POPULAR WIRELESS, July 3rd, 1937. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

TELEVISION PICTURES IN COLOUR

Popular Wireless & Television Times

BUILDING THE 1937 MIDGET PORTABLE

EVERY WEDNESDAY PRICE 3D

No. 787.
Vol. XXXI.
July 3rd, 1937.

HIMMEL! SAPRISTI! PARBLEU! CRIKEY!

He thought the set would receive dozens of stations, and it does, all together! Does *your* set suffer from over-eagerness? Do you get interference on your programmes from a station or stations you don't want to hear? If so, you should read about the "Station Separator" in this issue; also W. L. S. deals with short-wave selectivity.

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

SAILING RADIO
A NEW CABLE
CATCHING UP

RADIO NOTES & NEWS

AERIAL FIREWORKS
IN THE BATH
RADIO ROMANCE

Turkish Delight

YOUNG Turks are delighted by the announcement that their Government has placed with Marconi's a contract for the installation of a long-wave, high-power broadcasting transmitter, a high-power short-wave broadcasting transmitter, and a Broadcasting House for Ankara.

The long-waver will radiate 120 kilowatts on 1,639 metres, and it can be converted to a 60-kilowatter by a flick of the wrist. The short-waver will work on a carrier energy of 20 kilowatts, and will have an easy change-over between two wavelengths in the 14/100-metre band. It will be crystal-controlled and, like its big brother, will be up-to-date in every nut and bolt.

Ankara's Broadcasting House, with five main studios, ribbon mikes, effects studios, echo room, and assorted what-nottery will be the radio high-spot of the Near East. It will be linked by high-class music cable to the transmitters at Etimessut, 15 miles away.

A B.B.C. Appointment

MR. G. C. BEADLE, Director of Staff Training, has been appointed West of England Regional Director, in succession to Mr. E. R. Appleton. It won't take you long to like the West of England listener, Mr. Beadle.

The America's Cup

WIRELESS seems to find its way into so many odd corners that we ought not to be surprised that it has now become part of the historic yacht race for the America's Cup.

Mr. T. O. M. Sopwith, sportsman that he is, has decided to have another go for Britain, and Endeavour I created a great impression in the States by sailing, unaided, the last 1,000 miles of her trans-Atlantic passage, after parting company with her tug.

She will fill in the time until July 31st with trials of various riggings, and is to be assisted in this by Endeavour II (the other prospective challenger), and by radio telephony between the vessels. Changes of sail, etc., can thus be discussed, enabling really comparative results to be obtained for the first time.

It should be a grand race this year; and if the new methods of communication enable us to win we shall have something more for which to thank radio.

P.O.'s Motor-boats and Casks

HAD you been on the shores of Lock Awe and seen P.O. engineers with four motor-boats and 400 5-gallon casks, you might justifiably have concluded that they were going to have *some* party. Well, in a way it was.

They were laying a cable across the loch, which shelves so abruptly from the shore that it was decided to attach empty casks to the cable at intervals, float them across, and then puncture the casks below the waterline to enable them to sink with the cable in the desired position.

The motor-boats, working from the centre, flitted joyously from cask to cask, directed by an ultra-short-wave radio-telephone link between the shores of the loch. Eh, mon, it was a bonnie sight.

The new cables, linking Oban with the main trunk system, will enable this to extend to the Highlands and islands, with an extension from Oban to the Outer Hebrides by wireless telephone.

MY WORD **By THE EDITOR**

BRIGHTER B.B.C.?

The appointment of the Prime Minister of Mirth, George Robey, to an advisory position and John Watt's elevation to the post of Variety Chief are most commendable steps. They indicate that there is a move away from strict uplift and highbrowism at the Big House.

Let us hope that at long last Britain's Dictators of the Ether are going to start giving us more of what we want than of what it is thought we need.

British Broadcasting is well established on the peaks of dignity and integrity. Its reputation for dogged educationalism against the will of its public is a world-wide source of wonder.

Probably in no other country would eight million ten bobs every year be paid to a piper who persisted in calling his own tunes.

Yet eight million listeners can't be completely wrong. They keep on paying out. Why? No doubt because they try hard to believe that their radio fare is a "curate's egg"—good in parts.

One day broadcasting may please most of the people most of the time, and that will be when gloom and uplift have been almost entirely eliminated from the programmes and a card bearing the phrase "Your Job is to Entertain" stands on the desk of every programme executive at Broadcasting House.

The New Vice-Chairman

THE appointment of Mr. C. H. G. Millis, D.S.O., to be Vice-Chairman and Governor of the B.B.C. (as already announced in "P.W.") brings the number of Governors up to seven, in conformity with the recommendations of the Broadcasting Committee. As colleagues, Mr. Millis will have Mr. R. C. Norman (Chairman), Lady Bridgeman, Mr. H. A. L. Fisher, Mrs. Mary Hamilton, Sir Ian Fraser, and Dr. J. J. Mallon.

Mr. Millis was twice wounded when serving with the Sherwood Foresters in the war of 1914–18.

Advisory Council

THE B.B.C. has recently made the following new appointments to its General Advisory Council—an august body which advises on broadcasting policy.

Mr. L. S. Amery, M.P.
Mr. John Jacob Astor, M.P.
Mr. Harold G. Brown.
Lord Elgin and Kincardine.
Mr. John James Lawson, M.P.
The Dowager Lady Reading.
Mr. George Robey.
Sir Josiah Stamp.
Professor George Gordon.

Professor Gordon was appointed because he is Chairman of the B.B.C.'s Spoken English Committee. Mr. Harold Brown is a former vice-chairman and governor of the B.B.C.

A Loss to Listeners

HIS many friends were grieved by the recent death of Mr. Francis Bolton, the first person to act as Talent Spotter for the B.B.C. The listening public, whom he served so well, has lost a good friend.

Narrowing the Gap

ON the first of June the number of British radio licences in force was 8,202,000. The total for Germany on the same day was 8,372,818.

Germany, unlike Britain, has a short-period licence in force, and consequently there is a bigger fall-off in the summer than

(*Continued overleaf.*)

NEXT WEEK: AN ALL-MAINS "REACTO"

GOLD WATCHES GIVEN AWAY WITH RADIO LICENCES

if the licence was an all-the-year-rounder. With the fine weather the German total dropped in the month of May by 97,744, whereas the British total showed the usual steady rise, the net increase in May being 24,995.

Another month or two like this and the gap will be narrowed still further, possibly giving Britain the lead again.

A Short-Lived Triumph

DID I ever tell you of the American business man who decided to extend his factory, and who had a son who was mad on radio? The young fellow persuaded his father that the great new chimney then being built for the works would be a fine mast for a super aerial. And the old man became so enamoured of the idea that he decided not only to build in a support for the aerial wire, but also to have a firework display at the chimney-top on opening night.

There was to be a large assortment of fireworks, to be fired by an electrical circuit from the ground. Unfortunately, however, something went wrong with this circuit on opening night. At the crucial moment, when the button was pressed and all the guests were saying "What a marvellous aerial," the fireworks at the chimney-top all went off together with shattering unanimity, and blew the aerial's support away! Down came that super aerial with a rush—and the chimney isn't due for steeplejacking for another five years!

MELODY AND RHYTHM

A programme of "Melody and Rhythm," to be presented by Martyn C. Webster, on July 5th (Midland programme), will be given by two combinations which have broadcast before—Martini and his Music, and Eric Jeffcote's Rhythm Quartette. Martini maintains that hot jazz tunes should not be played on the Hawaiian guitar, but believes there is wide scope for arrangements of the classics, especially the Viennese waltzes. His bass player is only sixteen. Eric Jeffcote has frequently broadcast as an accordion soloist. Three of his quartet play with Jack Wilson's Rhythm Band.

Atlantic Isn't Romantic Any More

OLD Man Atlantic is about to take the biggest knock he has had since the late Senor C. Columbus beat him in 1492. I write on the eve of the Imperial Airways test flights from Foynes, on the Shannon, to Newfoundland; and when the regular air-mail service gets going between Europe and America, the "awe-inspiring waste of waters" will become just that—a dreadful waste of water!

As the gallant "Hindenburg" has shown, these fast flights across the Atlantic depend greatly upon radio communications. I understand that in this respect the new service is all set. The weather-report organisation is complete; the machines are ready—and, perhaps, before you read these lines the Atlantic ace will have been trumped for keeps.

History was a horrible subject at school. But it's exciting in the making, think you not?

An Unusual Fatality

THE Stockport coroner performed a public service recently in calling attention to the grave risks incurred by people who handled electrical apparatus while in their baths.

Readers of "P.W." will know that the effects of an electric shock largely depend upon the quality of the contact made with the body; a voltage that might do little damage to a dry skin may prove fatal if the hands are wet, or if the body is partly submerged.

The Stockport coroner was investigating the circumstances of the death of Mrs. Lightfoot, of Bramhall, who was found electrocuted in her bath with her wireless set resting on her body. As the coroner pointed out, it should be realised that any electrical apparatus—wireless set, electric iron, or other domestic appliance—may be made dangerous by using it in such conditions. Even to stand barefooted on a wet floor is to invite the possibility of a severe shock when high-voltage leads are being handled.

"We Have With Us in the Studio——"

GATE-CRASHERS have more than once given the B.B.C. something to think about, but some of the more out-of-the-way stations have problems such as we seldom imagine.

Did you hear about the to-do in British Malaya on Coronation Day?

The director of one station, newly erected on land reclaimed from the jungle, was taking a final look round before the all-important broadcast began when he encountered a cobra, short in the temper but 7 feet long! Having disposed of this unwelcome caller he hurried over to tell his assistant, and, stepping on something slithery, found that this time he had put his foot on a 12-foot python!

Despite these unexpected trifles the reception from Daventry was perfect, and everybody remarked that there hadn't been a hitch all day!

Radio Romance

MISS FENWICK, New Brunswick, listening on phone,
Heard the amateur call-sign of Mr. C. Stone.

* * *

He lived at Corinna, a township of Maine;
And Miss Fenwick heard him again and again.

* * *

They talked on their radios by day and by night;
When you have the short waves there is no need to write.

From friendship to courtship; to billing and cooing.
Within the twelve months 'twas a radio wooing.

* * *

When Mr. Stone asked her, Miss Fenwick said "Yes."
And now they are married—and happy, I guess.

* * *

So let us all wish them a long, joyous life.
Short-wave fan and radio wife.

* * *

(I made up the rhyme. But the facts are all TRUE.
C. Stone and his wife are as real as are you.)

COLWYN FOLLIES OF 1937

The Colwyn Follies of 1937, under the direction of Ernest Binns, will broadcast a light summer show (Welsh programme) from the Pier Pavilion, Colwyn Bay, on July 6th. Listeners are already familiar with the Colwyn Follies, as they have broadcast from the Pier Pavilion for the past three seasons. Among the artistes taking part in the programme will be Ton E. Brennan (comedian), Mildred Hammond (soprano), Reg Fenton (comedian), Phyllis Palmer (soubrette and dancer), and Jim Fitz (comedian and drummer).

News of New Stations

B.B.C. engineers are hoping to start work on the new high-power station at Start Point, Devon, very shortly.

* * *

The Irish Free State is hoping that finances will run to a short-wave station, to keep wanderers from the Emerald Isle in touch with the old country.

* * *

Baghdad is now broadcasting on medium waves (about 391 metres) on Mondays, Thursdays and Saturdays, from 5.30 p.m. to 8 p.m. * * *

The National Broadcasting Stations serving Melbourne, Sydney and Brisbane are to be replaced by high-power up-to-date transmitters.

Advertising Polish

POLAND has hit upon a bright idea for encouraging shilly-shalliers to buy wireless licences.

The first step was to bring out a cheap mass-produced set, inexpensive to run. The response was gratifying, but it did not become enthusiastic until some sporting official announced that the buyer of any licence completing a new series of 100,000 should receive a gold watch. Licence figures immediately began to leap, and the buyer of licence number 600,000 has recently been presented with his ticker.

In the rural districts of Poland the possession of a wireless set is quite sufficient to mark you as "one of the heads." If you can secure the watch, too, you are a man in 100,000.

ARIEL.

THE STATION SEPARATOR

Does your receiver give you a clear-cut programme free from all interference by other stations? Are you able to pick out just the one station you want or do you invariably get two at once? If your set suffers from this irritating lack of selectivity, try the effect of adding the easily made little unit described below. The improvement in selectivity will surprise you.

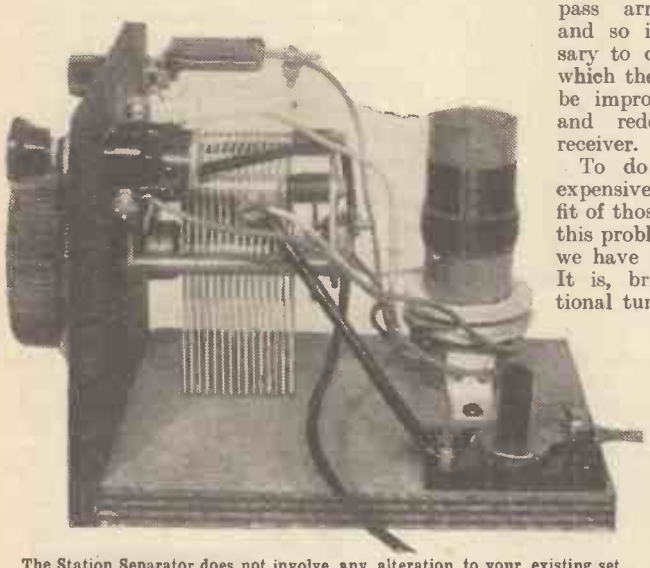
The panel is a piece of polished wood four inches square, with the tuning knob in the centre and the wave-change switch and aerial terminal placed half an inch in from the sides. But these dimensions are not in any way critical.

UNQUESTIONABLY the crying need to-day is selectivity—more selectivity—and yet still more selectivity. What is selectivity? you may ask. Well, it is simply the ability of a particular set to separate one programme from another, so that you can receive the particular programmes which you wish to listen to without some other station "butting" in.

A few years ago the problem was nothing like so acute. But to-day not only have we a large increase in the number of stations occupying the medium and long wavebands—in particular, the medium—but there has also been an all-round increase in power.

Actually it is the tendency for greater power to be used that is mainly causing the present-time complications. It is not difficult to appreciate the difference between trying to separate two adjacent programmes working on, say, 20 kilowatts, and two the same distance apart in frequency on 100 kilowatts.

It is this station-separating problem that largely accounts for the present-day popularity of the superhet, which, by reason of the principle underlying its operation, has an inherent selectivity not achieved by the simpler types of straight circuit.



The Station Separator does not involve any alteration to your existing set, and it works equally well on both medium and long wavelengths.

Increasing Selectivity

But there are very large numbers of these straight circuits in use. And very satisfactory they are except perhaps in so far as their selectivity is concerned. The good old three-valver with its two tuned circuits—particularly the less recent types which have not the advantage of screened iron-core coils—do not always manage to rise to the occasion when it comes to separating two powerful adjacent programmes, although from the point of view of volume and quality it does all that one requires.

Now selectivity is solely dependent upon the number of tuned circuits which a receiver has incorporated in its design, always assuming that the said tuned circuits are efficient. But a large proportion of sets cannot aspire to the more ambitious band-pass arrangements, and so it is necessary to devise some method by which the overall selectivity can be improved without rebuilding and redesigning the entire receiver.

To do this is obviously an expensive business. For the benefit of those who are troubled with this problem of station separation we have designed this little unit. It is, briefly, an efficient additional tuned circuit which can be tacked on to practically any set. It does not affect the existing receiver in any way, except in so far as improving its selectivity. Moreover, it is not critical as to its layout: those who prefer to build it on to some other type of base or into a small cabinet or box which they may have on hand may do so, so long as they adhere to the components specified and to the wiring.

But in practice it would be difficult to find anything neater or less expensive than the particular arrangement that we ourselves have adopted. The unit works equally well on both medium and long wavebands, and the change-over is effected by using an ordinary three-point push-pull switch.

There is a preset condenser of ·00005 mfd. to vary the coupling between the unit and the aerial tuning circuit of the set, to which it is attached. This preset is set by rotating a small ebonite adjuster on top of it.

The setting will depend upon the type of receiver with which the unit is used, but it is a very simple matter to find the best position, since this can be quickly done during reception.

To commence with, the adjuster can be screwed fully clockwise, this giving maximum coupling.

Preparing the Panel

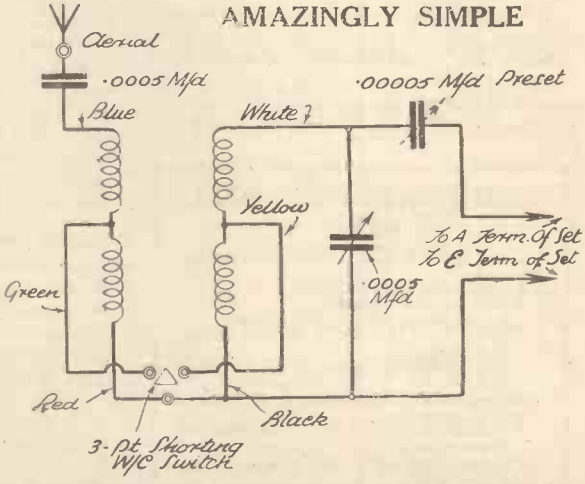
To commence the construction, take the panel—a piece of polished wood 4 inches by 4 inches by ¼ inch thick, and drill a hole in the centre for mounting the J.B. condenser. Drill two more holes ½ in. in from the top edge and sides for the aerial terminal and wave-change switch. Drill two holes for the wood screws which secure the panel to the plywood baseboard.

Mount the terminal wave-change switch and condenser, and then the wave-change coil and preset condenser on the baseboard.

Now wire up, remembering that one side of the ·0005 fixed condenser is secured directly to the shank of the aerial terminal, the other side being joined to the blue lead on the dual-range coil, as you will see from the wiring diagram.

The leads on the coil are all coloured, so that you can make no mistake here. You will need two lengths of rubber-covered flexible wire for the following connections:

(Continued overleaf.)



The connections to the dual-range coil are coloured so as to facilitate wiring up. The beginner will have no difficulty in making this invaluable unit.

TECHNICAL JOTTINGS

Varied aspects of radio discussed from a general standpoint

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

Modern Receiver Essentials

IN a modern high-efficiency receiver it is practically essential to have not only a volume control—which I suppose every set has—but also a tone control.

In these days, when it is necessary to separate stations on closely adjacent wavelengths, any sort of a decent set capable of receiving a fair number of stations has to be pretty selective. There are all sorts of dodges for securing this selectivity, amongst the principal ones being the bandpass tuning system and the use of the superheterodyne type of circuit; also the addition of an extra tuned circuit, which can take the form of a little unit, of which the "station separator" is a good example. As well as this we have the screen-grid, pentode and other high-amplification valves.

Given these high-magnification valves and a correspondingly high sensitivity, which enables us to pick out weak or distant stations, it is obvious that we must have some means also of cutting down the volume which we would otherwise get on stronger or nearer stations. This is not only a question of the unpleasantness of the extra loud volume but also the overloading of the valves, which will introduce serious distortion.

Multi-mu Screen-Grid

A simple method of volume control, and one which is now very popularly used, employs a multi-mu screen-grid valve. The grid bias applied to the grid of the valve can be varied at will by means of a suitably arranged potentiometer, and the volume can be increased by decreasing the grid bias voltage and, of course, decreased by increasing the voltage. In actual practice this simply means that the knob of the potentiometer is rotated one way or the other so as to control the volume.

Another method which can be used with almost any receiver, but particularly those having high-frequency amplifying valves not of the multi-mu type, employs a potentiometer connected across the aerial and earth terminals, the moving arm of the potentiometer, incidentally, being connected to the aerial lead. This method was described in Mr. Rogers' article, "Preventing Gatecrashing," in last week's "P.W."

Avoiding Distortion

Both of the methods mentioned above have the advantage that they do not introduce distortion: they act by controlling the input to the receiver at the source, and in this way cut out any overloading of succeeding valves.

If you particularly wish to go to refinements you can fit a second volume control which may, for example, consist of a very-high-resistance potentiometer, up to one megohm in maximum resistance, connected across the secondary of the low-frequency transformer, or alternatively you can use one of the special loudspeaker volume controls which are on the market.

Balancing the Cut-off

Coming to the question of tone control, which I just mentioned, you know that highly selective receivers—and this includes a large percentage of modern sets—have a tendency to cut off the higher musical notes. Against this, however, many output valves, more particularly those of the pentode and Class B type, have a tendency to over-emphasise the top notes. The extent to which these two effects cancel one another varies in different sets, and unfortunately so much so that you cannot rely upon anything in the nature of balance being thus obtained. It is better to make certain by fitting a tone control, so that the tone can be adjusted to individual requirements.

A Simple Arrangement

A simple tone control arrangement embodies a combination of capacity inductance and resistance, the resistance being variable. An arrangement of this kind connected in the output stage of a receiver provides a convenient method of balancing and controlling the tone. Such devices have, of course, been on the market for

(*Please turn to page* 405.)

THE STATION SEPARATOR

(*Continued from previous page.*)

(a) to one side of the ·00005-mfd. preset, and (b) to the moving vanes of the ·0005-mfd. J.B. condenser.

When you have completed the wiring, the next job is to join up the unit to your existing set. First remove the aerial lead from the aerial terminal on your set and attach it to the terminal marked "aerial" on the unit. Join the flexible lead which is attached to the preset condenser and marked "to A terminal on set" to the aerial terminal on your existing set from which you have just removed the aerial lead. Join the other flexible lead to the earth terminal on your set. Those are all the connections needed.

Now pull the knob of the wave-change switch towards you, so that the circular plate on the back of the spindle engages with the three contacts. In this position the long-wave windings of the dual range coil are shorted out, and the unit is then ready for tuning on the medium waveband.

Adjust the tuning control on your set to any station that you know—say, one of the Regionals, or National. Then rotate the knob on the "Station Separator" until you receive this station at its maximum volume. This is to give you an idea of the position at which a given station will come in on the unit. Do this for one or two stations and you will soon find the approximate settings of the separator dial and notice how they correspond with the tuning settings on your receiver.

Coupling Adjustments

This may sound a little complicated, but in practice you will find it the work of but a few moments. Having got the hang of the tuning on the unit you will soon see what an improvement it makes when you tune in some of the Continentals.

You will find that you can receive them with a clear-cut clarity that you haven't been able to obtain previously.

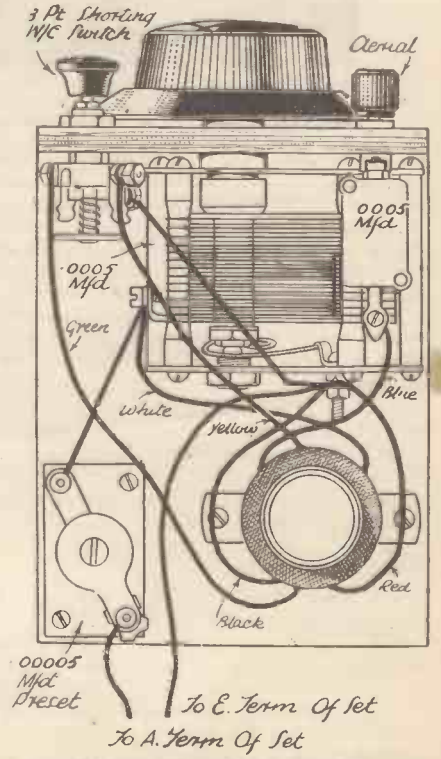
Juggle a little with the setting of the preset condenser and note the difference which the various adjustments make. Remember that the farther you unscrew the knob—that is, rotate it anti-clockwise—the sharper will be the tuning.

To switch over to the long wave on the unit all you have to do is to press the wave-change switch knob towards the panel so that the circular disc on the spindle disengages from the three contacts.

We feel sure that a very large number of "P.W." readers will find in the "Station Separator" just the little gadget they have been looking for. It will certainly give many sets a new lease of life. **A. J. R.**

THE PARTS YOU WILL NEED

- 1 J.B. "Popular Log" ·0005-mfd. tuning condenser.
- 1 3 inch diam. knob for above.
- 1 B.T.S. coil, type ML/U/1.
- 1 J.B. ·00005-mfd. baseboard trimmer.
- 1 Wearite 3 pt. shorting push-pull switch, type G.W.C.
- 1 T.C.C. ·0005-mfd. fixed condenser, type M.T.
- 1 Belling & Lee indicating terminal, marked "A," type R.
- 1 Baseboard 5 in. × 4 in. × ⅜ in. plywood (Peto-Scott).
- 1 Polished wood panel, 4 in. × 4 in. × ¼ in. (Peto-Scott).
- Wire, screws, flex, etc.



One of the tags on the ·0005 mfd. fixed condenser is bent over and clamped to the shank of the aerial terminal.

MY SHORT-WAVE ADVENTURES By L. CHESTER

I TRY A METAL CHASSIS

Describing a change-over from panel and baseboard design to the metal chassis idea

AS my extra set of coils hasn't turned up yet—and as I do not yet feel capable of designing my own—I have perforce left the idea of adding a high-frequency amplifier to my set. Instead, I have been very busy with an entirely new—to me, that is—structural layout.

The more I see of other people's designs, the more I am convinced that the all-metal chassis is "the thing." And, by the same token, that the old panel-and-baseboard construction is taking a back seat.

Improving the Design

Anyone can make a one-valver with nice short leads, all very efficient looking, even "professional." And this can be done, I have discovered, with the panel-and-baseboard idea. But as soon as you start adding low-frequency amplifiers—and I suppose even more so with high frequency—you find yourself with wires all over the shop.

My O–V–1 was rather a sprawl on that 16 in. by 8 in. metal panel and equally large Metaplex baseboard. Indeed, with the resistance-capacity amplifier in circuit the whole thing looked—and let me admit was—a "botch."

I had a spare 16 in. by 8 in. metal panel by me and decided to turn this, somehow, into a small metal chassis. I bent it twice at right angles to form an upright control panel 6 in. high, a baseplate 8 in. deep and a back support 2 in. high. Perhaps you will forgive me for having drawn this out as Fig. 3 (see page 407). The front support I sawed out of a Metaplex baseboard, as shown.

Well, there I was with a home-made metal chassis—very little trouble to make up and quite cheap, too. The problem was: "How can I squeeze in all the parts for my O–V–1 set?"

I drew out once again my theoretical circuit diagram, which I show as Fig. 1. Here you see a capacity-coupled aerial going to a four-pin, short-wave coil, with series-fed reaction and resistance-capacity coupling to a Harries-type power valve, whose output is through a choke-capacity filter. Looks simple enough—but it happens to represent a vast amount of trial and error on my part.

Determined to put this circuit into "all-metal" practice, I made a start by drilling the panel support for my ·00016 tuning condenser and ·0002 reaction condenser. Wondered why the centre cutting bit was going a bit stiffly—until I found I had cut a huge ¾-in. hole instead of the normal ⅜ in. One gaping hole in panel!

I then fixed the tuning condenser on the left and the reaction on the right. And for that little act of thoughtlessness I paid in several minutes of subsequent brain fag. I'll tell why in a moment.

Coil Connections

With the theoretical before me, I tried laying out my bits and pieces to ensure short leads. I had to fit in the coil holder, the valve holders, aerial pre-set condenser, short-wave choke, coupling condenser—and the low-frequency filter components.

Once more I got muddled with those four-pin coil connections—so difficult to know which is which when you are twisting the holder round and about.

To get over this I inked the marks "G," "A," "RC" and "E" against their appropriate terminals. Then I played, it seemed for hours, at arranging the parts.

They just would not come right anyhow. My difficulty was mainly in getting both tuning and reaction condenser leads short. I suppose actually this is a common enough problem, isn't it? Anyway, the light dawned at last—and now the tuning is on the right and reaction on the left.

The Layout Used

Which, I wonder, is the accepted standard? Or doesn't it matter? A lot seems to me to depend on where your aerial lead-in comes to the set. I sit at a table where the window bringing in the aerial is on my right—and under this condition it is certainly better to have the tuning on the right, with the 'phones terminals on the left.

If now you will look at Fig. 2 you will see how I finally got the main components laid out. The coil holder comes to the left of the tuning condenser, nearly dead behind the reaction condenser, which being narrow allows plenty of room for the insertion of the coil.

Behind the tuning condenser lies the detector valve holder, and behind that the low-frequency-amplifier valve holder. As you see, the short-wave choke is placed to the left of the coil holder, giving a short enough connection. And just beyond the choke is the coupling condenser—again a short lead.

I don't know whether the Editor will have time to get the set photographed for this week's article. If he does you will be able to see how I have managed to keep my high-frequency leads all quite short. The longest is 2 in. and the rest are even less.

(*Please turn to page* 407.)

How Mr. Chester's set appears in its latest form.

THE CIRCUIT OF THE SET ABOVE

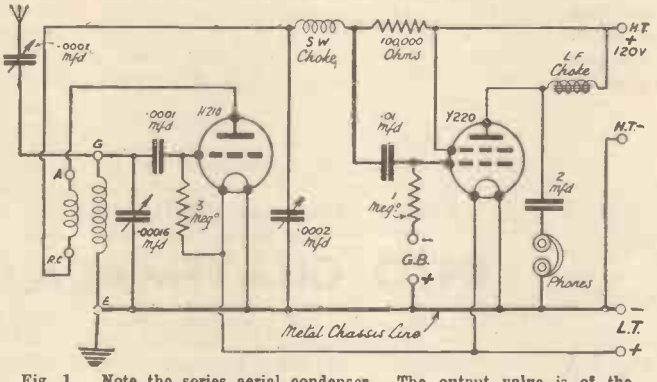


Fig. 1. Note the series aerial condenser. The output valve is of the Harries pentode type.

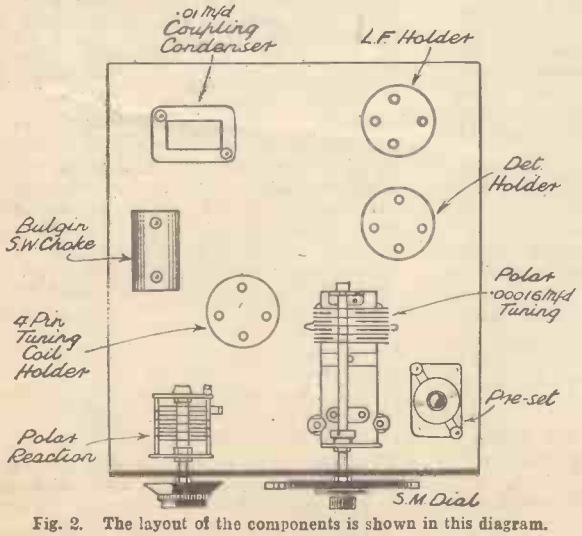


Fig. 2. The layout of the components is shown in this diagram.

THE DIAL REVOLVES

By LESLIE W. ORTON

THOSE AMATEUR HOURS

ATTRACTIONS ON THE 20-METRE BAND :: UNCERTAIN RECEPTION ON 49 METRES :: DX LISTENING ON A MOUNTAIN

HAVE you ever had to put up with the endeavours of someone who imagined that he or she (the latter is the worst variety!) was a budding "star"? Shake hands, brother, so have I, and the outcome was that reference to amateur hours was like a red rag to a bull—it made me stamp about in a rage!

Mortified!

Then came disgrace. One fine day I tuned in an excellent variety programme from W2XAF. Can you imagine my feelings when the announcement came and I realised that I had been enjoying an amateur hour? Was I mortified? Hm!—and reformed! Now, believe it or not, I'm suggesting that you gallant fellows tune to one or other of the amateur hours broadcast from the "States."

Willing to risk it? Try anything once, did you say? That's the attitude. W2XAF and W8XK transmit such hours regularly, and I'm confident that you will enjoy yourself listening to them. If you meet me at some future date you may remember this paragraph and, shaking my hand, say "Good fellow," or you may sock me on the jaw and say. . . !

At Your Finger-Tips

A twelve-hour service of "Yanks" is among the attractions the 20-metre amateur band offers this week. From all parts of the Continent stations are roaring in as if their lives depended upon it. Why not invest in a little midnight oil? You will have the time of your life if you do.

From 9 p.m. to 9 a.m. the world is at your finger-tips and a little searching will open your eyes and no mistake. Among my most cherished catches are WTOM (presumably a ship); IU5JA, Buenos Aires; X4SA, Puerto Rico; CO2OJ, Cuba; CP4BB, Bolivia; CX2AK, Uruguay; PY2AC, Brazil; VE1JA, VE1AC, and VE3EO, Canada. Envious? I thought you might be!

And as for "Yanks"—well, there seem to be two-million-quadrillion of them! Among my latest catches have been W1BEJ; W1TW, W2DH, W2PK, W4DZ, W5BY, W7BE (something to boast about!), W8XYT, W8VY and W9OM. At this rate I'll soon need a new log book!

Reception is excellent in the early mornings, and as late as 9 a.m. recently I picked up W9SY, Shawnee, Kansas, and W9AC, St. Louis, at excellent strength. Indeed, I was thoroughly enjoying myself when some sweet dame switched on a vacuum-cleaner or hair-drier. I was just beginning to get used to that when a car stopped outside and the driver left it with engine running—that was too much! Exasperated beyond measure I slammed the switch off and stamped from the room!

A 10-Metre Flash

Have you heard CRCX, Bowmanville, on approximately 10 metres yet? Or police stations W2XES, Englewood, and W3XAR, Brookline, on the same band? No!? Then perhaps you have heard W8XBT, Springfield, or W8XM, Detroit police.

This band is rather dull at the moment, but it's well worth watching, for no film star was more temperamental than it.

East Versus West

East and West are going it hammer-and-tongs for supremacy in the radio world, and the sparks are flying as a consequence! The centre of the battle appears to be the 25-metre band where JZJ has held its own against all comers. W2XE, W1XAL and a new Cuban station COCY on 25·4 metres have been providing entertaining but not particularly powerful signals.

I wouldn't give a bent dime for the 49-metre band at the moment—reception is about as uncertain as the weather.

On Top of the World

"Come up and see me some time" appears to be the motto of J. R. of Cheltenham, who does much of his DX listening from the top of a local mountain! Unusual? Perhaps, but that boy has brains as his log shows. He's heard over a dozen

Here are some more stations for your log.

VK's and goodness knows how many W's in the last two months. No, I'm sorry, boys, but I daren't divulge the whereabouts of the mountain, for I can visualise its sides covered with aerial masts if I did!

A Narrow Escape

I had a narrow escape the other day. I jumped out of the frying-pan into the fire and survived! And this is how it happened. I challenged a friend to tell me of a more attractive all-round entertainment than the amateurs offered. "Try the commercials," he said. My first catch was PLE, Bandoeing, followed by SUV and SUZ, Cairo; FZR, Saigon, and many more stations. I was just beginning to think that I had backed a loser when I tumbled on VK2SU at Cremerne, N.S.W., on the amateur band—and so I still consider it the best for entertainment.

SHORT-WAVE STATION IDENTIFICATION

By F. A. BEANE

INTO GUATEMALA AND MEXICO

I WONDER what our American cousins would do without the Republic of Guatemala! That may have set you guessing, although perhaps you already know that Guatemala is the chief provider of chicle, the essential ingredient in the manufacture of chewing-gum! But the Republic is not essential to me for its chicle or coffee; the product I like is its plaintive marimba music, and, fortunately for me, I can get quite a lot of it from TGWA, "Radiodifusora Nacional," of Guatemala City, which operates on 31·75 m., and is best heard any Sunday morning until about 09.00. Identification is simplified by frequent reference to the slogan and announcements in English, French and Spanish. Incidentally TGWA verifies reception by QSL card, and if you are very lucky you will also get a generous sample of coffee about three months later!

