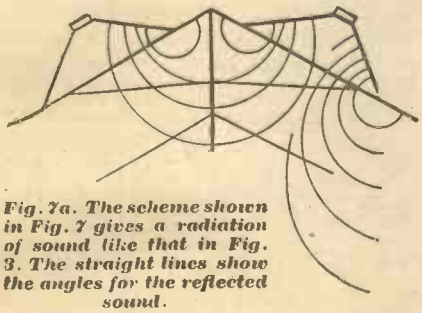


Fig. 7a. The scheme shown in Fig. 7 gives a radiation of sound like that in Fig. 3. The straight lines show the angles for the reflected sound.

obtained with a calibrated microphone and known amplifier; and while, owing to a certain amount of residual room resonance, they are not in themselves accurate, they are accurate in relationship to each other to a degree sufficient to show the very peculiar effect of this attempt at solving the problem of two loudspeakers in a confined space. The letters A B C are microphone positions and are shown on Fig. 2.

The next method tried was to place the speakers back to back, as shown in Fig. 6. This had very obvious limits with regard to the angle and was rejected on those grounds very early on.

It therefore became obvious that if some way of preventing or mitigating the effects shown in Fig. 5 could be found, the final solution lay along those lines.

Different Distances

In the early stages of his experiments with dual loudspeakers the writer had made a note of the fact that the distance between the two speakers when mounted on a flat baffle was governed by the distance away from

AN EXTRA BAFFLE

Fig. 7. Here the Fig. 1 arrangement is again tried, but with a baffle between the two loudspeakers.

the board the average listener would be, and that the greater the distance of the ear from the source of sound the farther apart it was necessary to mount the two speakers up to a distance of about 8 in. between the peripheries of the cones.

Beyond this it was not necessary to go. This suggested that if this distance between cones could be artificially increased with the angle assembly the solution of the problem might be on the way. As sound waves are a fluid type of thing, it seemed that to interpose a non-resonant barrier between the cones would be artificially to

USING A WEDGE

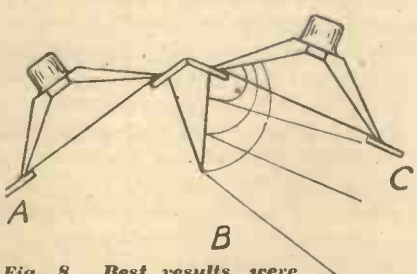


Fig. 8. Best results were achieved with this positioning of the speakers. The curves and reflection of sound for one side of one cone only are given above.

increase the distance between them.

A flat piece of beaverboard was accordingly fixed into the assembly,

A GOOD CURVE

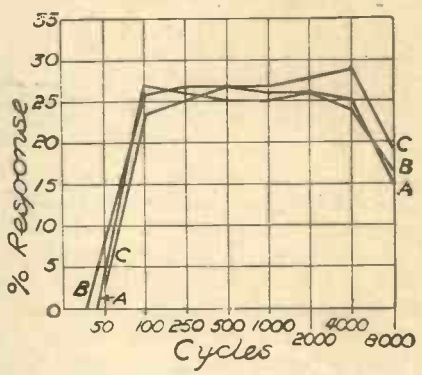


Fig. 9. Here are the response curves for Fig. 8. All the curves are better than those in Fig. 5, and that of "B" is particularly free from resonance.

as shown in Fig. 7, and the results seemed to justify the assumptions made up to a point. The sound radiation was now as shown in Fig. 7a, and, owing to the non-resonant properties of the beaver-board, some of the lower frequencies appeared to get lost altogether, although the distorted effect had been eliminated to a great extent.

Angular Arrangement

A piece of plywood of substantial thickness improved matters somewhat, but still left something to be desired.

THE FINAL ADJUSTMENT

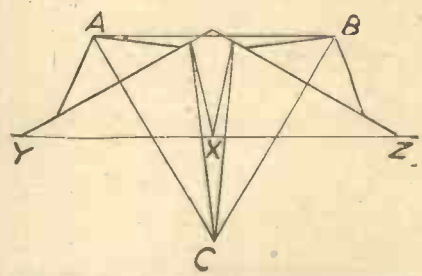


Fig. 10. The extreme limits of the centre piece were found to be the apex of A B C, but in most cases extension as far as X will be found to be satisfactory.

From Fig. 7a it will be seen that the sound is now being subjected to a reflecting action for half the area of each cone, and this leads to the conclusion that if the angle of this reflection was adjusted, so could the whole effect be adjusted.

(Please turn to page 141)

RAPID RADIO REPAIRS

By J. E. WATSON, A.I.R.E.

Whether service engineer or home constructor, the reader will find the following and final article in this series of particular interest. The author deals with inexpensive valve-testers that will prove invaluable.

OF all the components which go to make up a radio receiver, none is so important as the valve. The sensitivity of the set, the volume and quality of reproduction and the economy of operation all depend upon the valve.

All the responsibility for satisfactory valve operation does not rest with the manufacturer. The service engineer or dealer, who sells the valve, must share this responsibility.

Tests on the Spot

It is the service engineer who should know whether the valves in the set are being operated under correct manufacturer's conditions; it is he who must adjust the voltages to their proper values and warn the user against changing them.

In fairness to his customer the dealer should test all valves at the time of sale.

The service engineer, when attending a client's house, is often asked: "Do you think the valves are worn out?" and, unless he has suitable means available for testing them, he is faced with the alternative of guessing.

Not only is this an unhealthy state of affairs from a standpoint of efficiency, but it is one which paves the way for exploitation. The average set user is usually ignorant in the matter of valves, and will almost invariably take the engineer's word that a valve is defective, even though it may be a perfectly good one. In spite of his accepting the engineer's verdict, there is no doubt the customer often wonders, "Did I really *need* that valve?"

The progressive engineer, by building himself one of the testers described in the text, may effectively test valves in the client's house, thus dispelling all suspicion, in addition to demonstrating his efficiency.

EASILY CONSTRUCTED

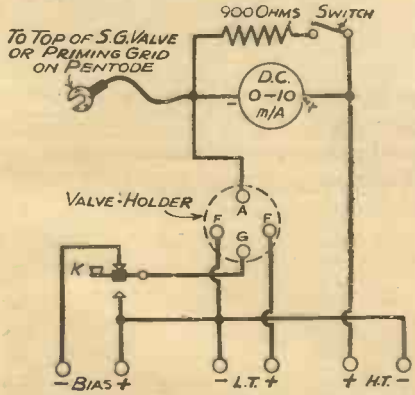


Fig. 1. A simple circuit for testing all types of four-pin valves.

MULTI-PIN TYPES

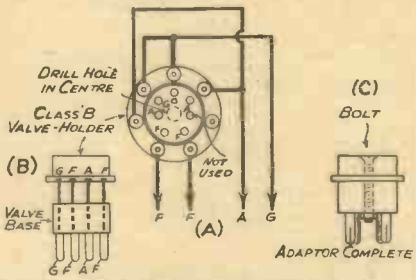


Fig. 2. An adaptor such as that shown above is suggested for Class B valves which have seven-pin bases.

The simple test of determining whether or not a valve lights is by no means sufficient. The engineer must acquaint himself with the operating characteristics of the various types of valves, in order to pronounce upon their condition of health.

About Mutual Conductance

Tests for anode current are liable to be misleading, the reason being that valves of similar construction may, under the same circuit conditions, register different anode currents and still be quite efficient.

The valve characteristic which forms the basis of our test is the "mutual conductance," and before working out a method for measuring this let us consider, briefly, what this characteristic really is.

As most of us know, a valve operates on the fundamental idea that a change in grid voltage produces a change in anode current. Some types produce a smaller change in anode current for a given change in grid voltage than others, and the extent of this change is known as the mutual conductance. That is,

$$\text{Mutual Conductance} = \frac{\text{Change in anode current}}{\text{Change in grid voltage.}}$$

The unit of mutual conductance is the "Mho." This is quite a large unit, and so, to get a practical figure, the mutual conductance is expressed in "micro-mhos," or one millionths of a mho.

A Simple Circuit

Now, as far as testing is concerned, we need not measure the mutual conductance in accurate terms; all we need is some method of determining whether a given valve has a normal value of mutual conductance. A method of doing this is suggested by the above formula.

MEASURING THE CORE

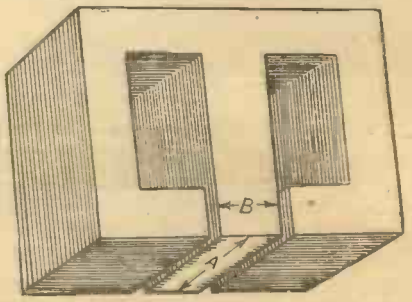


Fig. 3. The core used for the mains transformer described in these pages.

A Comprehensive All-Mains Valve Tester

If we change the grid voltage, while maintaining a constant anode voltage, we will obtain some idea of the mutual conductance by noting the change occurring in the anode current.

In Fig. 1 is shown the circuit diagram of an inexpensive tester, utilising battery supply, for use where A.C. mains are not available. The meter used may be a 0–10 milliammeter, provided with a 30 milliampere shunt for use when power-type valves are tested. The H.T. voltage may be anywhere from 70 to 120 volts, and the bias voltage from 2 to 4 volts.

All voltages, when once chosen, *must be kept constant* by periodical checking, or the instrument will be useless as a means of comparing valves, due to the changed circuit conditions obtained when the grid, filament and anode voltages are allowed to dwindle.

For Class B, Too

One valveholder is used and will accommodate three-electrode valves, screen-grid valves and pentodes. Class B valves may be tested by means of an adapter made up from a Class B valveholder and the base of an old four-prong valve.

The valveholder is taken first, and the two grids and the two anodes are joined together respectively, thus forming one grid and one anode as in a three-electrode valve. (See Fig. 2.) Short leads are joined to these points, and to the filament connections.

These leads are passed through the valve base and soldered to their respective prongs as a three-element valve. When the whole is suitably bolted together, we have an adapter which will plug into the tester, and into which Class B valves may be placed.

When testing screen-grid valves, the flexible clip (Fig. 1) is connected to the terminal on top of the valve, and when testing pentodes it goes to the auxiliary grid terminal on the side of the valve.

Run from A.C. Mains

With the key K in the normal "up" position, grid bias is applied across grid and filament, in which case the anode current flowing is indicated on the milliammeter. When the key is depressed the bias voltage is cut off and the grid and filament short circuited. This produces a definite change in the anode current, and is an approximate measurement of the mutual conductance of the valve. The instrument may be calibrated if desired.

Another tester, seen in Fig. 4, is entirely A.C. mains operated. The necessary voltages are obtained from a small transformer, the windings of which consist of the necessary primary, one H.T. section of 100 volts and a tapped filament winding to supply 2, 4 and 6 volts. As the valve under test functions as a half-wave rectifier, no other rectifier is necessary. Grid voltage is obtained automatically by means of the resistors R.2 and R.3 of 500 ohms and 3,500 ohms respectively.

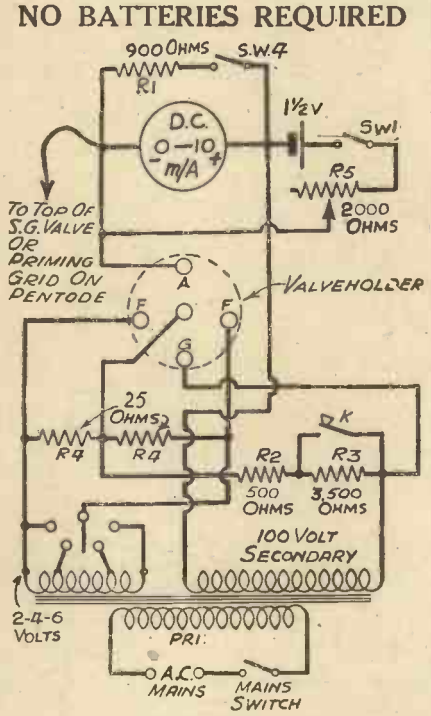


Fig. 4. A completely A.C. operated tester with a home-made transformer is illustrated in this circuit. Valves of different types can be checked with it and it is not difficult to build in portable form.

Shorting out the latter by the key K produces the necessary change in grid voltage.

A 50-ohm centre-tapped resistor, R.4, is placed across the filaments. R.5 is a 2,000-ohm variable resistor in series with a 1½-volt flashlight cell and switch, Sw.1, and is connected across the meter. This battery is opposing the meter—in other words, the plus side of the battery is connected to the minus side of the meter and vice versa, and serves to provide a "bucking" current, by means of which the instrument may be made direct reading.

The meter is a 0–10 milliammeter, and the shunt resistor, R.1, has a value of 900 ohms, which extends the meter range.

With the key K normally open, the meter will indicate anode current. By closing the switch Sw.1 and adjusting the variable resistor R.5, the normal anode current may be cancelled out and the needle brought to rest at zero.

Quick Comparison

The grid bias is then changed by depressing the key K, which results in an increase in anode current.

As the normal anode current has already been cancelled out by the previous adjustment, the reading now obtained is a measurement of the goodness of the valve.

When testing power-type valves, of course, the 30-milliampere shunt is placed in circuit by closing Sw.4.

Since the mutual conductance and anode current readings obtained will depend largely upon the particular tester, it is impossible to give definite figures for good and bad valves. The best procedure is to test a number of new valves and determine how much they vary. Take an average valuc of the mutual conductances noted, and draw up a chart for different types of valves.

(Although only one meter is used in the tester, an A.C. mains voltmeter may be incorporated, and the voltage regulated by means of a rheostat.)

Transformer Details

The mains transformer required for the above tester may, perhaps, be more readily wound by the constructor than purchased, and therefore a few helpful hints may not seem amiss at this time. The core of a small burned-out transformer may be used, and the number of turns for the primary winding may be calculated from :

Primary turns = $\frac{660}{\text{Cross-section of core in sq. ins.}}$

The cross-sectional area is taken from the centre leg of the core, as seen in Fig. 3. (A times B, in sq. ins.)

For example : Suppose dimension A is 1" and dimension B, 1", then the area will be 1" times 1" equals 1 sq. in. Then, $\frac{660}{1}$ = 660 turns required for the primary. Now we find the turns per volt by dividing the primary turns

(*Please turn to page* 142)

B.B.C. NEWS

BY OUR SPECIAL CORRESPONDENT

New Concert Suggestions
The Left-Over Receivers
No Long-Term Contracts

Skilled Programme Builders
The Discoverer of Mr. Ferrie
Will Sir Charles Retire?

Attracting Audiences

THERE is now in existence a special Concert Committee containing both outside experts and members of the B.B.C. staff. This Committee has recently been reviewing the concert policy of the B.B.C.

The year 1933–34 yielded attendances definitely behind those of the previous year. The Concert Committee has recommended the B.B.C. to pay more attention to what is technically called "Concert-Hall policy." This would mean building programmes definitely with a view of attracting audiences—accordingly, more popular and varied.

It would also mean getting more celebrated artists—people like Kreisler and Rachmaninoff. Another reform suggested is the giving away of the concert programmes and the lowering of the prices for the seats. There has been the view that, by keeping prices high, the "more important" people would be attracted, but experience has proved that this social aspect is practically a myth.

I heartily approve. It will be interesting to see how long it takes for the pundits of Broadcasting House to reform their concert policy in this sensible way.

Trouble in Scotland

Some trouble about the demobilisation of the Central Council for Broadcast Adult Education has occurred in Scotland. I am told that local resentment there has manifested itself in creating difficulties about the disposal of the receiving sets previously under the control of the Scottish Area Council of the Central Council.

The difficulty has been surmounted, temporarily at least, by giving the sets to the Carnegie United Kingdom Trustees.

Those Staff Rules

I have been hearing a good deal about a recent confidential publication entitled "B.B.C. Staff Regulations." If my information is correct, this sets out conditions of service and work which are singularly hard on the individual employee.

There are no long-term contracts. The weekly paid staff get a week's notice, the monthly paid staff a month's notice, and those with a salary of £500 and over three months' notice. The B.B.C. may terminate the arrangement with any member of its staff at any time without giving any reason.

It is stated that married women are employed in exceptional circumstances only, but that those few women who are allowed to stay on when married can claim three months' maternity leave.

The personal activities of members of the staff outside the office are all supposed to be under control. There are nominal office hours, but the B.B.C. may call upon any member of its staff to work all the time and to proceed anywhere in the world at a moment's notice.

I should like to see a copy of this document. There may be something in it modifying the severity of the clauses of which I have been told. I hope there is; otherwise the temptation to provide enthusiastic "round robins" is likely to diminish.

The Fresh Importance of Regions

The chief development in B.B.C. affairs during the past six months has been the growing importance of Regional Directors, both in their own part of the country and at London Headquarters. The victory of decentralisation seems to be decisive and permanent.

This means that Messrs. Edgar, Liveing, Appleton, Marshall and Dinwiddie form the strongest combination next to the Governors themselves. They meet secretly, and their decisions carry great weight.

What is more important is that they are all skilled programme builders.

Victor Olof, leader of the B.B.C. Sextet which bears his name. He is a firm favourite with listeners to the Children's Hour.

The B.B.C. and Professor Levy

Professor Levy's relations with the B.B.C. appear to form what, in sporting parlance, is called a "mixed bag." He is one of the most experienced of broadcast talkers, and has been used also as an intimate adviser to Mr. Siepmann and his colleagues.

It is said, but this is not admitted, that the Professor had something to do with the discovery of the famous Mr. Ferrie.

This recital of achievement does not, I believe, entirely

The Reputation of Admiral Sir Charles Carpendale

commend Professor Levy either to Admiral Carpendale or Colonel Dawnay, although it is believed that Sir John Reith is somewhat less exercised in the matter. Anyway, whenever Professor Levy is recommended to take on a fresh job of broadcasting there is some discussion.

I give him another year in this interesting sphere.

Sir Charles Carpendale's Future

Sir Charles Carpendale has reached the age of sixty, which, according to the rules and regulations of the B.B.C. to which I have referred on the previous page, is the age of retirement for members of the staff.

I gather, however, that in certain outstanding cases, not necessarily connected with programmes, the Governors of the B.B.C. may invite those who have reached the age of sixty to stay on year by year until they are sixty-five. No doubt this has been exercised in favour of Admiral Carpendale, and we shall hear more of him both in London and among the radio experts in Switzerland.

Incidentally, this month's meeting in London of the General Assembly of the International Union of Broadcasters provides an opportunity of public triumph for Sir Charles. It is in this international sphere, no less than in checking the discipline and morals of the B.B.C. staff, that his fine reputation has been built.

A new photograph of the world-famous Mills Brothers, who have given "surprise" broadcasts on several occasions lately.

Whose Fault Is It?

One does not need to be interested in the merits or demerits of the case against vaccination to deplore the nature of the controversy that has broken out between the National Anti-Vaccination League and the B.B.C. on this subject.

It is clear, from the published correspondence and statements, that the B.B.C. tried to shelve on the Ministry of Health the responsibility for declining talks against vaccination; whereupon the Ministry was prompt to deny.

How much better it would have been if the B.B.C. had said straight out that it opposed granting the required facilities because it thought it would be against the public interest to do so! I am sure the League would have resented such an attitude less than the one apparently adopted.

VOICES ON THE AIR

Making the acquaintance of the people in the programmes.

THIS month let us meet some of the voices which we hear with unfailing regularity in radio plays.

* * *

Dora Gregory, who started her stage career at the age of sixteen, was first seen in London in the first year of the War. She started her career badly by asking only £2 a week as salary—she was told afterwards that if she had stuck out she could easily have got £2 10s.! She seems fated, on the stage, to play parts in which she has to smoke cigarettes, cigars and (on one never-to-be-forgotten occasion) a pipe. The pipe proved too big an undertaking—which may be why Dora took up radio drama. Her first broadcast was eight years ago, and she has already topped her century for appearances before the microphone. Her versatility and unfailing good humour have made her one of the B.B.C.'s most distinguished actresses.

Dora lives in London, at Denmark Hill. Listen to the next play in which she appears.