Still in the capital city we visit the Police, but only to discover their station TG2X (50.51 m.) which is often heard until 06.00 B.S.T. Fortunately for us they announce in English and occasionally relay the National Police Band. Their slogan is "La Voz de la Policia Nacional." Then there is TGS on 52·45 m., which styles itself "Radiotransmisora de la Casa Presidential" and employs a five-chime signal; and a TG2 occasionally testing and relaying TG1 on 48·00 m. At the time of writing there does not appear to be any further activity in the Republic, and so we wander into Mexico, where we find confusion among the ranks of the S.W. Broadcasters.

However, at the moment, I can give a few definite details as follows:

XEBT (50 m.) Mexico City, a relay of XEB, may often be heard broadcasting until 07.00 and signing off with a long siren wail reminiscent of the films and American Police. Reference is often made to "El Buen Tono," and occasionally we may hear three chimes, cuckoo-calls or a cock-crow.

XECR (40·65 m.) of the Mexican Government, Mexico City, is seldom mentioned in publications, but is often very powerful between 00.00 and 01.00 Monday mornings. Prose and music by Mexican composers is given, and English used at frequent intervals. XECR verifies reception with a picture postcard and welcomes reports.

Excellent Strength and Quality

XEW Mexico City is a newcomer of excellent strength and quality operating on about 31·65 m. Listen for it between about 04·00 and 07·00 and note the employment of a four-chime (descending) signal and reference to "La Voz de Latina America." When closing the chime signal is heard at brief intervals and the announcement, in Spanish, is superimposed on a piece of native guitar music, and invariably followed by an English announcement running something like this: "Ladies and Gentlemen, you have been listening to XEW, the Voice of Latin America, in Mexico City; Good-night Folks."

There are many other interesting Mexican transmitters worth trying for, and I propose that we summarise these in the next number of "P.W."

ON THE SHORT WAVES

SHARPENING UP

By W. L. S.

SHORT-WAVE listeners, for many years, have been having an awfully easy time of it. Any old set has been good enough to give results that really pleased—well, anyone who was easily pleased. Above all things, this success of the simpler type of receiver has been responsible for the popularity of short-wave work as a hobby for the home constructor.

For many years a short-wave set just didn't *need* to be selective. There were plenty of short-wave stations, but they were spread out over such a vast ocean of kilocycles that it was only rarely that two of them clashed.

This state of affairs didn't last long on the amateur bands; more and more stations got on the air in every country in the world, and the selectivity problem started to become really acute. Up sprang "single-signal superhets," and other selective receivers, which alone made it possible for amateur work to continue on its old basis of unlimited numbers of stations and bands of a few hundred kilocycles.

More recently, the enterprise of various commercial concerns and of various governments has been responsible for an enormous increase in the numbers of the short-wave *broadcast* stations—and so the selectivity problem has arisen once more.

The Single Valver

Two years ago I was preaching the doctrine that quietness of background was the first consideration in a short-waver. I designed single-valve receivers galore, and readers built them and obtained excellent results—chiefly because of that very quality of background. Certain people laughed at me and said that sets with only one tuned circuit were bound to be hopeless; at any rate, in theory they were rotten, and if, in practice, they happened to work well, that was just an accident.

Well, I'm unrepentant. I still think I was right then—but I'm not foolish enough to say that the same thing holds good to-day. A single-valver is an excellent set to play with for all sorts of purposes, but it won't stand up to the modern requirements of selectivity.

If you do use such a set—and I include detector-and-L.F. sets in the same category, for I mean any set with only one tuned circuit—that tuned circuit has got to be extraordinarily good if the set is to give really good results.

One-Circuit Selectivity

For a tuned circuit to be good, the condenser has to be good, the coil has to be good, the link between them (*i.e.*, the wiring) has to be almost non-existent, and the external damping has to be negligible. That is to say, aerial coupling *must* be loose, even at the expense of signal-strength.

If you have a set with one tuned circuit, and you are bothered with flat tuning you must look to all these points, and the chances are that you will be able to improve its performance quite a lot. When you have done so—and not until then—you had better start thinking about adding another tuned circuit, which, in these days, means adding a stage of H.F. amplification.

But if your set is obviously inselective, don't just go and slam an H.F. stage in front of it, or the chances are that your new set, for all its two tuned circuits, won't give you more selectivity than you really *ought* to get with one. So sharpen up your detector first. Shorten the wiring, improve the layout, and use the loosest aerial coupling that you possibly can.

Use Loose Coupling

When you add an H.F. stage, take as much trouble with its tuned circuit as you did with the detector. And remember that you must still avoid the introduction of heavy damping into the detector circuit. This now means that you will have to use loose coupling between the H.F. valve and the detector. You can use six-pin coils and transformer coupling, or four-pin coils with tuned-grid coupling, using a neutralising condenser between the anode of the H.F. valve and the grid of the detector.

The superhet, of course, is another way out. Here the selectivity is gained largely from very sharply tuned circuits in the I.F. amplifier—but, again, you must watch the early stages. The H.F. stages, the detector and the beat oscillator must all be as efficient as you can possibly make them. If they are inefficient, and the I.F.'s very sharp, you will get one kind of selectivity only.

A powerful station very close to you, but some little way off in frequency from the one you are listening to, will no longer break through seriously; but the station next-door in frequency to the one you are tuned to will still interfere, if your "signal-frequency" circuits are poor. The same rules apply—good condensers, good coils, short wiring and low damping. Write these out in block capitals and stick them up in front of you whenever you build a set—unless you have sufficient imagination to think they're there all the time!

Ganged Receivers

Sets with ganged H.F. stages are a source of trouble unless the ganging is absolutely perfect. In fact, I would go so far as to say that a ganged set out of adjustment, with that beautiful "off-set" tuning that one gets in such circumstances, is generally worse from the selectivity point of view than a set with only one tuned circuit.

Small aerials are another thing that will help. One doesn't need to use 100 feet, or even 70 feet, these days. A really nice 30 feet of wire, slung "up in the clear," will give better results all round. Indoor aerials should be of low capacity—that is to say, even if they are short, they should be well clear of walls and ceilings, otherwise they may be just as poisonous in their effects as an outdoor aerial that is miles too long.

And so, you see, it is not so much the circuit you use as the way you lay it out that governs the set's selectivity.

NATIONAL 5-METRE FIELD DAY

The following is a list of stations which will be active on the 5-metre band during Sunday, July 4—R.S.G.B.'s "National 5-metre Field Day." It is hoped that there will be many others, but these in the list will definitely be on the air, mostly at high points.

G 5 C D	Wendover	G 5 F V	Keyingham, Hull
G 5 J U	Tag Hill, Bristol	G 6 L K	Pitch Hill, Surrey
G 2 D C	Liverpool	G I 6 Y W	Mourne Mountains, Northern Ireland
G 5 I J	Horsenden Hill, Middlesex	G 5 Q N	Burton Green, Coventry
G 6 F V	Foxes Cross, Whitstable	G 2 F A	Folkestone
G 6 U T	Abridge	G 6 W J	Wooley Edge, near Wakefield
G 6 N R	Dunstable Downs	G 6 D P	Frodsham
G 2 W S	Matlock	G I 6 X S	Orlock Point, Northern Ireland
G 6 Y J	Near Porth, Rhondda	G 5 F S	Dundry Hill
G 6 G L	Wirral	G 6 O K and G 6 Y Q—	Summit of Snowdon
G 5 Z T	Near Preston		
G 5 B K	Malvern Hills		
G 6 J Z	Whitehaven		

Listeners who hear any of these stations on 5 metres should report at once, either to me, c/o "P.W.," or direct to the R.S.G.B. at 53, Victoria Street, S.W.1.

ON THE SHORT WAVES—Page 2.

POINTS from the POST-BAG

W.L.S. Replies to Correspondents

THREE points from R. H. S. (Cricklewood): (1) Can he use Eddystone condensers, which he has on hand, in the "Simplex" Three, instead of those used in the actual set? Yes, certainly. (2) Have I forgotten about the H.F. unit that I was going to describe? No—a two-H.F. unit is being made now, and will appear as soon as possible. (3) *More* dope on amateur stuff wanted. (No answer necessary!)

P. M. B. (Wembley Park) comments on the way in which the 20-metre band has been "punk" for U.S.A. amateurs, but not by any means so for South Americans. In proof, he encloses a really terrific list of South American calls heard, including several that are new ones on me. The countries heard include Venezuela, Colombia, Uruguay, Argentina, Chile, Brazil, Peru, and several of the Central American and West Indian localities like Costa Rica, Dominican Republic, Porto Rico, Virgin Islands and Barbados.

He also comments on good reception from YI2BA (Iraq) at all sorts of times when nothing else appears to be coming in, and mentions XG3BY, who announced himself as "near Sardinia." This last sounds a bit doubtful.

The QSL Racket

R. D. E. (Sawbridgeworth) makes some very sensible comments on the QSL racket. He says, "Re your remarks about W2XAD or VK2ME cards being too common—I feel the same about this *now*; but there was a time when I valued them, in the same way as the beginners do now. But we have all got to start. I've a few common QSL's among my 1,450, but don't think any less of them for that."

R. D. E. reports VS7JW and VS7MP (Ceylon), both on phone, together with a list of thirty-three Australian phones. He also mentions a veri from W6XKG on about 11 metres and W9XJL and W3XEY on 9 metres—the latter at the Baltimore Radio Show.

L. E. S. (normally of S.E.5) writes from Wiltshire, where the "perfect location" at which he is staying makes him wish he had a portable. He remarks that from his station in London, during fifteen months of listening, he has hardly heard a single worth-while DX station that has not been in contact with a British amateur—or, at any rate, a European. He also comments on the number of British stations who misread the calls of stations heard. He heard the Javanese station PK1MX, and a Britisher immediately started up calling "VK1MX of Sydney"—rather odd, because there aren't any VK1's!

L. E. S. points out that the VK 9th district does not come in Zone 17 for the "18 Club"—it is in Zone 16. Quite right. And he says that the full QRA of J9CA, about whom I expressed suspicions recently, is in the new Call-Book. J9CA is in Formosa.

J. L. V. (Exeter) says that most of his DX listening is now done between 5.30 and 7 a.m. Energetic soul! But I know how good it is at that time in the morning. He comments on the extraordinary strength of the Australian phones VK2XU and VK2HF when conditions are anything like right. Other stations mentioned are PK1MX, PK1GL and PK4AI, along with a nice list of VE5's and South American whatnots. For XG3BY, also mentioned, see previous column.

Hum when Switched Off

S. J. (Croydon) is improving his detector by easy stages, and now claims to have something absolutely *white*-hot. And he asks whether readers who run their sets from mains units have ever noticed that there is still some hum there, even with the set switched off. This, he says, can always be cured by using choke-filter output. I believe he is absolutely correct.

W. P. (Ulverston) asks about how to join the R.S.G.B. and the B.S.W.L. For the former, apply to the Secretary, R.S.G.B., 53, Victoria Street, S.W.1; for the B.S.W.L., Mr. F. A. Beane, Ridgewell, Essex.

Reproduced on this page is a little picture of the "18 Club" Certificate, just to stir some of you to further activity. The full particulars of how to claim for it were given in the special short-wave number (May 1st), but I will shortly give another list of the eighteen zones and the countries included in them. There are plenty of these fine certificates left, and although we have made it fairly difficult to obtain them, we don't want to have any left at the end of a year! So roll up and claim them.

R. G. S. (Hastings) comments on queer conditions that have prevailed once or twice recently, the South Americans and U.S.A. stations having been all mixed up on 20 metres. This is rather unusual—one set or the other are usually good, but for both North and South to come through really well is certainly a freak.

THE HALL-MARK OF GOOD LISTENING

Here is a small reproduction of our "18 Club" certificate. The certificate itself is produced on glossy superfine art paper, and full details of how to qualify for it were given in our issue dated May 1st.

Short-Wave News

JUST as everyone had stopped moaning about bad conditions, and made up their minds that we had better settle down to a summer of poor results, back they all came again! But it's rather queer, because only those who restrict themselves to broadcast listening on the short waves have ever had the idea that conditions *were* bad!

They have been bad on the 19-metre band, admittedly; and they have been bad on the amateur 20-metre band, as far as "Yanks" have been concerned; but that's where the badness ends. South Americans by the score have been coming through for night after night, and the recent outbreak of thunderstorms seemed to bring back all the North Americans as well.

I find that short-wave listeners are getting more and more fed up with the indescribable welter of sound that goes to make up the so-called "49-metre band." Extending from the top edge of the 40-metre amateur band up to about 55 metres, there seems to be a sort of radio no-man's-land. The stronger stations which appear in the lists are usually there to time, but all round them are terrific numbers of other stations—mostly Latin-American—which vary so greatly from day to day that it's impossible to identify them without really hanging on and hearing an actual announcement.

Memory Refreshing

It's surprising how many people don't even bother to listen on that band at all nowadays. I don't, for one, except when I want to refresh my memory about the nasty noise that goes on.

Police transmissions are attracting a lot of attention among listeners who can get up to 140 metres or thereabouts. GTM (Edinburgh) is particularly strong in London; and, of course, the new station GWW at West Wickham, Kent, is making his presence felt in no uncertain way. I wonder how strong he is up in the North? He makes a proper mess of people in Bromley and Hayes who have inselective receivers.

Amateur work on the 160-metre band (while we are up that end of the spectrum!) seems to have received a fresh fillip since National Field Day. Quite a number of stations work regularly up there on week-day evenings nowadays, mostly on C.W., and quite surprising results are being obtained over distances of 200 or 300 miles with low power.

When you're feeling dull "down below," wind some coils to cover 130-200 metres. What with police, amateurs, trawlers and lightships, you will find quite a variety of stuff to amuse you. You will, however, need to cultivate the art of staying up late, because most of the amateurs on 160 metres are very late birds.

W. L. S.

MICROPHONES ALWAYS TELL THE TRUTH

Describing the use of the "atmosphere" microphone and how "mike" outputs are blended to produce various effects in the receiver

JUST as gossips can put an awkward twist to a straight story, so the microphone in the early days of radio did not always tell the truth. In other words, it was liable in some of its moods to make things sound either not so good as, or worse than, they were.

Intensive research by B.B.C. engineers has altered all that.

The microphone that gives you your daily radio programme is now the slave of the studio.

Important progress, this. It has brought to radio an entirely new technique that has radically changed production methods in certain broadcasts arranged by the Variety department in which, very often, there is a large cast of principals, a chorus, effects, a full orchestra—and even an audience.

Pioneers of the Art

Pioneers in multi-microphone technique, as it is called, Gordon McConnel, B.B.C. producer of operettas, musical comedies and comic opera programmes, and Rex Haworth, technical producer, in co-operation with Dr. F. W. Alexander, of the Engineering Research Department, have evolved a system which nowadays enables them to do to sound what make-up experts do to film faces.

Three years ago, Mr. McConnel was given permission to see for himself how studio opera and operetta were produced from Milan. Before he came home from Italy, however, he went specially to see Dottore Ingignere Tutino, Engineer in Charge of the Milan Broadcasting Station who, showing him over La Scala, demonstrated his multi-microphone-mixing methods in a special listening room two floors below the stage. They were, curiously enough, similar to those used by Rex Haworth.

But it was Tutino's use of the "atmosphere" microphone which was of particular interest, and it was introduced to St. George's Hall technique as soon as Mr. McConnel returned.

A few years ago, sections of the cast for one of Mr. McConnel's productions were scattered — isolated — in various Broadcasting House studios. Each studio had its own microphone, and the network of connecting lines led to a control panel elsewhere in the building from which, by a series of talk-back loudspeakers and cue lights, the producer linked dialogue, music and song into a coherent, continuous story.

At a Rehearsal

How does the present system work?

Watch them for a few moments during the rehearsal in St. George's Hall of a recent comic opera.

Towards the back of the stage, members of the Theatre Orchestra are spread fanwise on tiered seats. Tall, slender Mark H. Lubbock, Musical Director of Variety, is upon the conductor's rostrum before them. Behind him, the stage has been extended over the orchestral pit, turning it and the stalls beyond into a wooden plateau.

Upon it are trays of "effects"—shingle, broken crockery, sheets of metal.

About six feet away from the conductor are three microphones, two mounted on stands, the other suspended from the sides of the proscenium. On a sheet of green canvas on the floor below are figured squares indicating the exact spot at which each artist must stand whenever he or she is broadcasting.

A fourth microphone hangs inquisitively above the orchestra. A fifth, dangling six feet below the lofty roof of the auditorium, is reminiscent of the keyhole eavesdropper.

There may, at times, be a sixth or seventh hanging elsewhere in the building—one perhaps for a narrator, the other either for special effects or to act as a second "atmosphere mike," picking up a different quality of reverberation.

SYLVIA WELLING

The well-known stage and concert soprano, who has broadcast several times and who appeared in "Regatta," a recent television revue produced by Dallas Bower.

If you look to the left of the back stage, you will see a small building that looks very like a railway signal box of the size which usually equips a wayside station; the simile does not end in appearance, either. For the "signal box" is the silence room, the nerve centre of every broadcast from St. George's Hall, the line junction of each of the microphones, converging their traffic of voices and sounds sent speeding on their way through Broadcasting House to the transmitters.

The sound-proof material of which the box is built excludes from its interior the direct sounds that are coming from the stage. Through its wide range window, artists, orchestra, conductor, can be seen—but they can be heard *only* through the loudspeaker, working during rehearsals on a "closed circuit."

Microphone Instructions

Inside, you will see Gordon McConnel, script before him, another microphone nearby through which he can talk to anyone on the stage whenever necessary, giving them instructions on points that inevitably arise:

"Don't clip the 'church,' chorus. Give full value to the final 'ch.' It sounded like 'chur' to me——"

"That must be more slick, more speedy, but keep it clear——"

"Just too much voice there——" and lots of things like that.

Less urgent instructions can wait till the end of the rehearsal; meanwhile, the producer dictates his do's and don'ts to a secretary beside him.

Next to Gordon McConnel, Rex Haworth is mixing the output of the microphones, creating oral illusions, adding atmosphere and reverberation.

And as he operates the controls governing each microphone, his eyes are intent upon the needle of a programme meter above him, whose tell-tale dial shows from second to second the volume of outgoing sound.

Mixing the Output

All kinds of queer effects are obtained by judiciously mixing microphone output: alone, one "mike" may give an intimate drawing-room "close-up" of a piece of music or dialogue; but when its output is blended with that of another in a different part of the building the effect is so changed that listeners might well imagine that the setting is a vast empty hall or a stone-flagged corridor. All because microphones do tell the truth, reproducing sounds exactly as they reach them. A large part of the skill in multi-microphone technique rests, therefore, in the positioning not only of artists but of each microphone.

During the three years that the technique has grown, recordings have been made of typical broadcast performances during which it has been employed.

Useful comparisons are, as a result, easily available, for the story of progress is preserved in sound.

B.B.C. STATION CHANGES

COMMENCING on July 4th, there will be certain changes in the nature of programmes sent out by some of the B.B.C. stations. There will also be one exchange of wavelengths.

At present the West Regional and Penmon stations are synchronised and send out a combined programme for West of England and Welsh listeners. On July 4th West Regional will become the Welsh Regional. It will remain on the same wavelength, and Penmon will still be synchronised with it, and will send out the Welsh programme also.

At the same time as this change takes place the present West National, now synchronised with London and North Nationals, will become the West Regional, and cater specially for West of England listeners. Obviously its wavelength will have to be changed and will become 285·7 metres, the present wavelength as the Scottish National. This latter station will take over the old West National's wavelength and be synchronised with London and North Nationals.

West of England listeners, now that they are to have their own Regional station, will have to tune to Droitwich—the long wave—for their National programme.

There will be a special series of programmes for the West of England Region to mark its first week of independent existence.

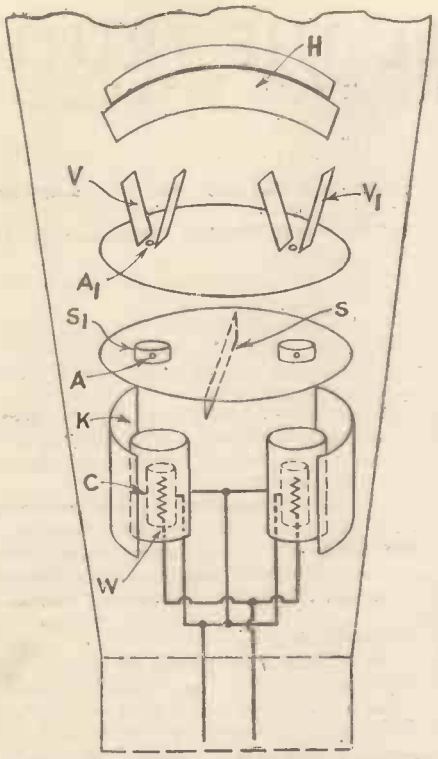


Fig. 1. The electrodes are duplicated and arranged side by side in the tube.

PICTURES IN COLOUR

By CARDEN SHEILS

How a double-gun cathode-ray tube can be employed to produce television pictures in colour

THE transmission of pictures in natural colour is not so far off as some people might think. Although we have taken a long time to get as far as we have, it is the usual story of slow work in the beginning. Once a thing like television reaches a certain stage of development, it is surprising how rapidly it forges ahead and acquires all the finishing touches that make for perfection.

Readers who have seen the regular B.B.C. programmes will agree that many of the items still depend very largely for their effect upon the spoken word. How often, for instance, the commentator adds colour—in every sense of the term—by remarks like these:

"Here, ladies and gentlemen, you see Betty, who is wearing the latest bathing creation in blue and yellow, complete with a wrap of emerald green." Or words to that effect!

Naturally, this kind of picture simply cries aloud to be shown in real colours. It has already been done on the cinema screen, and there is no reason why the B.B.C. should not be able, sooner or later, to follow suit on the fluorescent screen of a cathode-ray receiver.

All to the Good

The fact that the programmes are now being sent out on the ultra-short waves is all to the good, because colour effects usually require two or more separate sets of signals, which are of course combined together in the receiver. On a six- or seven-metre carrier, this is quite a reasonable proposition, though it would be impossible to attempt anything of the sort on the medium waves. For one thing, it would take up the whole of the available ether space, leaving no room for existing broadcast transmissions, and for another we haven't yet found the right kind of circuit to handle so wide a band of frequencies on the longer waves.

Reproduction in colour depends upon the fact that every tint in nature can be derived from the three so-called "primary" colours, namely, red, green and blue. Yellow, for instance, is a mixture of red and green. In practice it does not matter whether the mixture of colours required to produce a given tint are thrown on to a screen simultaneously, or in very rapid succession. In either case the eye receives exactly the same impression.

Incidentally a pleasing impression of colour can be produced by using only two of the primary colours instead of all three—though of course the results fall somewhat short of the real thing. But by saving one complete set of signals, it greatly simplifies matters, and at least offers us half the loaf—which is better than no bread at all!

Three Sets of Signals

The ideal scheme of colour transmission, however, calls for three different sets of signals, the first representing the "reds" of the picture, the second the "greens," and the third the "blues." Luckily, we have already at hand photo-electric cells which are able to discriminate between these different colours, so that as the picture is scanned at the transmitting end, one cell will respond only to the reds, another to the greens, and a third to the blues.

The signals may be sent out on three different carrier-waves, which are separately rectified at the receiving end and used to energise three differently-coloured lamps, the light from all three being thrown simultaneously on to the viewing screen. Or we may use a single scanning-disc having three different sets of spirals, one fitted with red glass, the second with green, and the third with blue. In this case the three "outlines" are actually thrown on to the viewing screen separately, but they appear in such rapid succession that the eye is "deceived" into seeing only one picture dressed up in natural colours.

For the present we seem to be anchored to the cathode-ray type of receiver, to which the ordinary scanning disc does not apply; so that it is necessary to find some other method of combining the signals.

Duplicated Electrodes

Fig. 1 shows a cathode-ray tube which has been designed for reproducing pictures on a two-colour basis. As will be seen, the usual set of electrodes is duplicated, so that instead of one electron stream we have two separate ones, produced along parallel paths on each side of the centre-line of the tube.

For instance, the emissive "spot" on the left-hand cathode C, in combination with the Wehnelt cylinder W and reflector K, produces one clear-cut stream. This passes through apertures A, A_1, in the first and second anodes respectively, and then between vertical and horizontal deflecting plates V, H on to the fluorescent screen. An exactly similar set of electrodes controls the second electron stream from the cathode on the right-hand side of the tube.

Preventing Interference

The two streams are prevented from interfering with each other by the focusing means already mentioned. In addition, a separating screen S is provided on the lower side of the first anode, and a focusing cylinder S_1 is placed around the upper side of the aperture A.

The fluorescent screen of the tube is made in two portions A, B, which are separated by a dividing band marked Z, as shown in Fig. 2. Scanning parallel to the line Z is controlled by the single pair of deflecting plates marked H in Fig. 1, whilst scanning at right angles to the line Z is separately handled by the two pairs of deflectors, V, V_1.

The material forming the fluorescent screen of the part A consists of zinc phosphate which gives a red picture, whilst the material covering the part B is of calcium tungstate which gives a blue one.

COMBINING THE IMAGES

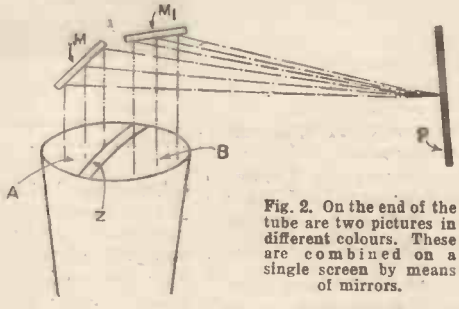


Fig. 2. On the end of the tube are two pictures in different colours. These are combined on a single screen by means of mirrors.

The two sets of incoming signals, corresponding to the red and blue outlines, are applied to the respective control electrodes of the "twin" cathode-ray tube, so that one picture is reproduced on the part A and the other on the part B. Both are then reflected by mirrors M, M_1 on to a viewing screen P, where they merge into a single coloured picture.

STARS FOR "MUSIC HALL"

GOOD news for broadcast "Music Hall" listeners. John Sharman has arranged for Flanagan and Allen to appear in his show—their fourth recent appearance—on July 3rd and, in the same programme, ever-popular Bébé Daniels and Ben Lyon will be making their last broadcast in this country before going on a tour of South Africa.

During the Variety performance on July 10th, John Sharman will introduce to listeners a new "team" of his own creation—Lupino Lane, a name known to every theatre-goer, and Mamie Souter, famous for her child impersonations, who will take part in a double act specially written by Douglas Furber.

FROM OUR READERS

RADIO MAKES PLANTS GROW IN BAD SPOT

Gardening readers will be particularly interested in this experience of a fellow reader.

The Editor, POPULAR WIRELESS.

Dear Sir,—I feel sure that electricity is a great benefit to flowers. Let me give an instance.

Four years ago I went to live in a newly built house, and, as usual, tried to grow plants in all sorts of places. There was one place, however, where nothing would grow—under my workshop window. One day I removed the earth wire from the water main, where it had been previously, and fixed it to a rod inserted in the ground under the window.

Well, although you won't believe it, I tell you that in three months plants were growing far better there than in more favourable conditions. So what?

G. SHELLEY.

69, Willifield Way, Golders Green, N.W.

MARKED BY LIGHTNING

The Editor, "Popular Wireless."

Dear Sir,—I would like to tell of an experience I had with lightning. I had just got into my tea when my wife said, "What's the matter with the wireless?" "I don't know, it was all right at dinner-time."

I went over to the corner where the cabinet was, switched on—no sound. Went over it, tried everything. I was about half an hour fiddling with it. I got the headphones. There was a storm coming on, and the wireless had been switched off. A blue light seemed to light up the corner. I got a bit of a shock from the lightning. When I took the headphones off, being a bit thin on top, I had the marks of the phones across my head. Now when there is lightning about I connect earth to aerial!

H. R. V., Sen.

Liverpool, 19.

WHICH IS THE REASON?

The Editor, POPULAR WIRELESS.

Dear Sir,—As an interested follower of Readers' Page topics, it seems to me the controversy about the "QSL" racket will never reach a satisfactory conclusion until the "racketeers" come to the real reasons for their insatiable thirst for these unusual mural decorations. Among the spate of arguments in favour of veri-collecting, I can recall no single instance where the purely altruistic intention to be of use to the transmitter has been advanced; the aim seems to be definitely selfish, a proof of one's prowess at the receiver. But, to be completely impartial, I must say that, like the anti-frothblower cranks, the anti-veri merchants would appear to have no other reason to advance against the practice than that they don't do it themselves.

All the same, it would be interesting to learn what is the real motive behind this etheric brotherhood of pasteboard chasers. What impels them to send reception reports in exchange for the sometimes weird and wonderful cards from across the world (and many more from across the street, of course)?

Has the fact that verification is closely related to veracity anything to do with it? Do the veri-hunters keep the cards up their sleeves, triumphantly to flash them out before the eyes of their sceptical friends who aren't convinced that one can get the back blocks of Saskatchewan on one valve, a couple of bent hairpins and unlimited optimism?

Are many cards collected purely for their artistic value as modernist mural decorations? Does anyone collect them because of a financial obstacle in the way of their obtaining a more orthodox wallpaper?

Do any veri-misers keep their hoard under the floorboards, to be fetched out and gloated over in the wee dark hours? Are the more impressive ones mounted and hung in the baronial hall along with the other trophies of the hunt? ("Got him with a single-valve, my boy!")

And, finally, is there any owner of a vast collection of veris who honestly can say that the cards have been a secondary consideration to his desire to be helpful to the transmitter, and that he would have sent reports just the same had no veris been forthcoming? It would certainly be very interesting to know these things.

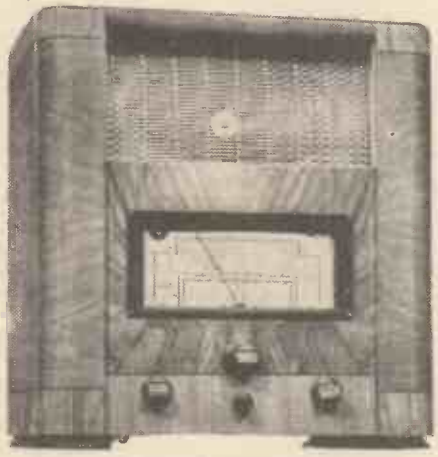
A. E. ROSE.

75, Breedon Street, Long Eaton, Notts.

WIN A GUINEA

By simply writing to us about any radio subject you like. This sum is awarded each week to the writer of the letter which, in the opinion of the Editor, is the best of the week's batch. Your letter may be long or short, practical or otherwise. It may give an opinion or describe an experience. Why not let us have *your* views or experiences? This week the guinea goes to Mr. G. Shelley of Golders Green.

A NEW H.M.V. SET



This model 499 A.C. receiver is a six-valve all-world instrument. It is produced at 14 guineas.

NORTH OR SOUTH?

The Editor, "Popular Wireless."

Dear Sir,—According to the laws of magnetism, like poles repel and unlike poles attract. The north pole of one magnet attracts the south pole of another magnet, and vice versa. If a bar magnet is suspended, it will come to rest pointing North and South; that is because of the earth's magnetism. The North Pole of the Earth's magnet attracts one end of the little magnet, and the South Pole of the Earth attracts the other end of the little magnet. The end of the little magnet which points North is named the North Pole, but actually it must be the South Pole, because it is the North Pole of the Earth's magnet which attracts it, and according to the laws of magnetism a north pole attracts a south pole.

If this is right, all the magnets in the world are wrongly named; where they now write "north" on one end, they should write "south," because where they write "north" they mean the pole which the Earth's North Pole attracts, which according to the laws of magnetism must be the south pole of the little magnet.

M. MOWBRAY.

26, Alteryn Road, Newport, Mon.

[An interesting point. Very often the north pole of a magnet is described in full as "the north seeking pole." For the purpose of convenient reading of a compass it would not be helpful if the pole which turned approximately towards the geographical north were called the South Pole.—ED.]

HEREDITARY

The Editor, POPULAR WIRELESS.

Dear Sir,—Although I have only been taking your paper for about nine months, I am very much impressed, and join with many thousands of other readers of your wonderful paper in congratulating you. I am only fourteen years old, but have already made three "P.W." sets. The "Simplex" Two, Mr. L. Chester's One-Valver and, believe it or not, a two-valver described in an edition of "P.W." for the year 1924!

The explanation of this is that while rooting about in a disused storeroom, I found a pile of books. After removing about two inches of dust, I saw the cover of a 1923 "P.W." staring at me! I discovered later that my thirty-years'-old brother had been taking "P.W." since its birth.

I am very interested in short waves, and find your articles extremely interesting and useful. My friends at school are all interested in your paper, and their names have appeared before in it often enough. But now, as I am itching to go into that little hut at the bottom of the garden, which is crammed full of wireless sets, parts (and wire), I will "can it."

NICHOLAS CARRINGTON.

Long Meadow House, Coombs Road, Bakewell, Derby.

WANTED BY ANOTHER

The Editor, "Popular Wireless."

Dear Sir,—I read with interest a letter from your reader, John B. Lowe, in May 15th issue, and have only just plucked up enough courage to write. I am in an exactly similar position to him. I am sixteen years old and have read "P.W." for four years, but have not yet been able to find a set to suit my pocket-money. I should welcome such a design as mentioned by your reader.

I find all your articles very interesting, and wish you and "P.W." every success.

T. E. OGDEN.

426, Stockport Road, Denton, Lancs.

[Our research dept. is now working on the idea referred to in this letter.—ED.]

MAINS S.W. WORKING

The Editor, "Popular Wireless."

Dear Sir,—Having been a reader of "P.W." for the last three years, I wish to take this opportunity of congratulating you on such a fine publication. The articles by Leslie W. Orton and F. A. Beane fill a long-left gap in S.W. news.

I would like to make one suggestion (and I think that many more readers of your paper would agree with me), that a few circuits of mains short-wave sets, such as 1v.2's or 0v.2's, described by our old friend "W. L. S.," would be met with great enthusiasm. I am quite aware of the fact that there are people who say that mains sets on S.W.'s do not work as well as battery, but I think a mains set properly constructed and well screened, should work quite as well as a battery set.

W. COLCLAUGH,

Member British S.W. League 316.

31, Lancaster Garden, Ealing, W.13.

P.S.—I should like to get in touch with any reader in my district, T N X.

[W. L. S. will be dealing with some matters relating to all-mains short-wave receivers very shortly.—ED.]

PRODUCER WHO WAS ONCE HIS OWN FLY-POSTER

Ernest Longstaffe, of the B.B.C., talks of Then and Now

PICTURE first a young man, little more than a boy, grinding music out of a rather ancient piano at one of the earliest cinema shows in this country.

Then picture him, his face wet with perspiration, pedalling a decrepit bicycle in the full heat of Summer along the dusty roads of rural England. Behind his saddle hangs a pot of paste with which, as he reaches the village, he sticks notices to trees and walls, announcing "a stupendous variety show in the Schoolroom to-morrow night."

Finally, picture him smiling contentedly as he watches from an express train the endless rows of radio aerials that stretch from leaning masts and chimney stacks to the homes of England to-day.

These glimpses of Ernest Longstaffe, author, composer, conductor, and one of the senior producers of the B.B.C. Variety Department, give at least a perspective of his life.

The Bottom Rung

"I always look back to the days when I played that piano as a time when I tried desperately hard to get my foot on the bottom rung of the ladder," he said. "Putting radio shows on the air is, to-day, my top rung. It may sound curious, but nothing does me more good than to see all those little clothes-prop aerials at the back of house after house. They seem to emphasise how great the opportunity we producers have of getting in close touch with people, making them happy, snatching them from their worries for an hour or two, giving them music and laughter which they would never otherwise have.

"Of course, the bottom rung was important at the time. The proprietor of the show was a patriarchal professor of phrenology who gave entertainment composed of 'pictures' and turns such as handbell ringing and Indian club swinging. One of my duties, by the way, was to fit up the stage, and as we were playing one night shows—well, we were pretty busy.

"The next rung up a ladder which at times seemed abominably steep involved driving in country carts in Somerset and Wiltshire with baskets of stage curtains packed up in front; each of these journeys followed my trip on that bicycle the day before, booking the schoolroom in the next village and fly-posting the show. What meant a lot at the time was this: the show belonged to me—but not for long. It was a genuine, hall-marked flop.

Globe-trotting Times

"The years between then and now have had their disappointments, their successes, their happiness and sadness. For a part of the time I was globe-trotting, touring companies in India, Burma, Ceylon and the Far East. Then there were those extremely happy years with shows in good old Lancashire and the North generally. Producing shows for several seasons on the North Pier at Blackpool made me a firm believer in the North's good taste for broad, healthy comedy and for 'a bit o' good singin'.' If the North likes a show it's usually a reliable guide.

"But let's forget yesterday."

In his quaintly shaped office at the top of winding stone stairs, which begin below the stage of St. George's Hall, London's old theatre of mystery, and end on the fifth floor, Ernest Longstaffe pointed to a wad of notices hanging on a wall. Each was a cast sheet of a new show.

"Let's talk of to-day, instead.

"My particular mission is trying to find new radio stars, artists who may be clever and very experienced in their profession and yet, perhaps, have but a very poor idea of what to put across the air. So this job of mine is largely one of 'grooming,' a word which means polishing, smoothing, 'dandifying' and making generally pleasing, not in its usual sense to the eye, but to the ear."

As a matter of fact, Ernest Longstaffe has put many a well-known radio act in a programme for the first time, and on the walls of his office are photographs of many of them. They include Nina Devitt, Tolleffsen—"Wizard of the Accordeon," the Arnaut Brothers, the Ragtimers, Percy Pryde, Biddy and Fanny, Neil McKay, Ray Meux, Susette Tari, and hosts of others.

Not Always Lucky

"For heaven's sake though," he says, "don't imagine that I am always lucky, I have my flops, too. Not every artist, even when 'groomed,' is necessarily a success at the microphone; even excellent stage performers just don't 'happen' on the air sometimes, largely because their ability may consist of facial expression, mime, or some other peculiarity that is strictly visual. Personally, I never consider it essential to put an artist before a microphone in a studio to find whether he or she will be a good broadcaster. A five-minute audition in the office will tell at once whether a comedian is funny or not, whether a singer can sing or not, whether an instrumentalist has some outstanding quality."

Not so difficult, perhaps, when you consider that Ernest Longstaffe has been waving a baton, hopping about stages, writing songs like "When the Sergeant-Major's on Parade," and producing shows, in "little one-lamp" Corn Exchanges and Market Halls, then at theatres in the provinces — from the smallest to the greatest—and finally in the West End, for more than a score of years before he came to Broadcasting House.

TO BE BESIDE THE SEASIDE

A Pye Baby "Q" portable "doing its stuff." This practical little set improves any picnic or other outing.

A BROADCASTER FOR GUERNSEY

Operating on Short Waves

SOME six weeks ago rumours were current in Guernsey and also in Alderney that spies had been detected in Alderney. There were rumours that Diesel engines had been found in a disused castle, and that these were intended for enemy submarines in case of war.

Now the situation has been cleared up. The engines were for the motive power of a broadcasting station. For the last ten days, Radio Alderney, as it will be known, has been broadcasting on a wavelength of 49·9 metres; the programmes have consisted of music, no call-sign or name having been announced.

The situation is now an interesting one, for those responsible for its construction are not prepared to admit that a licence from the General Post Office is necessary. Radio Alderney, Ltd., who have erected that station, applied some five weeks ago for permission to erect the plant. This was granted by the Royal Court of Alderney.

Advocate Randel, Chairman of Radio Alderney Ltd., said: "We are not certain whether the Post Office has jurisdiction over this area, but we have now communicated with them. It is perfectly true that we have been operating on a wavelength of 49·9 metres and on several other wavelengths, trying to choose the best channel."

Thus a broadcasting station of considerable power has come into being in a disused castle in Alderney. It's future is as yet unassured, but it is intended to be used as a commercial broadcasting centre, radiating over practically the whole of Europe.

NEXT WEEK

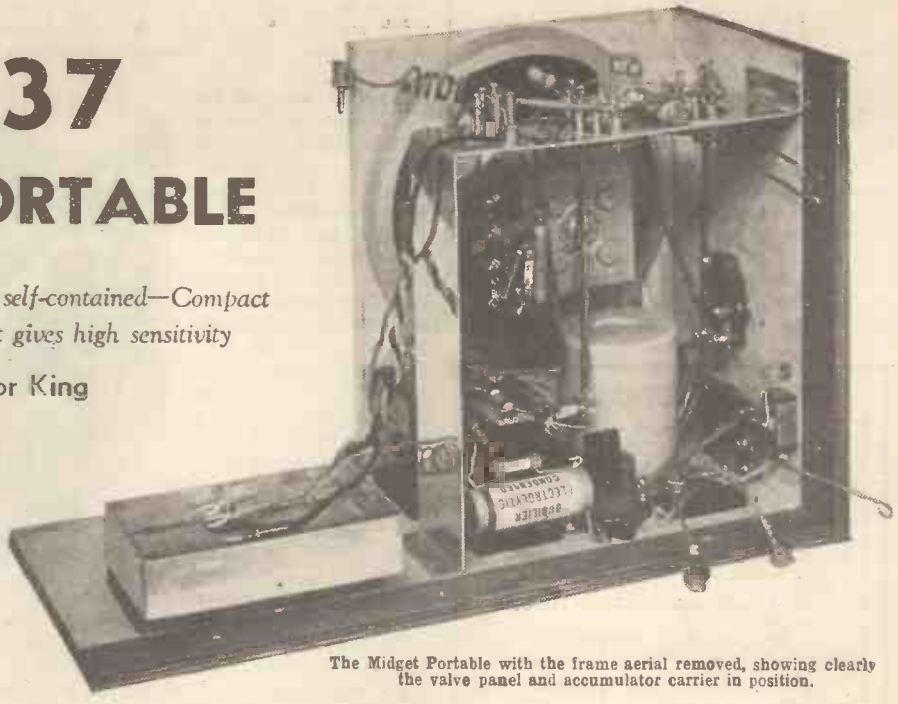
Full details for building a short-wave superhet-converter for running from A.C. or D.C. mains. Makes your set into an all-mains all-waver

BUILDING

THE 1937 MIDGET PORTABLE

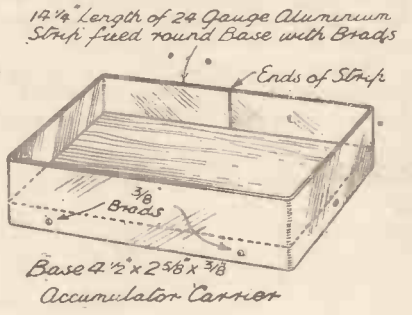
A set you can use anywhere—Completely self-contained—Compact and easily carried—All-pentode circuit gives high sensitivity

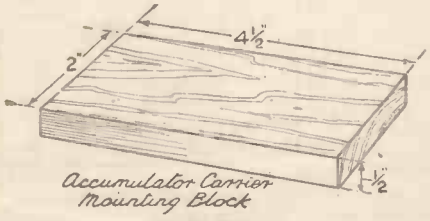
Described by Victor King



The Midget Portable with the frame aerial removed, showing clearly the valve panel and accumulator carrier in position.

CONTINUING the construction of the frame aerial, which was commenced last week, we now come to the windings. The long-wave winding is wound on first, beginning as shown in the diagram (see last week's "P.W."). The beginning of the wire is passed through the hole in the frame, and soldered to the tag on terminal E. Wind on 35 complete turns, then continue the winding towards the terminal marked "T." Bare the wire when it passes the tag on terminal "T," and solder it to the tag. Continue from here to wind the medium-wave winding. This consists of 13 complete turns (from terminal "T"), the 14th turn stopping just short of the complete turn, at a point opposite terminal





HOLDS THE L.T.
Dimensions for the aluminium tray which holds the accumulator in position and the wooden block upon which the tray is mounted.

"G." Cut off wire, pass it through the hole (marked end of medium-wave winding in diagram), and solder to tag on terminal "G."

That completes the frame proper. The screen, shown with the frame, is the next job to tackle. It is very obvious from the diagram how this is made. However, a few remarks may be helpful. It is made from a piece of 24-gauge sheet aluminium, 9 in. × 4¾ in. The holes should be drilled before any cutting or bending is done. The drilling should be followed by the cutting away of the pieces in the flanges. Finally, bend over the flanges. The screen is now ready to be fitted to the frame. This is done by means of four ⅜-in. No. 4 round-head screws. Make sure that you fit it in the correct position.

The bottom of the screen should be flush with the bottom of the frame, the top of the former thus projecting one-eighth of an inch above the top of the latter. The flanged edge of the screen projects over the front (the end bearing the terminals) of the frame by one-eighth of an inch.

The frame assembly is now completed and ready to be fitted in the final assembly.

THE PRELIMINARY CONSTRUCTIONAL DETAILS OF THE 1937 MIDGET PORTABLE APPEARED IN LAST WEEK'S "P.W."

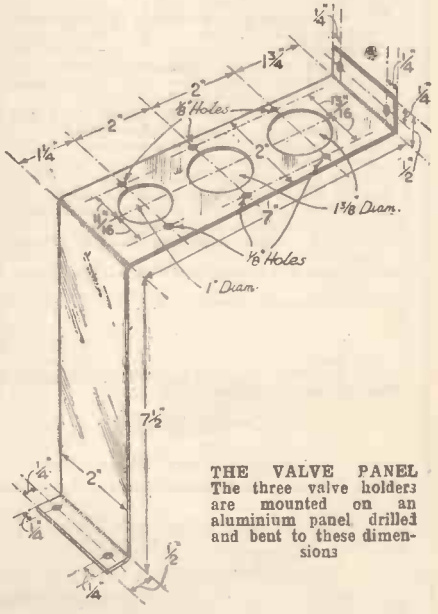
The baseboard is of ⅜-in. "Metaplex," and if bought cut to size, has only to have a strip of its metallising removed to be ready for use. The best way to remove the metallising, is to place a steel ruler one inch from and parallel to one (14 in.) side of the baseboard, and using the point of an old pen knife, as a scraper, run it down the baseboard close up to the ruler. This will remove a thin strip of metallising. The ruler may now be removed, and the rest of the metallising scraped away up to the mark.

The metallising on the back of the panel should be removed in the same way. It should be noted, however, that the strip of metallising removed from the panel is 1 1/16 in. wide, instead of 1 in. as in the case of the baseboard.

Mark out the panel from the front, as shown in the front of panel drilling diagram.

Now drill all holes with a one-eighth inch drill. This makes the drilling of the larger holes more accurate. The three holes down the centre of the panel should now be drilled with a ⅜-in. drill, and countersunk with a ¾-in. drill to a depth of about ⅛ in. This recessing is necessary, owing to the short bushes on the components to be mounted. Finally, drill the two ½-in. holes. The panel is now prepared.

The remaining "component" of the chassis, is the baffle-board for the loudspeaker. This is also of "Metaplex," the metallising of which is on the inside. Cut the hole for the loudspeaker, as shown in the diagram. This was actually cut by means of an adjustable centre-cutter. However, as you probably do not possess such a tool, you will probably cut the hole with a fret-saw. Of course, a key-hole saw may also be used, although you will not obtain such a clean cut.



THE VALVE PANEL
The three valve holders are mounted on an aluminium panel drilled and bent to these dimensions

Just to see that everything is going right, try a trial fitting of the chassis. Screw the panel to the baseboard, so that the panel projects on either side of the baseboard by one-sixteenth of an inch (the panel is one-eighth of an inch wider than the baseboard),

(Continued overleaf)

THE 1937 MIDGET PORTABLE

(Continued from previous page)

and the strip of plain wood on the baseboard is on the same side as the plain strip on the panel. The loudspeaker baffle fits inside the panel and baseboard, on the side remote from the " plain strips." It should be fitted so that its face is flush with the baseboard, and one-sixteenth of an inch inside the edge of the panel. It is fixed by two screws through the front of the panel, and one through the bottom of the baseboard. If everything fits correctly, the baffle-board may be removed, but the panel left attached to the baseboard ready for the components to be fitted.

YOUR SHOPPING LIST

2 J.B. " Dilecon " ·0005-mfd. tuning condensers.
2 J.B. 3-in. knob-dials for above.
1 B.T.S. ·0005-mfd. solid dielectric reaction condenser, with insulated bush and spindle.
1 Bulgin on/off switch, type S.80.
1 Bulgin W/C switch, type S.126.
1 B.T.S. screened coil, type ML/S/1.
1 T.C.C. 2-mfd. fixed condenser, type 50.
1 T.C.C. 1-mfd. fixed condenser, type 50.
1 T.C.C. ·1-mfd. tubular fixed condenser, type 250.
2 T.C.C. ·01-mfd. tubular fixed condensers, type 250.
1 T.C.C. ·0002-mfd. fixed condenser, type S.
1 Dubilier 50-mfd. electrolytic condenser, 12-v. wkg., type 3016.
1 Dubilier ·0005-mfd. fixed condenser, type 690 W.
1 Dubilier ·0003-mfd. fixed condenser, type 690 W.
1 Dubilier 2-meg. resistance, ½-watt type.
2 Dubilier 100,000-ohms resistances, ½-watt type.
1 Dubilier 50,000-ohms resistance, ½-watt type.
1 Dubilier 20,000-ohms resistance, ½-watt type.
1 Dubilier 10,000-ohms resistance, ½-watt type.
1 Dubilier 300-ohms resistance, ½-watt type.
1 Wearite H.F. choke, type H.F.J.
1 Varley L.F. transformer, " Niclet " 3·5/1.
2 Clix 7-pin chassis-mounting valve holders with screw terminals.
1 Clix 5-pin chassis-mounting valve holder with screw terminals.
1 " Metaplex " baffle-board, 8⅝ in. × 7 in. × ⅜ in. (Peto-Scott).
1 " Metaplex " baseboard, 14 in. × 6⅜ in. × ⅜ in. (Peto-Scott).
1 Plywood panel (polished front, " Metaplex " back) (Peto-Scott). 9 in. × 6½ in. × ⅜ in.
1 Plywood base for accumulator carrier, 4½ × 2⅜ in. × ⅜ in. (Peto-Scott).
1 Plywood block for mounting accumulator carrier, 4½ in. × 2 in. × ½ in. (Peto-Scott).
4 Plywood strips (two 13 in. × 1 in., two 8½ in. by 1 in.) for aerial frame (Peto-Scott).
1 Piece 18-gauge aluminium for valve panel, 15½ × 2 in. (Peto-Scott).
1 Piece 24-gauge aluminium, 14½ in. × 1 in., for accumulator carrier (Peto-Scott).
1 Piece 18-gauge aluminium for screen, 9 in. × 4⅜ in. (Peto-Scott.)
2 Belling & Lee accumulator spades.
2 Belling & Lee wander plugs (H.T.+, H.T.−).
1 oz. 36-gauge D.S.C. copper wire (Peto-Scott).
10 ft. 18-gauge T.C. wire (Peto-Scott).
2 Lengths 1½ m.m. insulating sleeving (Peto-Scott).
Screws, flex, 6 B.A. nuts and screws, etc. (Peto-Scott).
1 W.B. loudspeaker, type 37 B.P.

VALVES.

V_1.	V_2.	V_3.
Mazda S.P.210 (Metallised)	Mazda S.P.210 (Metallised)	Mazda Pen.231

H.T.
120 volts.
L.T.
2-v. Exide, type P.O.2.

The valve panel is made from a piece of 18-gauge aluminium, 15½ in. × 2 in. Mark out and drill before bending. Once again a centre-cutter was used to cut the holes for the valveholders, so if you do not possess such a tool you will have to use a fret-saw. A fret-saw will cut aluminium quite well, if it is done carefully. Of course, you can mark out the holes and drill small holes close together round the circumferences, and then tap out the centres, cleaning off the rough edges of the holes with a round file. The bending should be done in a vice. All the bends are right angles.

All we have to prepare now are the accumulator carrier, and the mounting block for same. The mounting block is simply a piece of wood ½ in. thick, measuring 4½ in. × 2 in. The base of the accumulator carrier is a piece of wood ⅜ in. thick and measuring 4½ in. × 2⅜ in. (preferably plywood). The aluminium strip fitted round the base is fixed by means of ⅜-in. brads, the bottom edge of the aluminium being flush with the bottom face of the base.

Fit the mounting block to the baseboard 1⅜ in. from the back edge, and 1/16 in. from the unmetallised strip. It may be fixed by means of ¾-in. panel pins, or ¾-in. countersunk wood screws. Fix the accumulator carrier on top of the mounting block, so that it is flush with the inner edge of the block, but overlaps the outer edge as shown in the wiring diagram.

Fitting the Valve Holders

That concludes the preparation of all the " bits and pieces," and the next job is to finish the valve panel.

First of all, fit the valve holders by means of ½ in. × 6 B.A. cheese or round-head screws and 6 B.A. nuts. One of the V2 valve-holder fixing screws is also used for mounting the ·0003-mfd. grid condenser, as you will see by referring to the diagram. The remaining fixing hole in this condenser has a 6 B.A. screw and nut fitted to it, which is used as the H.T.+ anchoring point. Now wire the valve panel except for the wires which connect it to the remainder of the assembly. The valve panel may now be put aside for the time being.

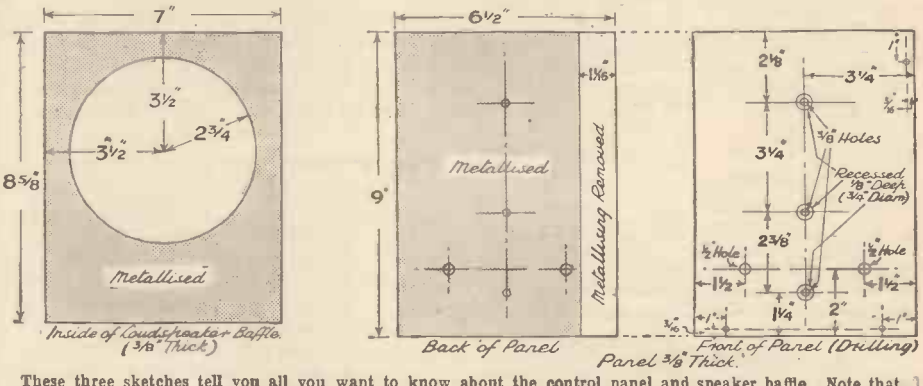
Fit the loudspeaker to its baffle-board and connect the 10,000-ohm resistance and ·01-mfd. condenser to terminals 1 and 3, but do not tighten them.

We now come to the main part of the chassis, namely the panel and baseboard. Mount the panel components. There are no points to note here except in the case of the switches. The back nuts of these should be removed, otherwise the bush is too short to allow the front locking nuts to be fitted. Mount the baseboard components as nearly as possible in the position shown in the diagram. Complete the wiring as far as possible without fitting the loudspeaker and valve panel.

Next fit the valve panel in position. The position of the fixing foot on the baseboard is clearly shown in the wiring diagram. The position of the fixing foot on the panel is not so clear, however, as the valve panel has been displaced to show the components on the baseboard. The top edge of the fixing foot is ½ in. from the top of the panel. The outer edge of the foot is on the line where the metallising of the panel finishes. Having fitted the valve panel, complete the wiring between same and the panel-baseboard assembly.

GOOD SELECTIVITY
With its two tuned circuits and directional frame the selectivity of the Midget is such that no difficulty should be met with in separating the various programmes.

CONSTRUCTIONAL DIMENSIONS YOU WILL NEED



These three sketches tell you all you want to know about the control panel and speaker baffle. Note that a portion of the metallising is removed from the back of the panel.

Completing the Assembly

Fit the loudspeaker assembly and make the necessary connections to the terminals 1 and 3. Before fitting the frame aerial, insert the valves in their appropriate

(Continued on next page)

THE 1937 MIDGET PORTABLE

(Continued from previous page)

holders: S.P.210 in V_1, S.P.210 in V_2, and Pen.231 in V_3. Fit caps to top of valves V_1 and V_2, as indicated in diagram. Offer the frame to the chassis and pass the flex leads marked to "G, E and T on frame" through the appropriate holes in the frame screen. Push the frame into position, so that the bottom outside edge is flush with the edge of the baseboard, and the screen making contact with the panel. Screw frame to baseboard. Screw flange of frame screen to panel above foot of valve panel. Connect appropriate flex leads to terminals G, E, and T on frame. The set is now complete and, assuming that everything has been carried out correctly, it should work first time!

Connecting Up The Batteries

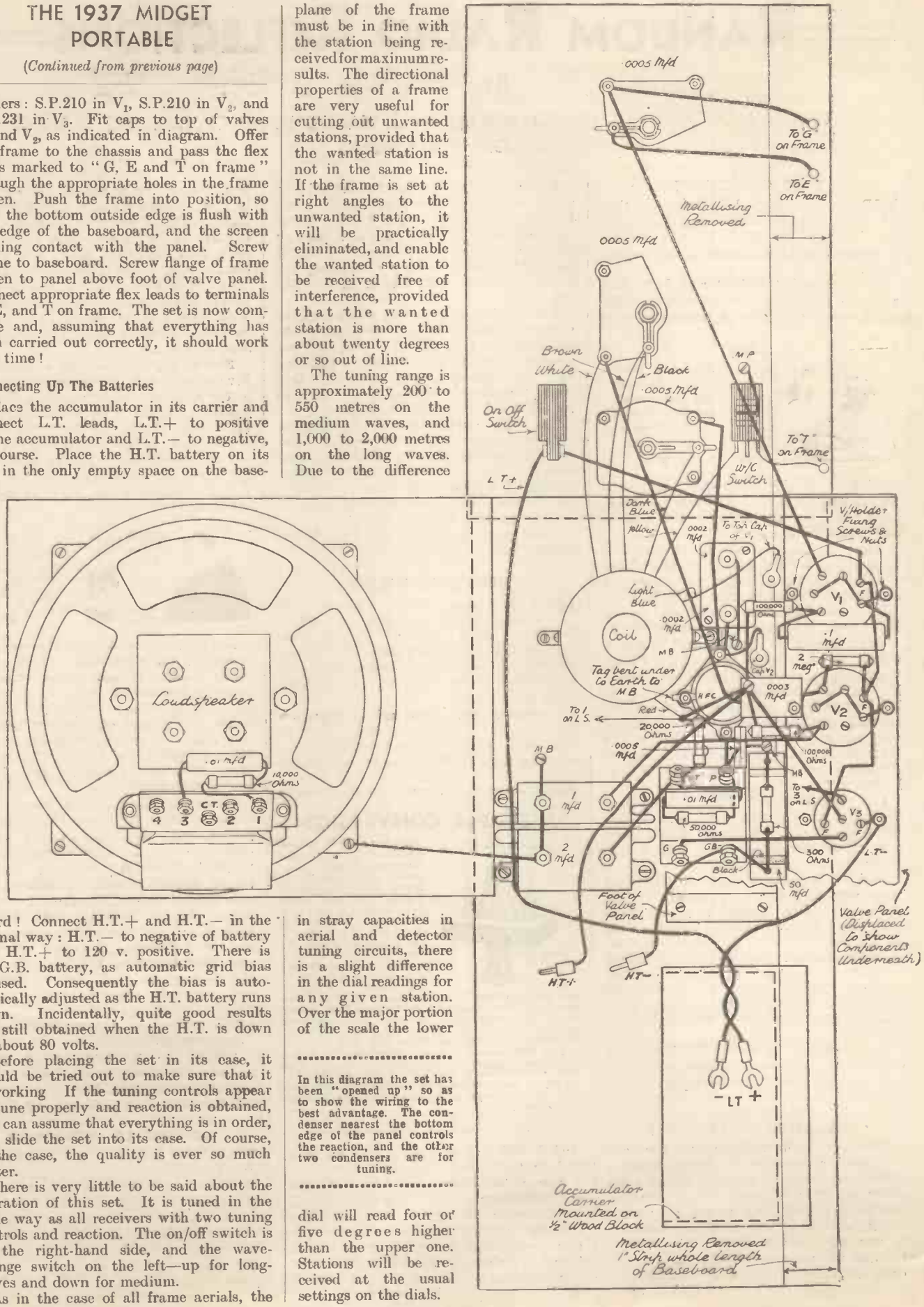
Place the accumulator in its carrier and connect L.T. leads, L.T.+ to positive of the accumulator and L.T.— to negative, of course. Place the H.T. battery on its end in the only empty space on the baseboard! Connect H.T.+ and H.T.— in the normal way: H.T.— to negative of battery and H.T.+ to 120 v. positive. There is no G.B. battery, as automatic grid bias is used. Consequently the bias is automatically adjusted as the H.T. battery runs down. Incidentally, quite good results are still obtained when the H.T. is down to about 80 volts.

Before placing the set in its case, it should be tried out to make sure that it is working If the tuning controls appear to tune properly and reaction is obtained, you can assume that everything is in order, and slide the set into its case. Of course, in the case, the quality is ever so much better.

There is very little to be said about the operation of this set. It is tuned in the same way as all receivers with two tuning controls and reaction. The on/off switch is on the right-hand side, and the wave-change switch on the left—up for long-waves and down for medium.

As in the case of all frame aerials, the plane of the frame must be in line with the station being received for maximum results. The directional properties of a frame are very useful for cutting out unwanted stations, provided that the wanted station is not in the same line. If the frame is set at right angles to the unwanted station, it will be practically eliminated, and enable the wanted station to be received free of interference, provided that the wanted station is more than about twenty degrees or so out of line.

The tuning range is approximately 200 to 550 metres on the medium waves, and 1,000 to 2,000 metres on the long waves. Due to the difference in stray capacities in aerial and detector tuning circuits, there is a slight difference in the dial readings for any given station. Over the major portion of the scale the lower dial will read four or five degrees higher than the upper one. Stations will be received at the usual settings on the dials.



In this diagram the set has been "opened up" so as to show the wiring to the best advantage. The condenser nearest the bottom edge of the panel controls the reaction, and the other two condensers are for tuning.

RANDOM RADIO REFLECTIONS

By Victor King

UNION JACK CUTS OUT FOREIGN STATIONS! :: REACTION AND CRYSTAL SETS :: THOSE OLD COMPONENTS

FLAG SELECTIVITY

DID you hear the B.B.C. broadcast that bit about the magic flag? In case you didn't, I'll repeat it. Anyway, I think it deserves to be ensbrined in the written word.

It appears that a listener in India tied a Union Jack to his wireless mast. The result was that all foreign stations stopped

★

He tied a Union Jack to his mast and all foreign stations stopped coming in on his short-wave set.

★

coming in on his short-wave radio set. And he could hear only the Empire stations, louder and clearer than ever and without any interference.

After the Coronation decorations had been dismantled in his town he pulled down the Union Jack and the foreign stations and all the interference at once swept in.

This was given as an item of news by the B.B.C., and no comment was made.

Mind you, I should feel very diffident about making any comment. Funny things happen in this jolly old radio of ours. For instance, I remember a man living in Leeds, who built himself a straightforward two-valve set. But he was able to receive only one station on it. And that wasn't his local station as you might think, but an American medium-wave station. W G Y, I think it was.

Can you beat that? I know that this is absolutely true, because that miracle set-builder communicated with "P.W.," who were sufficiently intrigued to send a man along to examine the outfit.

And the investigator reported back that there was no hokey-pokey about it. The set simply wouldn't take a squeak from anywhere day or night—except from W G Y, of the United States of America, at full loudspeaker strength, just as though it were next door. That went on for about a month. Then the set was dismantled during some tests, and when again brought into commission it acted quite normally.

That business cured me for all time of disbelieving anything, however strange.

So although that Union Jack yarn sounds just too fantastic, well——

OSCILLATING CRYSTAL SETS

SOME seven or eight years ago one heard a great deal about reaction with crystal sets. That may sound a bit potty to some of you younger readers, but it is a fact. By means of special crystal detectors, coils and little batteries it was said that a crystal circuit with reaction was not only possible but actually could be made by anyone.

For some reason or other I didn't achieve much success myself in that direction, but I seem to remember that a good many amateurs did. If there happen to be any of them reading this paragraph I would be mighty grateful if they would drop me a line telling me what sort of results they got.

I am toying with an idea which requires a reaction effect, but not necessarily the amplification that can be obtained from a valve in this way. If it could be obtained with the relatively simple apparatus that these "oscillating crystal sets" used to use, it would be a distinct advantage.

The only circuit that I can unearth fails to give even the tiniest squeak, however I wangle it. All those reaction crystal sets were pretty tricky outfits though, I believe, and I have a vague recollection of experimenting with them for ages to get only fleeting effects.

However, perhaps someone with a better memory can help me out.

REGARDING VALUES

HOW far radio manufacture has advanced during the past few years! It doesn't seem so very long ago that experienced constructors ignored the figures printed on components and either measured their values themselves or got some friend to do it for them.

Condensers with ·0003 mfd. stamped on them might be anything from ·0001 to ·01, and 2-meg—so-called—resistances, anything from 100,000 ohms to 5 megohms.

A SIMPLE CONVERSION

There must be many constructors who number among their spare components at least one two-point switch of the type illustrated in this sketch. Frequently the need arises for a three-point switch, as for instance, in certain wave-change arrangements and in circuits employing variable-mu valves where it is necessary to break the grid-bias connection as well as the L.T. when switching off the set to prevent the grid-bias battery from slowly discharging itself through the potentiometer resistance element.

The conversion of a two-point switch into a three-point type is a simple procedure. The only modification required is the addition of an extra lead which can be clamped beneath the nut through which the spindle passes, as shown.

And I really have encountered errors as bad as that. But, of course, there were a few manufacturers who were turning out very accurate stuff. Nowadays, though, such are in the great majority. Thus has the mass-production of radio gear advanced. You pay very much less for it and get a vastly superior quality.

All this is by way of being a prologue to a warning not to use old bits and pieces in your modern circuits, unless you know their pedigree pretty accurately. There appears to be an enormous lot of cheap radio stuff about just now. Just where it comes from, I don't know. Maybe, it is from old sets that have been accepted in part exchange and subsequently broken up. Well, some of it may be quite O.K., but, on the other hand, I happen to know that some of it is not.

How do I know? Because I bought some. Five bobs' worth from a second-hand shop in the East End of London. And I got a bargain. It was a boxful, assorted. One of several in the window. There were three grand old heavy-duty switches which just fitted in with some gear I am assembling. I'd have paid five bob each for the things. It was seeing those that made me lay down my money.

★

"The set wouldn't take a squeak from anywhere day or night—except from W G Y...."

★

As for the rest of the stuff, that was mostly just junk, and quite useless junk at that. Fixed condensers that would have made passable resistances, and resistances that read infinity on my "megger." One little thing that looked quite like a grid leak and had "2 megs." hopefully stamped on it proved to be nothing but a small black tube of "muckite" with a brass cap on each end.

There may have been a "pencil line" element drawn in some time and later rubbed out. The prize was a variable condenser which now reposes in the "P.W." Research Dept.—if the lads therein haven't thrown it into a W.P.B.

It seemed to be O.K., though the vanes swung rather loosely. But the only connection between the moving vanes and their terminal was via the spindle and its bearing at one end. So much dust had got into this that no contact as such existed. And so cunningly bad was the design that if you swung the vanes a million times it wouldn't have done any "self-cleaning."

A fault like that might not be spotted by every constructor. That's why I say you might buy trouble if you fall for a bargain offer in old components.

ADVICE TO INVENTORS

THIS is the title of a book published by Frederick Warne and Co., Ltd., at 2s. Written by an old friend, K. Trevellyck Hardman, it deals with the "Pitfalls in the Sale and Protection of Inventions," and should be read by all actual and potential inventors. I hope to be able to discuss this interesting work at greater length on some future occasion.

MARCONI—THE MAN AND HIS WIRELESS

Chapter V—AS TRIUMPHANT AS A CAESAR

Marconi reveals new possibilities for his invention—He reports yacht races off Irish coast by wireless—Queen Victoria invites him to Windsor Castle—Messages a Queen wanted sent and received—Royalty awed by wireless—An interview on the outlook—Defying the earth's curvature—Fooling the theorists—He discusses directional waves—First wireless service for lightships—Italy recognises Marconi and begs him to return—Patriotically he heeds the call.

MARCONI'S renown was spreading. Newspapers were telling more and more about the young Italian and his work. New commercial possibilities were foreseen almost daily for the invention, in fact, the applications of wireless to business were featured in predictions as well as further scientific advances. For example, why should wireless not speed the news? It could flash dispatches from remote regions beyond the reach of telephone, telegraph and cable, and in more civilized areas the ether might supplement them.

Marconi saw the possibilities and he gave an inkling of what his invention might do in this respect, when in July, 1898, he accepted an invitation to wireless bulletins of the yacht races off the Irish coast.

Already he had conducted a series of experiments under the patronage of a French Commission between a station he built at Wimereux, France, another at South Foreland Lighthouse and a third on the French battleship Ibis. Both transmitters sent messages to the Ibis, the replies from which proved beyond doubt that messages could be sent and received from a station in motion.

It was the *Daily Express* of Dublin that introduced a new fashion in newspaper reporting by arranging to have the races observed from a steamer, the Flying Huntress, used as a mobile station from which Marconi should describe the progress of the yachts.

The wireless men were still labouring under the idea that the higher the aerial the better would be the results, so from a 75-foot mast they suspended an aerial wire, which they figured would radiate messages to Kingstown, even while the steamer was twenty-five miles off shore.

The receiving mast at Kingstown was 110 feet high. As fast as the bulletins were received they were telephoned to Dublin, enabling the *Express* to print full accounts of the contest as soon as the races were over, and while the yachts were far beyond the range of telescopes on shore. During the regatta more than 700 bulletins were broadcast to the printing press.

If wireless had failed in this test of its career the Press might have lampooned it. But Marconi succeeded and won the backing of a powerful agency—the newspapers. Editors realised that wireless brought them news while it was still news on the spot where the event happened. It was not long after this that Marconi was invited by Queen Victoria to establish communication between Osborne House on the Isle of Wight, and the Royal Yacht Osborne with the Prince of Wales aboard, in Cowes Bay. The Queen was anxious for frequent bulletins in regard to the Prince's injured knee. Marconi lost no time in installing the equipment. Within sixteen days more than 150 messages of a strictly private nature were transmitted with success, bringing new laurels to the young man from Italy and his so-called toy of the air.

By permission of the Prince of Wales several of the messages were made public:

August 4, 1898.

From Dr. Tripp to Sir James Reid.

H.R.H. the Prince of Wales has passed another excellent night and is in very good spirits and health. The knee is most satisfactory.

August 5, 1898.

From Dr. Tripp to Sir James Reid.

H.R.H. the Prince of Wales has passed another excellent night, and the knee is in good condition.