* * *

The plays of Bernard Shaw were the first successes of **Harold Scott,** who recently distinguished himself in Lance Sieveking's new play "Wings of the Morning." He was also an early broadcaster, taking his first radio part in 1924 in G. K. Chesterton's "Magic." You probably remember him also as Edward in "The Flowers Are Not for You to Pick"—his favourite part, by the way. Meet him up in St. John's Wood, London, where he enjoys good music, smoking, country walks, Chinese figs and a host of other things besides. With characteristic energy he tells me that he dislikes everything which bores him. Harold Scott is one of the B.B.C.'s most regular actors—and one of the most popular.

* * *

Philip Wade writes radio plays—and then acts in them. He has done everything in the world of radio drama except produce, and he could probably do that as well as most people. He served during the War as "an officer of sorts" (his own modest description), and took a part—a "dirty, dusty and thirsty part"—in the relief of Kut. On demobilisation Philip turned to the stage, learning the groundwork of acting in the fine company of Sir Frank Benson. He was so successful in Shakespeare that C. B. Cochran gave him a part in "This Year of Grace"! Before that, however, he had turned his attention to the radio, where he could be heard and not seen, and Howard Rose produced him in a studio production in 1925. If you want to meet Philip he lives in Hampstead and does all his work in a small room right at the top of the house.

PATRICK CAMPBELL.

S.T. 300 S.T. 400 S.T. SUPER

Remember these next time!

S.T.300 STAR S.T. MANUAL

In his Armchair Notes this month Mr. John Scott-Taggart gives readers a hint that he is designing a new receiver for the autumn. Meanwhile enthusiastic constructors continue to write letters expressing their appreciation of the S.T. designs. Those who have not yet built one of Mr. Scott-Taggart's sets will find, from the selection of letters which we publish here, an example of what to expect in the future!

"NO OTHER SET TO EQUAL THE S.T.400."

I have been using the A.C. version of the S.T.400 all the winter. Lately I changed the A.C. Pen. valve for an A.C. 2 Pen., an A.F.5 transformer and an F.7 Rola speaker; and for volume and quality I know of no set, commercial or otherwise, to equal it.

I also have the battery version of the S.T.400, and while it lacks the punch and quality of the A.C. version, oh, boy, it does rake in the stations and slices them off like cheese!—[*From "Lessknobs," Dumbarton Road, Clydebank, Glasgow.*]

"THE TONE IS MAJESTIC."

I have built the S.T.300 Star, both battery and A.C. mains, and its performance is indeed a credit to its designer. The aerial reaction is a great improvement, both for sharp tuning, punch, and last, but not least, quality.

The depth of tone which the reaction gives is majestic. The reader who passed the remark that if anyone could get a quart out of a pint pot you could was perfectly correct.—[*From Walter Jackman, 36, Rivelin Road, Walkley, Sheffield.*]

"A.C. S.T.400 AMAZING IN AUSTRALIA."

As a reader of THE WIRELESS CONSTRUCTOR, mainly for your own articles on wireless constructions, I would like to register my appreciation of your A.C. S.T.400, which I built about four months ago.

I find the selectivity very good for a straight set of only three valves, and the volume is truly amazing, approaching a five- or six-valve set, superhet or straight, as we get them out here.—[*From V. Pennington, 43, Myrtle Street, Chippendale, Sydney, New South Wales.*]

"THE FOUR MOST SUCCESSFUL SETS."

I am making a rather belated effort to congratulate you on designing the four most successful sets for home constructors—namely, the 300, 400, 500 and Super. I have not heard a set, costing twice as much, approach the performance of any of yours.

I am now using a set built up from the attached circuit [see circuit on this page.—Editor], which, as you will see, is a mixture between 400 and 500; it is giving superb results in every respect. I have logged 57 stations clear of interference.

This I am sure you will agree is very good going, as I live within seven miles of Brookmans Park. And I must not forget to thank you for the wonderful Manual; it is the most comprehensive radio book I have seen.—[*From H. F. Harding, 30, Sutton Road, Muswell Hill, N.10.*]

"ONE COULD NOT WISH FOR ANYTHING BETTER."

I have just read your article in THE WIRELESS CONSTRUCTOR for May, and notice you conclude with an invitation from new builders and converters.

As one of the latter I can appreciate the great improvement between the S.T.300 and S.T.300 Star, and go so far as to say that unless your aerial reaction is heard it is difficult to believe such a great step-up in punch could be obtained and yet maintain such quality.

From my address you will see that I am only a stone's throw, as far as wireless in concerned, from Brookmans Park, and so loud is the signal that I often have to detune on the very strong programmes, such as full orchestra and organ, even with all controls at zero.

As regards foreign stations, they are plentiful and at good strength and quality; beyond that I don't think we could wish for anything better.

Thanking you for such a great improvement.—[*From G. Gammans, 9, Woodside Road, Wood Green, N.22.*]

"EXCELLENT PERFORMANCES."

I built your S.T.300 and S.T.400 during the last two years, and I must praise them both up for their excellent performances

Before I built your sets I had one from a factory, but I have a mother who is deaf and she could hardly hear that one. But when I made up your S.T.400 she said: "Isn't it plain to hear? It's better than the old one."—[*From J. Humphries, 13 Satchwell Street, Leamington.*]

"THE S.T. SUPER—A SUPER SET."

I have built your S.T. Super and find it the best I have handled. There is no doubt about its being a super set.—[*From John C. Shields, 22, Harrowby Road, Seaforth, Liverpool.*]

"AMAZING POWER, SELECTIVITY AND QUALITY."

I assembled the S.T.300 Star about a fortnight after it appeared in THE WIRELESS CONSTRUCTOR, and must say I was extremely pleased with its performance.

The amazing power from only three valves, the selectivity and, best of all, the quality of reproduction have yet to be surpassed in a set of this type. The addition of aerial reaction, tone control and selectivity range adjuster have placed it in a class of its own.

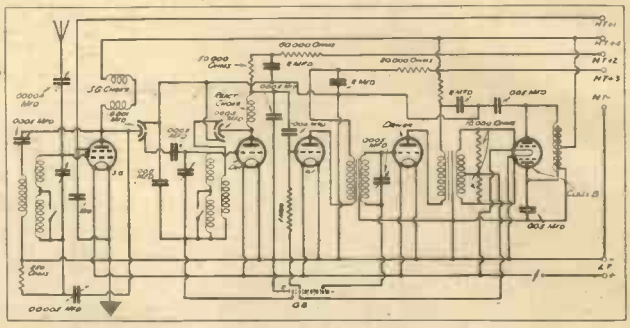
My advice to all is—"Build the S.T.300 Star, or Mark II, for simplicity in construction and powerful, lifelike reproduction."

I have heard many multi-valve commercial sets costing three and four times the price which I would not exchange for the 300 Star.—[*From Leonard Pick, 17, Meadowgate, Bourne, Lincs.*

"S.T.300 STAR QUITE THE BEST."

I believe that you like to have an expression of opinion from amateurs in various districts of your receivers developed for the home constructor.

The S.T.300 Star design, which in all-electric form I have had in use for just over a month, is quite the best design yet made available. The selectivity is more than adequate in this district, whilst the complaint levelled at your receivers of "too many knobs" must come for certain from the world's most ham-handed wireless fan.—[*From Donald Fairweather, 3 Sutton Street, Goole.*]



The circuit referred to by Mr. Harding in his letter.

"REALLY AMAZED AT THE S.T.400."

About a month or so after you brought out the S.T.400 I constructed this receiver and, like hundreds of others, was really amazed at the results. So much so that I fully intended to send you an appreciation, but not being a very keen letter writer I regret to say it didn't get done.

Now I feel I must write and thank you for such a wonderful receiver, and I expect you are wondering why, after all this time.

The fact is I have just returned from a fortnight's holiday on the Norfolk Broads,

Of course, my S.T.400 had to go with me (although the family weren't very keen about losing it for a couple of weeks!), and the performance it put up there so astonished my two friends who came with me that it has prompted me to write this letter.

(*Please turn to page* 140.)

How to obtain BETTER RADIO

Further hints for the home constructor to help him to obtain the best results from his receiver are given this month by our well-known contributor,

FREDERICK LEWIS.

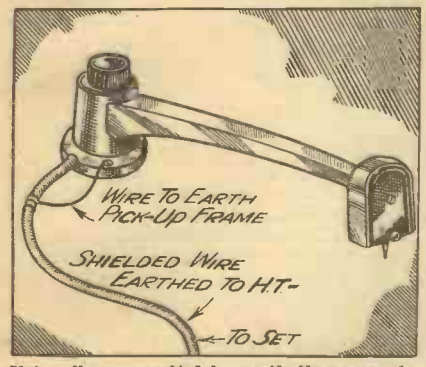
I HAVE recently been called in to the aid of a friend who has been bothered with a mains hum on the gramophone side of his radiogram. Not a difficult matter, really, when you know where to look for the trouble, but no pleasant task when you are hunting in the dark.

Spoiled the Records

On radio everything was "fine and dandy," but as soon as the gramophone was started (the motor, I mean), the radiogram switch being over to "gram," the hum came up and tended to spoil all soft records.

He had fitted screened leads to the pick-up and had duly earthed the

EARTHING THE ARM



It is often essential to earth the arm of a pick-up when it is used with an electric gramophone motor.

screening, yet this had not helped him much, he said. But he had omitted one very important thing.

In a metal-enclosed pick-up, and especially one that swings over an induction motor, the metal casing picks up quite a considerable amount of A.C., and unless this is earthed it will induce this A.C. into the magnetic circuit of the pick-up, or, in other words, on to the grid of the first amplifying valve in the set.

Earthing the pick-up frame immediately converts the metal tone-arm from a hum radiator, or inducer, to a hum screen, and a simple connection like that shown in the diagram was all that was required to cure the trouble experienced in the case I was called in to vet.

So if you have a pick-up with a metal arm, don't forget to earth it. It is easily done by just connecting a wire between one of the fixing screws (making sure that any enamel or lacquer on the arm does not prevent good electrical contact) and the H.T. — circuit of the set, either direct or via the metal covering of the screened pick-up leads, which will itself be earthed at the receiver end.

* * *

Modulation hum is another form of torment that is inflicted on the radio-set owner. It is a particularly vile sort of tyrant, for it is only to be heard when a station is tuned in, and its strength usually increases with the strength of the received carrier and vice versa.

Try Some Chokes

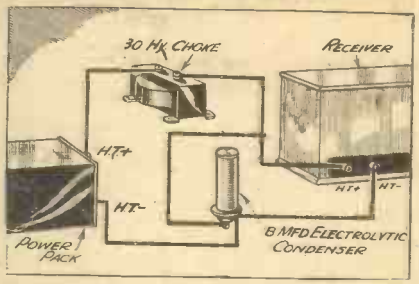
There is no guaranteed cure. It may take ages before a combination of palliatives effects a remedy, but it is always worth trying either H.F. or L.F. chokes with condensers in the H.T. positive feed, and sometimes both. If H.F. chokes are used they should be fitted between the mains input and the eliminator, and if L.F. smoothing is added it should be as shown in the sketch.

Modulation hum is due usually to H.F. or L.F. ripple being fed into the grid circuit of the H.F. or detector stage, and the best way of stopping this is obviously at the source—the mains or the power pack.

* * *

Have you ever tried the effect of changing the values of your grid leak and condenser on a leaky-grid

THAT TUNABLE HUM



The insertion of an L.F. choke, as shown, will often cure modulation hum.

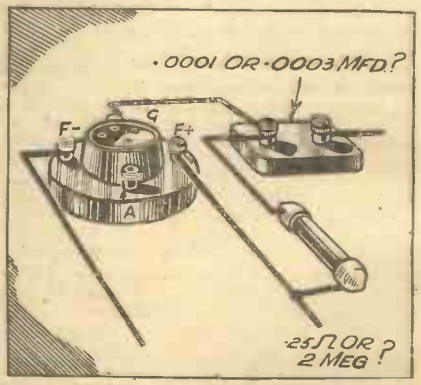
detector circuit? If not, just try the variation shown in the diagram. If you have a ·0003-mfd. condenser, change it to ·0001 mfd., and if the leak is 2 meg. try one of ·25 meg.

The result will probably surprise you if the rest of your set is capable of giving good quality. A ·0003-mfd. condenser with 2 megohm leak is excellent as a combination for the reproduction of low notes, but it may cause a cut-off in the higher frequencies.

The Smaller Values Preferable

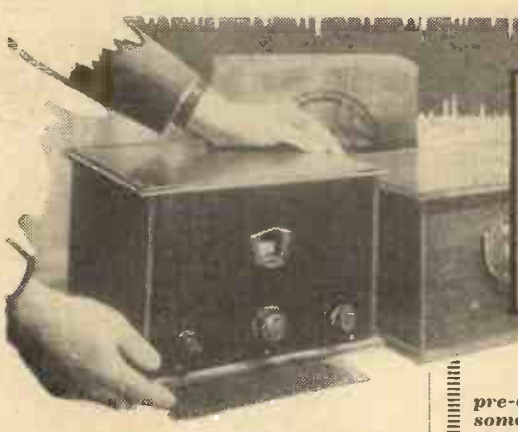
The smaller values are much better where the high notes are concerned (irrespective of whether power-grid detection is used or not, though they are the values usually associated only with power-grid circuits), and the decrease in low notes that occurs, due to less sensitivity of rectification at

WHICH DO YOU USE?



Try the effect of smaller grid-leak and condenser values on your receiver.

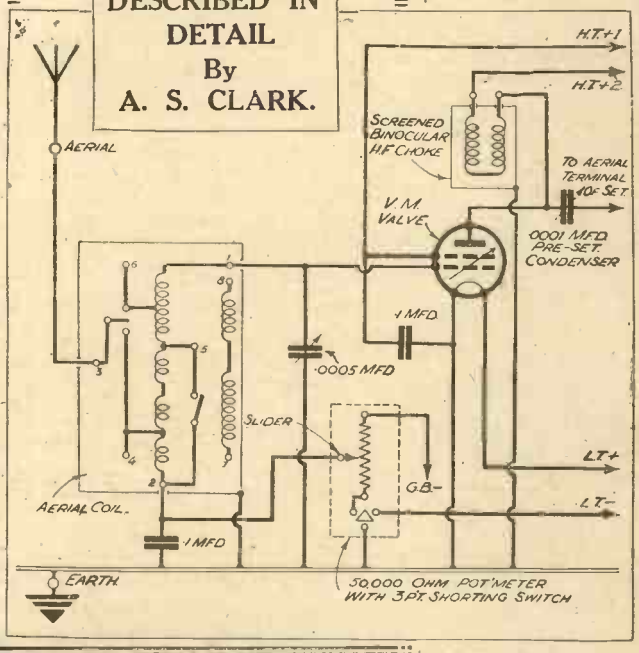
the low frequencies, is not sufficient to be appreciated by the ear.



AN H.F. ADAPTOR

Increased selectivity, more stations, better strength, and pre-detector volume control, are some of the advantages conferred on the battery-set user by this unit. The few components required are inexpensive, the operation is simple and the construction is perfectly straightforward.

DESCRIBED IN DETAIL By A. S. CLARK.



YEARS ago there was considerable doubt as to whether H.F. amplification had any advantages. But that was, of course, before the first S.G. valves.

Even when we first had S.G. valves there was some doubt about the incorporation of H.F. amplification in sets that were not intended for real long-distance work. Things are different now, and an H.F. stage employing a modern multi-mu valve confers quite a number of important advantages on the user, even apart from that of amplification.

Pre-Detector Control

There is, for instance, pre-detector volume control of a particularly attractive kind—namely, that attained by altering the amplification of the S.G. valve by applying different grid-bias voltages to it. With anything like a reasonable aerial, the presence of a powerful local definitely calls for such a method of controlling volume, unless detector overloading, and therefore distortion, is to be suffered.

Then there is the question of selectivity—admittedly one of the most vital in these days of crowded ether. With a single H.F. stage one obtains the advantages of two tuned circuits, without the loss in volume that is entailed when two tuned circuits follow one another before the detector and without intermediate amplification.

A third advantage exists in the decoupling effect the S.G. stage has between the aerial and the detector. The size and shape of the aerial thus becomes of little importance—a feature largely aided by the amplification obtained.

So far we have not taken into account the advantages accruing from the extra amplification. But they are quite considerable.

Sensitivity

To start with, the range is thereby increased. Which means that more stations, and therefore more programme alternatives, are available.

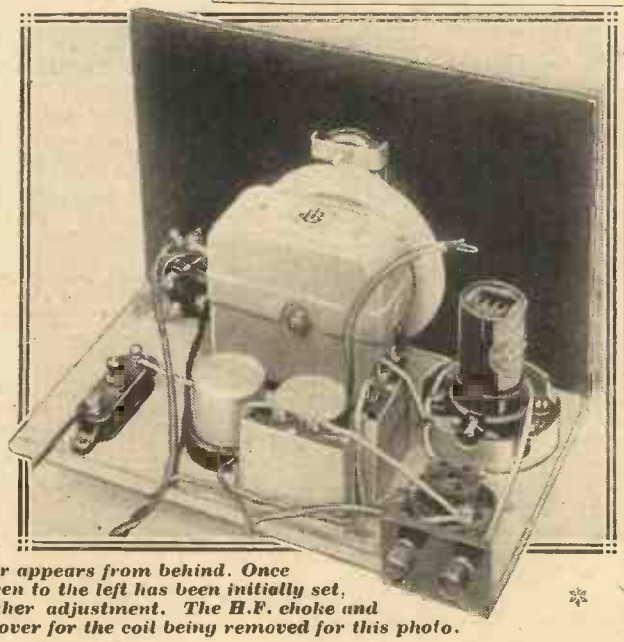
Also distant transmissions are easier to tune. Particularly is this so in connection with reaction, which never has to be pushed to fine limits when efficient amplification of the incoming H.F. pulses is available.

One could go on detailing advantages, but sufficient has been written to show how a set, at present without H.F. amplification, is likely to be improved if it is added.

Provides Better Performance

The majority of modern designs of three or more valves incorporate an H.F. stage, but there are many older receivers in use without H.F. Also many people who built a set without H.F. because of reasons of expense, may now be desirous of adding it to obtain better performances. Similarly, there are people who originally built local-station-only receivers who have since become more ambitious and would now like to reach out to the more remote stations.

In all cases where it is desired to add



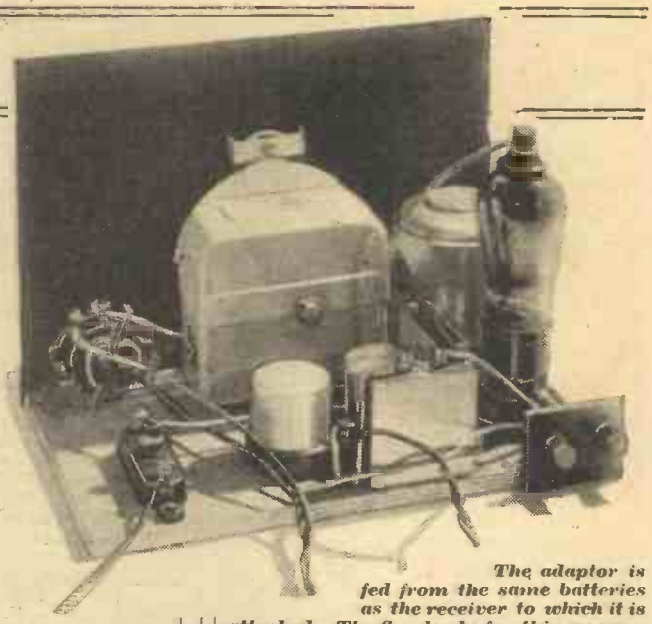
This is how the adaptor appears from behind. Once the preset condenser seen to the left has been initially set, it does not require further adjustment. The H.F. choke and coil are screened, the cover for the coil being removed for this photo.