These messages were intercepted by a vertical antenna suspended from a 100-foot mast at Ladywood Cottage on the grounds at Osborne House. The aerial on the yacht was attached to the mast, 83 feet above the deck. The lead-in wire ran down into the saloon, one corner of which served as a wireless cabin.

Royalty aboard, notably the Prince of Wales, the Duke of York and the Princess Louise, anxiously watched the instruments that were talking back and forth with the shore. They marvelled most at the fact that signals could be sent and answers received while the yacht was in motion. And even rain or fog did not stop them.

In the meantime the Needles station was becoming quite famous. Overhanging Alum Bay was the Needles Hotel alongside which towered Marconi masts braced against the winds as new symbols of safety for the men who went down to the sea in ships. From the halyard a wire dangled to a window of the wireless room, where seashore visitors caught their first glimpse of the flashing sparks as they enacted the mystery of talking through space.

Two matter-of-fact young men, whom a visitor described as doing something simple, adjusted the instruments. One of them worked a long, black-handled key up and down. Every time he touched it a bluish spark crashed and leaped an inch or more between two metal balls of a spark gap atop a large induction coil. He was saying something to the operator at Poole, eighteen miles away. It was a noisy

(*Continued overleaf.*)

AN HISTORIC OCCASION

This photo was taken in 1930, when the great inventor spoke direct to Australia by radio from his yacht, the "Elettra," at Genoa. His speech was picked up by the Sydney broadcasting station and relayed by loudspeakers installed in different parts of the city.

MARCONI—THE MAN AND HIS WIRELESS—*Continued*

machine but that seemed to add to the witchery and romance of wireless.

A short-lived spark jumped the gap when a dot was the signal. The dash was a longer stream of the spark. One terminal of the induction coil was linked with the acrial lead-in and the other knob was connected with the "earth" to form the so-called "ground." Press a key, flash a spark and it was picked up miles away.

That's all there was to wireless in the beginning!

A guest at the station looked out across the water, which was dull under a grey sky. He found something uncanny in the thought that the young man at the key, who seemed as far as possible from a magician or supernatural being, was flinging his words across the waste of sea, over the schooners, over the feeding cormorants to the dim coast of England yonder down the map.

It all seemed so simple, but not so easy to teach the world how to do it.

Marconi was busy now at the Poole station, where he and Dr. Erskine Murray, one of his assistants, were trying to unravel more of the ethereal mysteries. It was there that Cleveland Moffett, an American correspondent, found them; Marconi and his electricians granted one of their first interviews.

"How about the earth's curvature?" inquired Moffett.[1] "Or doesn't that amount to much just to the Needles station?"

"Doesn't it though," exclaimed an engineer. "Look across and judge for yourself. It amounts to 100 feet at least. You can only see the head of the Needles lighthouse from here, and that must be 150 feet above the sea. And the big steamers pass there hulls and funnels down."

"Then the earth's curvature makes no difference with your waves?"

"It has made none up to twenty-five miles, which we have covered from ship to shore; and in that distance the earth's dip amounts to about 500 feet," replied the electrician. "If the curvature counted against us then, the messages would have passed some hundred feet over the receiving station; but nothing of that sort happened. Therefore, we feel reasonably confident the Hertzian waves follow around smoothly as the earth curves."

"And you can send messages through hills?" asked Moffett.

"Easily. We have done so repeatedly."

"And you can send in all kinds of weather?"

"We can."

"Then if neither land nor sea nor atmospheric conditions can stop you, why can't you send messages to any distance?"

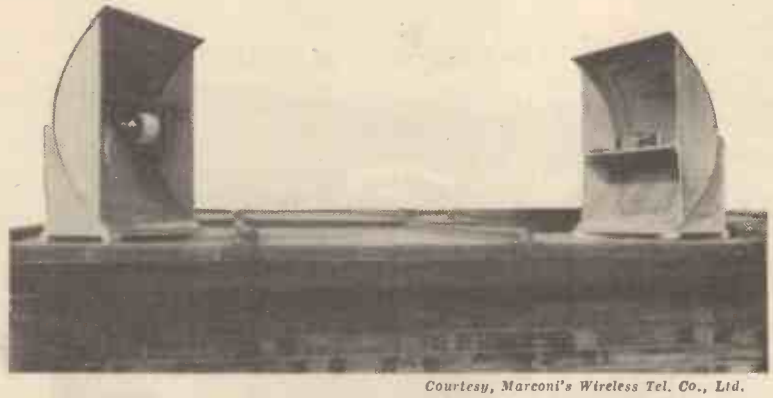
"So we can, given a sufficient height of wire. It has become simply a question of how high a mast one is willing to erect. If the height of the mast is doubled, a message can be sent four times as far; if trebled the message will go nine times as far. In other words, the law established by our experiments seems to be that the range of distance increases as the square of the mast's height. To start with you may assume that a wire suspended from an eighty-foot mast will send a message twenty miles. We are doing about that here."

"Do you really think it would be possible to send messages from Eiffel Tower to New York through the ether and get an answer without ocean cables?"

"I see no reason to doubt it," answered one of the Marconi men. "What are a few thousand miles to this wonderful ether, which brings us our light every day for millions of miles?"

Royalty as well as news correspondents was becoming deeply interested in Marconi; wireless in war would be ideal for quick communication, unhampered by the enemy. Wires could be severed but there would be no means of cutting, shooting or blasting electromagnetic waves. Various nations were casting envious eyes on the Italian and his wireless.

Interviewers invariably asked: "In what direction do you expect your invention to be first utilised?"



Courtesy, Marconi's Wireless Tel. Co., Ltd.

A replica of Marconi's first experimental apparatus which used parabolic reflectors for radio transmission and reception. With such apparatus he demonstrated in Italy, in 1895, the possibilities of beam transmission, and confirmed his results before representatives of the British Post Office and military authorities at Salisbury Plain in September, 1896, when he communicated over a distance of 1½ miles.

"The first may be for military purposes, in place of the field telegraph system," replied the inventor. "There is no reason why the commander of an army should not be able to communicate easily with his subordinate officers without wires up to twenty miles. It would be equally useful for the admiral of a fleet."

Usually he was reminded that his system was not secret. The queries of the doubting public or military men, however, did not discourage him. He was aware that it was natural for many to believe lack of secrecy in his system was a drawback to its practical use on a large scale. Who would want their private messages eavesdropped upon by anyone who owned a receiving set and understood the code? What good would such a blatant system be in wartime? The enemy could listen-in!

The inventor retaliated that admirals, generals and the public could always protect themselves by sending messages in cipher. Furthermore, the range of the signals might be restricted by lowering the aerial mast or by reduction of power output. On the other hand a boat in distress would want everyone to hear its call. Laws might be passed to protect the contents of a commercial or even a private communication.

"I believe one of the greatest uses to which these instruments will be put will be signalling in wartime," repeated Marconi, little realising that in seventeen years a great conflict involving twenty-three nations would devastate the world while thousands of listening-in posts eavesdropped on every word and cipher that wireless carried through the heavens.

Do you use stronger induction coils as you increase the distance of transmission? he was asked.

"We have not up to the present, but we may do so when we get into the hundreds of miles. A coil with a 10-in. spark, however, is quite sufficient for any distances under immediate consideration."

Do you think you will be able to send directed messages very much farther than you have sent them already?

"I am sure we shall," replied Marconi. "It is simply a matter of experiment and gradual improvement, as was the case with the undirected waves. It is likely, however, that a limit for directive messages will be set by the curvature of the earth. This seems to stop the one kind but not the other."

And what will be the limit?

"The same as for the heliograph, fifty or sixty miles."

And for the undirected messages there is no limit?

"Practically none. We can do a hundred miles already. That only requires a couple of high church steeples or office buildings. New York and Philadelphia with their skyscraping structures, might talk to each other through the ether whenever they wish to try it. And that is only a beginning. My system allows messages to be sent from one moving train to another moving train or to a fixed point alongside the tracks; to be sent from one moving vessel to another vessel or to the shore, and from lighthouses or signal stations to vessels in fog or distress."

Marconi foresaw one notable case where the directed waves might serve humanity.

"Imagine," he said, "a lighthouse or danger spot in the sea fitted with a transmitter and parabolic reflector, the whole kept turning on an axis and constantly broadcasting impulses in the ether—a series of danger signals.

"It is evident that any vessel equipped with a receiver could get warning, perhaps by the automatic ringing of a bell long before her lookout could see a light or hear a foghorn. Furthermore, as each receiver gives warning only when its rotating reflector is in one particular position—that is, facing the transmitter—it is evident that the precise location of the alarm station would at once become known to the mariner. In other words, the vessel would immediately get her bearing, which is no small matter in storm or fog."

The English Lightship Service, having faith in Marconi's predictions, authorised

(*Please turn to page* 408.)

[1] *McClure's Magazine*, June, 1899.

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

"TELEFRAMES"

Items of general interest

AMERICAN TELEVISION FOR RUSSIA

THE Soviet television centre is expected to start up at the end of this year.

The transmitter, we hear, is to be supplied by an American firm, and is identical with gear which has already had considerable experimental testing on the air.

If the gear is good enough to start a service in Russia, Americans will be even more puzzled to decide just what is the real cause of the hold-up of a public service is U.S.A.

* * *

POINTS IN THE R.C.A. SYSTEM

The following are interesting items concerning the experimental studio broadcasts of television being carried out by the R.C.A.–N.B.C. combination in America.

Demonstrations are prefaced by a short film showing the insignias of R.C.A. and N.B.C. against a background made up of Radio City skyline, and announcing "a demonstration of N.B.C. Telepictures."

A small red signal light, visible from both the front and the back of Iconoscope electron camera, flashes red as soon as the Iconoscope "comes on the air," to warn performers and others in the studio that the camera is joined up to and modulating the vision transmitter.

Engineers use light meters to test whether various parts of the face, and so on, are reflecting sufficient light.

Peculiarly enough, the camera used for close-ups is always farther from the subject than the "full-length" camera. This is because the "close-up" camera is fitted with a tele-photo lens.

* * *

A FUTURE PROBLEM

The reception of television signals at distances over 50 miles from the station is considered good, if extraordinary, these days. In the future, with many stations working, it will probably be good if it can be avoided, otherwise the problem of interference may well prove as big as that of television itself.

* * *

THE MURPHY RECEIVER

Here are one or two technicalities concerning the Murphy television receiver which was referred to last week.

A common frequency charger is employed for the sound and vision signals.

The time bases are arranged on the balanced gas-discharge scheme. Each employs one thyratron and two valves.

Two distinct chassis are to be employed. One will be suitable for use up to fifteen miles from Alexandra Palace, and the other for distances over fifteen miles. The latter is a more sensitive unit, but does not cover quite such a wide band of frequencies as the other chassis.

* * *

A HUMAN CONNECTION

A prominent American radio journal, in discussing what the radio engineer of the future should study if he is to specialise in television, places considerable importance on a thorough knowledge of the human eye. The similarity between the human eye and television is already considerable, and it is suggested that there are possibilities of future developments coming from a further adoption of the human-eye principles.

* * *

SPARE THE TUBE

Users of television receivers will often find that when a bit of adjustment is called for in the picture, the desired result can be achieved with the contrast control as well as the brilliancy control. When this is the case always use the contrast control if it would mean increasing brilliancy to get the desired effect with the brilliancy control.

The life of the tube will thus be lengthened. It is always desirable to keep brightness down as much as you can without spoiling the pictorial result.

AN EFFICIENT LAMP REFLECTOR

IN experiments associated with light-cell operation and television purposes, it is usually necessary for the experimental light-source to be provided with some type of reflector in order that as many as possible of the illuminant's rays may be made to converge upon the experimental apparatus.

The reflector part of this gadget is made from a cocoa or similar tin.

For many such purposes, an excellent reflector may be made entirely without cost. Take a large cocoa or coffee tin, remove its lid and in the metal base of the tin cut a circular aperture large enough to enable the article to be slipped over an ordinary lamp-holder and to be secured in position by means of an ordinary retaining or "shade" ring. Now, by means of a pair of shears or a strong pair of scissors, cut away exactly one half of the coffee or cocoa tin, leaving, of course, the circular base intact.

The reflector will now be complete. Such an article will be seen in the accompanying photograph, and, from a glance at the illustration, it will be evident that a reflector of this type has many inherent possibilities in connection with photo-cell, light-ray and allied experiments.

A VISIT TO THE TELEVISION SHOW

AT long last London is to become really television conscious. At the Science Museum, at South Kensington, has opened a special television section showing the growth of television during the last ten years, and, more important still, giving really good demonstrations of modern television.

I went to a "private" view the other day. I have been since to a "public" view, and am still pondering over the definition of "private." There were about 6,000 people at that first view, and I saw and heard a great deal more on my second visit.

It is a fine show. With one exception the whole thing is laid out with a good eye to educational value and to the necessary publicising of commercial television.

Demonstrations on Actual Programmes

There are eight booths in which modern cathode-ray receivers can be seen working either on films transmitted before your very eyes in the upper room (which is mainly devoted to theoretical demonstrations) or direct from the Alexandra Palace. Then there is a miniature theatre in which the Scophony system of projected television can be seen.

The eight booths in which normal commercial receivers are to be seen—but without their trade names—are occupied by Cossor, H.M.V., Ferranti, Baird, Marconi, Murphy, G.E.C., Pye: and they all give a very fine show. I must not say here which I thought was the best, but if you go and look you will be able to draw some very useful conclusions regarding the brightness and clarity of the various receivers.

They were all good, however, and I have not the slightest grumble about any of them. The film and the radio-ed B.B.C. stuff from Alexandra Palace both came over perfectly, and if there is anybody you know who is still sceptical about television for goodness' sake drag him along to the museum and let him see for himself.

I am now going to take a certain firm to task about one of the exhibition pieces. The firm is Baird, and while their receiver downstairs gives a perfectly clear and brilliant reproduction of modern television they do all they can—unconsciously, of course—to crab television by their upstairs demonstration—at least that is how it strikes me.

The Upstairs Section

Up in that portion of the show are all sorts of "working models." We have the Ediswan tube, showing in a very clear manner how the thyratron valve makes the spot jump backward after every line has been traced, and the tube "ticks over" perfectly. We have the Cossor full-size film transmitter working to supply the downstairs demonstrations and at the same time showing how the television programmes are monitored.

We have a Baird show in which the old-fashioned 30-line television with disc scanning is demonstrated as the beginning of the modern science. All that is good and useful.

Yet at the end of the Ediswan stand, with merely a notice that states it is Baird cathode-ray reception, we have the same old 30-line transmission that you can see in an adjoining booth as an historical relic, but being reproduced by a cathode ray tube.

(*Please turn to page* 408.)

SEEN ON THE AIR

NEWS AND VIEWS ON THE TELEVISION PROGRAMMES BY OUR SPECIAL RADIO-SCREEN CORRESPONDENT

L. MARSLAND GANDER

IF I followed the example of a distinguished colleague I should now retail my adventures on a motor-tour through six European countries, during which I covered 2,500 miles and a good time was had by all. However, I feel that I am not yet so exalted that while professing to write about one thing I can devote an article to something else and still satisfy my public.

Therefore my subject must be television, and I attack it with renewed zest after two weeks' absence. I returned to London to find television entering upon new and more exciting phases. I found Wimbledon tennis on the screen in my home and a first-class television exhibition attracting between 2,000 and 3,000 people daily in the West End.

The Television Exhibition at the Science Museum is dealt with elsewhere in these columns, but I feel impelled, with the Editor's permission, to return to the subject to pay my personal tribute to the organisers of the exhibition and particularly to Mr. G. R. M. Garratt, of the Science Museum. It was urgently necessary that somehow or other television should be presented to the public in an impartial way and on a non-commercial basis. The Science Museum Exhibition recognises not only a duty to the exhibiting manufacturers, but also a wider duty to the public. There is no attempt, as at the last Radio Exhibition, to conceal the names of sets. There is also as comprehensive an historical section as could, I should think, be assembled anywhere in the world.

Queues to See Demonstrations

Long queues of visitors have been waiting daily at demonstration times to see the eight cathode ray receivers and the big screen Scophony receivers. This is the first full opportunity given the public for a comparison of results. What interested me most was that of the eight different cathode ray sets, five showed a reflected picture and three a direct picture on the end of tubes mounted horizontally.

That is the great problem of the moment for the manufacturer. Shall the tube be mounted horizontally or vertically? If the tube is vertical and a reflected picture is shown then the whole apparatus can be self-contained in a cabinet little larger than a radiogramophone. But, says the other school of thought, there is considerable loss of light in the reflected picture.

To overcome the loss of illumination manufacturers have lately been concentrating on mirror improvement. I now have it on the best authority that a front-silvered mirror is 97 per cent. efficient. This seems to me to swing the balance in favour of the reflected picture. But on the whole, I think, on the evidence of practical results as appraised by the eye we must reserve judgment.

The Scophony picture is undeniably impressive on the screen 5 ft. by 4 ft. I have already described it for readers of "P.W.," but it must be remembered that the pictures seen at the Science Museum are actually being picked up over the air from the Scophony transmitter at Campden Hill, while I saw a land-line demonstration. The Scophony transmitter which is sending these excellent pictures to Kensington was expressively described to me as of "one flea power." Actually, it is using 100 watts, little enough to overcome local interference.

The Scophony Pictures

Visitors should clearly understand that the Scophony picture is on a definition of 240 lines at 25 pictures a second. This is not the London standard laid down by the Television Committee and used by the B.B.C. from Alexandra Palace. As I have already hinted in these notes, the problem of bringing Scophony up to the 405-line standard is connected with the synchronising signals transmitted from the Palace, and the B.B.C. is already working on the subject. There is every hope of a solution and may it be a speedy one, in the best interests of television.

Of the eight cathode ray sets I have tested four, built by the same manufacturers, namely the G.E.C., E.M.I., Cossor, and Baird. Two interesting newcomers are the Ferranti and the Murphy. The Ferranti set shows a direct picture. The Murphy set (reflected picture) is housed in an unusually attractive cabinet, which has several novel features. For instance, it is switched on by raising the lid, and the knobs on the surface of the cabinet fit into special sockets in the underside of the lid. Murphy, in this exhibition model seemed to be using a slightly smaller tube than the most popular size.

It was a stroke of luck for the exhibition organisers that the B.B.C. began its tennis broadcasts from Wimbledon. Readers may recall that I prophesied in these notes that Wimbledon would be the next job for these O.B. vans.

I saw the first day's play at home, and have never watched a programme with more exciting promise. But at the same time the pictures were not so good as those of the Coronation Procession, and I feel that we have not yet seen the best that can be done with Wimbledon. The B.B.C. was using the wireless link for the first time. It is a distance of 12½ miles from Wimbledon to Alexandra Palace. The 1-kilowatt transmitter was on a wavelength of 5 metres.

The Wimbledon transmissions necessitate breaking into fixed studio programmes from time to time. This is a more serious matter than interrupting sound programmes, and is one of the many minor perplexities of television. A carefully rehearsed visual item can be pretty thoroughly wrecked by haphazard interruption. Naturally, Wimbledon must take preference, but the B.B.C. will have to devise a light orchestral feature programme which will stand the shocks of sudden fade-outs and not offer too sad a contrast when restored to the screen.

And here I must register an emphatic protest at that abomination—the word "Interval"—flung on to the screen as a dismal anti-climax after every dip into Wimbledon. I shall count it a big step forward when that word and the painful gap disappear.

The first match I saw was that between Bunny Austin and the Irish giant, Rogers. Two (alternate) views were generally shown, one of Austin's half of the court with England's No. 1 in action and the other a full view of the court from greater range. The long distance shot made the court and players too small; the closer view, though it cut off half of the court up to the net, was more satisfactory. At the time of writing I do not know whether it is possible, by means of telephoto lenses, to give still closer views of the players, but this would be an improvement.

Proper Use of Television

The other match I saw, that between Crawford and Menzel, was decidedly better from the point of view of television. I had a vivid impression of Crawford's effortless style and the leisurely movement which seems to produce such devastating results.

Still, whatever criticisms I may have made, I am certain that this is the proper use of television, the ideal type of programme. As the last stages of the tournament approach, interest in television will be built up, until the final may repeat the triumph of the Coronation.

Wimbledon is extending the hours of transmission. On the first day there was to have been an additional transmission at 4.30, but owing to local interference in the neighbourhood of Alexandra Palace this was cancelled. The extra hour of film in the mornings will not be introduced until after the television holiday.

MR. JOHN SCOTT-TAGGART LEAVES FOR U.S.A.

TO STUDY LATEST AMERICAN DEVELOPMENTS IN RADIO AND TELEVISION

Articles in "P.W." will continue as usual

Readers will be interested to hear that Mr. John Scott-Taggart recently left for the United States in order to study at first hand the latest developments in television and radio generally. He will be returning before the autumn. He has in hand an important work on television and has been making studies recently on developments in France, Germany and Italy by visiting those countries. Readers can look forward to deriving the benefits of the thorough preparation that precedes all the writings of our eminent contributor.

This is Mr. Scott-Taggart's fifth visit to the United States, where he is almost as well known in radio circles as in this country. While he is away his articles for "Popular Wireless" will continue as usual.

TECHNICAL JOTTINGS

(Continued from page 388.)

some considerable time. Usually the effect is that the rotation of the control knob in one direction reduces the bass and thereby, apparently increases the treble range, whilst the rotation in the opposite direction causes the opposite sort of effect. If you are not already using one of these components it is well worth while to consider it, especially as it can usually be fitted without any modification of the existing circuit.

Slow-Motion Drives

Most sets nowadays are fitted with vernier or slow-motion tuning dials and, indeed, this is very necessary in view of the high selectivity prevailing in present-day sets. Some of the slow-motion dials used are quite elaborate; from an engineering point of view, works of art. For short-wave tuning it is if anything more necessary to have very accurate adjustment of the tuning than it is for medium or broadcast wavelengths. The reason for this is that with a short-wave receiver you are mostly working about the point of oscillation, so requiring you to give extra care to searching for stations.

Short-Wave Tuning

One of the things which first strike people who take up short-wave reception, after having been accustomed only to broadcast reception, is the extra care and delicacy involved in tuning. It takes a bit of getting used to and at first may seem rather tiresome.

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

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

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

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

But once you get into it you will find that, in view of the very large number of stations which can be picked up and the enormous distances over which reception can in favourable circumstances be effected, short-wave reception has an interest all of its own.

Looking Back

Looking back ten years to the early days of broadcasting, one would hardly have thought in those days that within the space of a few years such marvellous value in radio receivers could be placed before the public. I can distinctly remember a friend of mine about ten years ago paying £60 for a well-known receiver which I regarded at that time as nothing less than plutocratic. It was necessary to pay that sort of price in order to get what was then regarded as a really good set.

To-day you can obtain a set for ten, fifteen, twenty pounds which will do very many times as much as this set costing £60 did then.

Result of Mass Production

These great improvements are not only due to the invention of all kinds of new highly efficient valves—although that has contributed very greatly to the extra performance which can be offered—but also to a large extent are due to the marvellous way in which manufacturers have got down to mass production and have simplified the construction of sets so as to cheapen production costs. It is difficult to make an actual estimate, but I should think it is no exaggeration to say that for every pound spent on a radio set to-day you get in efficiency performance and general service and satisfaction at least twenty times what you got for your pound ten years ago.

Choke Coils

A point about choke coils used for high-tension smoothing is that they should be able to maintain their inductance whilst actually passing the intended current. Extra inductance usually means increasing the D.C. resistance and, of course, you cannot afford to go too far in this direction. Therefore, you want to be careful in your selection of a choke, choosing one which will give you a sufficiently high inductance value for the purpose—and the choke must be so designed that it will maintain this value when passing its rated current—and at the same time will not have too high a D.C. resistance.

Mechanical Hum

A further point with regard to the choke—and for that matter the same applies to a transformer or any other similar inductive component—is that the laminations of the core, or whatever form the core takes, should be really tight. There is nothing more annoying than the transformer or such-like component which gives out a steady hum in unison with the A.C. frequency, owing to the laminations not being properly screwed up—or screwed *down*.

CLUB NEWS

SOUTHALL RADIO SOCIETY

A successful Direction-Finding Contest was held near Oxford on June 13th, when in spite of terrible weather conditions more than thirty competitors from radio clubs all over the south of England took part.

Mr. H. G. Swann (Southall) repeated his success in the recent Golder's Green Society's contest, and the other teams in the first six were led by Messrs. Black (Golder's Green), Leister (Golder's Green), Rapsey (Southall), Childs (Golder's Green), and Pye Radio (Cambridge).

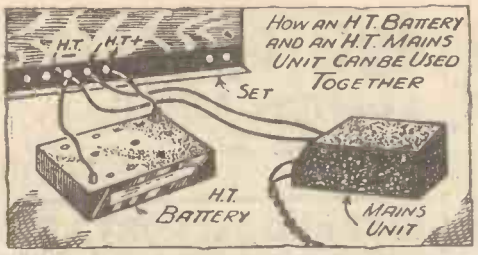
The transmitter was operated by Mr. Douglas Walters (G 5 C V), the Southall President, while the judging was performed by Mr. George Exeter (G 6 Y K) and Mr. Tyler.

The Southall Society is now engaged in a series of experiments designed in an attempt to explain the peculiar effects felt when direction-finding on waves of the order of 40 metres.

Readers who feel they can assist should write to the Hon. Sec., MR. H. F. REEVE, 26, GREEN DRIVE, SOUTHALL.

PRACTICAL POINTERS

Hints and Tips for the Constructor



How you can combine a mains unit and dry battery for supplying your set with H.T.

MIXING YOUR H.T.

IT is possible to run one set with several different supplies of H.T. at the same time. This fact is one which should be thoroughly understood by all listeners, for it enables all kinds of extemporary arrangements to be made if necessary.

Curiously enough, it would appear that many listeners consider it difficult, if not actually dangerous, to employ two H.T. batteries to boost up the output of a mains unit.

We say curiously because all whose acquaintance of radio goes back a decade or so know that in the early days the problem was to run more than one valve from a single source of H.T. supply.

At first each valve in a three-valve set, for example, had to have its own independent H.T. supply, and you may encounter old diagrams showing this.

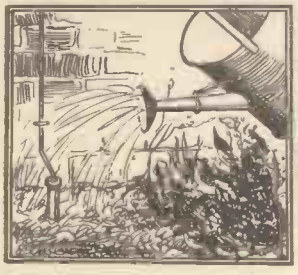
Arrangements Possible

Of course, H.T., especially if derived from the mains, needs to be handled carefully. But, given reasonable care, it may amaze many that quite a number of mixing arrangements are possible.

Let us now leave generalities and see what can be done in particular instances. Supposing we have a large set and a small mains unit which is incapable of supplying all the H.T. current needed.

To delay the obvious but initially rather expensive step of purchasing a larger mains unit, one or more of the valves can easily be fed by an H.T. battery while the small mains unit continues to supply the others.

It does not matter a scrap what type of unit is used. A.C. or D.C. All you have to do is to connect one of the H.T. plus terminals in the set to a plus socket of the H.T. battery, and the minus socket of this to the H.T. minus terminal of the set. (See our illustration of the arrangement.)



During the summer it pays you to keep an eye on your earth efficiency. If you use an earth tube, saturate the surrounding soil with water when the weather is dry.

You will naturally choose that H.T. plus terminal which feeds a suitable valve or valves. You will have to bear in mind the voltage required and current taken by the various valves, and arrange the battery and unit in accordance with their individual output potentialities.

It is better to use the battery for H.F. and/or detector valves, especially if there is any "hum," because this will be less pronounced if the mains unit feeds the L.F. end of the set. That is, in most cases.

But the most useful of all mixed H.T. schemes is when it is required to boost up the available H.T. voltage.

Perhaps there are D.C. mains of 110 volts and a round 150 is desirable for an output valve. But, of course, the battery must be capable of supplying the current demanded by that valve.

The connection is simple. Join the negative of the H.T. battery to the positive output of the mains unit in question and the positive of the battery to the H.T. plus terminal of the set. That is all.

OVERALL RESULTS

AN illustration on this page clearly shows how effectively a poor quality loudspeaker can ruin the results given by an otherwise perfectly sound set.

Three curves are shown, and these are designed to depict the condition of the energy at different points of the outfit.

The set has what is known as a "straight-line output." That is to say, it provides equal amplification to all frequencies. The middle C note of a piano is rendered with the same comparative strength as a top note of the violin or the bottom note of the 'cello.

FALLING OFF

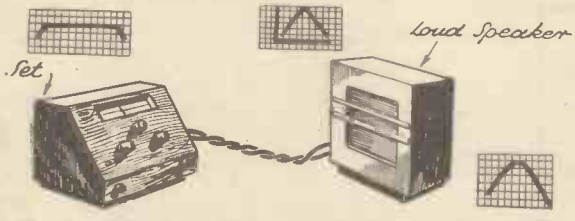
Of course, the "curve" is not absolutely straight, it "falls off" a little at both ends, but it is perfectly straight over the greater part of the useful frequency scale.

The loudspeaker, on the other hand, deals very unevenly with the various frequencies and its curve shows a serious falling off at both ends.

The result is that the set's "straight line" is absolutely mangled. But it is wrong to say that the output of a set can never be better than the curve of its speaker.

Obviously, there may be cases when the output of an inefficient set might be largely compensated for by a loudspeaker giving a kind of "inverse distortion" in comparison with that of the receiver. But it would be in the nature of a coincidence and it is not wise to reckon on that happening. The adjustment of tone in such a way is rather a haphazard method of working.

USE A GOOD SPEAKER

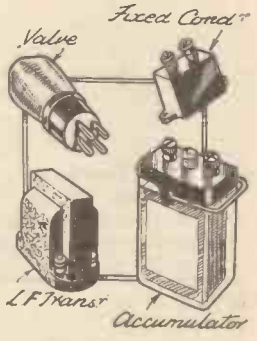


This little sketch is intended to show you how a good set may be throttled by an inefficient speaker. The curves indicate the falling off in the response.

DO RADIO COMPONENTS WEAR OUT?

YES, some components do tend to wear out. We suppose all would in the course of centuries, but most of them will last the proverbial lifetime.

Valves, dry batteries and accumulators are generally reckoned to be the only "perishables" of radio. But they are all accessories.



Which will live longest? What do you think?

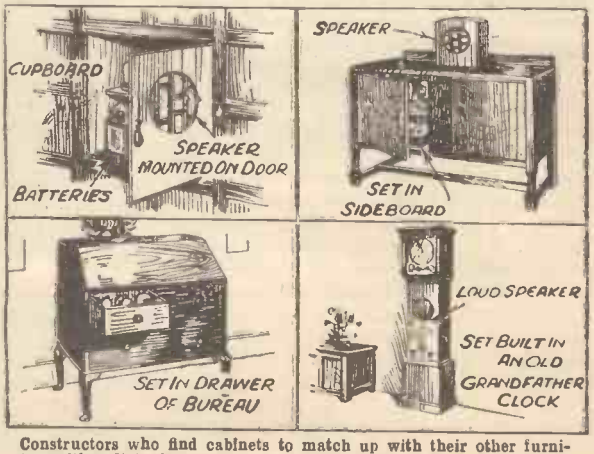
Of the components the only ones to have more or less definite lives are those which are so made that chemical action can take place.

Soldered joints may crystallise, contacts corrode, thin wires break, etc., but these, we suppose, are faults in manufacture. Nevertheless, they do happen.

At one time it was considered that all fixed condensers, except perhaps mica dielectric types, would inevitably decay. And it is true that breakdown could be reasonably anticipated after a couple of years with almost any of the earlier ones.

But we believe modern manufacturing methods make fixed condensers move into the "last for ever" class. And the same applies to L.F. transformers.

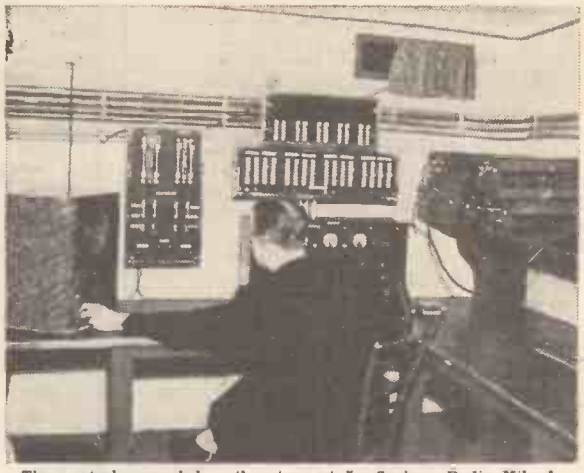
A CHANGE FROM A CABINET



Constructors who find cabinets to match up with their other furniture either difficult to obtain or too expensive, might try one of the schemes illustrated here.

BROADCASTING FROM LA SCALA

The greatest care is taken with the relays from this world-famous opera house



The control room below the stage at La Scala. Radio Milan's chief engineer, Mr. Tutino, is at the controls.

TO broadcast a performance from one of the world's most famous opera houses is no simple undertaking. Reputation built up during the course of years must be upheld. The distant listener must realise that he is listening to La Scala and not just to a relay from any opera. No discordant sound, no whisper from the prompter, no rustling of the music may go over the microphones, as otherwise the impression of a perfect performance might be marred.

For many years the Scala directors refused point-blank to permit performances to be relayed. It was only three years after the opening of the Milan station that the Italian broadcasting company succeeded in obtaining permission to put up their microphones. Puccini's "Tosca" was the first opera to go out from La Scala into the ether. Since then relays have taken place at regular intervals, in fact, as often as once and twice a week during the Scala's short season.

The Secret of Success

To the visitor with technical understanding the apparatus used for relaying the Scala performances may seem primitive compared with equipment used in other European cities. But the Italian broadcasting engineers prefer to leave well alone although they periodically try out new apparatus. But to introduce a new microphone or a new amplifier is a momentous decision, as the once-found balance must not be upset. Experience and personal supervision by Milan's chief engineer are the secret of the successful relays from La Scala. Mr. Tutino is one of Italy's broadcasting pioneers. Formerly a naval officer he joined the broadcasting company at the opening of the Rome station in 1924 and has been at Milan ever since 1925. He has personally monitored every single relay from La Scala. His method is painstaking and exacting: he attends the last rehearsals to be quite sure of the score, and then on the day of the relay he sits down in the little control cabin two stories under the surface of the stage and concentrates on his loudspeaker. He fades the microphones in and out without the help of a score, as he enjoys an excellent memory for music. He believes this to be the ideal method: to have an engineer with musical understanding at the controls and not hamper him with a written score, but to let him know the opera by heart and so leave both hands free for operating.

Six microphones are employed at La Scala: two next to the orchestra conductor, two in the footlights on the stage, one opposite the conductor above the orchestra, and a sixth which is permanently installed under the stage box in the third circle.

A. A. G.

MY SHORT-WAVE ADVENTURES

(*Continued from page* 389.)

I do think it worth while spending half an hour or so juggling with the components. By checking constantly with the theoretical it becomes easy to work out exactly how to place the parts for short wiring.

Underneath my little chassis, at the back, I have bolted the choke and condenser for the output filter. This, I believe, is good practice—anyway, it solved my problem as to where they might go.

Those "Earth Returns"

The drilling of the metal and the bolting down of the parts is a job I personally enjoyed far more than the "woodwork" of panel and baseboard construction. Possibly one feels that one is more of an engineer working with metal, nuts and bolts. To me, anyhow, it has been a great satisfaction.

Then came the wiring up. Having spent so much preliminary time arranging the components, the first part of this job was extremely easy. I got my tuning and reaction condensers wired up in no time—of course, only one lead being needed for each as the earth connection was made automatically by the spindle fixings.