Straightforward Construction

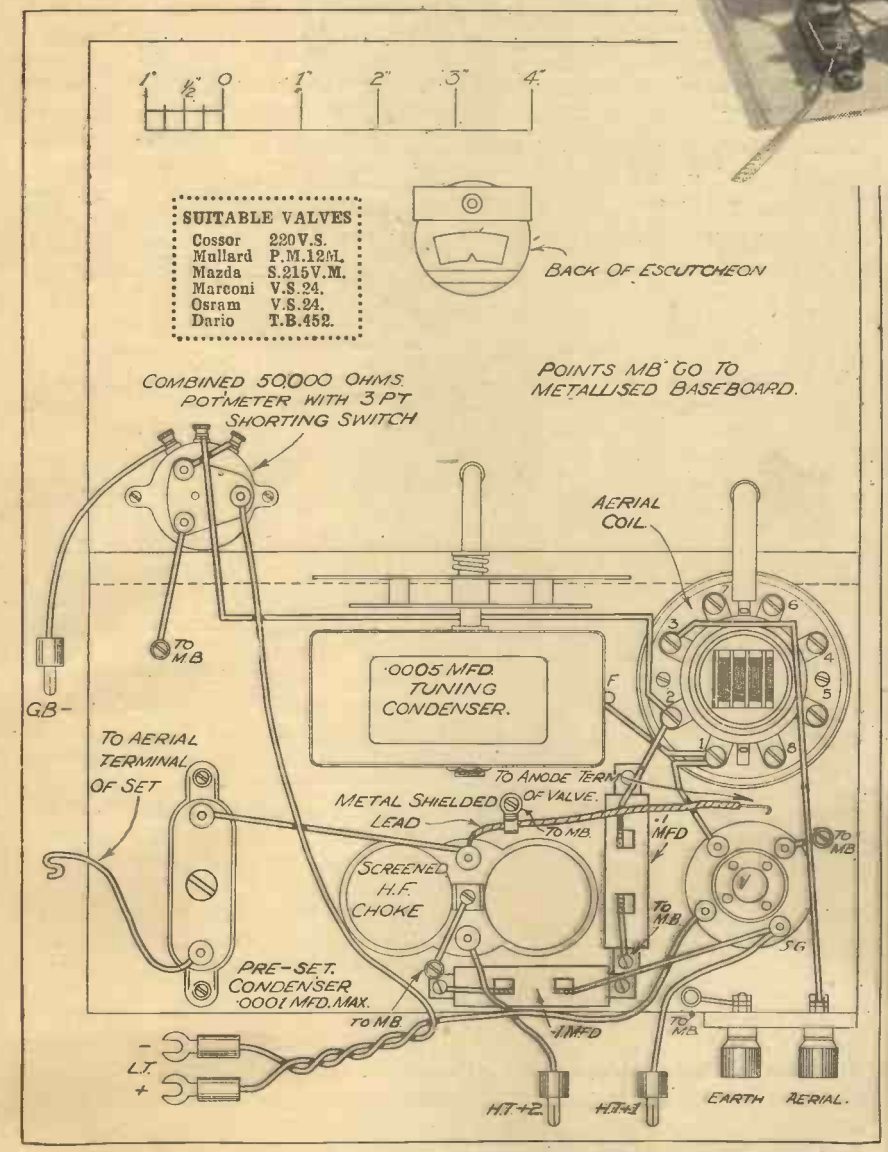
H.F. amplification to an existing receiver at present without it the unit illustrated in this article is ideal. Not only does it entail no alterations whatever to the present receiver, but it can be cut right out of circuit in a moment, leaving the old set to be used exactly as before.

In spite of its simplicity and inexpensiveness, it confers all the advantages that any properly designed multi-mu S.G. stage is able to offer. And the addition of an extra tuning control to be operated will not prove at all complicating to the tuning of stations, largely because, as already explained, it renders the reaction control on the set of far less importance. In fact, in many cases the knob for the latter will only be necessary for bringing the more distant and the weaker foreigners up to reasonable strength in the loudspeaker.

There are three controls on the unit. The centre one is for tuning, the left-hand one (looking at the panel from the front) is for wavechanging and the third one is a combined volume control and on-off switch.



The adaptor is fed from the same batteries as the receiver to which it is attached. The flex leads for this purpose can be seen in this photograph of the completed unit.



A few leads are taken to the metal baseboard, and these are marked M.B. in the above wiring diagram. The drilling dimensions for the panel are contained in the small diagram to the right.

The latter component consists of a 50,000-ohm potentiometer for controlling the grid bias applied to the multi-mu valve's grid, and a three-point on-off switch which controls the filament current and also breaks the circuit of the grid-bias battery across the potentiometer. Incidentally, a separate battery need not be used for this purpose.

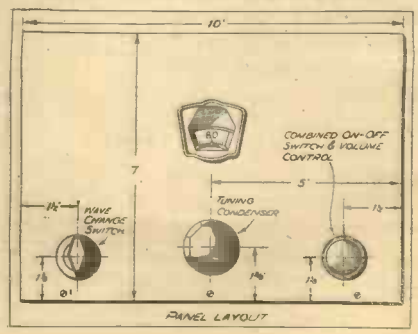
Automatic Battery Control

The same battery as employed for the main receiver is utilised, but a separate one could be used if desired. When the knob of this dual component is turned fully anti-clockwise the adaptor is switched off.

During the first part of its movement in a clockwise direction the L.T. is switched on, and thereafter volume becomes greater as the knob is turned further in a clockwise direction. It must be remembered that you will have two L.T. switches to operate when switching your receiver off—that on the main receiver and the one on the unit.

Terminals are provided at the back

THE PANEL DETAILS



It Makes Distant-Station Tuning a Real Pleasure

of the unit for aerial and earth. The aerial lead-in has to be removed from its terminal on the main receiver and attached to the aerial terminal on the adaptor.

The flex lead on the adaptor's preset condenser is then taken to the free aerial terminal. If the same batteries are used for the adaptor as for the main receiver, the normal state of affairs, the earth terminal on the adaptor can be left free.

The H.T. Voltages

If separate batteries are employed, the two earth terminals should be joined together, and the adaptor's H.T. battery should have its negative joined to the L.T. negative of the adaptor.

H.T.+1 will require between 60 and 90 volts H.T., while the maximum H.T. voltage available up to 150 should be given to H.T.+2.

From the circuit diagram you will see what is "going on" inside the adaptor. There is an ordinary dual-range tuned circuit feeding the grid of the multi-mu valve, the amplification of which is governed by the position of the potentiometer slider.

In the anode circuit of the valve is an H.F. choke and a preset condenser wired up as the coupling condenser of an ordinary parallel-fed H.F. stage. The aerial coil in the main receiver is thus employed as an H.F. transformer with parallel feed.

The diagrams make the construction quite a simple straightforward job. The ends of wires marked M.B. are fixed to the metallised baseboard by means of screws and washers.

The screening on the adaptor is quite comprehensive, not only the tuning condenser and coil being canned, but also the H.F. choke.

Stability

This makes it possible to stand the adaptor close alongside the main receiver, where it will be most convenient for operation, without any fear of instability. The operation has already been covered, and it remains but to point out that although the two tuned circuits, that on the unit and the one on the main receiver, have to be in step, there is no reason why their dial readings should be similar for any given station.

The adjustment of the preset is not critical. Its purpose is mainly to adjust selectivity, and it should be adjusted by trial on actual stations. Once the best position has been found for it there is no need to touch it again unless the adaptor is linked up with a different receiver.

HERE ARE ALL THE COMPONENTS NEEDED

1 Varley "Nicore" screened coil, type B.P.30.
1 J.B. "Nugang" screened ·0005-mfd. tuning condenser, type A.
1 Telsen 4-pin valve holder.
1 Graham Farish L.M.S. screened binocular H.F. choke.
1 Polar ·0001-mfd. preset condenser.
2 T.M.C. Hydra ·1-mfd. fixed condensers, type 25.
1 Bulgin 50,000-ohm potentiometer with three-point shorting switch, type V.S.36.
1 Peto-Scott panel, 10 in. × 7 in.
1 Peto-Scott "Metaplex" baseboard, 10 in. × 6 in.
1 Peto-Scott terminal strip, 2 in. × 1½ in.
2 Belling-Lee terminals, type R.
1 coil of B.R.G. "Quikon" connecting wire.
2 Clix accumulator spades.
3 Clix wander-plugs.
1 length of Goltone screened sleeving.
Flex, screws, etc.

NOTE: Constructors are advised to keep closely to this list.

THE CARE OF GANG CONDENSERS

Some useful hints for home constructors.

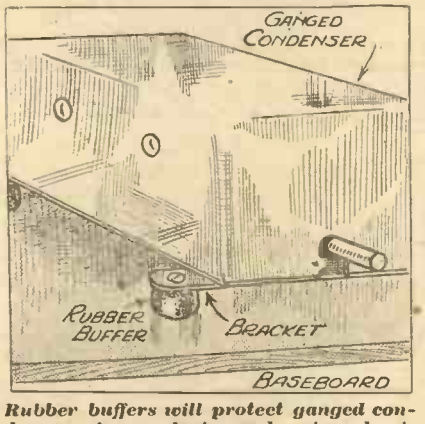
IT is not always appreciated that a ganged variable condenser, for all its robust appearance, is a component which should not be subjected to any kind of rough treatment. The reason is that the various units of the "gang" are carefully regulated by the maker to work as a team, and that careless handling by the constructor may neutralise the good work that has been done by the factory. It is of particular importance that the bodies of these condensers should not be subjected to any strains that might deform them even slightly.

Small Rubber "Buffers"

Not every baseboard or chassis has a perfectly level and true surface. Hence, if you clamp a ganged condenser hard down to either of these with screws or bolts, it is well within the bounds of possibility that the ganging may be upset. A safety-first mounting for ganged variable condensers is illustrated below.

Between each of the little brackets and the surface upon which the component is to be mounted is inserted a small rubber "buffer." These may consist of little, fat rubber rings, or of the "feet" made for the bottoms of small cabinets. Should these not be available, suitable pads are easily contrived by cutting pieces from the sole of an old tennis shoe or a sheet of crêpe rubber, and piercing holes through them.

TO AVOID STRAIN



Rubber buffers will protect ganged condensers from strain and microphonic vibration.

Tightening Down

When you turn down the mounting screws, go gently and let the pressure be just sufficient to compress the buffers lightly and no more. A condenser fixed in this way floats upon the buffers, and is in no danger of having its frame disturbed. There is a further advantage about the suggested method. When the loudspeaker is mounted in the same cabinet as the set, its strong vibrations may be communicated to the vanes of a variable condenser clamped tightly down to chassis or baseboard without any buffers.

A Microphonic Effect

The condenser then becomes microphonic, with curious and highly unpleasant results. Any such tendency is minimised by allowing its frame to float on rubber.

When a microphonic condenser is present in a set, a ringing effect is likely to be heard, not unlike that which a microphonic valve will cause.

R. W. H.

TELEVISION AND THE P.M.G.

The probable advent of organised radio-vision broadcasting in the comparatively near future has raised the question of whether or not it should come under Post Office control like other wireless matters

By Our Legal Correspondent.

THE onset of television is likely, before long, to raise once more the question of "Who owns the ether?" The problem first presented itself in an acute form in the early days of broadcasting, when argument raged fast and furious over the right of the P.M.G. to levy a tax of 10s. a year on all wireless receiving sets.

As the Law Stands

As the law then stood, it was clearly forbidden to *transmit* wireless messages without the special permission of the P.M.G., but the position was by no means so clear on the receiving side. For a time some listeners absolutely refused to take out a licence—or to pay the 10s. a year—on the ground that the demand was illegal, and that there was nothing to prevent them from listening to the programmes—if they wanted to—free, gratis and for nothing.

However, it soon became clear that the B.B.C. could hardly be expected to provide a service of programmes unless they were given a suitable income to cover expenses. The logic of this point of view could not be ignored, and in 1925 a new Act of Parliament was passed which laid it down that all listeners must take out a licence and pay the annual fee.

Although it is true that someone must provide an income for the upkeep of the B.B.C., the legal position goes deeper than that, and in fact raises an issue which overshadows all others when one comes to consider the question of television.

For Public Profit

The P.M.G. has, in law, a monopoly over the ether, in so far as it is used for transmitting messages. This is a right which is derived from the old State institution known as the Royal Mail. The King has always had the monopoly or sole right of carrying letters. In olden times he used to farm it out to a contractor or Court favourite, but nowadays it is vested in the Postmaster-General, and the profits of it go into the public purse.

When the electric telegraph was first invented, it was held to infringe or clash with the Royal privilege of carrying the mails, and so an Act was passed which made it a preserve of the Post Office. The same fate fell, in turn, upon the telephone, though only after a fierce legal battle with the private companies who first operated the telephone service.

Wireless telegraphy was the next to be brought into line with the older methods of "communication," and it, too, came under the control of the P.M.G. This does not necessarily mean that no one else could transmit wireless messages, but it does mean they could not do so without having first a licence from the P.M.G.

UNDER B.B.C. CONTROL?

A scene at the television studios of the B.B.C. Should television come under the same control as ordinary radio programmes, or should a separate concern be authorised to carry out the new system?

Margin of Liberty

State control over the ether, as a medium for communication, having in this way been firmly established, broadcasting also fell—without much of a struggle—into the hands of the P.M.G.

Although, for the time being, he has not taken over the actual business of running broadcasting as a State service, the position is that the B.B.C. can only operate under his special Charter or permission, and, although they have a wide margin of liberty under the existing agreement, the final control rests with the P.M.G.

Levy on Listeners

This state of affairs explains, for instance, why the P.M.G. does not transfer to the B.B.C. the whole of the 10s. a year tax which he receives from the listening public. After paying the B.B.C. an agreed sum, and after making good the cost of collecting the tax, there is a balance which goes into the funds of the Post Office as a payment from listeners for the right to use the ether. In point of fact, it is as much a "luxury" tax as that which is levied on tea, or beer or tobacco.

Therefore, when we come to consider the position as it affects television, we see that the P.M.G. has already acquired the sole right to use "any system of telegraphic communication through the ether." The point next arises as to whether the transmission of pictures falls clearly under the same heading as the transmission of speech or Morse signals, or whether any clear-cut distinction can be drawn between the two.

Will There Be a B.T.C.?

There is possibly some room for legal argument here, but in the long run it would seem inevitable that broadcasting and television must both be treated alike and given over to the same authority.

It does not, however, follow that television, when it does come, will necessarily be operated by the B.B.C. But it does mean that the P.M.G. will have the over-riding control. He may decide to continue the present arrangement with the B.B.C., so far as television is concerned, or he may decide, when the time is ripe, to give a separate Charter to whatever company is best equipped to transmit the required standard of pictures.

Two Strong Arguments

It may be said that the B.B.C. already has quite enough to do to keep the broadcast service up to the mark. This argument will be strengthened if—as is very likely to be the case—television programmes are radiated on ultra-short waves from a large number of local centres.

On the other hand, it will cost the public less, when it comes to paying, if both services are operated by a single concern.

Setubal is back in the news again with another letter from our friend Carlos—a new "S.T." receiver of revolutionary design is hinted at—offers of readers' aerials for testing are asked for—and a new viewpoint on the "round robin" to Sir John Reith is expressed in this month's instalment of John Scott-Taggart's informal chat with readers.

Ah, Monday morning, of course!

"You're a miserable-looking blighter when you're out," writes M. Philby, N. Philip, or U. Frisly, of Brixton. "Telling you this is my good deed for to-day. You wouldn't like anyone else to read this, would you?"

As others may feel like W. Filty, N. Olbridge, or W. Pkulij (it is impossible to be certain), and desire to get the same sentiments off their good-natured chests, I reproduce Mr. Phibig's comment for 99,999 others to read.

He proceeds to tell me a long joke, but, if my face reflects my feelings, I am now an even more miserable-looking blighter.

Some Homely Remarks

Thanks, Ernest Norman, of Deptford, for some homely remarks about those who insist on redesigning my sets. He writes:

"If you could see some of the sets that are brought to me and hear the owner say: 'This is an S.T.400.'! I look inside his cabinet, and the only specified stuff in it is the Glazite wire. He says to me: 'I get the local stations O.K., but Fécamp or Luxembourg I have never had'!

"I then let him hear an S.T.400 that is genuine, and you should see his expression change. I have found that people buy 50 per cent of the specified components and then the rest is *JUNK*.

"Some get the set all right, but spoil it by using an old screen-grid valve. Others connect their sets to speakers their relatives gave them. The weakest spot is always the spaghettis. I should like your opinion on this. [*They have proved unreliable and I should always advise other types now.*—J. S.-T.] I don't suppose it will surprise you when I tell you that I have seen about ten different imitations of the parts you specify, each costing a shilling, or in some cases only a few coppers, less than the real component!

"One S.T.500 had an output equal to a crystal set, only not so clear until I changed the 2 mfd. The old one got quite warm, which is not surprising, as it was shorting the H.T."

* * *

He ends his letter by saying: "How many people say to their friends, 'Come round and hear my S.T. So-and-so,' and take all the praise and never tell who or what 'S.T.' stands for!"

"Before My Time"

Shame! But it is surprising how many people interested in wireless are quite familiar with my sets, but not the name of the designer. Quite recently I received a letter from a man who was surprised I had called a set S.T.500—"because I remember a set called the S.T.100 about ten years ago, but that was well before your time."

I get quite a number of letters such as the following one from W. R. J. B., of Green Walk, Ruislip:

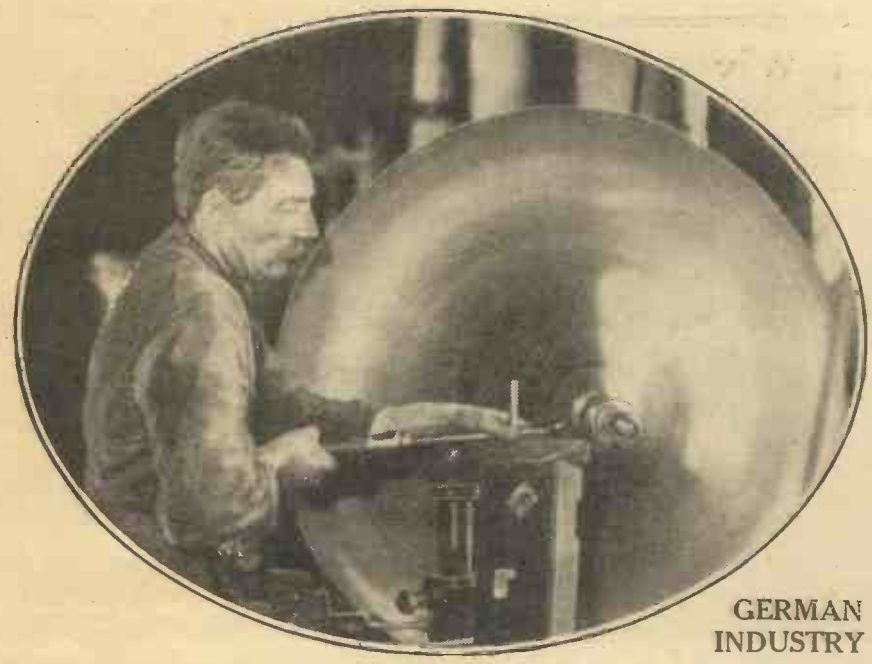
"I want to write another complimentary note on your S.T.300 Star. It's a wonder! I am an S.T.300 and S.T.400 user, but this 300 Star beats the pair together!

"I cannot praise it enough, and I say to all WIRELESS CONSTRUCTOR readers: Build this set. Results are wonderful. I feel it my duty to say I do not think you have exaggerated its abilities, volume and tone by the least iota. Again, it is a wonderful set."

Not Up to Scratch

Now this kind of praise is very gratifying, but it reveals a very common form of misunderstanding. To say that the S.T.300 Star is better than the S.T.400 with its four valves is a clear indication that his "400" was not up to scratch.

After all, I know exactly what the S.T.400 will do. So do tens of thousands. Several hundred letters of praise have been published in this journal. Yet, in the face of this, a reader will praise the 300 Star to the skies at the expense of the S.T.400. He is sincere, and gives not the slightest hint that his S.T.400 was faulty.



GERMAN INDUSTRY

A fine study from Berlin of a workman engaged in manufacturing one of the giant copper loudspeakers used for outdoor demonstrations.