Revelling in the ease with which "earth returns" could be made, perhaps I overdid the business of bolting down short bits of wire from nearby component terminals to the metal chassis. But you must forgive me—it is still a novelty.

When it came to connecting the low-tension-positive terminals of the valve holders together, I refused to use a 2 in. length of my bare tinned-copper wire—

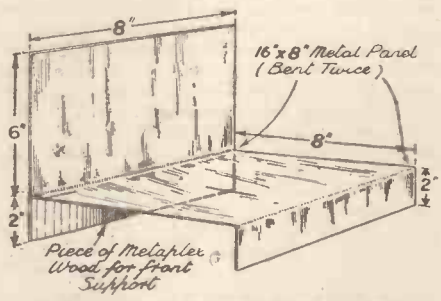


Fig. 3.—Details of the metal chassis referred to by Lionel Chester this week.

instead I took a rubber-covered flex lead "sub-chassis." This rather tickled my fancy, so that at the slightest provocation I dived underneath the chassis with "hidden" leads.

I wish you could see the set now. It looks so utterly devoid of complication. Underneath, of course, there is a bit of a tangle of leads—but does that matter? They are all battery leads and associated connections, anyway. The anode resistance and grid leak for the resistance coupling, by the way, are held "in the air" by short wires, covered with systoflex where they pass through the chassis.

It Worked Right Away

At the last minute I remembered I must make provision for the phone connections. So I fixed two of my baseboard mounted terminals on the wood support at the front of the chassis—and again made sub-chassis connections to the "innards."

Came the fateful test. I don't want to boast—but it worked right away. I seem to be lucky or something. Rome came roaring in on the middle-sized coil—so loudly I wished I had my loud speaker, which is on order still.

I took my aerial direct to the "free" terminal of the pre-set, my earth to the negative terminal of the accumulator. And, of course, I can't be bothered with a filament switch.

With the smallest coil plugged in I twiddled around and, at 52 degrees precisely on my 0-to-180 degrees scale, in came the wonderfully invigorated Wayne station, W 2 X E on the 16-metres band. I followed the Thursday morning broadcast by Columbia from a school where the kids certainly know how to sing the old songs.

No Hand Capacity Effects

A few comments. The rebuilding of the set into a chassis has definitely proved worth while. Hand-capacity effects are now just *nil*. And I dare to suggest the sensitivity is greater. With the H.210 valve I get a bit of a "squawk" with reaction—but with the D.210 there is no trace of the trouble, although there is a slight loss of signal strength.

Well, for the moment, I am a hot fan for the all-metal type of construction. I feel I am on my way now, with a background of sound practical experience that will stand me in good stead for the shape of things to come. Exactly what shape they will be I don't know. But you shall hear, all in good time. Meanwhile, I should like to hear from anyone interested in my adventures.

MARCONI—THE MAN AND HIS WIRELESS

(*Continued from page* 402.)

in December, 1898, establishment of wireless communication between the South Foreland Lighthouse at Dover and the East Goodwin Sands lightship, twelve miles distant. The incentive was to test thoroughly the utility of the Marconi instruments. Those anxious for results did not have long to wait. A heavy sea battered the lightship on April 28, 1899, carrying away the bulwarks ; the mishap was reported to shore and assistance was quickly dispatched. That might be called the first S O S. Two months later the steamer R. F. Mathews collided during a dense fog with the East Goodwin Lightship ; wireless summoned lifeboats to rescue the crew.

Practical and immediate applications of wireless were discussed far and wide. But there were still many sceptics. A professor at Clark University wrote to S. S. McClure and urged him to avoid announcing in his magazine such absurdities as wireless, for it made the periodical ridiculous. It was a source of relief for those who had confidence in Marconi to look back to the early days of the telegraph and telephone ; they, too, had been ridiculed by doubting Thomases.

The astounding fact about Marconi is that he did not conceive wireless piece by piece or merely stumble upon each succeeding development. The very spark of his genius is embedded in his historic replies to interviewers in 1898. The answers he gave at this early date reveal that he foresaw wireless as it would be developed thirty or forty years later. And he would devote the next three decades of his life to polishing these ideas of the '90's and making them practical. He realised the importance of short waves and ultra-short waves. He had visions of the "wireless lighthouse," the radio direction finder and the radio beacon before the dawn of the twentieth century.

Italy Takes a Hand

Reports went back to Italy, to the Government, to the Minister of Marine, to King Humbert and Queen Margherita. Italy, the land that sent its native son Columbus away to beg support from a foreign country, would never make a mistake like that again. Yet, it was on the verge of doing so. The Italians foresaw the possessiveness of the British and were quick to realise the folly of turning their backs on Marconi.

A "missionary" was dispatched to England to convince him that Italy had faith in him. Dinners were held in his honour and medals presented under Italian auspices, but by this time the Italian emissaries encountered resistance; the English Marconi Company naturally enough rather resented Italy coming upon the scene to capture the glory that had been nurtured under the Union Jack.

The Italian Minister of the Navy dispatched a message to Marconi in England extending an invitation to continue his research under the auspices of the Italian Government at the Naval Arsenal of Spezia. The cruiser San Martino was assigned to participate in the experiments.

Heeding the call, and delighted with the recognition of his native land, the inventor of wireless, as triumphant as a Cæsar, returned home.

NEXT WEEK

TWO CHAPTERS

CHAPTER VI

FRANCE CALLS FOR PROOF

The English Channel's challenge to Marconi—He makes "sparks" leap from France to the cliffs of Dover—Historic bulletins—Marconi turns his attention to duplex wireless—He demonstrates how waves can be separated by tuning—The value of a famous patent No. 7777—Marconi Company plans expansion ashore and afloat.

CHAPTER VII

AMERICA BECKONS MARCONI

James Gordon Bennett extends an invitation—Marconi accepts and plans to report international regatta by wireless—He arrives in New York—Impressions of Marconi by reporters—The yacht race begins—Marconi flashes bulletins to the *Herald*—Conversations with news men—Interest of Army and Navy aroused—Preece congratulates Marconi and reviews progress of wireless.

A VISIT TO THE TELEVISION SHOW

(*Continued from page* 403.)

If it were stated that the tube was showing 30-line television on a cathode-ray tube and that the demonstration was to show what was done with cathode-ray tubes some years back it would be quite O.K. As it is, however, one is forced to the impression that one is looking at modern cathode-ray reception, and the equally inevitable conclusion that it is ghastly. I advise Mr. Baird to have more explanatory cards printed and to label this part of his show, or many people seeing it will jump to the conclusion that television is still in the crude state ; many may not even bother to go downstairs to see the demonstrations of modern television if there is a crush.

Label that demonstration plainly, let everyone know that it is a cathode-ray museum piece and all will be well.

Enough of criticism. I found the whole show most interesting and instructive. The people on the stands are only too pleased to explain it all to the visitors. You can ask questions about the Alexandra Palace transmitter and its aerial, about the Cossor film television transmitter, about scanning from G.E.C. or Ediswan, you can go and see how Baird did his early televising, using a wax image and a 30-line disc. Then you can go downstairs to see what is offered to the public to-day.

Don't judge television by the programme material though. It is not fair. Television has been started by the B.B.C. with little enough money behind it. The programmes may not always strike you as particularly interesting. But that is not television's fault. Go to the museum—it's in Exhibition Road, South Kensington—and see for yourself what can be done in the way of providing radio entertainment in the home, and remember that the programmes will improve as the number of television set users increases.

If you could go back to the 1922 radio sound programmes now you would realise what I mean. There is one difference, television to-day is technically more perfect than was sound radio in 1922. But the programmes may not relatively be better produced, and you must make allowances there.

The Exhibition will be open till September. The admission is FREE, and the hours are 10 to 6 on Monday, Tuesday, Wednesday, and 10 to 8 on the remaining days except Sundays. On Sundays the show is open from 2.30 till 6.

A Useful Book

As you go in you will be offered a small green book. It costs 6d. Spend the money, it's worth it. The book contains a really well set out history of television in technical form. It will tell you heaps about the various steps that you did not know.

At the Radio Exhibition this year we shall all have an opportunity of seeing and hearing television sets in their special listening-rooms. There will be none of the hush-hush business that has attended it in the past. But don't wait for the radio show. There is a lot at the South Kensington Museum that will not be shown at the Radio Show, and now is the time to go and see it.

Television has come to stay, to develop, and it is only a matter of time before it will be as common to own a television receiver as it is to-day to have a radio set. You will see why at South Kensington, so don't miss this free show. **K. D. R.**

A NOVEL MICKEY MOUSE RECORD

IF you 'phone the London office of Walt Disney—Mickey Mouse, Ltd.—you will hear a piping voice say "Mickey Mou-use!" Joyce Hilder, the 21-year-old telephone operator, answers every call in this cheerful way, as it is the policy of the Walt Disney organisation to put everybody at ease.

But what will happen if a successor to Miss Hilder has to be found ? In order to provide against this contingency Mr. George Kamen, Walt Disney's European representative, has just paid a visit to the H.M.V. recording studios and made a special gramophone record in which he says "Mickey Mouse . . . Mickey Mouse . . . Mickey Mouse . . ." again and again in the pleasing lilting way he wants 'phone operators to adopt. This record will be kept on hand for the guidance of all 'phone girls employed by Walt Disney—Mickey Mouse, Ltd. A copy is being sent to the Mickey Mouse offices throughout the world, so that, wherever you may be, if you have occasion to ring the firm you will be greeted by that same smile-in-the-voice "Mickey Mou-use!"

Alas, this unique "His Master's Voice" gramophone record cannot be added to the famous range of "H.M.V." Mickey Mouse recordings, for it is not for sale.

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

A COMPACT portable is always an attractive proposition, since it is the one type of receiver which can be used anywhere, whether indoors or in the open.

McCarthy Radio, Limited, have produced a new portable employing a special reflex circuit which it is claimed gives results equal to a five-valve set. Fitted with a permanent-magnet moving-coil loudspeaker, this receiver is entirely self-contained and is available in three colours.

It is fitted with a carrying handle and turntable and weighs 16½ lb., including batteries. The H.T. current consumption is given as 7·5 milliamps. The price is 6 guineas.

* * *

NEW MAINS TRIODE-HEXODE

A further addition to the **Cossor** range of valves is announced. This is an A.C./D.C. frequency changer, and is listed as the 202 S.T.H. It is an indirectly heated triode-hexode, comprising separate triode and hexode sections with a common cathode. It costs 15s.

The characteristics are: Heater volts, 20: heater current, 0·2 amp.; mod. anode voltage (max.), 250; mod. screen voltage (max.), 100; mod. grid voltage, —1·5 to —10; oscillator voltage (max.), 100.

* * *

TWO DE-LUXE RECEIVERS

H.M.V. have just released two new models. The first is a six-valve all-world de-luxe receiver, and is known as the Model 499 A.C. It is priced at 14 guineas, and incorporates a fluid-light tuning indicator. The stations shown on the wavelength scale are arranged neatly in columns and are extremely easy to identify. There are over seventy names on the medium waveband alone.

On the short-wave range the scale is calibrated in half metres and has an effective length of 13 in., a feature which greatly facilitates tuning on these higher frequencies. The knobs of this new receiver are of an entirely new type, having flanges to obviate the cabinet being scratched by the finger-nails.

The second receiver is a **six-valve superhet transportable battery receiver,** and is styled the Model 464. Costing 15½ guineas, it is a two-waveband set having an A.V.C. circuit with two pentodes in the output stage. A pre-H.F. stage ensures high sensitivity.

The undistorted output is nearly two watts and the H.T. current consumption approximately 12 milliamps.

An automatic grid-bias system is employed, and two H.T. batteries having a combined voltage of 168 are used. The cabinet is mounted on a concealed turntable, and recesses at the sides provide convenient carrying slots. The illuminated tuning scale is placed at an angle and bears the names of the principal European stations.

Provision is made for the connection of an additional speaker, gramophone pick-up, and, if required, an external aerial and earth.

* * *

RADIO FOR "THE LONELIEST ISLAND"

Tristan da Cunha is a tiny island in the centre of the South Atlantic, and has no electric mains or facilities for accumulator charging. Batteries can only be obtained once a year when the annual mailboat calls.

Therefore, from the radio point of view, it must be admitted that the island inhabitants are not treated at all well. But they are going to have a radio set in spite of the many difficulties of current supply.

This has been made possible by Messrs. **E. K. Cole,** the well-known set makers.

An all-waver of the "No H.T." type has been presented to the Rev. H. Wilde, who is on furlough from the island. This set requires no H.T. batteries and is operated entirely from small accumulators. These will be kept fully charged by means of a small wind-driven generator.

Reception conditions should be very good on the island, and arrangements have been made for Messrs. E. K. Cole to receive reports on the results obtained.

THE SZECHWAN STATION

IN the course of last year a 10-kw. broadcasting station was completed and opened in Szechwan, provincial capital Chengtu (near the Tibetan frontier). Chengtu is the seat of a Chinese and of a Canadian Mission University, and has always been the cultural centre of the province. The transmitter is about five miles from the town outside the walls, which are 33 ft. high and about 25 ft. thick.

The Chinese Ministry of Communication is responsible for the transmitter, which was built by Telefunken. The station stands on a disused burial ground. The aerial masts, which are 300 ft. high, contrast curiously with the richly carved and typically Chinese entrance gate to the transmitter buildings. A wavelength of 536 metres is used to provide entertainment and instruction throughout the vast province, which is roughly the size of Germany and as thickly populated. An aerial power of 10 kw. is employed.

The broadcasting studios are in the centre of the town, which has 860,000 inhabitants, and they are close to the post-office buildings.

A. A. G.

"P.W." SHORT-WAVE STATION LIST

Wavelengths and other details of many of the stations you can hear on your short-wave receiver

Wave-length.	Station.	Call-Sign.	Power.	Wave-length.	Station.	Call-Sign.	Power.
13·93	Pittsburgh	W8XK	40	31·09	Lisbon	CT1AA	2
13·93	Daventry	GSJ	10–50	31·13	Rome	2RO	25
13·94	Wayne, New Jersey	W2XE	10	31·25	Moscow	RW96	20
13·97	Daventry	GSH	10–50	31·27	Radio Nations	HBL	20
15·93	Bandoeng, Java	PLE	60	31·28	Philadelphia, Pa.	W3XAU	10
16·86	Daventry	GSG	10–50	31·28	Sydney	VK2ME	20
16·87	Bound Brook	W3XAL	35	31·28	Huizen	PCJ	20
16·88	Huizen	PHI	23	31·32	Daventry	GSC	10–50
16·89	Zeesen	DJE	5–50	31·32	Lyndhurst, Australia	VK3LR	1
16·89	Wayne, New Jersey	W2XE	10	31·35	Millis, Mass.	W1XK	10
19·52	Budapest	HAS3	20	31·36	Bombay	VUB	4·5
19·57	Schenectady	W2XAD	18	31·38	Zeesen	DJA	5–50
19·60	Daventry	GSP	10–50	31·45	Zeesen	DJN	5–50
19·62	Buenos Aires	LRU	5	31·48	Jeloy	LKJ1	1
19·63	Zeesen	DJQ	50	31·48	Schenectady, New York	W2XAF	30
19·65	Wayne, New Jersey	W2XE	10	31·55	Melbourne, Australia	VK3ME	1·5
19·66	Daventry	GSI	10–50	31·55	Daventry	GSB	10–50
19·68	Radio Colonial, Paris	TPA2	12	31·58	Rio de Janeiro	PRF5	12
19·70	Podebrady, Prague	OLR	30	32·88	Budapest	HAT4	5
19·71	Huizen	PCJ	20	38·48	Radio Nations	HBP	20
19·72	Pittsburgh	W8XK	40	48·78	Winnipeg	CJRO	2
19·74	Zeesen	DJB	5–50	48·86	Pittsburgh	W8XK	40
19·76	Daventry	GSO	10	49·02	Wayne, New Jersey	W2XE	10
19·82	Daventry	GSF	10–50	49·10	Daventry	GSL	10–50
19·84	Vatican City	HVJ	10	49·18	Chicago, Ill.	W9XF	10
19·85	Zeesen	DJL	5–50	49·18	Bound Brook	W3XAL	35
22·00	Warsaw	SPW	10	49·20	Johannesburg	ZTJ	5
24·52	Reykjavik	TFJ	7·5	49·26	Hong Kong	ZBW2	2
25·00	Moscow	RNE	20	49·50	Philadelphia, Pa.	W3XAU	10
25·23	Radio Colonial, Paris	TPA3	12	49·50	Cincinnati	W8XAL	10
25·27	Pittsburgh	W8XK	40	49·59	Daventry	GSA	10–50
25·29	Daventry	GSE	10–50	49·67	Miami	W4XB	2·5
25·36	Wayne, New Jersey	W2XE	10	49·67	Boston, Mass.	W1XAL	20
25·36	Lisbon	CT1AA	2	49·83	Zeesen	DJC	5–50
25·38	Daventry	GSN	10–50	49·90	Bogota, Colombia	HJ3ABH	1
25·40	Rome	2RO	25	49·92	Podebrady, Prague	OLR	30
25·45	Boston, Mass.	W1XAL	20	49·96	Montreal, Canada	CFCX	6
25·49	Zeesen	DJD	5–50	50·00	Mexico City	XEBT	1
25·53	Daventry	GSD	10–50	50·00	Moscow	RW59	20
25·60	Winnipeg	CJRX	2	50·26	Vatican City	HVJ	10
25·60	Radio Colonial, Paris	TPA4	12	51·28	Maracaibo, Venezuela	YV1RB	25
28·99	Buenos Aires	LSX	12	51·72	Caracas, Venezuela	YV5RC	1
29·04	Ruysselede, Belgium	ORK	9	70·20	Kharbarovsk	RV15	20
30·43	Madrid	EAQ	20				

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POPULAR WIRELESS, July 10th, 1937 REGISTERED AT THE G.P.O. AS A NEWSPAPER

SHORT-WAVE UNIT FOR MAINS SETS

Popular Wireless & Television Times

ORTON ARRANGES ANOTHER "P.W." SHORT-WAVE TEST SOUVENIRS FOR READERS

EVERY WEDNESDAY PRICE 3D

No. 788.
Vol. XXXI.
July 10th, 1937

THEY'VE A FEELING IT'S FALLING!

And it doesn't matter much anyway because there's nothing inside it. It's just an empty cabinet from which the loudspeaker was carefully removed before we staged this picture. But we hope the moral is clear. And that is, leads should not be allowed to stray about so that they get caught up by passing feet, vacuum cleaners, brooms, cats, and what not. It is surprising how grimly tight a lead will hold on in such circumstances. They come loose on their own—when you don't want them to. And grip like the very devil if there's a new set or speaker or battery to be pulled over.

Can You Do Crosswords?

WIN £100 FIRST PRIZE

for Solving This One!

Second Prize £20 CASH!

ENTER *ANSWERS'* LATEST "X-WORD" COMPETITION!

HAVE you heard about the "X-Word" Contests in ANSWERS? Each week people are winning lots of money in these fascinating weekly puzzles.

To introduce them to you, here is this week's puzzle. Try it! An entry on this coupon may be worth a whole Hundred Pounds to you. And there is also a £20 second prize. The best solutions win!

TO ENTER simply use your skill and knowledge to complete the puzzle, and send it up before Thursday, the 15th. The letters already filled in give you a start, and here are the

CLUES

ACROSS:

2. The fruit rhyming with wig.
4. "Don't put the **** before the horse."
8. Prisoners are locked in these.
10. "All work and no **** makes Jack a dull boy."
11. Upon.
12. This sometimes keeps people apart.
13. "Much *** about nothing."
15. To spoil.
16. The heavens above.
18. Dwells.
20. "What's the *** of worrying."
21. "**** and bear it," they say.
23. "The next **** on the programme is——"
25. The wise bird.
27. "Happy the bride the sun ****** on."
31. We want peace, not this!
32. What the hen lays.
33. "Choose one or *** other."
35. Some give themselves "**** and graces."
37. United States—initials.
38. Business folk like a substantial one.
40. Distributed the cards.
41. A faulty one spoils progress
42. Move quickly.

DOWN:

1. To turn towards.
2. Move through the air.
3. "What ** to be will be."
5. A monkey.
6. Simply write down R.L.
7. These are designed to surmount "obstacles."
8. And this helps to keep one warm
9. A kind of animal.
12. A whim.
14. Implement used for rowing.
15. If they're well-developed these prove "rich."
16. Sun—as far as it will reach.
17. The opposite to "no."
19. To hang.
22. To pull along—as in a boat.
24. Nest, without a beginning.
26. They affect the running of a ship.
28. Has saved many lives.
29. No head to "figs" here.
30. An examination usually proves one.
34. Used in describing a ship.
35. Water is called "Adam's ***."
36. Half "pepper."
39. "Come ** once."
40. "How do you do?"

HOW TO SEND IN—Remember, the best solutions win in ANSWERS' "X-Words"—so think over each clue carefully and fill in your answering words across and down IN INK. The form here may be sent in: either one or two attempts may be made on it, but in either case the form must be cut out whole round the dotted lines and sent. Sign and address the coupon, attach 1½d. in stamps as entry fee for one "square," or 3d. if you fill in both, then post to:

ANSWERS' "New X-Words" No. 29,
G.P.O. Box 682,
The Fleetway House, London, E.C.4 (Comp.).

The Closing Date is THURSDAY, July 15th, 1937.

RESULT—The names of the winners will appear promptly in ANSWERS.

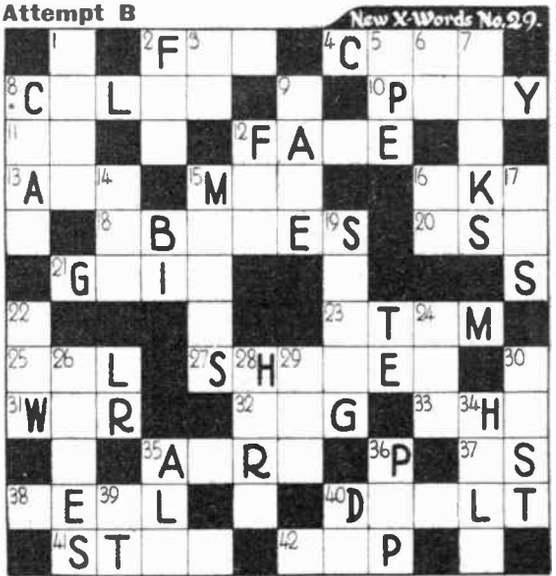
NOTE—Every entry is properly examined in ANSWERS' "X-Words," and it is the aptness and accuracy of answers to the clues that count. The £100 First Prize in this contest will be awarded to the sender of the best and most fitting set of answers to the clues. In case of ties, the prizes are divided. Full rules and conditions governing this contest and prize offer—also, if you are interested, other forms to enter—are in

This Week's ANSWERS (issue dated July 10th)
£120 Cash MUST be Won!

This panel MUST be cut out and sent in WHOLE!

Attempt A — New X-Words No. 29.

Attempt B — New X-Words No. 29.



In entering "X-Word" Contest No. 29, I agree to accept the published decision as final and legally binding.

Usual Signature.....

Address.....

.....P.W.

Affix 1½d. in stamps for "Attempt A," or 3d. if "Attempt B" is completed as well.
NOTE:—If "Attempt A" only is filled in, cross out "Attempt B," but send in the whole tablet—do not separate the squares.

This panel MUST be cut out and sent in WHOLE!

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

POLAR RADIO
COOL WORK
STARTING YOUNG

RADIO NOTES & NEWS

THE ALARM
STILL SMALLER
THE EXPERT

Thunderstorm Reception

SEVERAL letters have reached me recently in which reference is made to a dangerous practice—that of listening-in during a local thunderstorm.

I can well believe, as is claimed by these enthusiasts, that when heavily charged clouds are overhead radio reception is affected to some degree. It may be that reception seems to be "sharpened" at such times—as the memory of a drowning man is supposed to be sharpened when he comes up for the third and last time. But is the experience worth the risk?—as the chap said when a tight-rope walker offered to wheel him across Niagara Falls on a wire.

As one who has no desire to be permanently earthed before his time, I advise all thunderstorm listeners to do as I do, SWITCH OFF. It is better to watch the lightning than to conduct it.

Conquest of the Ice

RUSSIA'S faith in the possibilities of the air-route over the North Pole had not long to wait before being vindicated. The three pilots who blazed the route from the old world to the new are but forerunners of a mighty host, for there are many advantages in dodging the wide Atlantic by the short cut across the Arctic wastes.

Powerful planes, aided by well-placed radio direction-finder stations, could soon change the world's loneliest locality into a highway between the two hemispheres. How soon we shall see that happen will largely depend upon the lone wireless operators who have been chosen to man the chain of radio stations through the rigours of the coming winter.

Ambitious Australian Scheme

FURTHER news from Canberra about the new Australian broadcasting stations indicates that they are of the type to make glad the heart of the "Digger." Some £18,275 will be spent on the new equipment for Sydney and Melbourne, and the cost of Brisbane's station will be £3,309.

Melbourne's station will be on a site about ten miles west of the city; Sydney's will be about twenty miles out, at Liverpool. Later a new station will be built in each city to replace the existing transmitter.

Problem of the Children's Hour

IN Illinois, as in London, every care is taken with the Children's Hour.

On one occasion they were rehearsing a playlet which contained the lines:

She could not trust him. He had proved two-faced.

"Wait a moment," said the Programme Director. "You can't expect children to understand that."

He thought for a moment, and then inspiration came.

"Make it, *She was wise at last to that double-crosser. If he was straight, so was a corkscrew.*"

The play continues.

MY WORD — By THE EDITOR.

TELEVISION TRIUMPHANT

Technically television has advanced amazingly in this country. The Wimbledon tennis transmissions were marvellously successful. The ball could be followed across the net as easily by viewers as by spectators actually present on the court.

Yet television as home entertainment moves forward very slowly. The reason is easy to see. Sets are expensive and programme hours extremely limited. One hour during each week-day evening, no Sunday programmes at all and a three-weeks complete blot out for staff holidays and gear adjustment.

What chance has television to progress in such circumstances?

It is said that there can be no extension of service until more money is available. That, dear readers, is tripe. With a little ingenuity and without encroaching on the funds or facilities allocated to normal programmes, items from these could surely have the television cameras turned on them for the benefit of viewers.

Studio audiences, admitted free, are "played to" for no obvious purpose except to provide "atmosphere" and to give artistes something to leer at and bow to, and Toscanini's at £500 or so a time are hired by the B.B.C. to gesticulate before elite musical dilettantes of London's West End. Why can't Gerald Cock sneak in on these things with his television cameras? In such a way he could surely fill in a few more programme hours and hasten the day of really inexpensive sets.

Cool Work

NOW that the northern latitudes are so much in the news it is appropriate to recall the difficulties under which radio work is sometimes carried out there. Take the recent Oxford University Arctic Expedition, for example.

Like the War Office, they used for wireless work a motor-car engine and generator set, to provide the juice for long-distance communications. Starting up from cold—and in those latitudes the thermometer goes to 20 degrees F. below zero!—meant wrapping hot cloths round the carburettor, or even using a blow-lamp to heat the plugs!

Once the engine fired, however, the generator hummed like a bird, and transmission was perfect. From the reception point of view the Arctic regions are a paradise, as there are no X's, and no other stations to interfere. Once you can keep your accumulator from freezing over and your toes from dropping off with frostbite, you listen in comfort!

Starting Young

MUCH prominence has recently been given to the account of a young Southampton mother who wheels her baby out every day in a perambulator which is fitted with a radio set, an aerial and a loudspeaker.

But is this so very wonderful after all? My own experience suggests that most perambulators are liable to contain "loud-speakers," especially if there is more wind than usual.

And as for the aerial—well, it might have been only a "dummy."

Plane's Radio Brains

DESPITE the spectacular nature of some of the formation flying, the real star turn of the recent R.A.F. pageant at Hendon was the pilotless, radio-controlled plane.

For a long time, as has been disclosed in "P.W.", the Air Ministry has been able to equip "Queen Bees" with wireless controls that flew the little machines with uncanny precision, in accordance with the wirelessed direction from the ground. The Fleet Air Arm has been using these pilotless planes for years as aids to target practice.

But at the Hendon pageant the public got its first glimpse of the Envoy "Queen Wasp" biplane that is also a radio-controlled machine. The purpose for which

(*Continued overleaf.*)

Next Week: HOW TO SWITCH OFF YOUR SET IN BED

FEEDING THE BOGY MAN IN THE RADIO

this particular machine is intended, is no doubt somewhat similar to that of the "Queen Bee," but having a performance comparable with the modern fighter, it is a difficult target to hit.

From the radio point of view it is a beautiful piece of work. Those R.A.F. boys seem to be as happy "on the air" as in the air—which is saying something.

Matrimonial Problem

THE B.B.C. recently made known some of the queer requests they get from listeners to the Empire programmes.

Many are in connection with food—how to make pork pies, faggots, and so on. And one fellow wrote from Barbados to know if it was possible to send him out a pair of "Welsh Rabbits" for breeding, as he understood they made the most delicious supper dish.

So far, however, none of the enquiries are as bad as those which poured into one of the American stations that opened an information and advice bureau for its listeners. One day an agitated young farmer called up this bureau and said, "What would you advise me to do? My girl says she won't marry me after all unless I give up messing about with radio."

"That's bad," began the official reply, but the distant voice chipped in:

"I'll say it's bad. I'm going to miss her something terrible!"

Second Channel Mystery?

IN an effort to encourage the tourists from abroad to visit France, the Customs authorities there have relaxed some of the rules, and permitted the temporary importation of various articles without the payment of Customs duties.

Among the articles so permitted are gramophones; but there is no similar latitude with regard to portable wireless sets, which still incur the full duty. There has been a great outcry about this, and many explanations have been advanced as to why it is still so difficult to take your portable with you into France when you go there.

Perhaps the real reason is that the wily Frenchman, having seen some of our portables, are afraid that we may leave them over there, on the wrong side of the Channel!

Flying Boat Radio

UNLESS something unforeseen interferes with the schedule the Imperial Airways flying-boat Caledonia will have inaugurated the Atlantic air service before these lines are in print. That means another heavy responsibility will have been placed upon radio, for accumulated flying experience in all parts of the world tends to emphasise the importance of wireless on regular long-distance services.

The Caledonia carries a pilot and first officer, an engineer and two wireless officers. The wireless stations at Rynanna, on the Shannon, and at Botwood, Newfoundland, have been working together for several weeks in preparation for service conditions, and it is intended that all important changes in the meteorological situation on the route shall be notified immediately to the flying boat at all stages of the voyage.

Midnight Prowler

ONE of those wealthy Americans who spare no expense to be safe from gangsters and kidnappers engaged an inventor to make a super alarm device that would defeat the wiliest criminal.

The inventor, on his mettle, produced a device more sensitive than any before known—it was based on radio and worked by capacity effects; the mere presence of an intruder actuated the mechanism, and he did not have to cross an invisible beam, step on a contact, or anything so crude, for it was impossible to go near the apparatus without raising the alarm.

Satisfied at last, and feeling secure, the new owner went to bed and slept soundly—to be awakened in the dead of night by bells, sirens, searchlights switched on, and all the elaborate warning apparatus in full blast.

The armed guards turned out and rushed to catch the criminal: it was a big black cat cleaning his whiskers and looking with great earnestness at the too-sensitive alarm!

International Items of Interest

OSLO is experimenting in the humanising of prison life, and a well-appointed prison is shortly to be opened there. Every cell will have facilities for radio reception.

* * *

New Zealand has no prejudice against politics being aired by radio. The Parliamentary Labour caucus recently approved the regulation of controversial broadcasts.

* * *

Norway is planning to equip six new stations round her coasts to provide an up-to-date radio service of ship-and-shore telephony.

* * *

Burma is apparently aiming at a comprehensive radio coverage, and P.O. engineers there are now experimenting with short-wave transmissions in a big way.

* * *

The North Pole station established its first short-wave communication with an amateur transmitter at Alexund, Norway.

Smaller and Smaller

ALEXANDER, who burst into girlish tears because there were no more worlds to conquer, was spared a lot of misery by dying a long time ago; he would have hated to see how the scientist of to-day makes the world seem smaller and smaller every hour.

This new air-mail service to South Africa will bring the Cape almost within week-end distance, and the new radio-telephone rates now in force will allow you to speak to your best girl there for a mere matter of £1 a minute.

Should you find that the inconstant nymph has flown to India you can still hold sweet converse with her for about the same figure, or an extra ten bob at the most. (And what's ten bob when you're in love with a girl like yours?)

A Knowing Child

SPEAKING to the British Social Hygiene Council not long ago, an eminent psychologist brought up the question of the "problem child" in this age of scientific marvels.

He cited the case of a small boy who honestly thought that a strange man lived in the wireless set—a man who had to be placated and kotowed to. Offerings and tit-bits of various kinds frequently found their way to this wireless bogy, and when the set broke down on one occasion they found it full of small pieces of food.

I am not sure that this incident should be regarded as having some half-mysterious psychological significance. Some of those crooners really sound as though they needed a square meal to console them.

The Expert

DID you hear about the party of privileged visitors who were allowed to look over an island off the South American coast which is used as a convict settlement?

They saw prisoners working at every kind of uncongenial employment, but finally they came across one prisoner, garbed like the others, but granted amazing privileges—he was smoking a cigar, doing no work, and he looked extremely well fed.

"Who's that fellow?" asked the visitors.

"Ssshh! We mustn't offend *him*," said the guide. "He's the only fellow on the island who knows how to stop the Governor's wireless set from oscillating!"

ARIEL

BRIGHTER CATHODE-RAY PICTURES

By J. C. JEVONS

How the best advantage may be taken of the light produced on the screen of a cathode-ray tube.

THE loudspeaker has been called the weakest link in broadcasting, because in so many cases it is unable to handle the full range of musical frequencies supplied to it by the set. We can compare the fluorescent screen of a cathode-ray tube to a loudspeaker, in the sense that it is the last link in the chain of television. And from many points of view it is the weakest link in that chain.

One obvious defect is that it is unable to reproduce the pictures at a really high level of brilliance. To go back to the parallel of broadcasting, the fluorescent screen, so far as efficiency is concerned, is something like an old-fashioned pair of headphones coupled up to a modern high-powered wireless set.

Where Light is Lost

The trouble is that we have not yet been able to find any really efficient method of converting wireless signals into visible light, nor have we discovered how to amplify light in the same way as we can amplify an electric current. So for the time being, the cathode-ray receiver seems anchored to the fluorescent screen.

But the point is, are we making the best use of it? For instance, the fluorescent material is usually applied, either directly or indirectly, to the glass surface at the bulb end of the tube, and the picture is then viewed from the far side of the screen, that is, from the opposite side to the one on which the picture is actually formed by the impact of the electron stream.

Obviously this means the loss of a certain amount of valuable illumination, because the fluorescent light has to travel through the material of the screen, and its backing plate, as well as through the glass end of the bulb, before it reaches our eyes. Apart from reflection losses at the various surfaces, the screen itself must necessarily be made of a very thin layer of fluorescent material, since otherwise it would not be transparent enough to allow much of the light to pass through.

On the other hand, it would be better in many ways if we could use a fairly thick layer of fluorescent material. Finally, the fact that the fluorescent material is deposited over the curved end of the glass bulb, instead of being laid on a perfectly flat surface, tends to introduce a certain amount of distortion.

Use of a Flat Screen

Turning for a moment to the transmitting side of television, we find there is a type of cathode-ray tube known as the "Iconoscope," which is fitted with a perfectly flat photo-electric screen mounted at an angle to the main axis of the tube. This arrangement is necessary because, when using the Iconoscope as a "camera," the picture to be televised must be focused on that side of the screen which faces the anode or "gun" of the tube. Otherwise it would be impossible for the electron stream to scan it.