This example shows how dangerous individual opinions can be when they clash with that of the designer and the majority of constructors.

* * *

A far more unreasonable opinion is that of the occasional constructor, who so obviously gets poorer results than he ought that common sense should assure him that his particular set and not the design is wrong.

Completely Innocent

But such a large percentage of failures are incapable of believing that they themselves could be wrong or that a component or valve could be faulty. A few, in writing in, will even lie about the components or valves they are using. I know this, because sometimes I have seen the actual sets.

Often, however, the constructor is completely innocent, and some small matter stands between him and perfect success.

* * *

I have never made a pretence of "buttering up" my readers. The readers of my "boom" set articles (such as the S.T.300, S.T.400 and S.T.500) may rise to a quarter of a million. The sales of the S.T.500 issue of POPULAR WIRELESS were 250,000. Let us face the fact that this represents a cross-section of the population. Sir John Reith has said (at any rate, it sounds like the Director-General) that nine-tenths of us are fools.

Cranks and Criminals

It is certain that there are cranks, criminals and convicts amongst those who build my sets. They all get treated alike by myself and that most patient of all departments—the Query Department. But occasionally I revolt at a stupid letter.

Those who get medium results on one of my sets are the ones who can be forgiven most readily for complaining. The man who gets definitely poor results (and not just medium results) receives just as much help but far less sympathy if he damns the design.

He Won't Own Up!

Actually, it is very hard for us to help him because he is so unhelpful in describing the symptoms. If he has modified the design he will probably struggle like mad to conceal the fact, because he thinks we shall wash our hands of him. He refuses to own up about his doubtful coils or a "muckite" condenser. If he has a good component, however, he boasts about it, not appreciating that the strength of a chain is no more than that of its weakest link.

Ten to one he hasn't read the article carefully or, having bought the first number, has failed to buy succeeding issues containing invaluable hints for those who may not have obtained maximum results.

* * *

You would think this man would stop and say to himself: "This set of mine is no darned good. The fault is either mine, the component or valve manufacturer's or Scott-Taggart's. *It is unlikely to be S.-T.'s because he probably hasn't forged* ALL *the testimonials and probably hasn't lied successfully for twenty years.* He probably knows a bit about wireless and would hardly regard this rotten set of mine as a pleasing and satisfactory job. Moreover, the fellows at the office are probably not all liars. Tom Smith may be, but Jones, Williams and Robinson all have S.T. sets, and, if I only believe half of what they say, their results are ten times better than mine. The design of the set may therefore be all right."

But does this type ever say this? Not on your life!

* * *

And yet I honestly find it hard to blame any man who has spent good money and has failed to get good results. No matter what we do, there is always some percentage of failure. I think I am the only designer who frankly admits the fact and openly advertises his failures.

Only by that frank recognition can one build up that confidence without which the most superlative design would fail to attract the public.

Half-Digested Criticisms

I have struggled to make it awkward, if not impossible, for any idler to make half-digested criticisms of my sets. The most successful method of all is to have ten enthusiastic voices to disprove one unsuccessful voice whenever the latter is raised.

Actually, the number is a hundred to one; but when sets are built in tens of thousands, as my major sets are, there remains a small minority which, whether vehement or reasonable, receives very close attention from myself and this journal.

* * *

With a view to extinguishing dissatisfaction, my service scheme is in operation, but so far only on a small scale. I want very many more local wireless "doctors" who will go on my roll and to whom readers in trouble can go—or who will go to readers' own homes.

GENEROSITY DEPARTMENT

From a reader's letter:

"I am not in your class for theory and that sort of bunk, but just like mucking about generally. No offence meant and none taken, I hope."

None. **J. S.-T.**

Clergymen's Wives—Please Copy!

If you are competent, whether hitherto an amateur or in the trade, write to me giving your experience and qualifications. Readers who write to the Query Department will be referred, if they so desire, to practical men in their areas. The one essential condition is that the charge to the constructor must be reasonable and strictly on a payment-by-results basis.

SEZ YOU DEPARTMENT

"Home constructors do not mind how much a wireless component costs as long as it is of a good make," says the radio correspondent of a West Coast of Ireland evening newspaper.

Says the radio correspondent of a West Coast of Ireland evening newspaper! J. S.-T.

To many, of course, it could be a spare-time occupation for evenings and week-ends. Wireless dealers, however, will be specially welcomed provided they will familiarise themselves with my designs and take a genuine interest in home constructors.

Write at once if you desire to join up. Don't imagine that everyone else will write. It is very hard work to get together a list.

But do *not* write unless you can diagnose faults and put them right.

A New Set

Now and again I get letters telling me how to make THE WIRELESS CONSTRUCTOR a better paper. If you want to improve my own particular work, write to me, but note that I am not the Editor of the CONSTRUCTOR. Please kick his pants, not mine. Mine are threadbare as it is.

Moreover, I like to be left alone during these months—not so that I can have a nice easy summery holiday, but because I am in the throes of a new set.

It is going to be something worthy of its lineage, and no prizes are offered for suggesting its name. Its name is something very compact, and consists of two initials and a number consisting of three digits.

* * *

I wish I could design my really big sets during the winter, and so get a decent holiday when other people have theirs. But although the S.T.300 was a winter effort, my other principal receivers — S.T.400 and S.T.500—were finished during the summer months with locals strong and foreigners weak.

Of course, I have research going on all the year round, but my final work on my real national sets is a summer job. And never was I busier or more determined to create a great wave of construction than I am over my new set.

* * *

I don't want to work up excitement too soon, but I want constructors to go easy on my earlier designs. These will not be displaced, but I can assure you that, when you see or hear the new big S.T. set, your hands or hand (I'm not revealing anything) will twitch with desire to work it.

And the five hundred sets of nostrils at Papplewick will twitch more vivaciously than ever in the history of that township.

Her Name is Mary

What's this letter, now, written on blue paper?

"*Our Mary finds the pills you gave her excellent, and would like some more if you consider this a good thing.*"

I only know one Mary, and the most she's ever had from me has been liquorice all-sorts.

On further investigation I find this is the opening of a letter by a clergyman's wife to her local doctor, who arranged for her to have an S.T.400.

There is a P S which my medical disciple rings round in red. It reads:

"*Our wireless is a joy to us—so different from the old one.*"

Other clergymen's wives, please copy.

Funereal Note

"I wish S.-T.'s undertakings every success," writes L. B., of Cardiff. Some of my critics would substitute "undertaker" for "undertakings."

Which reminds me of a *bon mot* which was current in 1924. It was to the effect that when I died they would put on the coffin "S.T.100 in a new cabinet."

Police-Court News

It is reported that a kindly magistrate has ordered 1s. per week to be paid for the upkeep of a white rat—the companion of a man who is going into seclusion at the country's expense.

He presumably comes from Papplewick.

This township, by the way, has had a good smell at the "S.T. Super," but up to date I have heard nothing from any of its citizens.

They will, however, be able to nose the S.T.300 Star.

Carlos' Bulletin

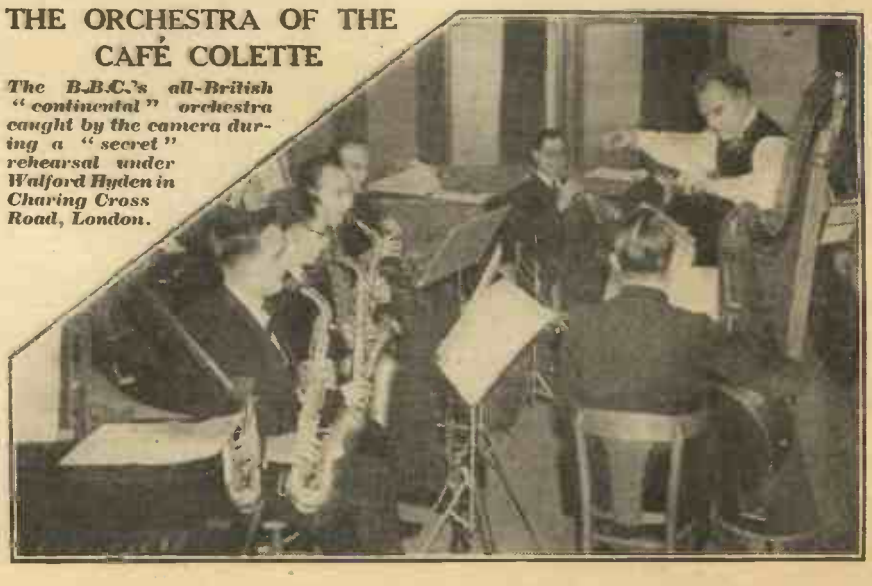
I have had a very severe letter from a colonel who thinks I am a cad for sneering at Carlos, "who, moreover, probably writes better English than you do Portuguese."

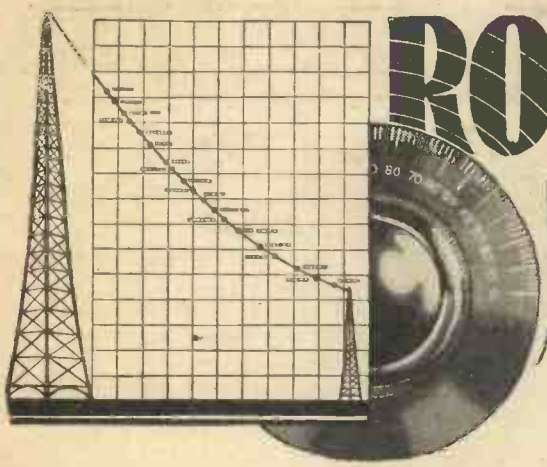
Of course, there are pages of elaboration. Nobody ever contents himself with a neat, succinct "You're a cad." Although I did once get a postcard containing a very brief suggestion embodying one of those homely

(*Please turn to page* 142)

THE ORCHESTRA OF THE CAFÉ COLETTE

The B.B.C.'s all-British "continental" orchestra caught by the camera during a "secret" rehearsal under Walford Hyden in Charing Cross Road, London.





ROUND the DIALS

A review of reception conditions, together with hints on the best stations to tune for and details of some forthcoming increases in power.

REGULAR listeners to the German programmes have been wondering what has happened to Langenberg of late. It is known that Germany's Radio Plan is still going forward, and the excellence of Muhlacker's performance on 522·6 metres is a reminder of recent Teuton technical progress (100 kws. are now being employed regularly by Stuttgart–Muhlacker).

A New High-Power Station

Langenberg, on the other hand, has receded to whisper-strength. But that is because Langenberg is merely biding his time.

A new 100-kilowatter, "Reichssender Cologne," is being installed, and should be on the air with preliminary tests about the time these words appear in print.

That is why strength has fallen off, the 60-kw. station being temporarily in the hands of the engineers, and the old 15-kw. Langenberg transmitter having to do duty in the meantime.

* * *

Incidentally, the Langenberg aerial system, too, is being improved. The two masts are to be replaced by one tower, 100 ft. high, carrying an anti-fade aerial of the type successfully tried at Leipzig.

Listen to Italy

Of the other foreign fare on medium waves, that provided by the Italian stations is as interesting as any. In fact, Italy is much more popular as a source of entertainment in this country than would be supposed from her geographical situation. Despite the great distance, Italy is now extremely well represented, and Turin, Trieste and Florence have all been in good fettle, as well as the more powerful stations at Rome and Milan. Rome, by the way, recently followed the example of Poste Parisien by introducing to listeners an organ specially built for broadcasting.

Poste Parisien has been enlivening 312·8 metres with some very tuneful daytime fare—not everybody who enjoys this station after dark realises how good it can be in the daytime, too. But Paris has been best represented by Radio-Paris, which is still probably the Briton's favourite foreigner, despite the lures of Luxembourg.

* * *

Incidentally, Luxembourg is now announcing its "local" programmes, as well as those specifically intended for this country, in English.

Long waves, on the whole, have been very satisfactory, but uneventful. It is, however, reported that Reykjavik is to increase its power. Certainly the Russians have been much better received since they decided on this course, and so has Kalundborg, who is now excellent on 1,261 metres.

More Radio Fare

Although bright weather is all against listening continuously there is plenty of interest to reward the long-distance man, especially now that Droitwich and other new transmitters may be "taking the air" soon.

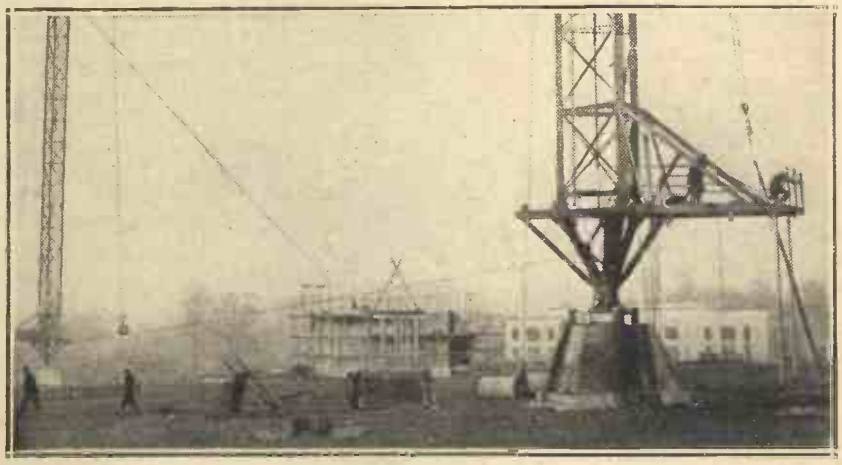
Czechoslovakia has ordered a new 30-kw. station, and it is likely that Kosice, on 269·5 metres (just above Belfast), will quadruple its power in the near future.

* * *

Extraordinary though it may appear to those unaccustomed to transatlantic reception, it was found possible during May to hear American stations broadcasting on medium waves. In fact, it seems likely that night-workers and others who are able to listen between 3 and 4 a.m. may be rewarded right through the summer by occasional freak reception of this kind.

For most of us, however, America will remain a closed book until September, or thereabouts, when the days draw in again.

P. R. B.



BRITAIN'S NEW SUPER STATION

"DROITWICH testing. Droitwich testing. One, two, three, four, five . . . . ." That is the sort of announcement you may hear at any time soon, when the B.B.C.'s new long-waver takes the air on 1,500 metres.

It will be far and away the most important of the British stations, with a power five times as great as that of the Daventry National station which it will eventually replace. (Droitwich has 150 kilowatts as compared with Daventry 5 X X's meagre 30 kilowatts.)

Moreover, its aerial, slung between the two 700-ft. masts partly shown above, is easily the best and highest that the B.B.C. has.

A flashing beacon on the end of each mast will warn airmen to keep away from the great structures, which are so high that in a gale they will "give" as much as four feet at the top!

ARTIFICIAL TONE ADJUSTMENT

By C. Johns

An amazing new system of loudspeaker reproduction has been evolved as the result of months of experiment by Mr. G. V. Dowding, Technical Editor of "The Wireless Constructor." This new technique gives such astonishing realism that it is easily possible to believe that one is listening to the actual performance.

EXTRAORDINARY progress has been made in loudspeakers during the past few years, and there is no doubt that the best speakers to-day give, *within their limitations*, a marvellously faithful copy of the original sound. But they *have* their limitations, and it seems to me that, so long as we stick to the ordinary technique, there will always be a definite limit to the *realism* of the reproduction.

A Big Order

If you think about this for a moment you will see that it is only what you might expect, because you are asking a little instrument like a loudspeaker diaphragm to go through the same evolutions as a whole range of musical instruments, many of which are much larger than the loudspeaker itself.

Take the case of a 'cello, for instance. Here the body of the instrument is made large for the express purpose of acting as a "sounding board," so as to set in motion a large quantity of air. And what about a church organ or cinema organ, where there is a whole battery of enormous pipes setting in motion a vast amount of atmospheric air?

How can you expect the poor little loudspeaker diaphragm, a few inches across, to compete with this? And yet, if you think about it, you are really asking this little diaphragm to set the air in motion in the same way as this great array of organ pipes!

In Miniature

This question has to be considered in two parts. First of all, there is the faithfulness of the reproduction—that is to say, the reproduction of the original *quality*, but on a small scale; and, secondly, there is the question of actual *quantity* of sound, the *grip* which the vibrating diaphragm or other instrument gets upon the atmosphere.

Let us turn away from this for a moment and consider another matter. You take a photograph of a person or a scene, and this may be perfect in detail and a precise representation of the original, although on a small scale—even down to the size of a postage stamp. Now this corresponds to what a good loudspeaker can do.

It can give you quite a faithful reproduction of the original, but this is necessarily on a miniature scale (although your imagination makes up for a lot and it may never have occurred to you before that it *is* on a reduced scale).

But it is definitely something different from the original sound, and I think everybody will agree that it is practically impossible to mistake an ordinary loudspeaker reproduction for the original. It may be ever so good as a reproduction, but it *is* always a reproduction, and this is always quite evident.

Now this is due to various causes, and one of the chief causes is the fact, at which I have hinted above, that the loudspeaker is a miniature and puny instrument compared to some of those which it has to emulate. It can never get that same grip on the atmosphere which you get with a much larger instrument.

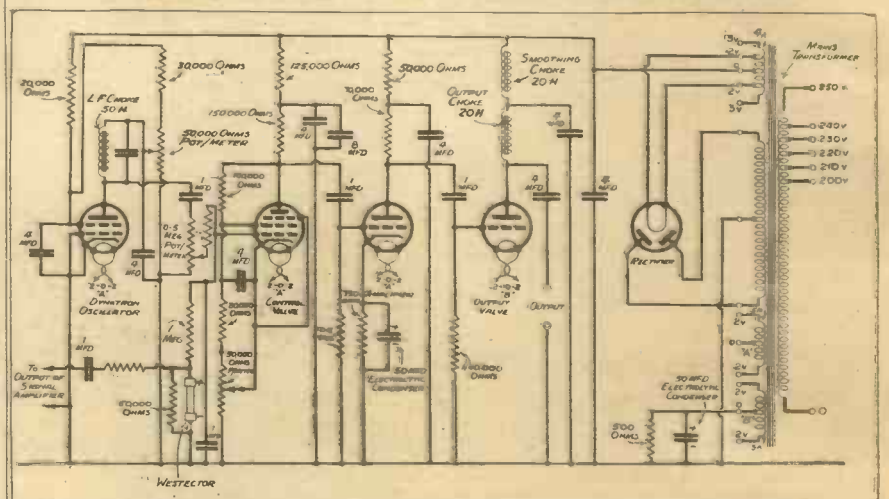
You may say that, if this is the case, the only thing to do is to make larger and ever larger loudspeaker diaphragms, until you have something actually comparable to the original instrument. Well, this is certainly one way of doing things, although it is obviously useless for the majority of purposes.

Amazing Results

Until recently I should have been inclined to say that you could never expect a small diaphragm to give you the same impression as to *volume* and *size* as an orchestra or cinema organ. But that was before I had heard the amazing results of some investigations which have been going on during many months past on this important question.

These investigations have been carried on with the object of getting round this apparently fundamental limitation of the loudspeaker. This experimental analysis has been undertaken by Mr. G. V. Dowding, Technical Editor of "Popular Wireless" and THE WIRELESS CONSTRUCTOR, and after studying the problem from all angles he has evolved a technique

A SPECIAL ALL-MAINS CIRCUIT IS EMPLOYED



The special Infra-Sonic generator and amplifier developed by Mr. Dowding. It is automatically controlled by the output from the normal "speech" amplifier or radio set, to which it can be connected in a few moments.

You Can Actually Feel the Music

which gives the effect of volume without the character of mere loudness.

This may sound rather contradictory in itself, but what I mean is that, without actually getting as much loudness, as much *grip* or *punch* on the atmosphere from the loudspeaker as is got from the original orchestra or organ, or whatever it may be, nevertheless he gets the same kind of result so far as the impression on the listener is concerned.

Like the Original

Indeed, having heard this new Dowding reproduction several times, and with all kinds of music and other sounds reproduced, I think it is no exaggeration to say that one would find it very difficult to distinguish it from the original.