The Fig. shows the same principle applied to a television receiver.

Instead of being fitted to the round end of the glass bulb, as usual, the fluorescent screen S is mounted at a definite angle inside the tube, so that it is inclined to meet the electron stream used for scanning. In this position it becomes possible to see the picture from the front face of the screen, instead of from the back.

As the illumination is obviously more intense at the point where the electrons first strike the screen, this arrangement also makes it easier to magnify the picture without losing any of the essential details. As shown, the picture is projected from the fluorescent screen S through a projection lens L on to an enlarged viewing screen mounted outside the tube.

The fluorescent material can now be deposited as a thick layer upon a metal backing-plate. This allows a higher voltage to be applied to the anode, with a corresponding gain in brilliance, because the metal backing will stand up to a more intense bombardment without risk of burning out.

Owing to the fact that the screen is set at an angle, scanning becomes somewhat more difficult than if the surface was everywhere at right-angles to the electron stream. The same difficulty occurs, however, in the case of the Iconoscope tube, and special control fields can be applied to put matters right.

Compensations Needed

There are two points to be observed. In the first place if the electron stream is correctly focused along the centre-line of the fluorescent screen, it will tend to fall slightly out of focus as it moves away from the centre, either up or down the picture. Unless this is corrected for, the resulting picture will appear clear-cut in the centre but slightly blurred at the top and bottom.

In the second place, since the upper part of the screen S is farthest away from the cathode or gun G, the electron stream will trace out a longer line there than it will at the centre of the picture. Similarly, the line traced out along the lower edge of the picture will be shorter still.

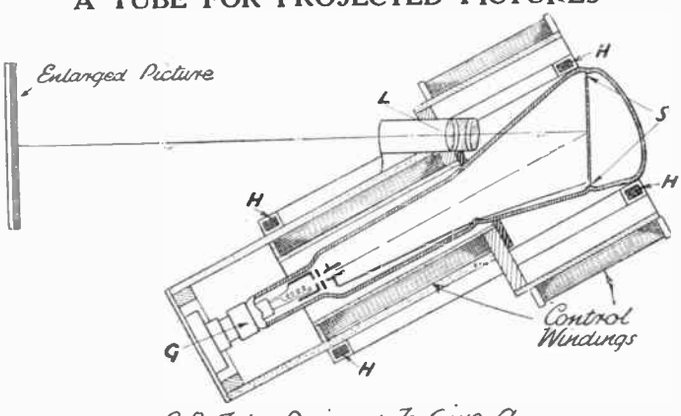
Corrector Windings

That this is so will be clear if one imagines the electron stream to be the equivalent of a thin rod or wire vibrating to and fro about the cathode as a pivot. Obviously as the wire "stretches out" to reach the upper part of the picture, it will sweep over a longer scanning line than it will at the bottom of the picture, which is closer to the cathode. The upshot is that the complete picture appears wedge-shaped instead of rectangular in shape, for which reason the effect is known as "trapezium distortion."

The necessary corrections are produced by first applying a uniform magnetic field along the main axis of the tube from two external "control" windings (as shown in the Fig.). In addition, there are the usual pair of deflecting coils for producing the scanning motion. One of these is shown at H, whilst the other lies at right-angles to it, but has been omitted from the drawing for the sake of clearness.

The combination of the "control" windings and the two deflecting coils causes the electron stream to take a slightly spiral path, instead of a straight one, the pitch of the spiral being such that it sweeps over equal lines at all points on the fluorescent screen, irrespective of its distance from the cathode of the tube. For the same reason, the focus of the stream is automatically varied as it travels from the top to the bottom of the screen, so as to keep all parts of the picture free from blurring.

A TUBE FOR PROJECTED PICTURES



This receiving scheme adopts some of the principles of the electron camera used for television transmission.

"CAFÉ COLETTE" NEWS

"CAFÉ COLETTE," the mythical radio rendezvous created by A. W. Hanson, the B.B.C. producer, will again be the scene of a broadcast on July 13th on the National wavelength.

Nicolina, the international singer, is coming specially from Paris to take part in the programme, which will also bring to the microphone for his first broadcast here Charles Vadja, the Hungarian singer.

Another point of interest to variety "fans" is that C. Denier Warren, well known for his work with Harry Pepper's "White Coons" and "Kentucky Minstrels," will be heard for the first time as "chef d'orchestre." He played in the "Café Colette" film.

THE DIAL REVOLVES

By LESLIE W. ORTON

SPAIN'S SECRET STATIONS

DISAPPOINTING CONDITIONS :: TOKIO'S TEST PROGRAMME :: 20-METRE RECEPTION

SPAIN is overrun with secret radio stations. Yet another one has been unearthed—this time in Madrid.

Indignant government officials claim that the station radioed results of air raids, transmitted information "lifted" from valuable documents procured by Bill Sikes' methods, and otherwise passed on information detrimental to the government to insurgent headquarters.

This somewhat naturally riled the Madrid authorities, who decided to take a hand in the game. Calling "cheek," they pounced, and now the officials of the secret station are behind bars awaiting with painful anticipation the next move!

A Game of Chance

The short-wave broadcast bands remind me of a game of chance; you don't know what to expect next. To be honest, conditions have been disappointing on the whole, and if you are after a thrill your luck is out, for you would obtain more excitement trying to cross Piccadilly during the rush hour!

COCD (Havana), on 48·92 metres, is about the only bright spot on the 49-metre band. Between 5 and 7 a.m. he is often quite an entertaining signal. Announcements in English make identification fairly easy.

There are a number of mysterious sounding Spanish stations around 40 metres. Half an hour on that band is enough to bewilder anyone. It's a hot-bed of terribly modulated unidentifiable stations.

One's ear-drums are in danger when taning to the 30-metre band. Here the European big noises—Zeesen, Rome, and Moscow—raise the roof with their volume. Unfortunately, programme value is poor, and often a Salvation Army band would win in a contest against them. W2XAF, W1XK, and W3XAU have been very disappointing signals, and W1XAL and W2XE on 25 metres have been little better.

If you wish to demonstrate the pulling power of your set to your friends I suggest that you turn to W2XAD or W3XAL on 16·87 metres—or, better still, put them off for a day or so!

JVH on 20·55 Metres

I was swinging the dials of my short-wave receiver in the region of 19 metres the other evening when a sound as if of cats fighting burst upon my ears. Thinking that one of my cats (I've only two!) was impersonating Tommy Farr, I was about to get a little cold water to clear the atmosphere when I realised that the din was coming from my loudspeaker. After listening to another cat fight and a lady "singing," I learned that I was listening to a test programme broadcast by JVH (Tokio) on 20·55 metres. Volume was excellent and I thoroughly enjoyed myself, resulting in a friend remarking with sarcasm: "You would enjoy hearing a pig killed if it were in America!" No indeed—that wouldn't be DX!

Klu-Klux-Klan Stations

The Goddess of Luck is once again smiling on the 20-metre enthusiasts—we must be in her good books!—and it behoves us to take advantage of our good fortune.

A Klu-Klux-Klan member could hardly be more mysterious than some of the fellows I've heard of late. First, WCCRA announcing as being "aboard an aeroplane." Then, coming to ground—or water—WTOM, presumably a ship. Where are these stations? Any of you fellows know?

Latin-American and Canadian amateurs have continued to provide the sort of signals that make the DX-hound spend nights on end at the dials.

An hour at the dials the other night resulted in my logging FR8VS (Reunion), LU8AA (Argentina), PY1FR (Brazil), YV5AK (Caracas), and VE3CH and VE1DR (in Canada). Doubtless you could beat that little lot hollow, for conditions are wonderful at present.

Listening to W1CZZ the other evening, I was amused at the following conversation that took place before "mike." "Ned here has got to beat it," remarked W1CZZ. "He wants to get something to eat, so you had better spill the beans quickly!" Friend Ned then spoke. "How-d'y-do, bo?" he asked. W1CZZ then closed down, leaving me with a smile on my lips.

South America offers plenty of opportunities for DX.

The Fighting Spirit

W2XAF let me down badly recently. Wishing to hear the Louis-Braddock fight I rigged up my set by my bed, set the alarm clock, and dropped off to sleep. At 2.45 a.m. I awoke and set about searching for W2XAF, COCH and COCQ (Havana), RAN (Moscow), and the Zeesen transmitters were coming in, but instead of hearing the thud of gloves I merely heard atmospherics where W2XAF should have been. I almost wished I were a fighter, so that I could ease my feelings on someone!

SHORT-WAVE STATION IDENTIFICATION

By F. A. BEANE

MEXICO'S TRANSMITTERS

STILL in Mexico, which is rapidly developing into a DX'ers paradise, we find, in the capital city of Mexico, XEWI operating on 25·2 m., which is devoted to the development of a "Moral, Mental and Spiritual Culture in Mankind all Over the World." Slogans such as "Fraternity of New Life" and "My Voice to the World from Mexico" are used, and talks given in various languages, including Esperanto, but it is doubtful whether XEWI is audible in this country, although good reception has been reported from Australia and New Zealand. Should you be fortunate enough to log it, write to P.O. Box 2874 in Mexico City; the report will be appreciated. Below will be found a few more details of some of the better-known stations, but I cannot guarantee that all are likely to be heard across this side of the "Pond."

XEUZ (49·10 m.) Mexico City, styles itself "Radio Nacional" and relays XEFO. Address: Apartado 2641.

XEPW (49·02 m.) Mexico City, announces as "La Voz del Aguila Azteca." Address: Apartado 8403. Reports are requested and answered over the air in English.

XEUW (49·83 m.) Vera Cruz, employs the slogan "El Eco de Sotavento desde Vera Cruz."

There are many more Mexicans, but at the moment I cannot "introduce" them all to you as I am not yet conversant with their identification signals or slogans. However, when I receive accurate details of any newcomer I will let you know.

Before leaving the Latin-American republics I would like to conduct you to a few additional stations that we have either overlooked or which have just made their etherical debut. To commence with we have **OAX4Z**, which is being heard particularly well on 49·42 m. Listen for it before 05.30 or 06.00 and note the announcement "Radio Nacional en Peru"; mention of "Westinghouse"; an organ playing the "Rhapsody in Blue" with superimposed announcement or the final closing announcement in Spanish, English and French.

Two Newcomers

Cuba provides two well heard newcomers. The first is **COGF** on 25·4 m., the relay of medium-wave CMGF of Matanzas. COGF, when first heard, obliged with periodical English announcements, but now one must rely on catching the Spanish call-sign, or its mention of "General Electric y Westinghouse," for it does not appear to follow the old Cuban custom of radiating a miscellany of noises and chimes! Havana provides the other Cuban, namely **COVC** (or possibly COBC) which has been heard from 06.00 until 06.30 on a wavelength of 32·1 m. approximately. For identification they use a bugle call, but do not appear to use English.

We have concluded our imaginary tour of the South and Central American countries, but should anything further of interest crop up I will temporarily defy time and momentarily revert to the countries we have left behind!

ON THE SHORT WAVES

BELOW 10 METRES

By W. L. S.

ALTHOUGH most of the long-distance transmissions on wavelengths below 10 metres fade out during the summer, listeners' interest in these shorter wavelengths shows no signs of abating. It may be that listeners want to build gear in readiness for the great rush of ultra-short-wave work that we all anticipate in the autumn and winter, or it may be that D X is not what they're after.

At all events, by popular request I am coming on to the subject again, particularly from the point of view of straight circuits.

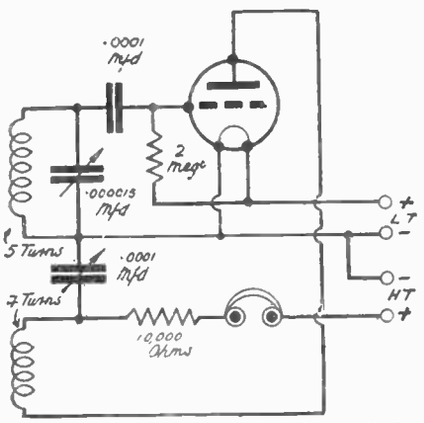


Fig. 1.—A well-tried circuit in a form suitable for use on wavelengths below 10 metres.

Now that most of the amateur transmitters have "seen the light," and are beginning to drop the use of those terrible wobble-modulated, self-excited transmitters for 5-metre work, the popularity of the super regenerative receiver is waning. It couldn't help being popular before, since it was the only type of circuit that *would* receive those unstable, broadly-tuned transmissions.

Coil Differences

Now that crystal-control and other methods of frequency-stabilisation are coming into their own, good receivers are following in their train, and maybe we shall all be able to *do* something one of these days!

Although freak circuits for these wavelengths have had a certain measure of popularity, there is no earthly reason why our favourite straight circuit should not be used. The thing to bear in mind is that it will need some modifications on the practical side.

For one thing, it's just about time to stop thinking of coils wound on four-pin formers by the time one gets to 7 metres or thereabouts. They *will* do the job, but it is certainly more efficient to change over to self-supporting coils that can be connected straight across the tuning condensers.

A coil on a four-pin former is all very well, as far as the coil itself goes. But what most people forget is the leads connecting the leads of the actual coil to the pins; the contacts between the pins and the sockets into which they fit; the connections from these sockets to the terminals on the coil-base; and then the wires leading from these to the tuning condenser.

Concerning the Layout

Actually there is quite a lot of "lost inductance" in such a contraption; and while it may not be serious with a big coil you must remember that it doesn't become less as the coil becomes smaller. All these externals are fixed, and therefore become a bigger and more serious percentage of the whole as we use smaller coils.

Fig. 1 shows the good old circuit once more, in suitable form for "below 10-metre" work; and Fig. 2 gives a hint about a possible layout. Don't imagine that it has been drawn to proportion. I have spaced it out specially to show the broad idea of the layout.

The grid coil (at the bottom) is slap-bang across its tuning condenser, and the reaction coil goes from the anode to the fixed plates of the reaction condenser—in each case without unnecessary wiring about the place. In actual practice the valve holder would be much closer to the condensers and the coils—or possibly mounted edgewise-on underneath the coils—an arrangement that gives a really excellent layout, with wiring that could hardly be made shorter.

The coils should be wound on a pencil with fairly stout wire, No. 16 or 14 is excellent. They will spring out to a diameter of about half an inch, and sufficient extra wire should be left over for the connections to the various points in the circuit to be made. One continuous wire is so much nicer and cleaner—both in theory and in practice—than something with a lot of soldered joints and terminal connections.

Covers a Wide Band

I have suggested five turns for the grid coil and four for reaction. With a ·000015 tuning condenser this arrangement will cover the 5-metre band, and should get up to the television band. Other coil-sizes may be chosen, according to the band that it is desired to cover.

Remember, though, that however broad your tuning might have been with that old super-regenerative receiver, you certainly won't have broad tuning now. In other words, if you try to cover too wide a frequency-band with one lot of coils, you'll be properly sunk.

From 5 to 10 metres represents a frequency band of 30 megacycles—just as much as the whole band from 10 metres up to the top limit of all, or roughly thirty times the width of the medium broadcast band. So don't pile on the agony too much, or you'll have to use a slow-motion dial with a ratio of 1,000 to one, and take a week's holiday when you want to tune right round the band.

A good slow-motion dial is absolutely *essential*, even with a condenser of ·000015, which, although it may seem small to you, is big for these very high frequencies.

Careful Tuning Needed

Tuning becomes a very slow business if you hope to make a job of it. Good layout of the components should act as an insurance policy against hand-capacity and all that sort of thing; but you will need to be *careful* about tuning. I'm not out to scare you by saying that it's frightfully difficult, but you will find it needs a bit of concentration at first.

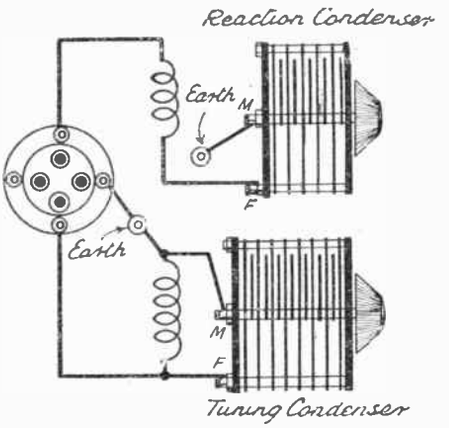


Fig. 2.—A suggested layout for the Fig. 1 arrangement. The two coils are of the self-supporting type and should be wound on a pencil.

Basically, the receiver for these short waves will be exactly the same as any ordinary short-wave receiver. You will find an L.F. stage useful, particularly if you use resistance-coupling. H.F., on the other hand, will not be much good to you with standard types of valves. One begins to feel the need for "Acorns" down below 7 metres or so.

ON THE SHORT WAVES—Page 2.

POINTS from the POST-BAG

W. L. S. Replies to Correspondents

L. W. J. (Sheffield) writes: "My vote goes to 'more dope on the broadcast band stations.' I get them better than the hams, so naturally I want to know more about them." Might I suggest that L. W. J. would find the hams even more interesting than the broadcast stations if he took steps to find why he doesn't receive them so well? I always look upon a set that doesn't receive the amateurs very well as one that can't be working too well on the broadcast stations, either. Some of the weaker and lesser-known broadcast stations are far more difficult to receive than the hams.

The same reader, L. W. J., wants to "travel round the world via loudspeaker, not headphones, and asks about connecting his two-valver up to the pick-up terminals of a five-valve broadcast receiver. If he does it through an L.F. transformer, as I mentioned recently, he will be perfectly safe and should get good results. But readers who do this must not be disappointed if instability sometimes sets in before the volume control has been turned the whole way round.

More Wailing Noise

Re S. A. K.'s recent remarks about a wailing noise on 31 metres, N. P. (Darwen) now writes to say that he has heard it blotting out Zeesen on 25 metres—so it really looks as if it may be one of these "sabotage" stations one hears about occasionally. He also heard a funny phone transmission from someone asking "if D J D and D J N were O.K.," and saying that he would "try to get D J E ready by Sunday." It all sounds somewhat "phoney" to me!

H. T. J. (Cleethorpes) submits one of his pet brainwaves. He metallises his panels and baseboards by saving sheets of silver paper from cigarettes and chocolates, sticking them to the wood by means of liquid glue. He puts on three layers, allowing one to dry before starting on the next. It's an excellent scheme, but I shouldn't be inclined to trust too much to all the different kinds of "silver paper," some of which are practically non-conducting.

I recently had a 5-amp. fuse blow on my car. I did the usual stunt of wrapping some "silver paper" round the glass tube of the fuse and re-inserting it in its clips—but it wouldn't work. It didn't blow again—it just didn't complete the circuit at all. So beware—and even if you use good stuff, don't trust to it for closed-circuit returns or L.T. connections.

A. D. (Handsworth) has made a one-valver that I recently described, but seems to have come properly unstuck, since it doesn't oscillate and it receives Midland Regional and National programmes all round the dial. This always puts me on the track of a broken grid circuit or dud grid condenser or something of that kind. Possibly the coil wiring is all wrong. Once more let me drop a hint about making sure whether your coil connections are thought out by looking at the bottom of the former or the holder into which it plugs.

Bitten by Short-Wave Bug

S. A. (also of Handsworth) says: "You got me bitten by the short-wave bug and now I'm short waves all over!" Sounds like a painful disease. He has a "Simplex" Two with a power valve added, but wants to "supercharge" it still more for loudspeaker work. I don't think it would be a terribly good plan to add a *third* L.F. stage—and yet an H.F. stage won't give a terrific increase in output. It should be capable of working a speaker perfectly well as it is, with the extra valve.

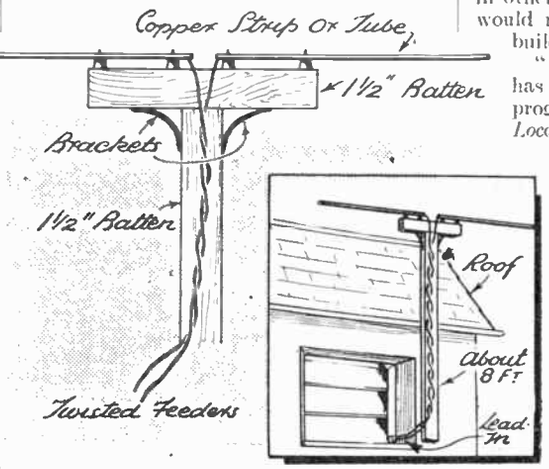
He asks whether a bandspreader would help, as he gets U.S.A. stations all mixed up with Daventry. A bandspreader won't improve *selectivity*—only ease of tuning. It looks as though real inselectivity is the trouble, in which case an H.F. stage should help matters.

J. M. S. (Glasgow) has built up several specimens of the "B.C.L." Two, and finds them all afflicted by a strange fault—to wit, the tendency to go into oscillation with a "shuddering" noise. This only happens on the 41–94-metre coil, so I am inclined to think that the H.F. choke may have something to do with it. An alternative suggestion is to play around with the voltage on the screen of the S.G. detector until the thing behaves itself.

Another little trouble that he mentions is "hill and dale" tuning on the reaction condenser—in other words, a tendency to dead spots. This is probably due to tight aerial coupling. Although six-pin coils were used in the "B.C.L." Two, that separate aerial winding sometimes provides too tight a degree of coupling, and it is an advantage to use a pre-set condenser in series with the aerial terminal.

The sketch on this page is the answer to a reader who wants to know how to make a 5-metre or 7-metre dipole effective without climbing about on the roof. The thing can be mounted quite well on a length of battening, and it is easier to do with a verticle dipole than with a horizontal arrangement—but the latter is all right if copper strip or tube, thick enough to be self-supporting, is used.

FOR THE ULTRA SHORTS



Here is a neat scheme for those who are thinking of erecting a dipole aerial for ultra short-wave work.

Short-Wave News

THE engineer in charge of W 2 X A D/W 2 X A F has been forwarding descriptions of the two stations to listeners who have sent reports. One of these has reached S. J. (Croydon), who has been good enough to send it to me. For the benefit of readers who are interested in these two stations I am reproducing it below:

"A Brief Resumé of General Electric's Around-the-World International Broadcast Transmitters—W 2 X A D and W 2 X A F, Schenectady, New York.

"The General Electric Company operates W 2 X A D and W 2 X A F on a non-profit basis without charges for services rendered, for the purpose of improving the international broadcast field, furnishing listeners in other countries with programmes which would not otherwise be received, and the building of international goodwill.

"W 2 X A D, operating on 15,330 ke., has been on the air for regular programme service since July, 1926. *Location:* *Latitude* 42° 47 mins. 37 secs. N. *Longitude* 74° 0 mins. 36 secs. West. Power input to final amplifier output stage, 55 kilowatts. Power output (carrier), 18 kilowatts. Maximum variation from assigned frequency, 100 cycles. Modulation, Class B, low level; — 100 per cent. on modulation peaks.

Directional Aerials

"*Antennas:* Vertical dipole (essentially non-directional). Beam on Europe (Centre of beam on London, England).

"*Effective Carrier Power* of W 2 X A D with beam antenna, 180 kilowatts.

"W 2 X A F, operating on 9,530 ke., has been on the air for regular programme service since June, 1925. *Location:* Same as for W 2 X A D. Power input to final amplifier output stage: 80 kilowatts. Power output (carrier), 25 kilowatts. Maximum variation from assigned frequency, 100 cycles. *Modulation:* Class B, low level; — 100 per cent. on peaks.

"*Antennas:* Horizontal dipole (essentially non-directional). Beam on South America (centre of beam on Buenos Aires).

"*Effective Carrier Power* of W 2 X A F with beam antenna, 250 kilowatts."

Here is another news item: W 2 X G B is now testing on 17,310 ke. (just above 17 metres) every day except Saturdays and Sundays, between 15.00 and 18.00 G.M.T. The address of the station is Radio W 2 X G B, Hicksville, New York (U.S.A.). These particulars were supplied by K. B., (Derby).

Finally, I should like to mention a new short-wave club: The Redhill and District Short-Wave Club, of which the secretary is Mr. S. Hessenauer, of 139, Frenches Road, Redhill, Surrey. Anyone in that district who is interested is asked to get in touch with the secretary, who will be pleased to supply full particulars.

W. L. S.

MY SHORT-WAVE ADVENTURES

By LIONEL CHESTER

NONE SO BLIND . . .!

Our contributor describes his experiments in his attempts to overcome a common short-wave trouble, viz., that of "blind spots" at points on the tuning range

MY last flourish before going over to a high-frequency amplifier valve has been a systematic worrying of the eternal blind spot business, which seems inseparable from all simple short-wave sets where the first valve is an ordinary reacting detector "tube."

You remember I got over most of my troubles with the adoption of the four-pin type of coil, doing away with the aerial aperiodic winding altogether and coupling the aerial to the grid end of the tuning through a small pre-set.

METHODS OF AERIAL COUPLING

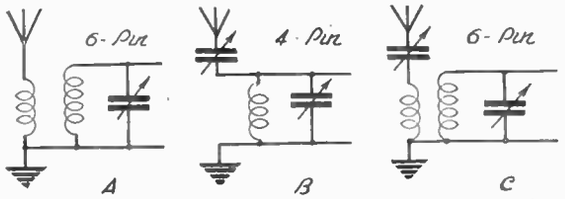


Fig. 1: Three methods of arranging the aerial coupling. B is the scheme used by our contributor in his two-valver. C is a combination of A and B.

The three possible alternatives I know for aerial coupling are shown by Fig. 1 this week. *a* is the aperiodic coupling (not so aperiodic when it comes to the point!) used usually with six-pin coils. *b* is "my" system—and maybe yours, too—with a ·0001 pre-set or "neut" condenser used with a four-pin coil. *c* is the combination of the two methods, whereby the pre-set is inserted in series with the aperiodic aerial winding to loosen the coupling enough to dodge the blind spots.

Lack of Oscillation

By blind spots I am, of course, referring to those distressingly "dead" sections of the tuning band over which no oscillation seems possible. And, of course, without oscillation the set is a very dead thing indeed.

I have, as I say, been worrying around. And I have made out a list of all the possible causes I can think of to account for blind spots. Whether it is comprehensive I don't know; nor do I pretend to know that all the causes I mention are, in fact, causes—and not just my wild imaginings.

Here, anyway, is the list:

(*a*) Type of Coupling.
(*b*) Value of Coupling.
(*c*) Size of Aerial.
(*d*) Efficiency of Earth.
(*e*) Type of Reaction Circuit.
(*f*) Efficiency of Anode Choke.
(*g*) Degree of Grid Damping.

Using my standard capacity coupling with a four-pin coil, I have found that there are fewer blind spots than with any form of aperiodic winding—and believe me I have tried every number of turns of wire and placed them along different parts of the coil.

One thing that is most important: the coupling *must* be made small. If too much capacity is used—in, as in my case, a mistaken belief that it will let stronger signals through!—the only effect is to stop the detector oscillating. Indeed, too tight a capacity coupling seems to be even worse than an aperiodic coupling in the production of really blind spots.

Another thing: the pre-set or neutralising condenser must be a good one, preferably air-spaced. And it must be raised a little from the Metaplex baseboard or even more so from a metal chassis. I made a grave error in bolting down my pre-set to the chassis—and it took me quite a time to realise what was wrong. In my new metal chassis O–V–1 I have got my pre-set half an inch above the metal baseplate. Even so, there are blind spots, especially around middle settings of the coil tuning from 22 to 47 metres.

In an attempt to remove this particular spot of blindness, I inserted a small short-wave choke in the aerial lead, so that the complete aerial circuit then had the hook-up of the Fig. 2 diagram. This seemed very cunning at the time, because the blind spot did actually disappear.

NOT A CURE!

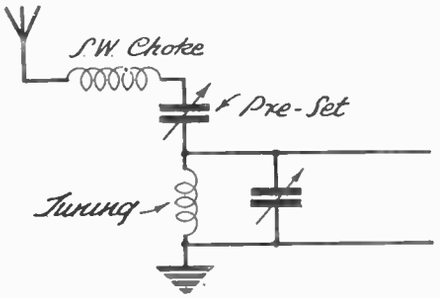


Fig. 2: In an attempt to remove the "blind spots" around the middle settings of the tuning between 22 and 47 metres a small H.F. choke was tried in series with the aerial.

Not entirely, though. It simply shifted to another part of the tuning scale. You see, my feeling was that the aerial might in some way be coming into tune at certain points, and I gather that this has the same effect as a very tight coupling, which would stop the oscillation.

I proceeded, still undaunted but definitely wilting, to my next attack—the aerial. I got up a fairly long aerial, about 80 ft. total length, in place of the standard 35-ft. aerial. Sorry, but this didn't make the slightest sign of difference, the blind spot occurring at exactly the same point as before—although I had to use even less aerial-coupling capacity than ever to get oscillation over the rest of the scale.

One naturally jumps to the conclusion my earth is pretty dud—but is it? I found by removing the earth lead altogether the blind spot still stayed where it was. And, what is even more odd, the aerial made no difference, either. Even when that was taken off there was still this mysterious lack of oscillation over some 15 degrees.

Still, I did put down a new earth, because I live on rather dry soil, and the former earth was left over by the preceding tenant of my cottage. It was one of those spikes, about 18 in. long, with the earth lead soldered to the top. I carefully laid to rest a large biscuit tin with neatly soldered 7/22 wire.

Well, I don't know, chaps. Either there is a lot of bunk talked about aerials and earths—or I am particularly immune from the so-called benefits of careful installation: For the plain truth is I could detect no difference at all—and the blind spot remained!

Looking Elsewhere

It dawned upon me the trouble might not be in the aerial circuit at all, but in the detector valve's circuits. Yet my prior tests with the two forms of reaction—series fed, as now being used, and the old system of connecting the reaction winding and condenser between anode and earth—were not greatly different in results; although I did decide, you remember, that the series-fed system gave slightly freer oscillation.

UNDER SUSPICION

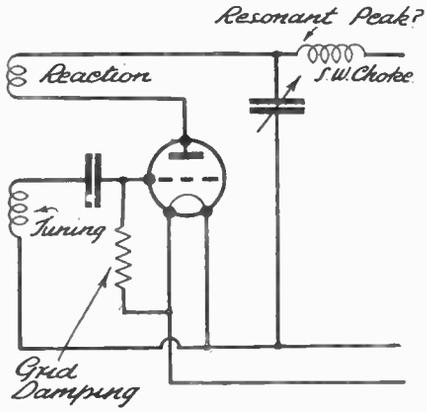


Fig. 3: Two points which Mr. Chester thought might be the cause of the "blind spots" were the S.W. choke and the grid leak.

Fig. 3 shows the two points I considered might be responsible for the continued blind spot. First, I wondered if that short-wave choke in the anode circuit was "peaking" in some way, and so causing the trouble. I tried two different makes of choke—and even wound 100 turns of No. 26 wire on a 1-in. test tube in an attempt to make my own.

My confession is this: The original choke proved the best for oscillation, the other two having the effect of demanding more reaction condenser capacity to produce oscillation. From which I concluded that

(*Please turn to cover iii.*)

RANDOM RADIO REFLECTIONS

By Victor King

GIVE THE TURNS A CHANCE—STUDIO APPLAUSE IS A GOOD THING :: HOUSE-TO-HOUSE COMMUNICATION :: RADIO AND RECORDS WITHOUT INTERFERENCE

STUDIO AUDIENCES

EVERY now and then there is a whale of a criticism in the Press against studio audiences. Apparently, judging by some of the printed comments, everyone ought to know that studio audiences are a wash-out. Useless folk serving no useful purpose. But on the contrary helping to boost bad broadcasts.

Yet clearly the B.B.C. considers them desirable. And doubtless the artists like 'em, although, probably, some of them are momentarily surprised at the readiness of the applause.

Of course, there will be applause. No one having waited eighteen months or

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"Some of them are momentarily surprised at the readiness of the applause."

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thereabouts to gain the privilege of a free evening's entertainment is going to start barracking. No, a studio audience is predisposed to be appreciative of everything dished up.

And why not? I think it's a good idea. Where's the advantage of giving a turn the "bird"? Someone thought that turn good even if it was only the man at the B.B.C. who booked it. You can't imagine that there would be a deliberate booking of a bad act.

Well, if there's someone who likes it, then the chances are that there will be millions of others who like it. And they'd be frightfully fed up if their listening were interfered with by outbursts of studio raspberries. Having got to the mike, a turn must be allowed to have the best chance of going over right up to its end. And its chances will be enhanced enormously by a measure of appreciation from an audience. What you or I might think a bad turn could well be transformed into tolerable listening by being put right up on its toes by an audience prepared to cheer anything.

Ask the profession what it thinks of those unresponsive, phlegmatic, unsympathetic audiences it gets in some parts of the country. "Like trying to be funny in a cemetery," said one old pro. to me a little while back.

You know I haven't much time for current criticism, whether of radio, books, films or the drama. So much of it is done by young "smart Alecs" residing in west-end service flats who don't know how real men and women live, let alone what they are likely to want in the way of entertainment. Anyway, it's something a sight different from either Bach Cantatas or Surrealism.

YOU CAN'T DO IT

A YOUNG reader of my notes has been sending me many words on the subject of communication without wires. He desires to establish a link between his house and that of a friend. I have explained that radio is out of the question. That the P.M.G. in his wisdom (or that of a predecessor) has made it quite, completely and entirely illegal for any but the Post Office or the B.B.C. or the Armed Services or the Police Force to engage in ether message exchanging.

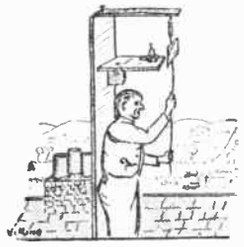
What about amateur experimenters? he then asked. To which I responded that they had to have qualifications and purposes before being allowed to experiment, and that if they used their little wireless stations for sending communications regarding social engagements and Aunt Matilda's health, they'd soon have their antennæ extracted.

Then followed these Q.'s and A.'s.

Q. What about a buzzer stuck right on to an aerial?

A. Insufficient range for doing anything but interfere with the neighbour's radio. Penalty, on being detected and convicted, social excommunication and a fine dependent on the Magistrate's liver.

Q. Can one fix up a telegraph or telephone line so long as it doesn't pass across a main road?



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"He desires to establish a link between his house and that of a friend."

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A. Not if it wanders outside one's own domestic domain.

Q. Why not light signals?

A. Even such things as that, if used for communication purposes, can be held to be a contravention of the Wireless Telegraphy and other Acts which give the P.M.G. a communication monopoly in this land unfit for unofficial hearers to live in.

And why shouldn't he have a monopoly? After all, the P.O. services are cheap. But they wouldn't be if all kinds of "pirating" were going on.

PHONING YOUR RECORDS

I'VE been playing some of my records on to telephone receivers and been somewhat surprised at the good hearing one can enjoy by this means. You know the idea. You merely join the pick-up direct to the phones without using any amplification of any kind.

It's quite a useful way of enjoying dual entertainment in the same room. The phones tend to keep outside sounds getting to your ears, so even if there is a radio going you don't notice it much providing it is not too loud.

Of course, if you stuck phones on the radio you'd hear nothing at all of it and two lots of people could share radio and records without mutual interference.

There's another angle on the idea. Garden listening. You won't bust into the balmy quietness of a summer afternoon if you do your stuff on phones. A nice, pleasant little idea. All your latest jazz records (or chamber music recordings) with nary a squeak drifting to the outside air.

And another thing. Pick-up-'phone listening is cheap. In fact, it costs you nothing at all beyond the wear of your records and the needles. Is this a sound scheme? My brothers, it's philanthropy and good fellowship and economy with gilt edges.