When I say this I am not just using a hackneyed phrase, because one has heard that sort of remark so many times before about ordinary loudspeakers. I make this statement with a full consciousness of *the new standards by which this new technique must be judged.*

When you hear an organ or an orchestra, you know how you actually *feel* the sound, in addition to merely hearing it. There is a kind of *embrace* about it which takes hold of you, and it is impossible to say where the sense of hearing leaves off and the sense of feeling begins.

This is why we employ orchestras, massed bands and so on in order to get a *mass of sound* and feeling, instead of merely the thin rendering of a single instrument.

You notice that I talk about the sensation of *feeling* accompanying sound, and this seems to be associated more particularly with the very low-frequency vibrations. In fact, it seems that we really feel those which are below the lower limit of hearing.

This gives the clue to the new Dowding technique, for what he does, in effect, is to create and put back into the reproduction this low-frequency energy—Infra-Sonic energy, he calls it—which gives to the reproduction that fundamental basic robustness which is often so characteristic of the original sound, but which is so lacking from the loudspeaker reproduction.

I do not want you to get the idea that the Infra-Sonic frequencies are just pushed in anyhow as a background or foundation. That would be very easy to do, but there would be no artistic value to it at all. On the contrary, this Infra-Sonic foundation is blended with the music at each and every moment, and it faithfully follows every inflection of the broadcast reception.

MAKING "SOUNDS" YOU CANNOT HEAR

Mr. Dowding checking the operation of his latest Infra-Sonic generator in "The Wireless Constructor" Research Laboratory. The whole apparatus is packed into a remarkably small space.

Large Amplitudes

The Infra-Sonic vibrations are reproduced from a pair (or more) of diaphragms, precisely after the style of ordinary moving-coil loudspeaker diaphragms, but adjusted in a special way so as to handle the very large amplitudes of vibration which are generated. (Actually, you can *see* the vibrations of these diaphragms when they are in action.)

The result is absolutely amazing. When you hear the whole system in action you can scarcely credit that such a volume, such a *reality* of sound, could be created by such means.

I am not really concerned whether there is actually the volume of sound that you get from the original production; all that matters is whether the listener *thinks and feels* that there is the volume of sound, and I can assure you that if you are listening to an orchestra reproduced by this new Dowding system (especially if you are a little distance away, so that your judgment is not influenced by seeing the apparatus itself), you will very well believe that you are actually hearing the real thing at last.

That "Missing Link"

There are, of course, many minor problems still to be solved, but it seems that this new system is going to revolutionise loudspeaker reproduction, both in the cinema theatre and in the home.

I can think of nothing more suitable for the big loudspeakers used in connection with the talking pictures, and I prophesy that in the near future you will find this system adopted by the talkie industry. At the same time, in a modified form, it is capable of completely transforming ordinary loudspeaker reproduction in the home, and there is an enormous field for it in this direction as well.

Mr. Dowding seems to have found that "missing link" in loudspeaker reproduction which gives us *really realism* at last!

AS WE FIND THEM NEW APPARATUS TESTED

Interesting reviews of the latest apparatus submitted by radio manufacturers and traders for examination and test in "The Wireless Constructor" laboratories.

The Blue Spot "Star"

THE average listener probably doesn't realise the immense amount of research that goes on "behind the scenes" in the laboratories of our leading radio manufacturers.

There is the constant striving to achieve something better than that which already exists. This is specially true in loudspeaker design, and there could be no finer example than the latest model from the Blue Spot factory.

The new model is called the "Star,"

The latest Blue Spot moving-coil loudspeaker, together with its remote volume control.

a name which is fully justified in view of the instrument's numerous outstanding features.

The Blue Spot "Star" is a moving coil of novel design. An entirely new arrangement is employed for the magnetic system. Instead of the usual scheme, the "Star" utilises four chromium-plated tubes enclosing a special magnetic material.

The chassis frame is die-cast in one piece, thus giving a very rigid assembly and freedom from mechanical resonances or chattering. Great care has also been taken to exclude dust and to provide protection for the diaphragm and speech coil.

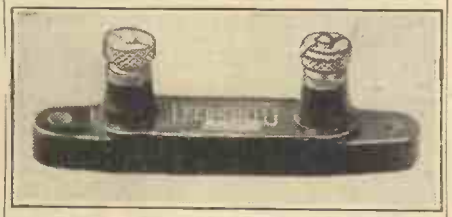
An easily handled plug-and-socket arrangement enables the speaker to be matched up to any output, including Pentode, Class B and Push-Pull, either direct from the anode circuit of an output valve or from an existing output transformer. Moreover, it can be used as an extension speaker in combination with any other without upsetting the tonal balance of the second speaker.

The response is very good indeed, this no doubt being largely due to the excellence of the suspension as well as to the matching facilities referred to above.

As regards price, the chassis sells at 70s., while for an extra 10s. 6d. the makers will supply a remote volume control which can be placed on the arm of a chair and the volume adjusted to a nicety without the listener getting up and without any alteration to the controls on the set.

It should be noted that this volume controlling can be carried out without affecting the volume on any other speaker which may be joined up to the same set.

SUPPLIED IN ALL VALUES



The Ferranti "New Type" resistances are supplied in manufacturers' models with wire ends, or in constructors' models complete with holder as shown above.

The makers are The British Blue Spot Company, Ltd., Blue Spot House, Rosoman Street, Rosebery Avenue, London, E.C.1.

Ferranti Resistances

Two new models of Ferranti resistances have been recently placed on the market. The resistance elements are constructed by a special process, the result being an efficient and accurate component guaranteed to be within plus or minus 5 per cent of the rated value and having a temperature coefficient of ·04 per cent.

The working temperature is limited by the perishing of the protective covering and is approximately 80° centigrade.

The makers state that the resistances have been tested in atmospheres of various humidities, the effect being less than 10 per cent.

The manufacturers' models are fitted with metal-end caps and wires and sell at 6d. each, whilst the constructors' type, which is supplied with a holder and slotted terminals, costs 1s. 6d.

The manufacturers' type, have colour marking in accordance with the standard colour code, whereas those in holders have transfers indicating the values.

On test we found these resistances to be satisfactory in every way, background noises being non-existent and the values were within the limits stated by the makers. The sizes available range from 300 ohms to 250,000 ohms, and will shortly be extended to 2 megohms.

The Wearite Wavetrap

There is unquestionably a demand for some simple means of improving the selectivity of the non-selective set. That there are many thousands of receivers in this category is an undisputed fact, and this in spite of the Lucerne Plan.

(*Please turn to page* 143)

A direct and reflected view of the Wearite wavetrap—a very efficient unit which can be used with any set.

WIRELESS IN THE GREAT WAR

"RADIAT" DESCRIBES THE BATTLE OF CORONEL

THE naval engagement of Coronel, off the Chilean coast, on November 1st, 1914, was, from a wireless point of view, immensely important, for in this fight British wireless was in action for the first time in history; it was, in fact, radio's first real baptism of fire.

Overheard Radio Signals

Moreover, wireless was directly responsible for the coming together of the opposing British and German squadrons, and it was largely by means of the enemy wireless signals that the British Commander-in-Chief, Admiral Cradock, was able to locate the German ships. Location, however, was not obtained by wireless-direction finding, for that was still in the cradle, but by the perspicacity of the various British wireless operators in estimating the position and distance of the enemy vessels by merely overhearing the signals from the various German battleships.

The Hidden Fleet

When, on August 4th, 1914, Britain declared war on Germany, Admiral von Spee, the German Commander-in-Chief in the Far East, was, with his powerful and modern cruisers the Scharnhorst and Gneisenau, in the vicinity of the Solomon Islands. Immediately war was declared he disappeared into the Pacific, and, except for a momentary appearance at Samoa and Papeete, the whereabouts of the Germans remained a mystery.

All our wireless stations in that part of the world were told to keep a very close wireless watch and report any German wireless signals immediately.

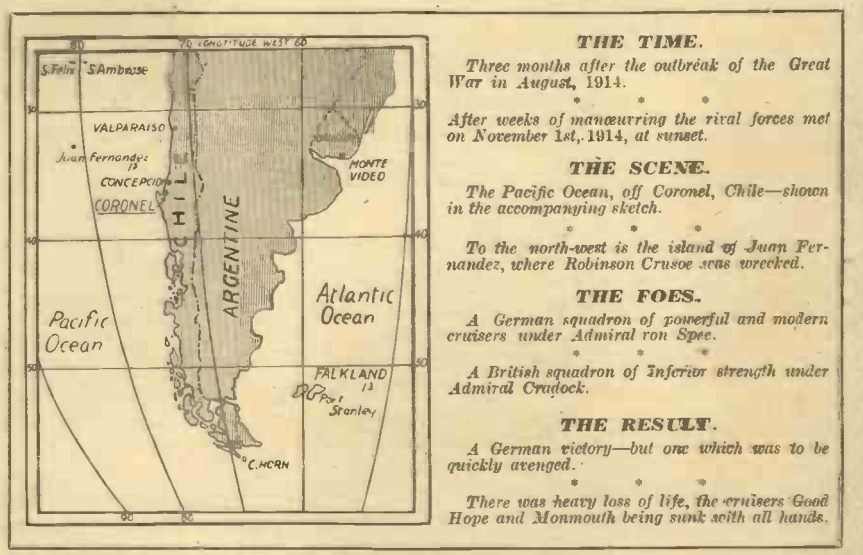
During those anxious weeks the British wireless operators on ships and shore in the Southern Pacific strained their ears for the high-pitched note that was so peculiar to the German cruisers; but it was not until later on in October that the Suva wireless station dispatched an urgent message to the effect that wireless signals had been picked up from the German cruiser Scharnhorst, very weak but quite audible. At the same time the operators at the wireless station of Wellington, New Zealand, also reported the Scharnhorst's wireless.

By careful reckoning it was estimated that the German squadron was somewhere between Marquesas and Easter Island, evidently bound for the South American trade route, or possibly the Straits of Magellan, where the Germans were thought to have a secret coaling base.

By means of his wireless the German admiral was able to summon other German vessels in those waters to augment his fleet, and he was heard communicating with the Leipzig, Dresden and Nurnberg, three light cruisers, which presently joined his command.

A Motley Connection

To oppose this fleet the British admiral had the battleship Canopus; the two old cruisers Good Hope and Monmouth, neither of which was a match for the German cruisers in gunnery or armour; the light cruiser Glasgow and the armed merchantman Otranto. The powerful battleship Canopus was infinitely superior in gunnery or armour to any of the German vessels, but, unfortunately, was only half as fast as the Germans, so that, with her, Admiral Cradock's squadron could not hope to catch the Germans. With this fleet the British were safe from attack, provided they kept under the powerful guns of the Canopus, but the faster vessels of the enemy would always be able to escape owing to the slow speed of the Canopus.



Scouting for the Enemy

Admiral Cradock's instructions from the Admiralty in London, or at least the way in which he interpreted them, were to the effect that he was to search out and, if possible, engage the enemy.

The light cruiser Glasgow was the fastest vessel in the British squadron—she was, in fact, the scout—and on October 28th, 1914, while the Glasgow

The Naval Engagement Off Coronel

was scouting off Santa Maria, she suddenly heard German wireless signals, evidently emanating from the German cruisers. The signals were of such a strength as to indicate that the enemy were not far away. All wireless reports were, of course, in secret cipher.

The Glasgow at once wirelessed her report to Admiral Cradock in his flagship the Good Hope, and the latter decided to sail in that direction immediately. During the night of October 29th-30th signals from the German ships continued to grow louder than ever, and these signals appeared to be now coming from the direction of Santa Catalina Island.

The Squadrons Approach

At 1 a.m. in the morning any doubt that the signals did come from the Germans was set at rest by the Leipzig, who, by some error or carelessness, began to use her international call sign. Apparently she was interrogating a merchant vessel off Coronel.

The Glasgow again wirelessed to the British admiral, and, owing to this wireless from the Glasgow and other factors, the German admiral concluded

that a British warship was in the vicinity, and he therefore attempted to cut her off.

At the same time Admiral Cradock, on receipt of the intelligence regarding the wireless signals from the Leipzig, moved in the same direction, hoping to cut off the latter vessel.

Thus the two opposing squadrons are approaching each other, and now all is set for the coming engagement. Unfortunately, the British squadron, at the moment, is very unequal in strength to the Germans, for the battleship Canopus is nearly three hundred miles away. Some time before, the British admiral wirelessed to the Canopus to proceed to a lonely island five hundred miles north of Juan Fernandez (Robinson Crusoe's island), where he intended to coal his squadron later.

A Precarious Position

By listening to the British wireless signals it is likely that the Germans fully appreciated this fact; they could recognise the powerful note of the 25-kw. wireless set on the Canopus as apart from the more feeble spark on the 1½-kw. sets of the English cruisers. They could tell quite easily that the Canopus, their only fear, was hundreds of miles away, while the English cruisers were very near.

The British commander must have realised his precarious position only too well; the wireless told him that

***ADMIRAL CRADOCK* (*Right*).**

Born on July 2nd, 1862. Given command of the Atlantic Fleet in 1911. Knighted in 1912. Lost with H.M.S. Good Hope at Coronel.

***ADMIRAL von SPEE* (*Left*).**

Maximilian von Spee was born at Copenhagen in 1861. Helped to create the German navy, and commanded the Far East Squadron when War broke out.

His triumph at Coronel was short lived. (About a month later he met his doom at the Battle of Falkland Islands.)

the Germans were now in full strength. But this did not deter him. His orders, as he understood them, were to seek out and engage the enemy; here was his opportunity and duty, and, Canopus or no Canopus, he was going to do it.

At 4.45 p.m. that afternoon the seaman in the foretop of the Glasgow reported the enemy in view on the horizon. Even now Admiral Cradock had still time to get away—a move he was perfectly entitled to carry out in view of the weakness of his squadron. In fact, the Admiralty had already sent him an urgent message telling him not to engage unless accompanied by the Canopus.

Chaotic Interference

But with the spirit of the British Navy, the tradition of a hundred battles fought and won against long odds in days gone by, the British admiral determined to take the chance, knowing that only a miracle could save him from destruction or a super-miracle give him victory.

As the battle commences let us examine the engagement from the wireless point of view. The interference is chaotic; no wireless operator, in the usual way, would dream of attempting to get his messages through the screeching, growling ether that pertained off the Chilian coast that gloomy November afternoon. The air is rent with the growl of the spark transmitters of the British cruisers and the high-pitched whistle from the

quenched gaps of the Telefunken system on the German vessels. Every message is hectically jammed by the enemy operators. The Glasgow, in her capacity as scout, is continually trying to wireless reports through to her flagship, and every time the Glasgow's operators start up the German operators "sit on their keys," thereby emitting continuous and piercing interruptions. Far away the faint cry of the Canopus can be heard asking for news.

Radio Soon Silenced

The small-power buzzer sets of our ships, used for emergency purposes or close-contact work, are hopelessly inadequate for getting through the screaming jamming of the Germans, so that everyone is radiating on full power. The screech of the German wireless and the hoarse notes of the British system are as the wailing of a cat compared to the growl of the British bulldog. In those days there were no valves, and the crystal detector was only just replacing the magnetic detector in the receiver.

The difficulties of the wireless operators can well be imagined, cooped up in the confined atmosphere of their

(*Please turn to page* 141)

IF you think from the above title that I am going to argue the case for the portable set, you are quite wrong. I do not consider that it needs arguing.

In my opinion, the portable is often as desirable an article as many things which are used much more widely—if it is not more so.

I know that there are fewer bought or built than there used to be; but if there are people who don't take advantage of the miracle of have-it-where

"I am amazed at the results my 1934 portable is even now giving."

and-when-you-want-it radio, that is their affair.

Personally, I have never been without a portable in all my ten years of broadcast radio. And I'd feel quite lost without one now.

Sometimes my portables have long periods of rest, but at other times they work overtime for weeks on end. Let me tell you what my last portable has been doing during the past year.

It went away with me on my vacations. On the journeys to and from the coast it acted as a car-radio outfit, and stood on the seat beside me pouring out news bulletins and weather forecasts and occasional musical interludes.

Which made me ask myself: "Who wants a car-radio equipment?"

Keeps You in Touch

At the hotel it was very pleasant to be able to keep in touch with the B.B.C. during those odd intervals in the day that needed filling up.

Mind you, if the B.B.C. inflicts its wretched 24-hour clock on us this year, I may not be so anxious to "keep in touch."

I must take this opportunity of expressing my disapproval of that absurd piece of "reform"! The other day I was testing a set in THE WIRELESS CONSTRUCTOR laboratories when the

"I have never been without a portable in all my ten years of broadcast radio. And I'd feel quite lost without one now," says our well-known contributor, and he goes on to relate how valuable he has always found this type of wireless receiver.

announcer said: "That concludes the (whatever it was). The time is now seventeen-forty-five."

"Quarter to eight," observed my assistant. "Time to turn off that charging gear, isn't it?"

In case you don't get the drift, "seventeen-forty-five," according to 24-hour time, is 5.45 p.m., though it doesn't sound much like it!

A SUMMER SCENE

Many hours of entertainment in the open air are possible with a portable receiver.

Well, I had four or five years solid of the 24-hour system in the Royal Engineers' Signal Service, and I can tell you I was jolly glad to get back to our good old English "o'clock" method again.

However, I predict that, marvellous though our B.B.C. may be, they won't put over this latest stunt of theirs. If any of you favour the change and write me hot letters on the subject, I will think no less of you for that, because, in that you've bought THE WIRELESS CONSTRUCTOR, I shall know that your judgment is sound at the core!

But I divert from my theme. I must get back to my portable. It has done grand sick-bed service. There's nothing like a portable for an invalid. Fortunately, I haven't had to use it myself in that way, but I have lent it to a number of relations and friends.

An extension speaker in the sick-room is not a satisfactory alternative, because it doesn't give the invalid a personal control of programmes and volume, and it is this which makes the portable quite invaluable.

Twelve Months' Service

My portable also spent over a month at a sanatorium beguiling away the hours for a sick friend.

Then it (and I) spent a few happy week-ends yachting. I firmly believe I should never have been invited to join that merry band of amateur sailors if it hadn't been known that I supply good radio.

I can still vividly visualise the lengthening shadows of the sails shimmering across the rippling water as we made the mouth of the Wash towards sundown to the strains of the "Theatre Orchestra" after a grand day prowling along the East Coast.

Then those river trips. Pleasant backwaters of the Thames well above Maidenhead! Once the "Eton Boating Song" came through marvellously,

"Portable receiver technique has improved during the past year or so. Actually it has made greater strides than anything else in radio."

and although I've not been to Eton I felt as if I could share in just a little of its glamour and traditions.

Good old portable! You served me well last year. Remember that picnic in Epping Forest when we brought Henry Hall and his boys along to provide the music, and he played

"A Wonderful Piece of Original Thinking"

something about rain just as a surprise cloudburst sent us scurrying for the car?

But now you've got to go. In fact, you've practically gone. I've torn out your L.F. transformer, and your loudspeaker may go any day.

Nevertheless, you give way to something better: you've got to admit that. I wonder what my "1934 Portable" is going to do. I know quite clearly what it *can* do, but I wonder where and when it is going to do it.

A HALT ON THE ROAD

A half-hour's radio recreation during a lunch halt by followers of the Quorn Hounds at Thorpsatchville

As I write these words the sun is shining and the thermometer in my office registers 65 degrees without the aid of the radiator. A fine start for what we all hope will be a grand summer.

There is one thing quite certain, and that is that wherever I may happen to be beyond the acoustic range of my household or laboratory outfits, that portable will keep me *au fait* with the Test Match situations and crises!

Which all sounds like a plea for the portable, no doubt, yet it isn't really anything more than a plain statement of facts.

Those Recent Improvements

"Out-of-Doors Radio"! Yes, I could be sufficient of a journalist to write reams of eulogy on its delights; but if the phrase doesn't at once strike a responsive chord in your heart, then I fear you are indeed lacking something!

Of course, it is probable that you don't realise how vastly portable-set technique has improved during the past year or so. Actually it has made greater strides than anything else in radio.

Transformed Technique

You won't have to apologise for your 1934 portable, saying, "To use a frame aerial means losing as much as two valves," or, "You lose bass in the open air," or, "Sorry, but the batteries have run down: these portables do eat up the juice," etc., etc., etc.

Moving-coil loudspeakers, quiescent push-pull, better valves and components have all transformed the whole portable skyline. And the pity of it is that so many have fixed ideas on the subject, based on those earlier and less efficient efforts.

* * *

I now want to deal with one or two other matters I have in mind.

Infra-Sonics, for instance: my friend G. V. Dowding's great new scheme. I expect you will have put two and two together and guessed that I have been working on this with him. At least, I helped him to build some special amplifiers.

All Cut and Dried!

I can't claim to have contributed any original ideas. As a matter of fact, G. V. D. had the whole scheme cut and dried before a single piece of the apparatus was hooked up. A wonderful piece of original thinking, that!

In my view, Infra-Sonics is going to play a big part in the talkies, and may well be as widely used in future radio as the loudspeaker itself.

It is an astounding effort. You simply cannot imagine it. It must be experienced to be believed. Infra-Sonics act as a kind of acoustic cataclyst and transform the whole response of a loudspeaker.

My own ambition is that some day I shall think of something as grand as this latest G. V. D. expedition into new fields of sound engineering.

* * *

I have received a letter from a Mr. Howard, of Ringwood, Piltdown, Sussex, who has built an "Explorer Three." At least, he took my original design and rearranged it to suit special requirements.

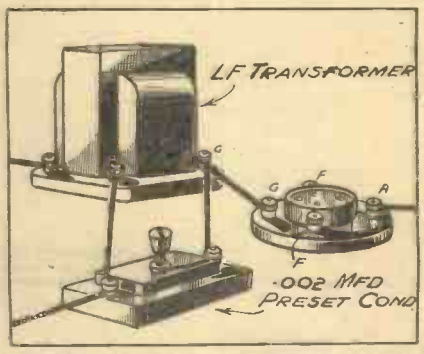
In the course of his letter he says: "I can see you shake your head and say, 'But it is all wrong and not orthodox.' But it works!"

To which I respond: We designers may hate like poison to see our designs twisted about by those who know not what their twists signify; but when our schemes and plans are subject to intelligent experimentation we should indeed be without the pale of the true roll-your-own fraternity if we did not regard *that* with pleasure.

A SIMPLE TONE CONTROL

UNFORTUNATELY, nowadays, a considerable number of people using simple receiving sets are troubled by heterodyne whistles when receiving certain stations. It is difficult to remedy this trouble completely without adopting a more selective set design.

EASILY FITTED



It is the work of but an instant to connect the preset condenser in position.

However, the strength of the whistle can easily be reduced by connecting a variable or preset condenser across the secondary (grid and grid-bias) terminals of one of the L.F. transformers in the set. Varying the capacity of the condenser will alter the degree of high note cut-off, so giving a simple tone control and whistle reducer.

C. R.

In Lighter Vein

By Wayfarer

Confined to the bathroom while his den is being spring-cleaned, Professor Goop sends for his closest friend. And to show that mere man, too, can do his bit in times of stress, the Professor and Wayfarer decide to do a bit of spring-cleaning on their own. What happens to the piano, the carpet and the ceiling makes amusing reading.

IN response to an urgent telephone call from Professor Goop I hastened round to The "Microfarads" and was promptly shown by Eliza Jane, the housemaid, up to the bathroom. There I found the Professor busily brewing his morning coffee with the help of the geyser.

"Good morning, my dear fellow," he cried, raising his right hand in a Hitler salute. Next instant he had brought it down again with a rousing yell. The Hitlerite Johnnies have the knack of doing the thing with beer mugs in their hands, I believe, but the Professor had simply poured the scalding contents of his coffee pot straight down his sleeve.

Full of resource as ever, I ripped off his dressing-gown and the top of his pyjamas. Then I seized a soft-looking towel, and, having dried him with that (it got stained completely brown in the process), looked round for something soothing to apply. Ah, ha! there it was on the shelf before the mirror—a large dainty tube of ointment stuff. I squeezed the lot out and slapped it all over him.

At this moment the Professor found words.

"Great Scot!" he cried. "You've done it now."

"What on earth do you mean? Haven't I rendered first aid in the most tophole way?"

"You ass! That's not a towel; it's my wife's best silk scarf, and the muck you have just sloshed all over me is the skin food that cost her thirty bob the day before yesterday."

For Future Experiment

This was rather a facer. The scarf was stained with great dark brown blotches, but we put it aside to form the basis of some interesting bleaching experiments with chlorine a little later. The skin food, however, I felt could be replaced with a little ingenuity.

I started scraping it off the Professor with the handle of a toothbrush, but this so incommoded his scalded torso that I had to desist.

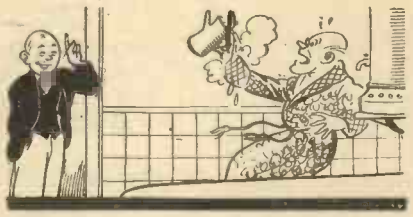
A New Skin Food

"One moment," I said, and dashed off downstairs.

I returned with a tin full of gearbox grease and some whiting. By stirring in the whiting we soon produced a compound of the proper hue, though it was rather too claggy for the real thing. Again I flew downstairs, taking the Professor's coffee pot with me. I returned with a good measure of the contents of the drip tin which stands beneath the engine of his somewhat leaky car.

Mixed in with the help of Mrs. Goop's curling tongs, which happened to be lying handy, this produced just the right texture, and the colour was soon corrected by the addition of a little more whiting. The only thing that didn't seem quite right was the smell, but this was soon rectified by the addition of a few drops of hair-wash.

A HITLER SALUTE



"'Good morning, my dear fellow,' he said, raising his right hand in a Hitler salute. He poured the contents of his coffee pot straight down his sleeve. . . . . On the shelf was a large, dainty tube of ointment stuff. I slapped it all over him."

RENDERING FIRST AID

And let me tell you that since she used the Goop-Wayfarer skin food Mrs. Goop looks twenty years younger. Another tube and she will be back in her second childhood.

Having cleaned the curling tongs, the toothbrush and the coffee pot with the scarf, which we decided was probably past praying for and had better be lost, we were able at last to get down to serious business.

"And why, my dear chap, did you send for me?" I inquired.

The Professor sighed.

"In the spring a woman's fancy," he breathed.

"In the spring a woman's fancy
Lightly turns to thoughts of dust."

"Now you see what I mean?" he asked.

"You are being spring-cleaned," I cried. "That's why you're occupying the bathroom."

Spring-Cleaning Defined

"Precisely," replied the Professor. "That infer—that's to say, my dear wife—is at the present moment engaged in spring-cleaning my den. She has carted the whole of my apparatus into the drawing-room, whilst she does her worst with the den. You know, my dear fellow, what women are?"

"I do indeed," I agreed. "The whole idea of spring-cleaning appears to be first of all to remove everything from somewhere to somewhere else. You then clean the room from which you have taken all that it contained, pushing the dust off the walls, mantelpiece and so on on to the floor, and then sending it back again by sweeping the floor vigorously. You then bring back the carpet and furniture, losing as many things as possible in the process. You end by thoroughly

A Scene of Something Like Carnage Downstairs

tidying up, which means putting everything behind or underneath something else. This process takes two days on the average. The victim requires the remaining three hundred and sixty-three days, before it starts all over again, in which to find his papers, his books and his various bits and pieces in their new positions."

The Great Decision

A moment's solemn silence fell upon us.

"Look here," I cried suddenly,

IN THE APPROVED MANNER

"We wrapped towels round our heads in the approved manner and sallied forth to spring-clean."

"why shouldn't we men show that we, too, can do our bit in times of stress? Has the drawing-room yet been spring-cleaned?"

"It has not," said the Professor.

"Very well, then," I said; "you and I will do it now. You said, I believe, that it contained, for the moment, the whole of your wireless and electrical gear."

The Professor admitted that this was so.

"We will remove the drawing-room furniture into the dining-room, after which we will thoroughly clean the drawing-room. We will then make it into a temporary wireless den for you and me until such time as the gear can be returned to its proper quarters."

No sooner said than done. The skin food had worked such wonders that the Professor felt no inconvenience from his scalds. He replaced the top half of his pyjamas and his dressing-gown, we wrapped towels round our heads in the approved manner and sallied forth to spring-clean.

Science to the Rescue

Moving the drawing-room furniture proved to be magnificent exercise. The only thing that stumped us for a moment was the grand piano, which seemed to be about a quarter of an inch too wide to go through the door. Push as we would and did, it just wouldn't make its exit. After strenuous efforts the Professor crawled under it and returned presently from the cellar with two bottles of brain lubricant.

The effect was most satisfactory.

"I have it," I cried, putting his and my empty inside the piano, on the well-known tidying principle; "hitherto we have been working on the wrong lines. What we want is the application of dynamic force, or, in other words, shock tactics." We drew the piano back to the far end of the room, aimed it well and truly at the door, and then started off behind it, gathering speed as we ran. It sailed through the doorway like a red-hot knife through butter, though I admit that the accompanying sounds were somewhat different. Anyhow, we got rid of it. And that was that.

"Fixing" the Dust

"Women," I said, "would now remove the carpet lest it should collect dust whilst we do our cleaning. They don't understand that the proper way to deal with dust is to fix it in position by means of moisture." The Professor heartily agreed. By attaching the hosepipe to the bathroom tap we soon got the carpet into a thorough dust-fixing condition. It seemed, though, to take a lot of water, so we left the tap running gently whilst we plied duster and broom.

When logical and methodical masculine minds get to work, tasks are soon accomplished. We had that room thoroughly spring-cleaned in less than a couple of hours. This accomplished, we settled down to some wireless experimental work in the ample space that was now at our disposal. The subject of our experiments was the superheterodyne circuit, which has always seemed all wrong to both the Professor and my unworthy self.

A Little Radio Research

I mean, why take the signal frequency and whack it up (or rather down, said he, thinking in kilocycles) to intermediate frequency, and then just change it again to audio-frequency? Our idea is for a super-superheterodyne, or, as we, having had a sound classical education, prefer to call it, a hyper-heterodyne. We don't (or rather, our idea was that we wouldn't) go brutally in one stage from, say, 1,000 kilocycles to 110. We treat our kilocycles more gently, moving gradually from 1,000 to 500 in the first stage, from 500 to 250 in the second and from 250 to 125 in the third.

This simplifies immeasurably the—er—well, you don't need to be told by me what it simplifies. It also eliminates entirely—well, shall we say certain undesirable effects that the intelligent reader will understand perfectly?

We are Interrupted

Our experiments had just reached that particularly interesting stage known to all experimenters at which nothing can be heard even from the local station when they were interrupted by a loud crash in the den downstairs.

The Professor and myself we leaped as one man for the door. Having disentangled ourselves from the body and legs of the piano, which still encumbered the passage, we proceeded downstairs.

The ceiling had fallen down, accompanied by deluges of water. Mrs.

A DELUGE

"Mrs. Goop and Eliza Jane had sustained blows from falling plaster that might have slain the thin-skulled mere male."

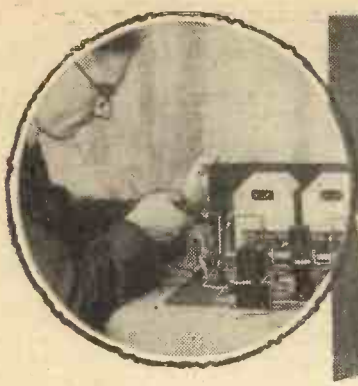
Goop and Eliza Jane had sustained blows from falling plaster that might have slain the thin-skulled mere male, and both were crying loudly for brandy.

I drew the Professor aside.

"For heaven's sake," I hissed, "go and turn off that bathroom tap."

When he had departed on his mission I explained to Mrs. Goop and her handmaiden that they had now one of the most marvellous opportunities in history for the exercise of spring-cleaning. This cheered them up tremendously, and within a few minutes they were hard at work.

Meantime, the Professor and I decided that we would transfer the discussion of our experiments to the Dog and Duck until the atmosphere showed signs of clearing.



The Causes of INSTABILITY

One of the most puzzling faults in present-day radio receivers is instability. It may be due to poor design, or on the other hand it might gradually develop in a set which, in the first place, was above suspicion. Faults which produce trouble of this nature can be very difficult to trace, so readers will welcome this information in which their cause and cure are very fully dealt with.

By BERNARD BARNARD

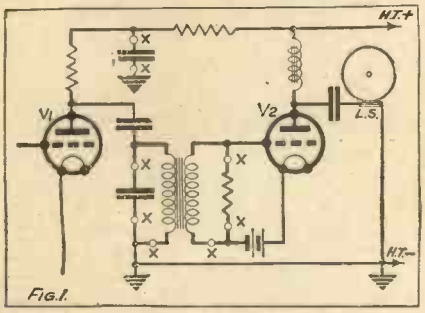
INSTABILITY in wireless receivers is one of the more common of radio "diseases," and as most amateurs have found—to their cost—the effects of instability can completely mar the operation of the best of sets, whilst the causes are often extremely difficult to locate.

Actually the causes range from the major extreme of fundamentally bad design to the minor extreme of badly made connections, or similarly "trifling" faults.

In these notes I do not intend to deal with the possibilities of wrong design, for they are too numerous and complicated to be properly covered in one short article.

I shall assume, therefore, that the receiver under consideration has been built exactly to the designer's specification and that the design itself has been taken from some completely reliable source.

WHERE TO LOOK



This diagram is a theoretical representation of the L.F end of a receiver. The crosses indicate places where high resistance joints are liable to cause trouble.

The Possibilities

This state of affairs leaves us with two possibilities as regards instability.

The first is that the set is unstable when the constructional work has been completed and the initial tests are being made.

The second possibility is that the instability has developed after a fairly long period of service has been obtained from the receiver.

As will be seen later, a slightly different line of investigation is required according to which of these two conditions exists.

But for the moment it will be as well to say a few words about instability in general.

Divided into Two Groups

First of all, what do we mean when we say that a receiver is "unstable"?

In the early days of set construction the answer to that question was easy enough, for the fault was synonymous with "uncontrollable oscillation," and was clearly divided into two groups—H.F. instability and L.F. instability.

If the fault lay in the first group, then the symptoms were H.F. oscillation and the heterodyning of carrier waves which no amount of adjustment would resolve. Faults in the second group produced "motor-boating," or long piercing howls and chronic distortion.

More often than not we got a mixture of both groups!

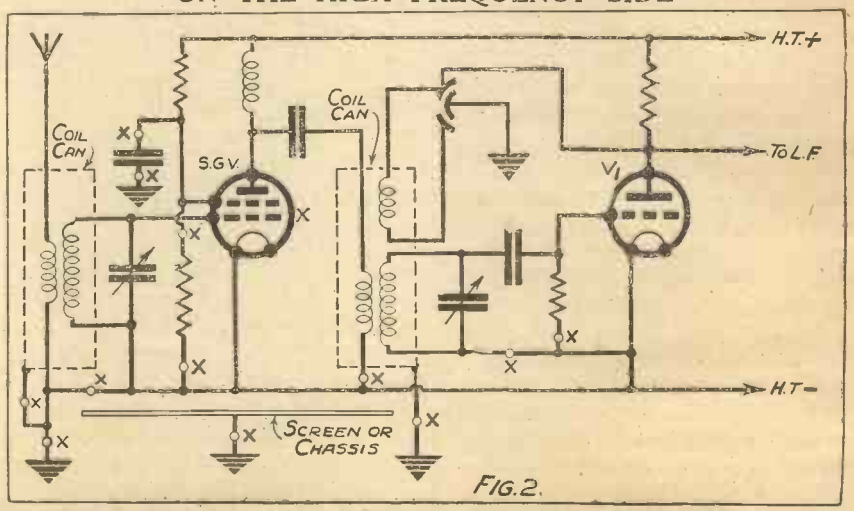
Effects of Improvements

But nowadays we seldom have quite such violent symptoms to deal with and, although the "grouping" of instability causes still holds good, we experience more difficulty in separating them and identifying them.

This is, of course, primarily due to the enormous improvements in receiver and component part design which have rendered the older forms of instability practically non-existent.

But these same improvements have given us a far higher standard of sensitivity and quality of reproduction which show up to our now very critical ears the slightest deviation from perfection.

ON THE HIGH FREQUENCY SIDE



Instability in the H.F. as well as L.F. end of a set can be caused by high resistance contacts. As in Fig. 1, the most likely places to look for this type of fault have been marked by small crosses.

Check the Decoupling Circuits

So that, to meet modern requirements, we can rewrite the answer to our question and say that instability is synonymous with *tendency* to uncontrollable oscillation.

In practice we find that this "tendency" often gives us no more to work on than results that are slightly "below par," or range of reception that does not quite come up to expectations.

Poor Quality

The symptoms will take the form of bad quality. If the top notes screech and the reproduction appears to be "breathy," it may be taken for granted that the L.F. stages are very nearly oscillating—you will get a continuous howl if they are actually oscillating—and you must start to look about for the cause of the trouble.

I have described these symptoms as closely as possible, but you must bear in mind that they may not be anything like so obvious as is indicated.

The L.F. amplifier may be well off oscillation point when the middle frequencies are being handled and the reproduction will be normal and good; the fault will then only be apparent when a very high note is received, which will be distorted and amplified out of proportion to the rest of the reproduction.

You must therefore carry out your bench test for a sufficiently long period to ensure that all the normal broadcast musical frequencies have been received and properly dealt with by the set.

Assuming that you find this over-amplification of high notes and the accompanying distortion, where is the fault most likely to be discovered?

Where Troubles Occur

Look at the diagram, Fig. 1, for a moment.

It is an L.F. amplifier which embodies most of the circuit details in use at the present time.

I have indicated with crosses the likely places for trouble in the form of high-resistance connections to develop.

A high-resistance connection will mean that the path it is desired the speech currents to take will be partially or completely blocked, and consequently the normal stray capacities of the circuit will offer a *comparatively* easy path to them with consequent slight "feed-back" and, therefore, slight tendency to oscillation.

The possibilities of faults in the decoupling arrangements must not be overlooked. Signal currents are bound to find their way into the H.T. feeders, and it is the purpose of the decoupler, usually a resistance and a fixed condenser, to filter them away to earth.

The fixed condenser offers practically no resistance to these currents, and it is therefore so arranged that they can pass through it straight down to the earth busbar.

It is possible for the decoupling condenser to be faulty, so that if the investigations fail to reveal bad joints or other constructional faults, it is wise to test all by-pass condensers for open circuit with a neon lamp, or similar testers.

The H.F. Section

Having cleared any such troubles which may exist in the L.F. amplifier, continue the bench test by making careful observation of the behaviour of the H.F. valves and circuits under operating conditions. (Fig. 2.)

Instability at this end of the receiver is often indicated by the H.F. valves going into oscillation as soon as the tuned circuits are properly ganged.

As I have previously mentioned, most of the points in the foregoing relating to the audio-frequency circuits apply to the H.F. amplifier, and the same faults in the H.F. decouplers or wiring will produce instability.

H.F. circuits are usually more critical as regards working voltages, and these should be checked against valve emissions with a good meter.

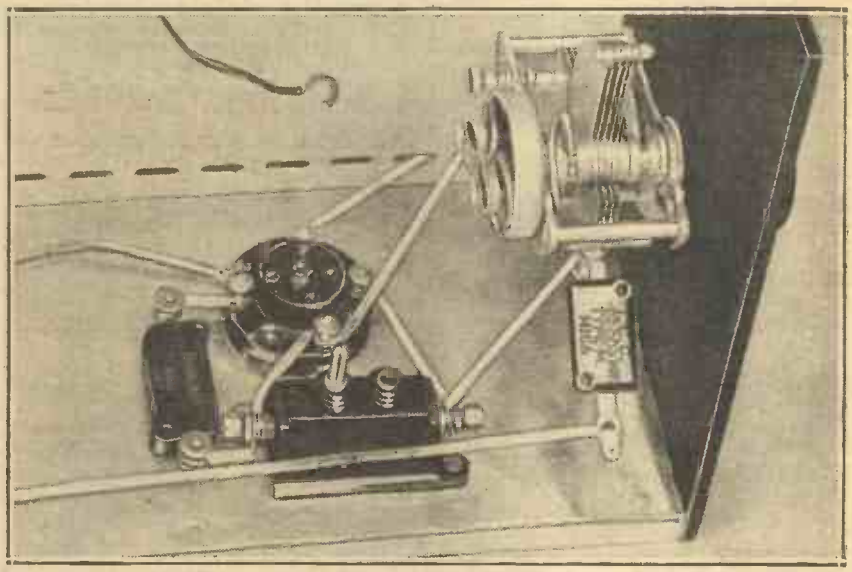
Those Stray Capacities

Remember, also, that the stray capacities referred to earlier will have a much greater effect where radio-frequencies are concerned, and even more importance must be attached to careful spacing of the wiring of the receiver.