WHERE?

A NUMBER of you have written asking where those resistance leads I mentioned a few weeks ago are obtainable. I'm afraid I don't know where they can be bought separately in this country. You see, they come over from the States stuck on low voltage sets.

A jolly good idea. As you are probably aware, 110 volts is almost a standard pressure "over there." Which means that all the surplus stock sets for export have to be modified to suit our 230 and what-not mains. Instead of indulging in any interior fiddling about which would put up costs, the artful Yanks thought of turning out leads made of resistance wire to drop the voltage the required amount.

No doubt replacements are obtainable from those who handle the sets in this country. But to be quite frank I don't concern myself much with the commercial aspects of imported radio gear. Why should I when I derive the bigger part of my income from the commercial radio gents of my own country?

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"They'd be frightfully fed up if their listening were interfered with by outbursts of studio raspberries."

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POLICE RADIO

HAVE any of you who live in or near London seen the new police radio cars?

Glistening black outfits with large, built-in horn speakers streamlining from the top.

With a maximum speed of goodness knows what, I got on the tail of one on an arterial road, but at 75 m.p.h. I gave up. The thing seemed only to be ambling at that velocity, and when the driver, with a grin, put his foot down good and hard I think he must have accelerated up to 100 m.p.h.

Anyway, still maintaining my 75, I dropped back as though I'd gone in reverse.

And all the time the other perambulating P.C. was sitting with phones, on intently listening. Wonder if he was listening to Henry Hall?

MARCONI—THE MAN AND HIS WIRELESS

CHAPTER VI—FRANCE CALLS FOR PROOF

The English Channel's challenge to Marconi—He makes "sparks" leap from France to the cliffs of Dover—Historic bulletins—Marconi turns his attention to duplex wireless—He demonstrates how waves can be separated by tuning—The value of a famous patent, No. 7777—Marconi Company plans expansion ashore and afloat

CHAPTER VII—AMERICA BECKONS MARCONI

James Gordon Bennett extends an invitation—Marconi accepts and plans to report international regatta by wireless—He arrives in New York—Impressions of Marconi by reporters—The yacht race begins—Marconi flashes bulletins to the "Herald"—Conversations with newsmen—Interest of Army and Navy aroused—Preece congratulates Marconi and reviews progress of wireless

FRANCE called to Marconi in 1899. Could he send a message through the air across the English Channel? Marconi answered "Yes," and left for France to prove it.

It was March and all was ready for wireless to meet one of the most critical tests of its career. The "sparks" must leap from the little town of Wimereux, three miles out of Boulogne, to the cliffs of Dover. That was a long distance! Soldiers in ancient times had dreamt of digging a tunnel under the Channel to link the British Isles with the Continent, but no one had thought of talking back and forth across the water without the use of wires.

The French Government wanted Marconi to try this span. Electrical experts and government officials visited the station at Wimereux where Marconi and Jameson Davis met them and explained the installation, and what they believed could be accomplished.

Monday, March 27, was a momentous day in the history of wireless. At five o'clock in the afternoon Marconi pressed the sending-key that tapped out the first cross-Channel signal. There was nothing new in this for him except the distance! Months of work at the Poole and Needles stations had made wireless an everyday event in his life.

The transmitters and receivers used to spin the invisible thread to link England with the Continent were quite the same as utilised in previous experiments.[1] A seven-strand copper wire insulated from a sprit 150 feet high served as the aerial. The mast projected up from the sand at sea level, with no high cliff on the French side to aid in tossing the messages across the water.

[1] *McClure's Magazine*, June 1899.

Crack! flashed the spark under the master hand from Italy. All eyes seemed to glance anxiously out upon the sea as the spring gales lashed angrily against Napoleon's old fort that rose forsaken in the foreground. Would the message carry all the way to England? There was nothing in the confident, deliberate action of Marconi to reveal that it would miss the mark. Thirty-two miles seemed a long leap!

Suddenly, as if he sensed something in the air for him to lend an ear, Marconi signed off with three Vs and stopped transmission. The room was silent. Every one was watching Marconi and their ears seemed to be strained more than his to catch some sound from the receiver. There was a pause but only for a moment, and then briskly the dots and dashes began to click as the tape rolled off the message.

"And there it was," said a guest, who later described the historic scene, "short and commonplace enough, yet vastly important, since it was the first wireless message sent from England to the Continent: First 'V,' the call; then 'M,' meaning 'Your message is perfect'; then, 'Same here 2 CMS. VVV'; the *cms* being an abbreviation for centimetres referring to the length of the spark, while V was the conventional finishing signal.

"And so, without more ado, the thing was done. The Frenchmen might stare and chatter as they pleased, here was something come to the world to stay. A pronounced success surely, and everybody said so as messages went back and forth, scores of messages, during the following hours and days, and all correct."

Marconi with a stroke of diplomacy was quick to acknowledge the debt of science to Branly, the Frenchman. He flashed this message:

Marconi sends M. Branly his respectful compliments across the Channel this fine achievement being partly due to the remarkable researches of M. Branly.

Two days later Robert McClure, magazine publisher, was at the Dover station. Cleveland Moffett was at the Boulogne terminal to hold cross-Channel conversation. To test the accuracy of transmission, Mr. Kemp, who was operating the French transmitter, was handed this message which he clicked off the spark:

McClure, Dover: Gniteerg morf Eenarf ot Dnalgne hguorht eht rehte—Moffett.

This meant, "Greeting from France to England through the ether," each word being spelled backward. The Dover operator may have thought something was tangled up, but he copied just what he heard, and all were pleased when the Boulogne receiver intercepted:

Moffett, Boulogne: Your message received. It reads all right. Vive Marconi—McClure.

(Continued overleaf.)

MARCONI CHATS TO RADIO CHIEFS

This picture was taken during the Marchese Marconi's visit to America a few years ago. He is seen here with David Sarnoff (left), President of the Radio Corporation of America, and E. F. McDonald, President of the Zenith Radio Corporation, in the library of the latter's yacht.

MARCONI—THE MAN AND HIS WIRELESS—*Continued*

The operators flashed "Good-bye" and the trial was over.

"How fast can you transmit a message?" Moffett asked Kemp.

"Just now at the rate of about fifteen words a minute; but we shall do better than that no doubt with experience," said the engineer. "You have seen how clear our tape reads. Anyone who knows the Morse Code will see that the letters are perfect."

"Do you think there is a field for the Marconi system in overland transmission?"

"In certain cases, yes. For instance, where you cannot get the right of way to put up wires and poles. What is a disobliging farmer going to do if you send messages right through his farm, barns and all? Then see the advantage in time of war for quick communication, and no chance that the enemy may cut the wires."

"But the enemy can read your dispatches."

"That is not so sure," replied Kemp. "Besides the possibility of directing the waves with reflectors, Marconi is now engaged in most promising experiments in syntony."

A great secret was out of the bag! Marconi had developed a method to separate stations on different wavelengths. His engineer referred to the invention as "syntony." He called it electrical tuning.

"I may describe syntony as the tuning of a particular transmitter to a particular receiver, so that the latter will respond to the former and to no other, while the former will influence the latter, and no other," said Mr. Kemp. "That, of course, is a possibility in the future, but it bids fair soon to be realised. There are even some who maintain that there may be produced as many separate sets of transmitters and receivers capable of working only together as there are separate sets of locks and keys. In any event any two private individuals might communicate freely without fear of being understood by others."

Those sceptics who had always clamoured that the weak link in wireless was the fact that if more than one station sent at the same time the messages would be a discordant jumble, now had no reason to scorn.

Tuning—a wireless miracle, protected by Marconi's famous patent No. 7777, solved the problem.

Little did the public realise in 1899 that their children would be using this magic tuning to separate great symphonies from talks by kings, weather reports from menus, and a funeral oration from jazz. Marconi had completely mastered the wild waves criss-crossed overhead.

New possibilities for wireless were seen overnight. Did not the wonder of tuning boom wireless as a powerful force? Indeed it did, and some inquired if the granting of a limitless number of distinct tunings for transmitter and receiver did not threaten the telephone, the cable, the telegraph and even the newspaper.

"Our newspaper system?" exclaimed a correspondent.

"Certainly," said a Marconi engineer; "the news might be ticked off tapes every hour right into the houses of all subscribers, who have received instruments tuned to a certain transmitter at the newspaper distributing station. The readers would have merely to glance over their tapes to learn what was happening in the world."

Great was the foresight of these pioneer Marconi men. Did they dream of facsimile broadcasts, photoradio or television?

Prophets were moved to point to the day when citizens would set wireless dials at a definite wave when retiring, so that during the night the machine could pluck a facsimile newspaper from the air. Should the owner of the machine prefer a New York paper he would tune to a specific wave; and another for Chicago. He would have a choice of tele-newspapers.

GOING ABOARD

Another snap of the great inventor—going aboard his yacht this time—during a Cowes Regatta.

Wireless in its race to overtake print, however, runs in a circle. The only way it can catch up is to receive and record automatically what the air waves say. That gets back to print again. Wireless and print supplement each other. Both are needed.

Marconi had other things to think about without trying to compete with such a powerful force as the printed word.

The Marconi Company then started unaided to develop its own systems of shore-stations for communicating with ships at sea. This course was free to anybody and everybody, because no licences were required, and no permission had to be acquired for performance.

The "ether" was a gold field of science: Marconi was the main prospector.

CHAPTER VII

AMERICA BECKONS MARCONI

MARCONI was anxious to see America. His mother had often told him stories of the land across the sea. As a boy he had read the adventures of Columbus. He had heard of America's commercial enterprise and how intensely interested Americans were in his invention.

A representative of the *New York Herald*, Milton V. Snyder, was in Ireland when the Kingstown regatta was wirelessed. Snyder reported what he had seen and heard to James Gordon Bennett, an enthusiastic yachtsman and owner of the *New York Herald*. He told him how the *Dublin Express* had posted the wireless bulletins in the window. In the meantime Snyder went to Paris.

"Go back to London," cabled Bennett, "and make arrangements for Marconi to go to New York in September to report the America Cup races for the *Herald*."

In London, Snyder talked with Jameson Davis, chairman of the British Marconi Company. He was in favour of the proposal, but Marconi hesitated. He was not sure he could send messages the distance required in following the yachts off New York Bay. Finally, the inventor agreed if the experiments he planned for the spring of 1899 in the English Channel were successful he would accept Mr. Bennett's invitation and go to America in September.

During the first half of that year, he increased the range of the wireless apparatus on a boat from eighteen to seventy-two miles, and boosted the speed of transmission to twenty words a minute. That satisfied him, as did tests he was invited to conduct during the British Fleet manœuvres, so he decided to see America. The *Herald* attracted international attention when Marconi's acceptance was announced on September 12th, 1899.

Sir Thomas Lipton's Shamrock I had been built on the Clyde, and then was taken to pieces, sent in sections to London for reassembly at the yard of the Thornycroft Ship and Boiler Builders on the Thames. Finally, after much mystery, the Shamrock slipped into the Thames and headed for Manhattan Island.

Marconi, accompanied by William Goodbody, a London director of the Marconi Wireless Telegraph Company, Charles E. Rickard and W. W. Bradfield and William Densham, skilled engineers, sailed on September 11th from Liverpool on board the Cunarder Aurania, which arrived in New York on the 21st. As he came down the gangplank Marconi confidently exclaimed, "We will be able to send the details of the yacht racing to New York as accurately and as quickly almost as if you could telephone them. The distance involved is nothing, nor will hills interfere."

Sightseeing attracted Marconi for the next few days. After spending much time at the Custom House, he went to the top of the St. Paul building to get a bird's-eye view of New York's "monster" buildings; he was impressed with the swift-moving lifts.

(*Please turn to page* 432.)

LOW-MELTING-POINT SOLDER FOR CONSTRUCTORS

A practical article in which instructions are given for the making of a number of extremely useful alloys for electrical and radio use.

By J. F. Stirling

INVARIABLY in the working practice of every radio constructor there comes a time at which a small quantity of some ultra-low-melting-point metal is required or, at least, would be an advantage for some delicate piece of soldering work which is in hand.

If, for instance, you wish to join up permanently two or three fine strands of instrument wire you will find that unless you apply ordinary "soft solder" to them with extreme care, you will, in the act of attempting to join them together with any normal solder, merely burn them away.

The melting-points of the constituent metals of low-melting-point solders.

Metal	*Melting-Point*
Lead	326°C.
Cadmium	320°C.
Bismuth	270°C.
Tin	231°C.

For the uniting of such wires, the use of special low-melting-point metals is extraordinarily advantageous. Also, when it is required merely to make a temporary joint, a special low-temperature-melting solder will be found very useful, since such a joint can be released at the merest touch of a warmed iron.

The majority of these "ultra solders" are good electrical conductors and they will not give rise to resistance losses. They have one defect, and one defect only. They will not bear heavy strains when the melting-point of the solder is lower than 100° C. The majority of instrument connections in radio work, however, are not required to stand up to severe mechanical stresses. Hence, to all practical intents and purposes, this objection to the use of such low-temperature-melting solders is disposed of.

The Various Alloys

On this page the reader will find tabulated the exact composition and melting-points of a number of solder-like alloys. Ordinary solder, it will be remembered, contains merely lead and tin in varying proportions. By incorporating various quantities of bismuth and/or cadmium with lead-tin alloys, it will be seen that it is possible to obtain metals which melt at relatively very low temperatures.

Some amateurs may have a difficulty in obtaining small quantities of the metals tin, cadmium and bismuth in the pure state. Such metals are best obtained from the nearest wholesale chemical and laboratory furnisher, and they will not be found expensive.

The necessary lead can be obtained from any form of scrap lead, but this should have been melted down and all the impurities skimmed away from the molten metal.

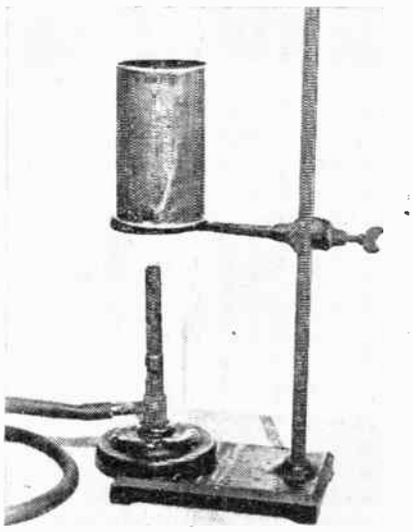
The whole secret of success in the making of low-temperature-melting solders lies in the accurate weighing out of the requisite quantities. These special solders cannot be made sketchily. The component metals must be weighed out accurately and the melting down must be done carefully and without undue heat.

For melting the metals an earthenware crucible is the best vessel. Since, however, the amateur may find it difficult to procure one of these articles, a small "tin" coffee or cocoa container, very carefully cleaned out, will make a perfectly satisfactory substitute.

The Order of Mixing

Support the container over a low bunsen-burner flame, that of a spirit-lamp or else an ordinary low-burning gas-ring, and melt up the metal with the highest melting-point first of all. In every case, this metal will be lead; cadmium coming next; then bismuth and finally tin—as shown from left to right in the table on this page. This procedure is important and should be rigorously adhered to.

Stir the molten metal with a clean iron nail. Take care that the molten mass of metal is not heated unnecessarily high. After the last ingredient has been added, stir the molten mass for about half a minute.



A carefully cleaned coffee or cocoa tin makes a convenient container for alloying the ingredients of low-melting-point solder.

If, to any of the alloys enumerated on this page, varying quantities of mercury (quicksilver) are added when the alloy is in a molten state, the melting-point of the resultant metal will be lowered enormously. Indeed, by adding large quantities of mercury, the alloys can be obtained in a permanently plastic state.

The radio constructor, however, should *never* employ mercury-containing solders for wireless work, for the reason that mercury is a slightly volatile metal and it is easily possible for traces of its vapour coming in contact with the aluminium vanes of a condenser to enter into union with the latter and to form a soft and rapidly corrodable surface on the metal. It should also be remembered that the mercury in a special soft solder uniting two copper wires will, in time, tend to spread along the wires and will set up a softening of the copper metal which is exceedingly detrimental to the latter.

All things considered, it is far better to avoid the use of mercury in the making of ultra-low-melting-point metals when such are required for normal fine electrical and radio soldering work. Otherwise, as explained, you may meet trouble.

Here is a wide range of low-melting-point solders for fine radio and electrical work. The constituent metals should be melted in the order given—from left to right.

Name	Melting-Point	Composition (Parts by Weight)				Characteristics
		Lead	Cadmium	Bismuth	Tin	
Lipowitz's Alloy	63°C.	2·7	1	5	1·3	Warm water melting alloys.
Wood's Metal	65°C.	2	1	4	1	
Lichtenberg's Metal	91°C.	3	—	5	2	—
Arcet's Alloy	93°C.	1	—	2	1	Melt just below boiling-point of water.
Newton's Metal	94°C.	3·1	—	5	1·8	
Rose's Metal	95°C.	2·8	—	5	2·4	
"Boiling-Point" Alloy	100°C.	3	—	8	4	Melts in sharply boiling water.
"Softened Solder"	150°C.	2	2	—	4	An ultra-soft solder capable of bearing strains.

Then turn out the flame and tip the molten contents of the heating vessel on to a clean slate, marble or stone slab. If none of these is available a perfectly clean brick will do. The metal will instantly solidify in "strip" or "ribbon" form, in which condition it is the most useful for soldering purposes.

It is best only to make small quantities of any of these special solders at a time, the reason being that when a large area of the molten alloy is exposed to the air, fairly rapid oxidation takes place, with consequent wastage of some of the metal.

"RADIO DOCTORS" OF THE B.B.C.

The Story Behind the Technical Hitch

Mr. W. T. Forse, Controller of the H.M.V. factories, shows Mr. M. J. Savage (left), Prime Minister of New Zealand, one of the firm's latest all-world radiograms.

HARLEY STREET, within a stone's throw of Broadcasting House, is no more proficient in its diagnosis of obscure human ills than B.B.C. engineers are at discovering technical hitches-to-be.

Thousands of delicate pieces of apparatus, hundreds of valves, scores of phone lines that stretch like tentacles from one end of the country to the other, as well as a large amount of studio and other equipment, are all potential "patients." But radio technicians, unlike doctors, do not wait for a breakdown to occur before they begin to keep a "condition graph"; the exact behaviour of every link in the broadcasting chain is logged from the day that its useful life begins.

Nothing Left to Chance

There is a remarkable story behind this little known work at Broadcasting House. Let Mr. L. Harvey, Assistant to the Superintendent Engineer (Studios) tell it:

"Every possible precaution is taken to avoid even one second's breakdown; nothing is left to chance, and if we had a motto it would probably be something about prevention being better than cure.

"There are, of course, literally thousands of potential causes of breakdown. A studio programme could cease because of the failure of one of the numerous relays in the control room, of one of the scores of valves, or in any of the circuits connecting more than twenty studios. Only vigilant maintenance minimises the risk of breakdown till it is almost negligible. For instance, each valve is tested at regular intervals and rejected as soon as its efficiency, according to a carefully kept graph record, begins to decline; we scrap them long before listeners do. It's a full-time job for one man.

Plotting Characteristics

"Prior to every rehearsal and transmission, all studios and their associated apparatus are tested throughout. Amplifiers are examined regularly for their response to the musical range, and special testing apparatus gives a frequency up to about ten thousand cycles. That is about the limit of the normal human ear. Some people, it is said, can hear sounds up to a frequency of 13,000 cycles, but even ten thousand is nothing more than an almost inaudible whistle. At each test graphs are plotted, and when they are compared with the originals any diminution of 'characteristic' is obvious. In addition, amplifier tests will usually locate any other brooding 'snags.'

"A special engineering section looks after all telephone lines. Normal circuits—like those connecting studio centres—are tested daily, and lines for outside broadcasts are examined immediately before a transmission. Each line, you see, has its own distinct response to music, and sometimes electrical correction is necessary.

"Then there is inter-station working. Every morning a general round-up is made of music lines from London throughout the whole network to all stations—'station line-up' we call it. From Broadcasting House we send a definite tone down the lines at pre-arranged frequencies ranging from 50 to 10,000 cycles. Each station en route measures it and sends a report to us. Helps us to keep a watchful eye on circuits; more, we can usually anticipate trouble if a line shows a gradual loss of response. We know that some day a programme is going to get lost. So we just see that it won't.

"Studio microphones are inspected before every rehearsal and transmission, even though there is often an interval of only a few minutes in which to do the job. We send an engineer to talk to the control room through each 'mike'—a sort of private broadcast. No, they do not tell funny stories! But you'd be surprised how necessary this precaution is. In the old days, particularly, people used to trip over mike leads and jerk them out of the wall sockets.

The Turntable Tune

There are literally dozens of gramophone turntables in Broadcasting House, many of them in studios. They, too, have to be examined daily. You'd never guess the tune we use! The 'Teddy Bears' Picnic' played by the B.B.C. Dance Orchestra. An engineer sets off each morning with the record under his arm, playing it at least thirty times a day as he makes his tests. This little piece of music is played by such a combination of instruments and covers such a wide range of frequencies that it gives the engineer all that he needs for the test. Moreover, his ear gets so accustomed to the one piece that he can detect at once if the reproduction is not what it should be. Gramophone pick-ups have a test of their own carried out by the use of a special record on which are a series of different frequencies; quite by the way, it is a double check on amplifiers, too.

"All this, and more, is done to prevent irritating little breakdowns of even a few seconds.

"Yet breakdowns are bound to happen. So we have various ways and means of limiting their duration.

"Supposing a programme from the Concert Hall suddenly 'disappears.' It has to be found and put on the air again quickly. The first man who has direct indication that broadcasting has ceased is the engineer controlling the programme. He formally notifies the supervisor—who probably already knows—and a test is made by means of the appropriate jack-field in the control room. You can tell sooner than it takes to tell at what point the programme is being lost. A button is pressed, and reserve amplifiers automatically change the circuit. Fifteen seconds later the programme is going out again. The faulty amplifier is repaired immediately.

"One of our biggest difficulties is correcting a breakdown in a microphone circuit; an engineer has to dash to the studio, change the mike—and that takes perhaps a minute. Worse still if a whole studio goes 'dead'; thank goodness it very rarely happens because of our stringent tests. But if it does—well, the whole cast of a show may have to be moved to another studio. That's a real technical hitch!

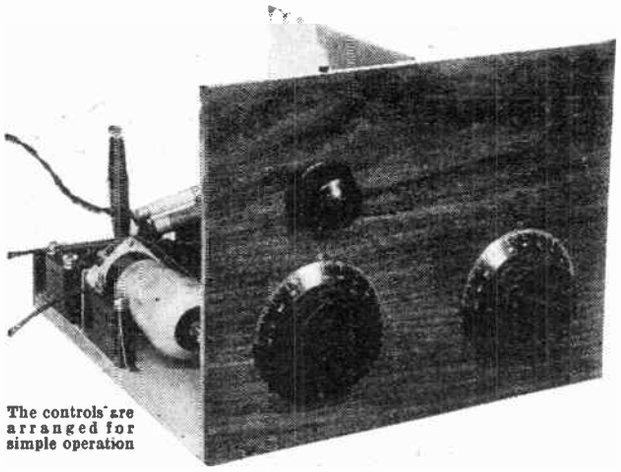
"There is, as you know, quite a lot of S.B. work to-day—simultaneous broadcasts from several B.B.C. stations of the same programme. Imagine that London is giving one to the Regions:

"The programme goes along the normal telephone lines through the various centres, at each of which it is checked and passed through amplifiers. If a breakdown occurs at any point of the route a special control line makes it easy for the engineers at every centre to check backwards or forwards with each other, ascertain where the programme is being lost and switch over to a reserve circuit.

Keen Engineers

Engineers generally are exceedingly keen fellows, and losing a programme is to them as dreadful as dropping a musket on a Guards' parade.

They still smile at that old but true story of the dear old soul who 'phoned the B.B.C. one day and said: "When are you going to broadcast again? Your transmitters have not been working for three whole days. I know—because my valves won't light up."



The controls are arranged for simple operation

THE ALL-MAINS "REACTO"

Designed by the "P.W." Research Department

A superhet converter—run entirely from the mains—which will turn your broadcast set into a highly efficient all-wave receiver. It will work on A.C. and D.C. Mains and incorporates several unique features

TO own a receiver to-day which is incapable of receiving short waves, is to be out of the fashion. Perhaps being out of the fashion does not matter very much, but you are also missing quite a lot. There is a great deal of very interesting and entertaining matter broadcast on the short waves, which is unobtainable on the normal broadcast bands.

If your present "medium and long" set is still giving good service, you probably do not feel inclined to scrap it and buy an "all-waver," even although you would very much like to obtain the short-wave stations. For only a fraction of the cost of a new all-wave set you can convert your present set to receive short waves. There are two ways of doing this: (1) by the use of an adaptor fitted to the detector (the second detector if the set is a superhet) of your set, or (2) by means of a superhet converter.

In the case of an adaptor you obtain in effect a short-wave set consisting of a detector, and a number of L.F. stages depending upon the receiver in use. This type of short-wave reception is inclined to be rather inadequate to-day, owing to its selectivity being insufficient for the present ether congestion on the short waves.

The Advantage of the Superhet

Consequently we have to resort to the second method, viz. the superhet converter. This makes use of the supersonic heterodyne method of reception, with its tremendous advantage of really excellent selectivity. It is unnecessary to disturb the receiver in any way whatsoever. You simply remove the aerial, and connect it to the aerial terminal of the converter, and two leads are connected from the converter to the aerial and earth terminals of the receiver.

The converter which is the subject of this article is, of course, for use with mains receivers. The battery version has already appeared in POPULAR WIRELESS. It was decided to make it suitable for use on A.C. or D.C. mains, so that it could be used with any mains set. Furthermore, as there is no mains transformer, it is cheaper to build than the normal A.C. version would be.

It might be pointed out that for the D.C. mains user, the rectifier is an unnecessary expense. However, there are two arguments against that. (1) It would be necessary to use paper smoothing condensers, which are more expensive than their electrolytic counterpart, as, in the event of D.C. mains being connected the wrong way round, the electrolytic condensers would be destroyed. (2) All over the country D.C. mains are being changed to A.C. Consequently those constructors who are at present on D.C. mains will not need to change this converter in any way, should their mains be changed to A.C.

It has already been mentioned that a superhet is, to say the least, desirable at the present day for receiving the short waves. Even with a superhet, however, it is sometimes impossible to separate, say, a weak American station from a powerful European.

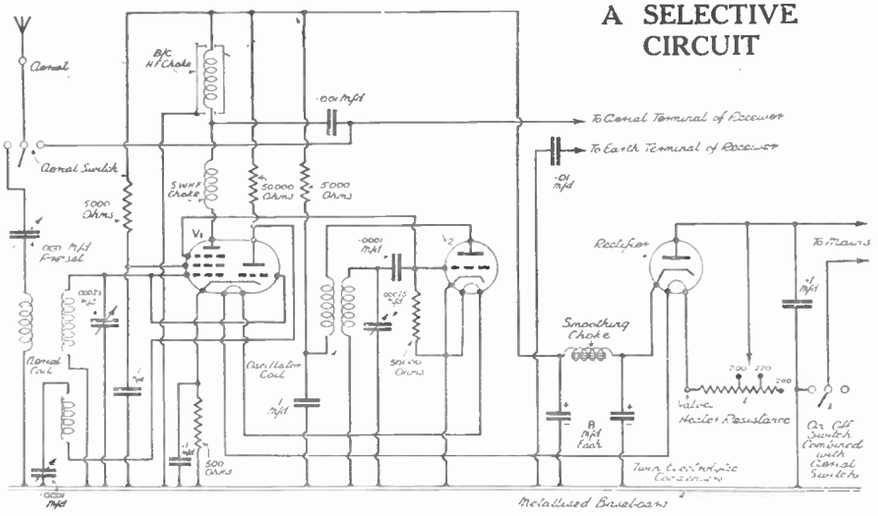
Improving the Selectivity

An example of this congestion is Zeesen DJN and Schenectady. In consequence of this state of affairs it seemed imperative that something should be done to improve selectivity still further. Consequently it was decided to experiment with reaction on the aerial circuit. In order to do this in a satisfactory manner it was found necessary to use a separate reactor valve. Finally, the triode section of the triode-pentode frequency-changer was used as the reactor valve, whilst a separate triode was used as the oscillator. This is the form of the present circuit.

The increase in signal strength and

(*Continued overleaf.*)

A SELECTIVE CIRCUIT



This is the circuit of the All-Mains "Reacto," which is highly selective and sensitive, due to the application of reaction to the aerial circuit of the mixer valve V_1.

WHAT YOU NEED

- 2 Polar ·00025-mfd. tuning condensers, type C.
- 1 J.B. ·0001-mfd. Midget reaction condenser.
- 1 Eddystone 4-pin coil holder, No. 949.
- 1 Eddystone 6-pin coil holder, No. 969.
- 1 B.T.S. 9-pin valve holder type, U.H.9.
- 1 Clix 7-pin baseboard-mounting valve holder, S.W. skeleton type.
- 1 W.B. 5-pin valve holder, A.C. type.
- 2 T.C.C. 1-mfd. fixed condensers, type 50.
- 2 T.C.C. ·1-mfd. fixed condensers, type 250.
- 1 T.C.C. ·01-mfd. fixed condenser, type 34.
- 1 T.C.C. ·001-mfd. fixed condenser, type 34.
- 1 T.C.C. ·0001-mfd. fixed condenser, type M.W.
- 2 Dubilier 50,000-ohm 1-watt resistances.
- 2 Dubilier 5,000-ohm 1-watt resistances.
- 1 Dubilier 500-ohm 1-watt resistance.
- 1 Wearite smoothing choke, type H.T.15.
- 1 B.T.S. mains heater resistance (for 1 : 40v., 1 : 26v., and 1: 13v. valve at ·2 amp.).
- 1 Wearite H.F. choke, type H.F.1.
- 1 Wearite H.F. choke, type H.F.3.
- 1 Bulgin toggle switch, type S.93.
- 1 J.B. baseboard trimmer, ·0001 mfd.
- 1 Dubilier 8-8-mfd. electrolytic condenser, type 9203E.
- 1 Peto-Scott bracket for above.
- 1 Belling and Lee terminal marked A, type R.
- 1 Wood panel (polished front, "Metaplex" back) 10 in. × 8 in. × ¼ in. (Peto-Scott).
- 1 "Metaplex" baseboard, 10 in. × 10 in. × ¾ in. (Peto-Scott).
- 1 Ebonite terminal strip, 3 in. × 1½ in. × ⅛ in. (Peto-Scott).
- 1 Piece 24-gauge sheet aluminium for screen, 8 in. × 7 in. (Peto-Scott).
- 1 Piece 18-gauge aluminium for valve brackets, 2½ in. × 2 in. (Peto-Scott).
- 10 ft. 18-gauge T.C. wire for connecting (Peto-Scott).
- 3 lengths 1½ m.m. insulating sleeving (Peto-Scott).
- Screws, flex, etc. (Peto-Scott).

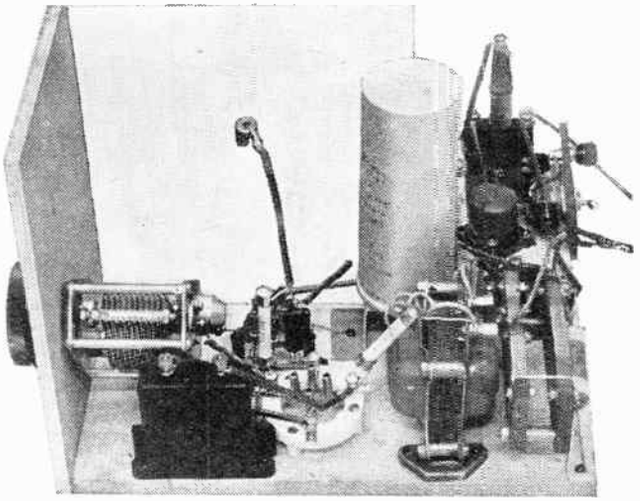
VALVES		
V1	V2	Rectifier
Mazda T.P.2620	Mazda H.L.1320	Mazda U.4020

THE ALL-MAINS "REACTO"

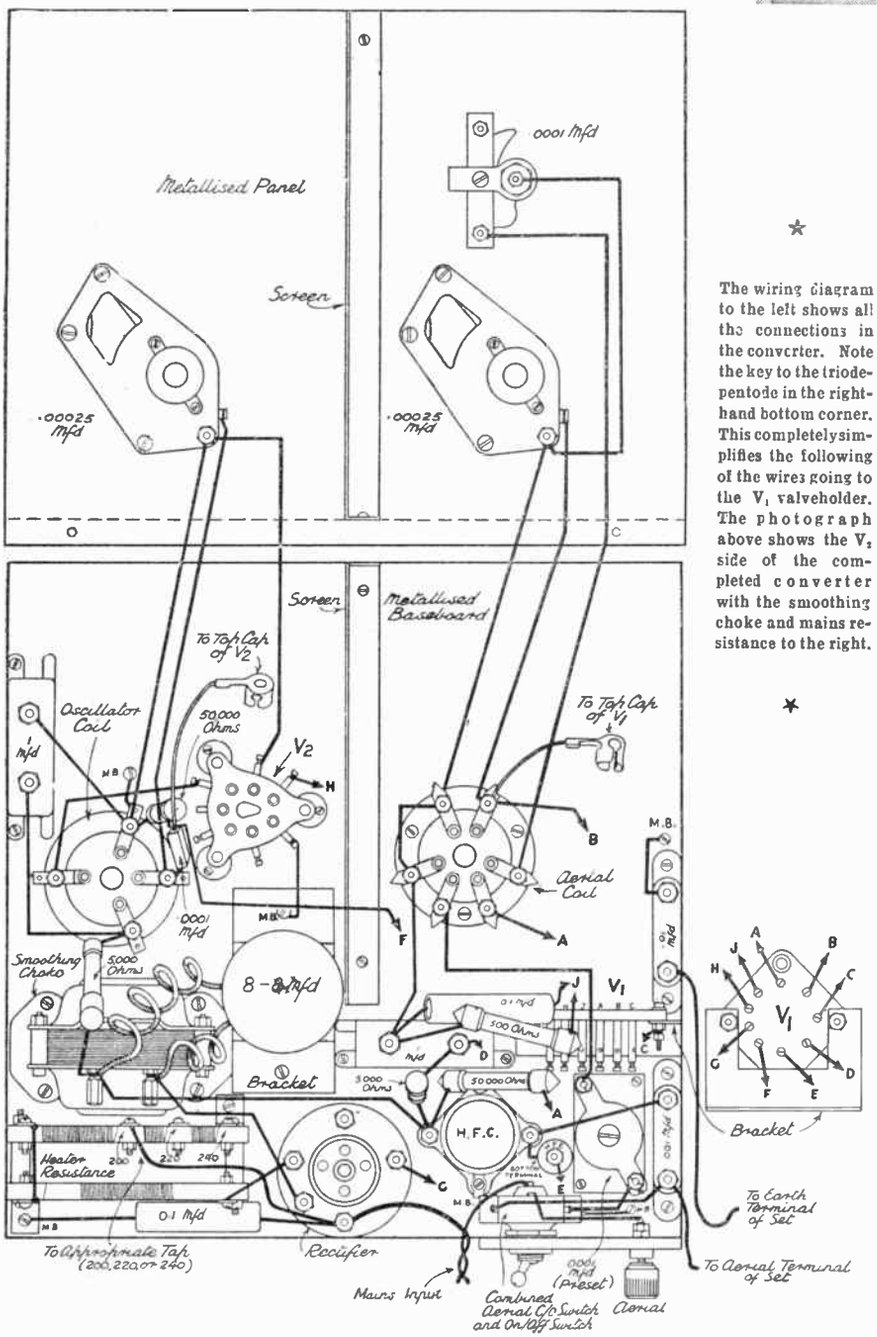
(Continued from previous page.)

selectivity which results from the use of reaction is enormous, and the inclusion of the necessary extra valve is easily justified.