A particular point to watch where a metal chassis is used is the proper earthing of each metal screen or component part of the chassis itself; never rely simply on holding-screws to furnish the necessary connection to earth, but always make a point of giving each separate metal part its own connection to its neighbour.

A high resistance between two screens will mean that each is at a different potential, and the shielding effect of each will be different—and very often inconstant. Obviously such a state of affairs will upset the operation of the receiver and may cause a form of instability that is very difficult to trace.

EFFICIENT SCREENING IS AN AID TO STABILITY



One form of instability is caused through interaction between the H.F. and detector circuits. The best method to adopt to ensure freedom from this source is to screen thoroughly the S.G. stage. This photograph shows the H.F. end of a set in which the aerial circuit is shielded from the detector circuit by a vertical screen.

SHORT-WAVE NOTES

The call of the open—Below 30 metres—Hours of American stations—W3XAL goes down to 16·87 metres—Newcomers to listen for—Telephony and Gramophone Tests, etc., etc.

Broadcasting a description of army manoeuvres in Manchuria via a short-wave portable transmitter.

IT is unfortunate that the short waves happen to be most interesting during the summer, when the "call of the open" somewhat interferes with our pre-arranged ideas about what we would do with our sets! There is one way, however, in which the real short-wave enthusiast can be sure of hearing something exciting without interfering with his tennis, cricket or swimming. I refer to the habit of early rising.

Hawaiian Reception

The waves below 30 metres are extraordinarily lively at this time of the year between 6 and 8 a.m. For the last three mornings I have been reliably receiving two Hawaiian amateurs on the 20-metre band between 7.30 and 8. One may go for years without hearing these people at all; if there *is* a chance of finding them it nearly always comes in May, June or July.

I am not quite clear about the regular schedules of the American broadcasting stations at this time of day, but one morning I logged fourteen of them between 6 and 7 a.m. and took a fair amount of time off during that hour to listen to other things.

Generally speaking, one's listening time-table should be planned, at this time of year, on the following lines: During daylight (3–11 p.m. and 5–8 a.m.), below 30 metres, concentrating on waves below 25 metres. During darkness (11 p.m. till 5 or 6 a.m.), above 30, with special concentration on the 49-metre band.

Midnight Activity

There is an unusual amount of activity on the latter band round about midnight nowadays. A whole bunch of U.S.A. stations, two or three Canadians and a spice of variety from Colombia, Venezuela and the Central American republics, may all be found on a good night in an hour or so.

The chief item of interest, if one happens to be at home during an afternoon is the wonderful strength and reliability of the 16-metre broadcast stations. W 3 X A L, Boundbrook, on 16·87, is the "big noise" as a rule, while W 3 X L has recently started a transmission down there which, as far as I am concerned, quite "cuts out" his 47-metre signals.

On the 19-metre band we have the old favourites, W 2 X A D and W 8 X K, both pretty reliable, together with W 2 X E.

Interesting Newcomers

Some interesting newcomers to listen for are the following:

C O C, Havana, Cuba, 49·92 metres.

H J 5 A B D, Cali, Colombia, 46·30 metres.

Y N C R G, Granada, Nicaragua, 44·64 metres.

P R A 3, Rio, Brazil, 36·65 metres.

H B P, Praggins, Switzerland, 15·78 metres.

The latter is not a new station, but is inserted for the benefit of those who are proud of the fact that they can "get down to 14."

In addition to the regular broadcasting stations now using short waves, of which there are well over a hundred, the commercials and "experimentals" seem to be making more and more use of telephony and gramophone records for test purposes, which considerably increases the interest attached to short-wave listening.

POINTS FOR PURCHASERS

Details of recent trade activities.

FULL details of the Micromesh range of universal valves are now available, and each of the five types it comprises is rated for a heater current of ·2 amp.

The 9D2, a varimu H.F. pentode, has an amplification factor of 1,200 and slope of 1·5 ma./v.; the 15D1 is a heptode frequency-changer; 11D3 is a double-diode triode, and 7D3 is an output pentode, the power output for the latter being 2·5 watts; and finally there is the 1D5, a half-wave rectifier.

Details will be sent on application to Standard Telephones and Cables, Ltd., at 364, Grays Inn Road, W.C.1.

News in Brief

The Telephone Mfg. Co., known to all constructors as makers of the T.M.C. Hydra range of condensers, have formed a new company to take over Harwell, Ltd., of the Sessions House, Clerkenwell Green, E.C.1.

Under the name T.M.C.–Harwell Sales, Ltd., the new concern will act as trade distributors for all T.M.C. lines.

* * *

Peto-Scott, Ltd., have recently arranged with the British Radiogram Co., Ltd., to act as wholesale distributors of Metaplex, the coated baseboard which has solved once and for all the problem of easily earthed screening.

* * *

The new Heayberd handbook on Mains Power (sent for 3d. in stamps to any reader) contains a special television section and details of kits of parts for television uses. Address, 10, Finsbury Street, E.C.2.

* * *

Battery users who like to keep abreast of technical development are sometimes heard to bemoan because

(*Please turn to page* 144)

TOPICAL TIPS

Ideas about current practice culled from actual experience.

IT'S easy enough to remember the valveholder connections for the ordinary four- and five-pin valves, but to remember the connections for all the seven-pin valves is asking a bit too much of anyone. And quite often when the connections to a valve of this type have to be checked, or a seven-pin holder has to be wired into a set, much searching for valve makers' leaflets takes place.

To Avoid a Slip

And if the right one cannot be found one is stumped, for, as you know, all these seven-pin valves do not have the same pins for the same electrodes. Even if you do find the leaflet, I'll bet the connections are given looking at the bottom of the valve—when what you want to wire up is the holder, *not* the valve pins.

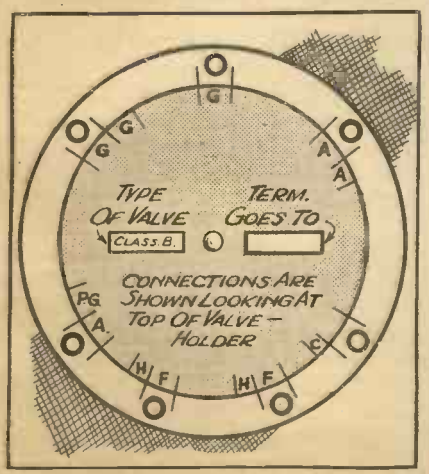
So you have to transpose the connections. Easy enough if you are careful, but a point where a slip *can* take place.

The little cardboard indicator illustrated on this page will give you in a moment the valveholder connections direct for any valve you are using. It consists of two pieces of circular cardboard, the lower one larger than the upper, fixed together with a brass paper clip.

It is Easily Made

Around the edge of the lower one, which projects beyond the top one, are marked the seven pins of the holder. You will see that their disposition is a little exaggerated so that it is easy to pick out the "apex" and the two pins close together that are used for filament or heater.

"WHERE DOES IT GO?"



A scheme for finding at a glance the correct connections for any particular seven-pin valve.

Two slots are cut in the upper piece of card. In one of these the type of valve is entered, such as Class B, and in the other the connections which go to any terminals which may be on the type of valve entered in the left-hand slot.

Round the edge of the smaller card disc letters indicating grid, anode, etc., are entered. The diagram shows these for the Class B valve, while the next letters round are for a typical indirectly-heated mains valve.

The short lines separating the indicating letters, are parts of radial lines and help in rapid adjustment of the rotation and in easy reading. To avoid complications it is as well to mark on the connections only for valves you have in use.

HOT WEATHER REMINDERS

G.B. batteries often deteriorate in the hot weather. When did you last test yours?

* * *

When the acid in an accumulator gets low due to evaporation, water only must be used to bring up the level.

* * *

Unless you use a permeating chemical earth such as the "Filt," it is desirable to water your earth occasionally in the summer if it is of the buried variety.

* * *

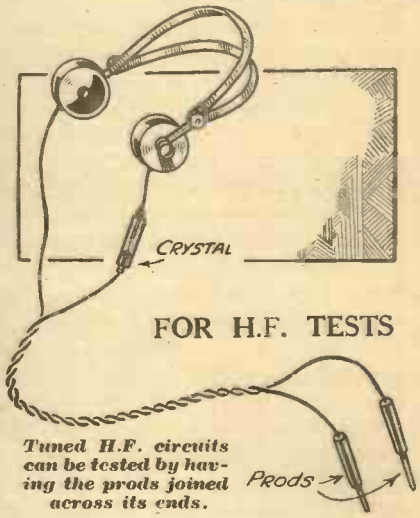
A falling off in reception of certain stations may quite likely be due to summer conditions, and does not necessarily indicate something wrong with the set.

Pre-Detector Probing

From the complications of seven-pin valve connections to the increasingly involved H.F. circuits used in receivers these days is but a small step. To test a faulty receiver stage by stage has always been a good way of locating the trouble.

Even with modern receivers it is easy enough to deal in this manner with the detector and L.F. stages, but the present-day band-pass circuits and multi H.F. sets are a different proposition. But even these can be dealt with step by step with the little tester shown on this page.

It consists of a pair of phones in series with a crystal detector. When the ends of this combination are placed across any tuned circuit, they will immediately reveal whether all is in order up to that point.



Tuned H.F. circuits can be tested by having the prods joined across its ends.

A Radiogram Hint

I expect you have noticed that the heading to this page is different this month, but have you noticed what the constructor is doing in it?

Some pick-ups are extremely noisy mechanically, and even when the lid of the radiogram is closed spoil the reproduction. Strips of felt stuck round the edges of the lid will do much to keep the sound in. And if a large square piece is stuck over the inside of the lid, nothing whatever should be heard.

If the hinges require lifting a little to make room for the felt, a small, thin piece of wood, or even washers, will do the job admirably.

A. S. C.

VICTOR KING'S 1934 PORTABLE

—*continued from page 104.*

The grid-bias voltage required is about 7½ volts, and so the usual 9-volt battery can be used.

You will see that it is easy to short circuit the H.T. to the metal-panel covering if care is not taken. That is why I placed a piece of card under my reaction condenser, besides using a washer for the spindle itself.

Watch all the leads, therefore, to see that they do not make contact anywhere not intended.

Those Screened Leads

Perhaps another word about those screened leads may be useful. As the wiring diagram shows, there are two of them, each containing two insulated flex wires and having a cotton-covered screen over them both. This screen is bared at each end and the flex is twisted firmly round it, *the joint being covered with insulating tape.*

In the case of the loudspeaker lead this flex (one piece at each end of the screened lead) becomes lead "e," and in the case of the frame connections the flex joined to the ends of the screen becomes lead "b."

One word about the detector valve holder that I must not omit. It will be noted that the grid condenser is fixed on the terminal of the valve holder direct, and not by means of a wire. This is convenient to do but not always easy to show in a wiring diagram, and so it is best that I point it out in words in case the diagram is not clear.

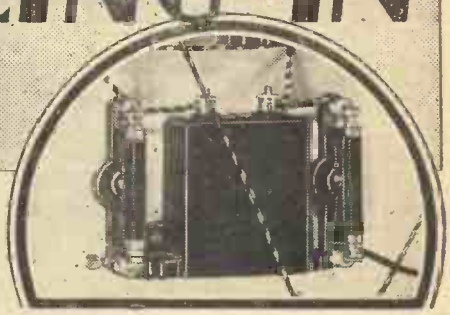
The grid leak is placed between the grid terminal of the valve holder and the filament positive terminal, and this is not too easy to show in a plan diagram like a wiring sketch that I have given. The connection to the anode of the S.G. valve goes to the end of the grid condenser, not taken to the valveholder terminal, of course, and this end also is joined to terminal No. 1 on the tuned-anode coil, and also to the fixed vanes of the tuning condenser.

AN INTERESTING COMPETITION

Readers of THE WIRELESS CONSTRUCTOR are given an opportunity of winning valuable prizes in connection with the ingenious competition organised by the makers of the famous AvoMinor testing instrument. The prizes include £1 a week for a year, 10s. a week for the same time, and a lump sum of £10. Full details and entry forms can be obtained from The Automatic Coil Winder & Electrical Equipment Co., Ltd., Winder House, Douglas St., London, S.W.1.

GRID DECOUPLING IN MAINS SETS

By G.P. KENDALL, B.Sc.



Constructors often go to much trouble and expense to ensure good decoupling—but might not simpler and cheaper methods be just as efficient? This is the interesting suggestion which our contributor makes in an unusually readable and essentially practical article.

IN a recent article ("Engineering the Mains Set") I set out to show how modern methods of design can be applied to make a mains set both simpler and cheaper, and I illustrated my argument with examples in H.T. circuit decoupling.

But there is also the question of grid-circuit decoupling. Here the object is not, as a rule, to prevent instability, but to obtain the full possible magnification of each stage.

This is a point which should be clearly understood by anyone who wishes to take a real interest in the problems of mains set design, so I may perhaps be permitted to explain it briefly. The point of the matter is that, to get the bias for each valve, we usually insert in its cathode lead a resistance so placed that the voltage drop produced across its ends by the passage of the anode current is applied to the grid, and this means that we must do something to prevent the *fluctuations* in the anode current from affecting the grid.

If no such precaution were taken the result would be that the variations of current produced when signals are being amplified would cause fluctuations in voltage to be transferred back to the grid of the valve. This would set up a sort of negative reaction effect, since the energy fed back in this way is normally so phased as to oppose that already present in the grid circuit. The result is obvious: reduced amplification from the stage.

Money Needlessly Spent

This is where decoupling comes in, for it can prevent the signal-current component from setting up fluctuations in the bias voltage, but it does not follow that it should be carried to extremes.

I have seen cases where people have spent as much as ten or twelve shillings on the grid-circuit decoupling of a valve which would have worked *almost* as well with no decoupling at all, and *quite* as well if a simple 2-mfd. condenser had been shunted across the bias resistor and all the rest of the decoupling filter left out.

Mistakes like this are easy enough to avoid if we understand certain simple principles. Here are some general rules which may be found helpful: In those cases where the whole anode current of the valve—i.e. both the D.C. and the A.C. components—passes through the bias resistance, a certain measure of decoupling, or at least by-passing, is definitely needed.

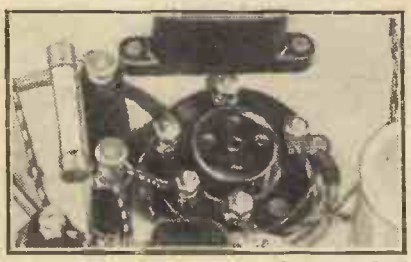
How Much Bass?

The degree of elaboration—and hence the cost—of this decoupling depends upon the nature of the bass response desired from the stage. If you require full amplification of very low frequencies, then you must be prepared to spend a little more on your grid-circuit decoupling. If, on the other hand, you know that the bass response of the stage is limited at some other point, or you desire to limit it in order to compensate for an over-emphasis elsewhere, then a simplification of the decoupling is in order. You will see how this works out in practice in a few moments.

In those cases wherein only the D.C. component of the anode current passes through the bias resistor, full decoupling is useless, and only a very sketchy sort of by-passing is needed. An example of this condition is to be found in the case of an output valve which is provided with a choke-condenser output filter.

If this filter is properly arranged the "return" from the loudspeaker circuit will be made direct to the cathode or filament of the valve. The A.C. component of the anode current i.e. the actual signal impulses, will therefore go straight from the speaker to the cathode or filament without passing through the bias resistor at all, It is thus impossible for it to set up fluctuations in the bias voltage, so that decoupling can serve no useful purpose.

FOR MODERN VALVES



This close-up of a valve holder in which a very steep-slope valve is used shows how a 50-mfd. electrolytic condenser by-passes the resistance (in this case 250 ohms) in the cathode lead of the valve.

Deciding the Value

This, of course, assumes theoretical perfection in the output-filter circuit. In practice a small fraction of the A.C. component will make its way through the output choke, round through the H.T. circuits, and so back through the bias resistance to filament or cathode, and it is to deal with this (chiefly) that we need just a spot of by-passing across the resistor, even in this case.

Cost, by the way, is not the only reason why unnecessarily elaborate decoupling should be avoided in grid circuits. It is very apt to accentuate any slight tendency to hum.

Now let us look a little more closely at this question of bass response, and see how the cost factor

(*Continued on next page*)

GRID DECOUPLING IN MAINS SETS

—continued from previous page

enters into it. We will assume that we are using the simple by-pass method, and try to arrive at a clear idea of the critical value of the by-pass capacity below which we shall lose bass unduly and above which we shall merely be wasting money.

Suppose that our bias resistance is of 1,000 ohms, and that we want full bass response down to 100 cycles, and can tolerate a slight falling off from this point down to 50 cycles. This is a good, practical arrangement, for it is sheer waste of money to cater for lower frequencies unless you have most exceptionally good L.F. circuits and an even more exceptional loudspeaker.

A Question of Reactance

Across our bias resistor we wish to connect a capacity large enough to act as an effective by-pass to all frequencies down to 100 cycles and a less efficient one to lower notes. The measure of the by-passing effect of a condenser depends upon its "reactance" in relation to the resistance across which it is shunted.

Remember that a capacity of 1 mfd. has a reactance of 1,600 ohms at a frequency of 100 cycles (a very useful relation to memorise), and that a by-pass must offer a path of sensibly lower "difficulty" than the bias resistor if it is to be of full efficiency.

Try a condenser of 2 mfd. This will have a reactance of only 800 ohms at a frequency of 100 cycles, and this, in shunt with a resistance of 1,000 ohms, will produce an equivalent resistance for the combined path which will probably be low enough for most practical purposes.

At a frequency of 50 cycles the reactance goes up to 1,600 ohms again, and the by-passing effect is no longer good; but it is still appreciable, and there will be only a moderate limitation of notes of this frequency.

Steep-Slope Valves

So far so good. It would appear that, where the bias resistor is of the order of 1,000 ohms, a by-pass capacity of 2 mfd. gives quite a practical degree of immunity from reverse feed-back effects, even well down into the bass. Many modern valves, however, have so steep a slope that they call for bias resistances of perhaps only 500 ohms, and here things begin to get a little difficult.

An effective by-pass across so low a resistance would require to be of at least 4 mfd., and in some cases it may well be cheaper to employ a little actual decoupling instead of attempting to do it all by means of a plain by-pass. This, then, is a rule to be borne in mind when very steep-slope valves are used and the bias resistances are of something less than about 750 ohms.

The Electrolytic Condenser

The point arises more particularly in the case of intermediate L.F. stages. In the output stage the problem can usually be dodged, as I have explained, by the use of a correctly arranged output filter, while in H.F. stages it does not arise at all—at least, in this form. It is quite an inexpensive matter to provide a condenser which is a complete short-circuit for all the frequencies handled by the H.F. stage.

It should perhaps be mentioned that the development of the low-voltage electrolytic condenser may make plain by-passing the cheapest method, even with steep-slope valves; for such condensers provide us with large quantities of microfarads for very little money. They are, in fact, very valuable, the 50- and 80-microfarad types being quite small, as can be seen in the photo on the opposite page.

REMEMBER THESE NEXT TIME!

—continued from page 112

For an aerial we strung up about 20 feet of bell wire *inside* the cabin, and for the earth we hung a length of 7/22 copper wire in the water. A cheap 120 v. H.T. was used.

On Sunday evening, September 3rd, I "went round the dials" and collected 54 stations on the medium waves and 10 on the long, making a grand total of 64—or, rather, I should say a grand total of 65, for, chancing to wake up one morning at 4.30 a.m., I switched on and managed to pick up an American transmission.

I gazed at the set in awe and marvelled at the man who could design a four-valve set with such a performance and under such conditions.

All this was received on the speaker—it had to be, as we didn't take phones: you don't need them with the S.T.400!!

From various hints you have dropped in THE WIRELESS CONSTRUCTOR I believe you are working on a new set with a better performance than the "400." If this is so, you have two big jobs in front of you.

One is to design such a set, and the other to get me and all other S.T.400 owners to believe that it can be better!

As a very grateful home constructor I say "Thank you."—[*From C. A. Closs, 393, London Road, Westcliff-on-Sea, Essex.*]

"A PERFECT JOY."

My S.T.300 has been in constant use for several years, and I have always been delighted with its performance.

I have resisted the temptation to build the 400 or 500, feeling that before long you would bring this wonderful three-valver up to date, which I have been anxiously looking forward to.

After reading your notes re the Mark II, I intended to do as you recommend and rebuild; but as an experiment I have merely added the aerial reaction, altered the aerial coupler, inserted the presets, leaving the single wave-change, original anode reaction and the rest of the set as before.

The results after these few alterations are extraordinarily good, and the pleasure of bringing up *weak* signals to "hearing" strength is a perfect joy.

The operation of the various knobs has always given me a further interest, as I feel by their aid that I am doing things myself instead of the set doing them automatically for me.

The selectivity and general performance of the set are heaps better than I have had before, and my object in writing is to personally thank you for the pleasure you have given me.—[*From E. Grove, High Trees, Glenbuck Road, Surbiton.*]

"S.T.300 STAR MARK II—A MOST DELIGHTFUL RECEIVER."

I have built your S.T.300 Star Mark II and it is a most delightful receiver. But there is one thing I am writing about which will perhaps be a great help to all S.T.300 owners. Of course, I am a bit of a wireless enthusiast myself, and I have fitted a pentode valve in the output stage.—[*From J. L. Kellaway, East Stoke, Wareham, Dorset.*]

[The use of a pentode output valve is perfectly in order.—J. S.-T.]

A "DISCIPLE'S" APPRECIATION.

As a disciple of yours I venture to write to you once again to give you my appreciation of your work.

I have just completed a conversion of my S.T.400 into something better. I have had the audacity to completely remodel the H.F. portion of the S.T.400 into your S.T.300 Star, using exactly the same components. The L.F. stage has not been altered, with the exception that I have retained the anode-bend rectification.

I am getting the finest quality I have ever heard. How I wish you could hear it! Last night the set was given a try-out by a highly qualified radio engineer, Mr. Fitton, of the firm of Bannister and Fitton, the leading firm for miles round here. We got over 30 stations in the course of two hours.

What was noticeable about the long waves was that the foreigners came in all at the same strength as Daventry. My output stage is Varley push-pull, with two P.M. 256 matched supers at 250 volts.

The output is fed into a large Marconi M.C., mounted into a Howe baffle. My screened-grid anode is working on 150, with about 80 on the screen, detector at 55, first L.F. at 150 volts and the push-pull stage as I have stated.

I am a terrible crank on quality, being awfully fond of music. I do really hear the resin on the violin strings and the vibration of the bass violin. Thanking you again for such great ideas.—[*From Mr. M. A. Hardman, 49, Cheltenham Street, Rochdale.*]

[It is not necessary to point out to Lancashire readers that Rochdale is well in the shadow of the North Regional stations—Ed.]

"ABSOLUTELY SILENT BACKGROUND."

I feel I must write and congratulate you on your S.T.300 Star. Being quite fed up with the hum, "histles and barkles" of the mains set, as well as the boominess and false bass generally associated with the average cabinet set, I decided to get back to simpler things.

With a really good L.F. transformer (A.F.3), a P.M.202 in the power stage, an Ekco A.C.18 eliminator and a Microlode speaker mounted on a 3-ft. ⅝-in. baffle, I get ample volume for a smallish room, together with really good quality (bass in proper perspective) and an absolutely dead-silent background.

I am a real music lover, and therefore you can believe me when I say it is a pleasure to sit and listen in.

THE NEW S.T. RECEIVER

Mr. Scott-Taggart is at work on a new set. Following his policy of testing new circuits under all possible conditions before publishing them, S.T. wants readers of THE WIRELESS CONSTRUCTOR to lend him their aerials for trying out his new receiver. Please turn to page 143 and read all about it.

As regards selectivity, outside the superhet, your circuit produces the goods. The knack of getting the best out of it, however, is not to be picked up in one evening, but the more one experiments the better one gets, which is one of its charms.

The selectivity can also be varied to deal with changing conditions, and future increases in power abroad will just cause me to smile and get more entertainment without interference. Incidentally, I think it's good going to get Breslau and Poste-Parisien absolutely clear of one another at equal volume.

I understand you are bringing out a new set in the autumn. I don't see that you can improve on this one except to give it a bit more punch.—[*From Mr. R. B. Macleod, Highwold, Burntwood Lane, Caterham-on-the-Hill.*]

[My autumn set will very definitely be an improvement, but it will probably be totally unlike any previous set of mine. Meanwhile, the Star is the best for 3 valves.—J. S.-T.]

S.T.300 STAR: "WONDERFUL ACHIEVEMENT."

I built your S.T.300 about two years ago and was well pleased with its results, but, purchasing the March issue of THE WIRELESS CONSTRUCTOR and studying the blue print of the 300 Star, I thought I would convert my S.T.300.

I have now completed my conversion, and I must say I do not regret it; as it is a most wonderful set, both for selectivity, range and volume. Several people here have heard it, and remarked that it equals an all-electric set.

Thanking you for your wonderful achievement and wishing you further success in your future designs.—[*From Mr. Ernest Linsey, Ockham Park, Ripley, Surrey.*]

WIRELESS IN THE GREAT WAR

—*continued from page* 128

action stations down in the bowels of the ship: the almost hopeless task of trying to take in urgent messages as the great guns thunder out their salvos at the enemy; each message, out and in, repeated and repeated again; the heat and confusion. A shot from the enemy damages the ship's dynamos, and the main transmitter is useless. But the time for wireless is passing; the aerials are shot away; our guns are firing more feebly now.

As all the world knows, there was no miracle; the unequal struggle could only have one ending. Almost the first German salvo disabled the Good Hope, and both she and the Monmouth were soon on fire. Darkness was coming on rapidly and the sea was becoming rougher. A great explosion was seen to take place on the Good Hope, and presently she vanished.

Complete Catastrophe

The Monmouth, although completely disabled, refused to surrender, and the Nurnberg sent salvos into her. After this she foundered with her flag still flying. No one was saved from either ship; all perished in the icy waters of the Southern Pacific on that November night. For the British it was defeat, but a defeat more glorious than victory.

Nor, if report is true, were the victors overjoyed. True, they had defeated a brave enemy, but possibly they realised that vengeance must follow swiftly. Surely enough, and barely thirty days later, they, too, met their fate in the battle of the Falklands—another engagement in which wireless played an important part.

A NEW LOUDSPEAKER MOUNTING

—*continued from page* 108

No point is served by detailing the many various shapes of centre-piece that were tried before the arrangement shown in Fig. 8 was arrived at; neither is it necessary to do more than state that the best angle for the two speakers is between 110 and 130 degrees.

The curves for the arrangement shown in Fig. 8 are given in Fig. 9, and the microphone positions indicated by the letters A B C are given on Fig. 8.

By mounting two speakers with cones of 6¾ in. projected diameter in the manner shown, it is possible to accommodate them within a cabinet of the dimensions that were mentioned earlier in the article and at the same time give ample room for a six-stage superhet if required.

Centre-Piece Dimensions

Many other possibilities in the way of putting felt on one side of the wedge-shaped centre-piece and so on can be tried to give the results that are most pleasing to the reader, and it is also possible that different makes of speaker would require slightly varying treatment.

In this connection the writer would say that he has found the results to hold good with most of the well-known makes, and has also found that for large sound outputs the same arrangement can be used with a flared mouthpiece to give a horn effect.

There is only one thing that must not be done, and that is that the centre-piece must not, in any circumstances, project beyond the apex of a triangle formed by the axis of the cones and a line across the base line of arrangement.

RAPID RADIO REPAIRS

—*continued from page* 110

by the mains voltage, which in our example would be:

$$\frac{660}{220} = 3 \text{ turns per volt.}$$

This means that, for each volt required from the secondary, we must use 3 turns of wire in the secondary winding.

Therefore we require 300 turns for the 100-volt H.T. section, and 6, 12, and 18 turns for the filament supply of 2, 4, and 6 volts respectively.

The windings, which must be insulated from each other very carefully, may be wound with the following size wire: Primary winding, use No. 28 single cotton enamel wire. 100-volt section, use No. 32 single cotton enamel wire. Filament winding, use No. 16 single cotton enamel wire.

(The above data is given for use with A.C. mains whose frequency is from 50 to 60 cycles, and is not applicable for any other frequency.)

FROM MY ARMCHAIR

—*continued from page* 121

old Saxon monosyllables which, as someone has said, are so universally known that the dictionaries do not bother to print them.

However, the colonel was unjust. Carlos and I are on the friendliest of terms. But I am not one to have the old school tie lightly besmirched. I have sung "Forty Years On" till I have felt forty. I have hiccupped "Follow Up" until my voice has cracked.

I therefore wrote specially to Carlos, telling him that not for one second would I wish to hurt his feelings or to let down the old school.

His reply was instantaneous, and I give it here verbatim to confound all my critics.

* * *

"Setubal,
"27th February, 1934.

"Dear Mr. John Scott-Taggart,

"Your intimate letter of 22nd. inst., where you once more try to link and fortify our so man to man friendship, left me embarrassed, how to satisfy to your rehabilition, from the vindicated accusation of the kind-hearted readers.

"Well if your Arm-Chair Notes are read with sympathy and amusement by the hundred thousand readers throughout your own country (England), the are not less read with *great enjoyment and fun* by the humblest Old Sport, to whom you conceed your so earnest fraternity feelings.

"In regard your asking to authorize to publish my exoneration to = S.T. One Thousand Folds = I have only and, ask to refer, to the few but simple words, I had the opportunity, in connective with the portrait, posted you, to offer you, *beforehand*, you should be accused for pitilessness, which is quite natural, owing to the lack of our relations connection through yours set, as also your co-operation in THE WIRELESS CONSTRUCTOR.

"I don't what you emagine me to full of vainglory but, should think the best, best retorsion, you could give to all the kind-hearted 'T.W.C.' readers, would be to give publicity to my photograph's autograph, when printing the portrait, I had the pleasure to ask you to accept from,

"Your truly admirer,
"CARLOS."

* * *

The above is certainly the best retorsion to any "T.W.C." reader who thinks I am exploiting Carlos.

One reader, Jim Monte, of 6, Sawley Street, Beswick, congratulated me on my "invention" of Carlos. He said that even the photo of Carlos was suspiciously like me, that our ties were similar, both wore double-breasted waistcoats and that the loudspeaker was pointed away from the set (a fad of mine). He thought, however, that Carlos was a good stunt, even if he was invented.

Now, Carlos, old boy, it is up to you in some way to prove existence. I have done my best by sending a packet of your original letters to Mr. Monte, who now apologises.

There is no need, Mr. Monte. I was flattered. But it would take a much cleverer man than I to invent Carlos.

"Public Extrication"

And don't imagine I am the only recipient of letters from Setubal. Messrs. W/B (advert.) have written to the Editor.

"*You may be interested to know that we have just received a letter from Carlos X., of Setubal, in which he asks us as his apologizes to go through all John Scott-Taggart's writtings to ascertain the responsabilities which grievance substroke was to apoplexity. He is proportioning us the means for a tremendous Public extrication, and accepts our Public Plead Proposition.*

"*The Speaker has not yet arrived, but when it does it will be denuded of splitters and returned immediately.*"

From the above it will be seen that W/B's (advert.) have been completely extricated.

Five Streets Ahead

I continue to receive letters from contented S.T. 400-ers who defy me to do better than this set and challenge me to provide a more effective design. They refuse to build any future set, because they think this is not possible.

I don't wish to be ungracious, but, good as the "400" is, I am rather annoyed by excessive praise which implies I can't do better. In point of fact, I am, as stated elsewhere, very busy on an autumn set, and even in its present state of development it is at least five streets ahead of and ten sights better than the S.T.400.

The trouble, of course, is that nobody allows me to "go back" on my really big set of the year. It has to be better than that of the previous year.

The S.T.500 is in a special class, because it is better than the "400" in some directions, but not quite as good on all stations as the "400."

(*Continued on next page*)

FROM MY ARMCHAIR

—continued from previous page

My next receiver will set a new standard in performance and selectivity, and therefore I advise readers to look out for it. Do not, therefore, build the S.T.400, but wait. There is, however, nothing on the way to compete with the S.T.300 Star, which, though announced without the fanfare of trumpets which heralds my great annual set, remains a remarkably good "three."

* * *

As regards S.T.400 users, I accept now their challenge and will enter into competition with their sets. Write to me c/o THE WIRELESS CONSTRUCTOR, Tallis House, Tallis St., London. E.C.4.

Make no Forecasts

I want to warn you all that you must not make any forecasts of my next big set. It will be a waste of time. Past designs will not prove the slightest help to you. If I do something radically better you must be prepared to see me jettison ideas which were improvements at the time but which in turn may have to give place to later ones.

I feel that I am on the verge of some remarkable developments in radio reception, and, if I am half as successful as I hope to be, an open mind on your part will be a great help to me.

* * *

There is a good deal still to be done, and once more I appeal to readers who would lend me their aerials for an evening to write and tell me so. I cannot enter into correspondence, but will visit a limited number of readers' own homes. My object is not to put sets right, but to carry out tests with my new set. I expect nothing but a table, an aerial and an earth. And I want aerials in all sorts of places in Britain. No aerial, however remote or however close to the B.B.C., will fail to receive consideration.

Amongst replies I certainly want to hear from those who are blotted out by any of the B.B.C. stations.

It does not matter a scrap whether you have built a set of mine or not. But tell me what you are now using and the results you get.

And please do not say to yourself: "Thousands will answer; it's a waste of time writing." The thousands you think will answer will also think that thousands will answer, and therefore will themselves not answer. Got that?

* * *

Sir John Reith has once more "faced his critics" of the House—the only place which a civil, or quasi-semi civil, servant fears. He succeeded, again, but not as dramatically as on the first occasion.

That testimonial by 800 employees of the B.B.C. to their Director-General was a windfall for Sir John. It was a "vote of confidence" handed to him just as he was leaving to meet the band of Conservative M.P.'s who were getting ready to cross-examine him.

When the question of staff unrest was raised, Sir John was in the position to unroll his valentine.

How much better it would have read if Sir John had been too proud to make use of his testimonial! And if someone had revealed the incident!

After all, a testimonial round-robin is almost valueless. Its success is certain unless there is a state of revolution. You have a document pushed before you, you see hundreds of other signatures and—unless you are contemplating resignation—you sign it even if you are dissatisfied.

The loyal and satisfied employee would, I imagine, resent the need of joining in a mass tribute. The dissatisfied employee would resent being expected to sign something to which he could not wholly assent.

J. S.-T.

AS WE FIND THEM

—continued from page 126

Possibly it has never occurred to listeners that many of their troubles would be solved by the addition of efficient wavetraps to their sets.

We have in the past described circuits based on the famous Brookmans' rejector principle, first described by Mr. G. P. Kendall in our sister publication, "Popular Wireless."

A wavetrap embodying a modern version of this well-tried principle was recently described in that journal and proved to be very popular.

Readers will therefore be interested to learn that Messrs. Wright & Weaire are marketing this wavetrap in commercial form at the extremely moderate price of 7s. 6d.

The circuit is remarkably efficient and can be adjusted to cut out the unwanted station in a mere second or so. The unit is of small dimensions and is fitted with two feet for screwing to the back or side of the cabinet. The waveband covered is approximately 200–550 metres.

We can thoroughly recommend this wavetrap, details of which are obtainable from Messrs. Wright & Weaire, 740, High Road, Tottenham, N.17.

QUESTIONS I AM ASKED

—*continued from page 105*

Q. 89. When switching on the S.T.400 I have to wait quite an appreciable time for signals to build up. In this respect it resembles a mains set. On first switching on there is practically no signal. What is the cause?

A. Ten to one it is one of the spaghettis used for decoupling the detector or the first L.F. valve. Spaghettis, when defective, should at once be replaced by resistors of the metallised or composition or ceramic type.

The defect above mentioned may be due to the resistance of the spaghetti being initially high and then becoming normal when warming up. A much more likely cause is that the spaghetti is of unduly high resistance, and considerable time is required to charge up the decoupling condenser.

Q. 90. I have tried your suggestions for receiving Radio Normandie, but I still seem unable to get the station effectively on my S.T.400 as the reaction at this point seems inadequate. What do you think I can do further?

A. Check detector H.T. voltage and accumulator. Disconnect reaction equaliser preset and resistance. Move anode coupler near extreme right position. Set anode reaction at or near zero, and use reaction distributor knob as the means of introducting reaction. You can also reduce capacity of selectivity range adjuster. These, of course, are extreme measures. You can also try anode coupler towards the left; it should never be in the middle.

Why did I advise the anode coupler not to be in the middle?

Because the "stepping-stone" capacity of the differential anode coupler is then at its maximum, i.e. across the fixed plates. This capacity is in parallel with the tuning condenser of the anode tuned circuit, and therefore will raise the wavelength to which that circuit is tuned.

Since we have assumed a difficulty in getting down to 200 metres, a reduction of this capacity is essential. Moving the anode coupler to either side will enable the anode circuit to tune lower.

The biggest reduction is obtained when the coupler is to the left, but this will reduce signals somewhat and reduce the link reaction.

POINTS FOR PURCHASERS

—*continued from page 135*

they think that a superhet is out of the question for them on account of the H.T. current consumption. They want "mains" quality, but their limit of H.T. is ten milliamps or so.

Instead of bemoaning, anyone who is in this situation should send to The Westinghouse Brake and Saxby Signal Co., Ltd., for an envelope of building instructions for the Westinghouse Battery Superheterodyne Receiver.

For one shilling they will receive, post free, not only a large chart, but a handsomely-got-up book of instructions for making a single-dial five-valver, highly selective and extremely sensitive. It introduces a number of recent radio developments to the constructor, and incorporates two Westectors, one as second detector and the other in a special battery economiser circuit.

It is impossible even to outline the main features of this attractive proposition in the space available here. But full particulars will be gladly forwarded to any WIRELESS CONSTRUCTOR reader who writes to the above-named firm at 82, York Road, King's Cross, London, N.1.

NEXT MONTH

How to Make

A FINE SINGLE-CONTROL FOUR-VALVE RECEIVER

Full of Power

Recent additions to the Siemens' range of "Full-o'-Power" batteries designed for use and replacement in well-known commercial receivers have just been announced.

Owners of the K.B. 274 Kobra set will now be able to obtain battery No. 1,193, which provides 120 volts H.T. and an incorporated G.B. with tappings every 1½ volts. Six H.T. tappings are available between 60 and 120 volts.

The 1,165 battery for the Marconiphone 255 receiver is also reduced in price from 14s. to 12s.

For Television Enthusiasts

The quickening interest in television has recently led to some interesting home-construction developments in this science. Peto-Scott, Ltd., pioneers in television work since 1927, have now placed two television kits on the market, one of the disc type and the other of the more ambitious mirror screw variety.

The huge production resources of Peto-Scott, Ltd., coupled with their "Easy Way" system of payment, thus places a television constructor's kit within reach of all readers. Full particulars will gladly be supplied on application to the firm at 77, City Road, London, E.C.1. This is a venture certainly worth investigation by all keen constructors, for Peto-Scott kits are complete down to the last screw, and full instructions, etc., are embodied.

A remarkable claim for the Disc Television Kit is that it can be assembled in half an hour!

INDEX TO ADVERTISERS

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