Having pointed out the reasons for the particular design of this circuit, we will now briefly run through the circuit from the aerial. The aerial is connected to the common point of one pole of a double-pole change-over switch. When the switch is thrown one way the aerial is connected to a ·0001-mfd. pre-set condenser, which couples it to the aerial coupling coil of a 6-pin aerial tuning coil. When the switch is thrown the other way, the aerial is coupled straight through to the receiver, and the converter is put out of action. The other pole of the double-pole change-over switch is connected in the mains lead, so that the mains are switched on when the aerial is coupled to the converter, and switched off when the aerial is coupled to the set.



YOUR GUIDE TO THE WIRING



The wiring diagram to the left shows all the connections in the converter. Note the key to the triode-pentode in the right-hand bottom corner. This completely simplifies the following of the wires going to the V_1 valveholder. The photograph above shows the V_1 side of the completed converter with the smoothing choke and mains resistance to the right.

In other words, once the converter has been connected up, it is only necessary to use the change-over switch to change from short waves (using the converter) to medium and long waves (using the set alone).

Separate tuning condensers are used for aerial tuning and oscillator tuning. This is necessitated by the use of reaction. It would be impossible to gang them effectively, as ganging would not hold over the whole of the waveband without some form of external trimmer.

One ·00025-mfd. condenser tunes the grid circuit of the triode and pentode of the triode-pentode frequency-changer. The inductance in this circuit is the grid winding of a six-pin Eddystone coil. The aerial winding has already been referred to. The reaction winding is in the anode circuit of the triode section of the frequency-changer, reaction being controlled by means of a ·0001-mfd. reaction condenser.

The Oscillator Circuit

Another ·00025-mfd. condenser tunes the oscillator circuit. This is a 4-pin coil, the grid winding of which is tuned and coupled to the grid of a triode oscillator. The anode is connected to the reaction winding. Oscillations are fed into the frequency-changer (from the grid of the oscillator) via the suppressor-grid. Otherwise, the oscillator and frequency-changer are completely isolated and screened.

Of course, indirectly heated universal mains valves are used, with their heaters connected in series, the necessary voltage being dropped by means of a tapped resistance in one mains lead.

The signal output from the converter is fed from the anode of the pentode section of the frequency-changer, via a filter consisting of a condenser and a short-wave and a broadcast H.F. choke, to the aerial terminal of the receiver. That concludes the theoretical aspect of the circuit, and the actual construction of the converter will now be described.

The panel (back) and baseboard (top) are both metallised. The baseboard is a standard "Metaplex" ¾-in. board, measuring 10 in. × 10 in. Of course, it could be a plain baseboard covered with copper foil; but Metaplex is just as effective and looks infinitely cleaner. The panel is polished on the front side and is ¼ in. thick. Mounted in the middle of the baseboard, by means of a flange, is a 24-gauge aluminium screen,

SEEN ON THE AIR

NEWS AND VIEWS ON THE TELEVISION PROGRAMMES BY OUR SPECIAL RADIO-SCREEN CORRESPONDENT

L. MARSLAND GANDER

DISAPPOINTMENT awaits televiewers who are cricket enthusiasts. Negotiations had been proceeding between the B.B.C. and the M.C.C. for transmission from Lord's.

Though the presence of the vans at Wimbledon precluded the possibility of televising the Test match there were high hopes of seeing on the home screen the Eton v. Harrow match, Oxford v. Cambridge, Gentlemen v. Players, and possibly some county matches.

Now I hear that there has been a hitch, whether technical or otherwise is not specified. I hear also that Mr. Gerald Cock has had doubts as to the suitability of cricket for television. Owing to the distance of the wickets from the boundary and the only possible sites for the cameras, the batsmen and bowlers might look too small.

On the other hand it seems to me that the stationary batsman is a better subject than a fast-moving tennis player, assuming that the telephoto lens can enlarge the figure to a reasonable size.

Wimbledon Thrills

I had, as I hinted last week, a slight feeling of disappointment about the quality of the Wimbledon transmissions. Just before I began to write these notes, however, I had some exceptionally good pictures in my office. After a "technical hitch," which delayed the switch-over to Wimbledon, the transfer from the studio was made shortly before 4 o'clock towards the close of the exciting match between the two "pocket" players, Bitsy Grant of America and our H. W. Austin. So clear were the pictures that the ball in its flight could be followed easily. I had for the first time a genuine kick out of television tennis, and all in the room agreed that the pictures were excellent. "Why go to Wimbledon?" I heard. Well, lest the Lawn Tennis Association should get it into their heads that television is keeping people away from Wimbledon, I am bound to remark here that good as it was the real thing is better.

To and fro swung the battle. Match point was called again and again. Then Austin made the extra effort which gained him the day. Net play makes an exhilarating subject. As Austin smashed and smashed again I was thrilled as never before by a tennis match.

We saw Queen Mary twice during the transmission. Her Majesty could be seen in the Royal Box, easily distinguishable by her toque, wearing sun-glasses. Later she retired for tea and was shown by the camera returning to her seat.

At the end of the game Grant was depicted taking his beating in a philosophical and sportsmanlike way, with a broad smile. After bowing to Queen Mary the two walked off the court together arms round one another's shoulders. What better entertainment could the viewer wish for, than this?

A Contrast in Styles

The next match, between Crawford and von Cramm, presented contrast in size and in speed on the court. If the previous game was a fast lightweight contest, this was a struggle of slower-moving heavyweights—so it seemed.

By the way, the programme which preceded the tennis, though unduly drawn out, provided good entertainment of an entirely different order. Principal dancers of Colonel W. de Basil's Ballets Russes, from Covent Garden, came to the studio to rehearse. It is a peculiar circumstance that while ballet has not been particularly successful on the small screen this particular show, because of its easy informality, the laughter that greeted mistakes, and chiefly because of the graceful artistry of the performers, made a most favourable impression.

An Attractive Item

The dancers, who included Danilova, Baronova and Riabouchinska, were dressed in bathing costumes—or garments closely resembling bathing costumes. I have never seen better pictures or a more attractive item than Danilova performing the Sugar-plum fairy *pas seul*.

Television, like sound broadcasting, exposes insincerity in a deadly way, and makes acting extremely difficult. By the same token, reality on the television screen is nearly always more interesting than the most elaborate and carefully rehearsed production. The ballet rehearsal, though as I say too long, was an object lesson.

While the programmes are reaching new levels, television on the sales side must necessarily be in the doldrums until after the three weeks' holiday at Alexandra Palace. I have said and I repeat that the shutting down of transmissions altogether for three weeks is a mistake.

But in the meantime manufacturers are preparing for television's first really big sales push in the autumn. This will coincide with the Radio Exhibition where, it is now revealed, there will be sixteen separate demonstration theatres each seating about thirty persons.

I am rather doubtful of the wisdom of this arrangement, but I am not disposed to prejudge, and anyway it will certainly be an improvement on the hole-in-the-corner demonstration of last year. Admission will be by ticket, and the idea is to let each visitor see a complete entertainment by television. This is certainly better than being marshalled in a queue and kept on the move.

Exhibition Times

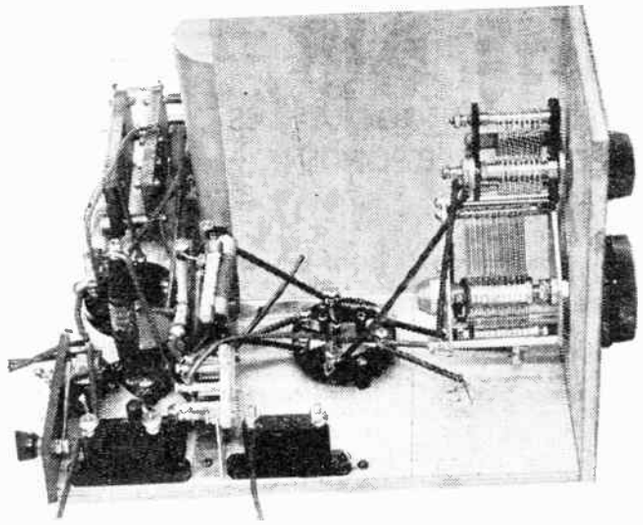
The B.B.C. is completely revising its programmes for Olympia. During the afternoon, while the exhibition is on, the time of transmission is being put back to from 4 to 5. There will be a film transmission in the period from 12.30 to 1.30 p.m., and the evening transmission will be at the usual time, from 9 to 10.

Each hour of the afternoon and evening periods is being divided into three fifteen-minute programmes with intervals of five minutes between. These intervals are to allow the theatres to be cleared. Then each of these fifteen-minute periods will, as far as humanly possible, give a sample of the best that television can do from inside and outside the studio.

I understand that the manufacturers who have already booked theatres are Baird, Cossor, Ediswan, Ekco, Ferranti, G.E.C., Halcyon, H.M.V., Kolster-Brandes, Marconiphone, Philips, Pye, R.G.D., and Ultra. Entry into the television market of so many new firms is highly significant. I regret, however, that the arrangements being made at Olympia will make difficult any direct comparison of results. But, of course, one cannot have things every way, so we'll hope for the best.

BRITAIN'S HEAVYWEIGHT CHAMPION

TOMMY FARR, British and Empire heavyweight champion, with his Philco all-waver. He used this set when he listened-in to the recent Louis-Braddock fight in Chicago.



The V_1 side of the converter is shown in this photograph. The valve-holder, which is mounted on a bracket, can be seen in the foreground.

dimensions of which are given in a diagram on this page. This screen is also screwed to the panel by means of its other flange.

A terminal strip measuring 3 in. × 1½ in. × $\frac{3}{16}$ in. is provided at the back of the baseboard to carry the aerial terminal and the change-over on-off switch. Terminals for connection to the receiver have not been used, but flex leads have been taken out from the ·001-mfd. and ·01-mfd. coupling condensers.

First drill the panel. Three-eighth inch holes are drilled for the two tuning condensers and the reaction condenser, whilst the two holes for fixing to the baseboard are $\frac{1}{8}$ in. That is all the panel drilling that is necessary. Now fit the panel to the baseboard. Next prepare the aluminium screen. This consists of a sheet of metal 8 in. × 7 in. of 24 gauge. A ½-in. flange is turned over along each of two adjacent sides. Two fixing holes are drilled in the shorter flange for fixing to baseboard, whilst one hole is drilled in the longer one for fixing to the panel. The positions of these holes are not a bit critical, and are shown in the diagram.

The Terminal Strip

The screen on completion should be fitted to the panel and baseboard. The terminal strip, carrying the switch and aerial terminal, is drilled as follows: $\frac{1}{8}$ in. hole for the switch, ½ in. from top, and ¾ in. from the appropriate end; $\frac{5}{32}$ in. hole for aerial terminal, ¾ in. from the top, and ½ in. from the other end; two $\frac{1}{4}$ in. holes for fixing screws, $\frac{3}{8}$ in. from the bottom, and ½ in. from each end. Mount terminal strip on the baseboard and the "chassis" is completed, ready to take the components.

Before this is done, however, it is necessary to make the 18-gauge aluminium bracket for the valve V_1. A diagram of this bracket will be found on page 302 of "P.W." dated June 5th (The Reacto" Converter). The holes by means of which the valve holder is fitted should be drilled fairly accurately, otherwise they will not register properly with the holes in the valve holder. Make sure that you mount the valve holder the right way round. The two heater pins form an isosceles triangle with the pin at the apex. The bracket should be mounted on the baseboard before the valve holder is fitted. The bracket is in line with the back edge of the screen and flush with the edge of the baseboard.

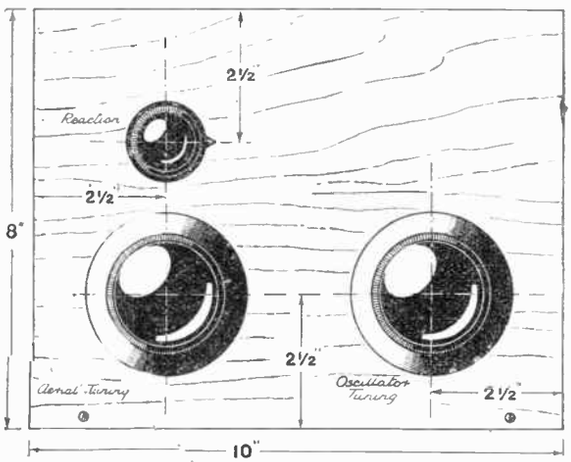
The components should now be mounted on the baseboard and the wiring done. Before mounting the V_2 valveholder you should fit the necessary leads to its terminals, as they are rather inaccessible when the holder is mounted. Wiring is carried out with 18-gauge tinned copper wire and 1½ m.m. insulating sleeving. Connection to the V_1 valve holder is indicated in small diagram at the side of the main diagram. There is nothing further that need be said regarding the wiring.

THE COILS REQUIRED

2 Eddystone 6-pin coils, types 6 LB and 6 Y.
2 Eddystone 4-pin coils, types LB and Y.

When the construction has been completed, connect mains leads to the mains plug, throw switch towards aerial terminal, and see that all the valves glow. By the way, make sure that you connect the lead from the "A" terminal of the rectifier valve to the correct point of the heater

THE PANEL DIMENSIONS



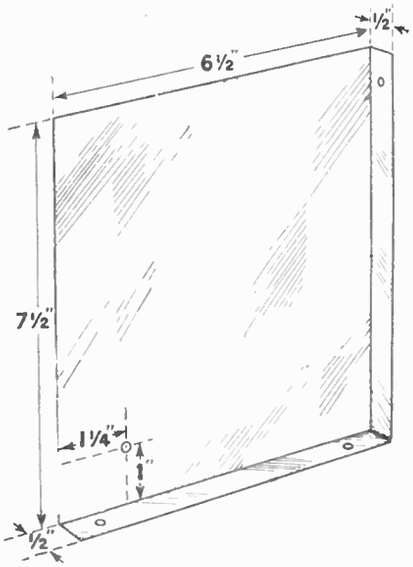
Five holes are required in the panel. Three for components and two for fixing screws to hold the panel and baseboard together.

resistance to suit your mains voltage. Mains voltages between 200 and 210 inclusive should be connected to the 200-v. tap. Voltages above 210 but not higher than 230 should be connected to the 220 volt, and those above 230 volts to the 240-volt tap.

Now for the testing with the receiver. Needless to say, it is necessary that your receiver should have at least one H.F. stage, or be a superhet. Remove the aerial from the aerial terminal of the receiver and connect it (the aerial) to the aerial terminal of the converter. Connect the lead marked "To aerial terminal of set" to aerial terminal of receiver. Connect the lead marked "To earth terminal of set" to earth terminal of receiver. Switch on both receiver and converter, the converter by throwing switch on terminal strip towards the aerial terminal. The receiver should be set to receive medium waves, and tuned to between 500 and 550 metres. Such a wavelength prevents any chance of double-channel interference.

Depending upon the time of day at which the set is tested, insert the appropriate

SCREEN DETAILS



With the aid of this dimensioned sketch you will find it easy to make your own screen from a piece of aluminium.

six-pin short-wave coil in the aerial coil holder, and four-pin coil in oscillator coil holder. As a matter of fact, at practically any time of the day or night you will obtain some of the powerful European stations on the 31-metre band. You will probably find it best to search with slight reaction applied—that is, with the reaction condenser vanes about one-quarter in mesh.

As a guide to finding the various stations we give the positions of the following stations. The first figure represents the aerial tuning and the second the oscillator.

Bound Brook (W 3 X A L), 26: 23; Schenectady (W 2 X A D), 40: 36; Pittsburgh (W 8 X K), 42: 38; Boston (W 1 X A L), 64: 60; Schenectady (W 2 X A F), 88: 82. These stations are obtained with the L.-B. coils. Using the Y coils: Schenectady (W 2 X A F), 28½: 23; Bound Brook (W 3 X A L), 74: 63.

Just a final word, and that is regarding the ·0001-mfd. preset condenser. If too high a coupling is used here with a big aerial it may be found impossible to obtain reaction, so don't forget to adjust this to obtain a compromise between sufficient reaction and good signal strength.

The waverange of the converter is approximately 13 to 33 metres with the L.-B. coils, and 24 to 60 with the Y coils.

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

"TELEFRAMES"

Items of general interest

A SELF-SUPPORTING AERIAL

THE following is an extract from details we have received of a novel aerial from the inventor, Mr. A. F. Kent, Lee Moor, Plymouth.

"The self-supporting vertical aerial, herein described, obviates the use of mast or guy wires, is light in weight, and when fixed on a housetop adds to its appearance as well as embodying all the advantages of the vertical aerial.

"The flat-dweller may fix it at an angle to a wall from a window and where no space beyond the premises is available the problem of an outdoor aerial, so necessary for short-wave and television work, is solved.

"For portable aerials, the base insulator would be mounted upon a metal stake, which when thrust into the ground forms both the support and the earth. Field Service transmitters are suggested as being the most likely users.

"A noteworthy feature of American broadcasting is that the lattice aerial towers are now insulated at the base and used as aerials—being far superior to the wires previously supported by them. The self-supporting conical aerial lends itself admirably to such a purpose.

"The physical requirements of such an aerial are that it must be progressively stronger, towards the base, and that the least possible resistance is offered to wind from any quarter.

"The obvious form is that of an elongated cone, and to make this transportable and easy to construct, it is segmented.

"Owing to the gradual taper, the sections fit quite tightly when pushed together."

It is an ingenious idea, although not, so far as we know, yet on the market in any form.

AT THE SHOW

We understand that quite twice as many firms will be exhibiting television apparatus at the next Radio Show at Olympia, which is from August 25th to September 4th. Sixteen miniature theatres are to be built as television demonstration rooms.

* * *

DEMONSTRATING OPERATION

One of the most popular special exhibits on view at the Television Exhibition at the Science Museum, South Kensington, is an ingenious working model of the cathode-ray tube of a television receiver produced by the G.E.C. Cleverly arranged devices are used to show in slow motion the movements of the scanning beam which normally travels towards the screen at the amazing speed of 70 million miles per hour.

Alongside the model an actual cathode-ray tube is mounted as in a television receiver. The controls, arranged for operation by the public, are "ganged" to the model as well as to the real tube.

* * *

YOU MUSTN'T SWAY!

New broadcasters to television, who are to give a talk or other item in which they are televised from close quarters showing just their heads and shoulders, are told they must not sway. If they do, they are likely to go out of focus.

So it would not seem advisable for newcomers who are nervous to boost up their spirits with a little "Dutch courage"!

* * *

HOW IS IT DONE?

It has been stated that television programmes can be recorded for future broadcasting just as sound programmes are. This is said to be done by recording the sounds of the vision channel.

The puzzling part is that recording on wax is said to be satisfactory. We wonder, because it is amazing if engineers have succeeded in producing a wax record that will faithfully reproduce the tremendously high frequencies dealt with in television.

* * *

BRIGHTER PICTURES

There is plenty of demand for brighter television programmes and brighter pictures. The new Baird receiver is claimed to give the latter—but cannot be expected to give the former!—and bright daylight is said to be no drawback to viewing. We do not at present know the voltage used on the tube, but think it may be higher than the average.

* * *

NINETY MILES AWAY

A whole television programme has successfully been received on a G.E.C. receiver at Coventry, ninety miles from Alexandra Palace.

SYNCHRONISING TERMS

SYNCHRONISING, as applied to television, refers to the keeping of the picture at the receiver in step with the scenes as picked up at the transmitter. Thus, not only must the spot in the cathode-ray tube at the receiver move across the picture at the same speed as the electron camera scans the scene at the transmitter, but each instrument must be dealing with the same spot of the picture at the same time.

Synchronising Impulses are transmitted along with the picture pulses to enable this in-step effect to be achieved.

Frame Impulses keep the change back to the beginning of a fresh picture or frame at the right moment, and,

Line Impulses, which are shorter than the frame impulses, do the same for the switch back of the spot to the beginning of a fresh line.

Synchronising Modulation refers to the percentage of the total maximum modulation that the synchronising takes up, and is usually about one-third. In order that the synchronising impulses shall not affect the picture, what is known as

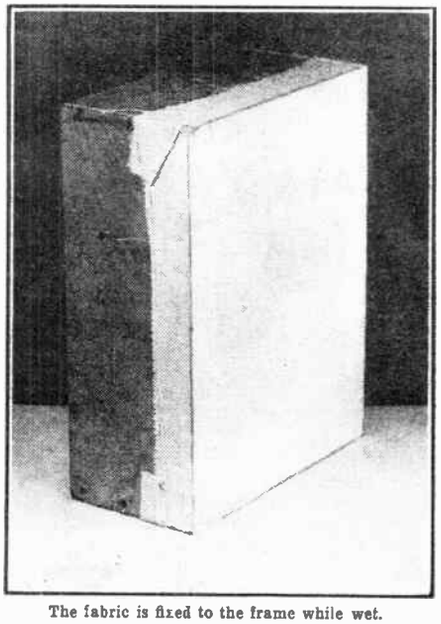
Black-out is adopted. This implies that the synchronising impulses occur at a value of modulation farther towards the black end of the picture than the value of vision impulse that produces a black effect on the screen.

Saw Tooth describes the type of impulse that the time base has to produce, and which is kept in step—or made to occur at the right time—by the synchronising impulses.

Separating Circuit, sometimes called differentiating or filter circuit, is the name of the circuit arrangement employed to pick out the synchronising impulses from the vision signals and to pass the right impulse—line or frame—on the right time-base circuit.

Separating Valve usually applies to a valve often used in conjunction with the above circuit whose essential task is to "trim" the synchronising impulses so that their value is always the same even if the received impulse varies. This ensures dead steady working of the time-base circuits.

A SCREEN FOR LIGHT-RAY EXPERIMENTS



The fabric is fixed to the frame while wet.

ONE of the simplest screens for light-ray projection in connection with television and photocell experiments is illustrated in the picture above.

It consists merely of a shallow box of convenient size, the bottom and top of which have been knocked out so that only the sides remain, making a sort of frame. Upon this improvised yet amply efficient frame a piece of white cotton or linen fabric is stretched and glued down over the wooden sides. It is really essential to glue the edges of the fabric to the sides of the box and not to rely on securing the fabric edges by means of tacks or nails, for, when the latter method is employed, it will be very difficult to secure an even "pull" all round the fabric.

Immerse the Fabric in Water

Before securing the fabric in position on the frame, immerse it in water for about half an hour so that the fibres of the material become thoroughly saturated. Then pass it once or twice through a mangle or wringing-machine and, in this uniformly damp condition, immediately glue it down to the frame. The fabric will contract on drying and, being under a uniform tension all round, it will, when dry, present a perfectly smooth, taut and creaseless surface.

If, for any reason, the fabric, when stretched upon the frame, is not white or opaque enough, it may be gone over lightly with a rag charged with pipeclay and water. Usually, however, a good white fabric needs no other treatment after being secured to the box-frame—and in this condition it will serve over a prolonged period as a highly efficient and convenient screen in all experiments, television and otherwise, requiring such an adjunct.

FROM OUR READERS

RESULTS ON AN EARTHED AERIAL

An unusual pick-up system used by a reader, with satisfactory results on the short waves.

RESULTS ON AN EARTHED AERIAL

The Editor, POPULAR WIRELESS

Dear Sir,—The operation of my two-valve short-wave receiver, which has a single-tuned circuit using four-pin plug-in coils followed by a reacting detector, transformer-coupled to a small power output valve, has presented a rather interesting problem which I pass on as information and for comment. From my aerial, which is a single-wire bare 7-22 copper, one of the inverted-L type out-of-doors, I have three separate leads-in.

One of these is taken through a three-point aerial-set-earth change-over switch to the set when it is installed during the day in an attic, which I use as a listening-den. The other two leads-in go, each respectively, to an aerial-earth point in the living-room and in my bedroom. The points are ceramic short-wave chassis type valveholders, with the anode and grid sockets employed as aerial and earth connections.

At night, before going to bed, I remove the set from the attic to the bedroom so as to listen late and early without disturbing the rest of the family. The three leads-in and the three earth-leads are all of electron insulated stranded wire and the earth-leads all go to the same earthing-point, namely, a water-tap. The aerial leads-in are all taken from the same point on the aerial, which is a continuous length of about eighty feet, and is not sub-divided by intermediate insulators in any way.

The length of the attic lead-in is about 16 feet, and the earth-lead about 25 feet, giving a total of about 41 feet; the length of the living-room lead-in is about 15 feet and the earth-lead 5 feet, making in all 20 feet; lastly, the dimensions of the bedroom lead-in and earth-lead are about 16 feet and 20 feet respectively—i.e., a total of 36 feet. In no case, thus, are the lengths the same.

The curious fact is that, when transferring the set from the attic I always place the earthing-switch there so as to earth the aerial. The switch is functioning correctly, since when earthed all signals are cut off when the set is operated from the attic point. Despite the fact that the aerial would seem to be earthed for all signals, I find that the set operates perfectly from either of the points in the rooms, bringing in the same DX stations as when working from the attic lead-in.

There is no question of the aerial being earthed in the latter case, as the flex-leads from the points to the set are disconnected, and the point is therefore open-circuited. It does not seem that the leads-in to the points are acting as aerials, as the setting of the aerial series condenser in the set is the same for both points and for the attic site. Further, the settings of the tuning-condenser are the same for all wave-bands when the set is used in any of the three positions, thus showing, apparently, that it is the whole aerial that is the signal-collector in all cases. What is the explanation, and can any other reader claim to be receiving short-wave stations on an earthed aerial if, indeed, they are being so picked up?

GORDON BIRRELL.

11, Grove Road, Broughty Ferry West, Dundee, Angus, Scotland.

JUNK-PARTS SET

The Editor, "Popular Wireless."

Dear Sir,—Re J. B. Lowe's letter. I would also urge the making of a set from junk parts—or, as H. W. White stated, making most of the components. If these are not cheaper it would be more interesting, and a greater satisfaction would be felt when it is known that it was as near "home-construction" as possible.

Also, could the set be an all-waver?

If not, could a S.W. set be included with the series?

I am only 17, but follow your paper enthusiastically. Wishing your paper every success, etc.

JACK GRUNDY.

P.S.—Kind regards to J. S.-T. Long may he contribute to "Popular Wireless."

41, Ashton Street, Little Lever, nr. Bolton.

FROM AN ENTHUSIAST

The Editor, POPULAR WIRELESS.

Dear Sir,—I thought, maybe, you would be interested in a photo of me in my "den." Being a very old reader, I have not, until now, competed with other readers on the "Guinea Page," but after reading your promptings week after week, I plucked up enough courage, etc., to write; and here we are.

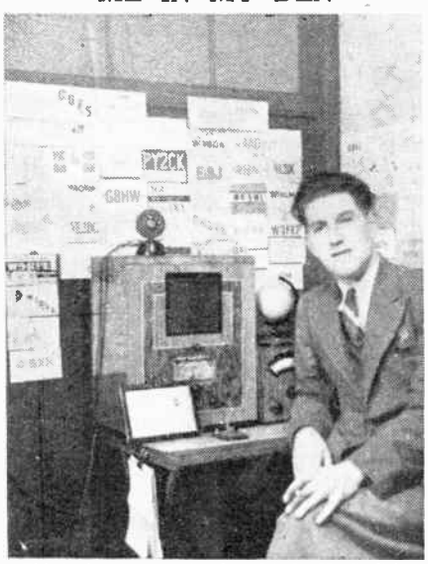
Short-wave listening, as a hobby, has definitely "got me." My receivers are a six-valve superhet plus converter and a well-known "Bandspread Three." My occupation, clerk in G.P.O., gives me wonderful opportunities to tune-in DX, as some weeks I arrive home about 1 a.m., 6 a.m., or 10 p.m., and I never miss an opportunity to give the dial the "once over."

Not being a Rockefeller, I do not report on every station I hear, but anything like good DX is worth the trouble and postage, not only for the sake of the QSL which sometimes arrives, but to show those "doubting Thomases." I find personally that reports—"real reports"—are really welcomed by amateurs; not, of course, English "hams" who can get a report from another station, and who are "just around the corner," so to speak; but those who do not contact so often, and who are "not on your doorstep."

At the moment my "bag" consists of 160 QSL's from 42 countries. I am also the proud possessor of W. L. S.'s POPULAR WIRELESS V.A.C. and "18" Club certificates, and anxiously awaiting the next "task."

The articles by Leslie Orton, Victor King, W. L. S., and the others are indeed a weekly tonic and eagerly awaited.

"ME IN MY DEN"



This is the photograph referred to by Mr. Croft in his interesting letter on this page.

Regarding the article ("P.W.," 19/6/37) "In the Post Office Radio Service," I should like to inform any interested readers that during the past few months two of our clerks have left to take up Radio as a career. One is now in "school" at Port Patrick and the other in London. These two "graduated" from Telegraph messengers, and are, from reports received, having a "rattling" good time; others will be following them shortly.

Time is short, so I think I'll sign, after wishing you and "P.W." every success, "Kay please,"

WILLIAM J. CROFT.

"Pendine Villa," 53, Richmond Street, Totterdown, Bristol, 4.

BRINGING BACK OLD MEMORIES

The Editor, POPULAR WIRELESS.

Dear Sir,—For seven years, from being fifteen years old, I traversed the oceans and seas from corner to corner of this world of ours, through the fine limits of the Merchant Service, visiting one hundred and thirty cities and ports in every clime and nationality. China, Japan, Java, East Indies, West Indies, Australia, Africa, Europe, South and North America, Panama, on eight occasions through the Suez Canal, and had the joy of being one of a crew to go to the northern limits to within a few hundred miles from North Pole to supply whalers with fuel and stores, and many more places.

Being unable to carry on this fine life I now work ashore, and this is where I turn to radio, the "greatest of gifts" to mankind, especially the short waves, for here within their unlimited boundaries I again visit my ports of yesterday. "Rio" with a tone and voice picture of its waterfront and beautiful harbour with "old" Sugarloaf. I heard this description from P R F 5 during the hours broadcast on Monday, April 26th, and what a thrill this was, coming in at R7/Slight F/Q R M 2.

I have heard Georgetown on only two occasions, however. But, again, the thrill of hearing the announcer calling streets in Georgetown by name and cafés being advertised through the sponsored programmes there, bring back fond memories of when I paid a short visit. The station V P 3 B G on 49 metres at midnight on Wednesday, April 28th, was responsible.

Havana on 31 metres (too bad, no English!), U.S.A., Sydney, and many more I've heard and logged, but my best long-distance station is Tokio (J Z K) on 19·79 metres—a fine station, and has been received every night on my set at R7 since May 31st, and it delights me. No need for aerial as this transmission is received easily on 6 feet of wire hung anyhow. Do believe me, readers—try it!

Yes, indeed, I have a lot to thank short waves for. I even had the fine experience of visiting the Mustapha Barracks at Alexandria, and still do now, although not in person but to hear S U I S G. Several of the boys came to his "mike" during a QSO with a G station, only last month! I remember the boys there trying on my "civvy" suit. Ha, ha! They are a lot of mixed tongues, from London to Durham "twang." If only you could give me space enough, but I'm not going to be selfish. Only to hear these place names over the air after my visits to many of them tends to make me talkative.

I receive a large amount of the popular stations and thank radio for a marvellous pastime, and to me a fine reminder of wonderful scenes. Whilst listening to a tropical station I imagine the transmitting masts as I often saw them; towering above tropical growth and in terrific heat, the top of the masts invisible at times as the hot misty clouds envelope them away up on some mountain side. Such is the scene at many stations near the line.

Carry on Short Waves and "P.W."

Wishing you continued success,

H. M. ROSS.

232, Blythe Road, Hammersmith, W.14.

WIN A GUINEA

This sum is awarded to the writer of the letter, which, in the Editor's opinion, is the most interesting of the week's batch. Letters on any radio subject are welcomed. Let us have *your* opinions or experiences. This week the guinea goes to Mr. Gordon Birrell.

50 STATIONS TO SEARCH FOR

There are over 50 stations to search for in this new reception test, and souvenirs for the best reports

By LESLIE W. ORTON

WHAT did Gladstone say in 1886? Candidly, I don't know. But I feel sure that if he had heard of the new POPULAR WIRELESS test which I am conducting on July 17th, and of the support I have received, he would have exclaimed "Gee, bo', it's a wow!" or something of the sort.

In many ways this new test is of more interest than the cross-country one conducted over the Whit-week holidays.

Have you ever had the experience of picking up stations well from one direction and only moderately from another? If so, it will probably have set you twisting your aerial all over the place, lopping down trees and so on and then you may have found conditions exactly the same. The annoying thing about this one-direction-signal business is that one's rival always seems to be situated in an ideal locality!

Up in Arms!

July 17th is a day that will go down to posterity—perhaps!—for then some fifty amateur stations and many hundreds of members of radio clubs will co-operate with POPULAR WIRELESS in an interesting experiment to ascertain reception in different places from different directions. Throwing away tennis rackets, they will arm themselves with receivers and transmitters and whilst one batch take the air the remainder will sit with headphones glued to their ears, fingers deftly twisting the dials, searching, ever searching.

And all this time yours truly will be crossing the country by car, receiving en-route and checking up positions, etc. Maybe I'll be enjoying myself more. But perhaps I'll get a puncture and then you wouldn't wish to change places with me!

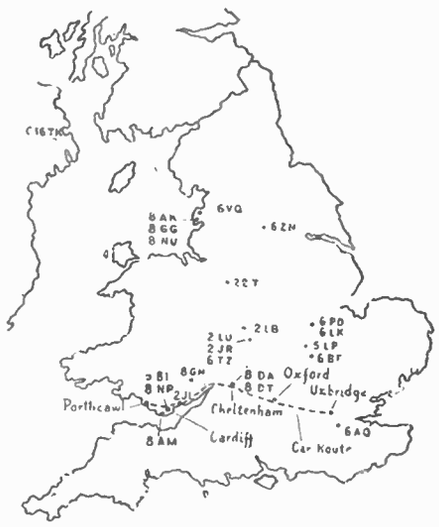
What You Can Do

The more receiving stations co-operating the more likely are we to get results. Why don't you co-operate? POPULAR WIRELESS has a heart, and seeing your gaze wander longingly towards the open window we feel that you gallant fellows deserve some reward for your help, and we are consequently presenting over a hundred souvenirs to those of you who send in the best reports. These souvenirs will look splendid hung up near your radio.

The test will commence at 11.55 a.m., and with a roar like Niagara Falls over fifty amateur transmitters will take the air. Transmissions will be made every hour until 7 p.m. for about ten minutes duration. Maybe you will be wondering where I am during the day—maybe not!—and you will get some cue from the stations participating in the test.

Listen for These

As this test is something of a competition as well as a test, I intend to give you the calls of about half the stations participating (they will all operate on the 40-metre band) and so here they are:



The route to be taken by Mr. Orton and the position of some of the stations co-operating.

G5BK	Cheltenham	G8AK	Blackpool
G8DA	Cheltenham	G8GG	Blackpool
G8DT	Cheltenham	G8NU	Blackpool
G2ZT	Stoke	G6PD	Peterborough
G2LU	Coventry	G8GN	Monmouth
G2JR	Coventry	G6AQ	London
G6TZ	Coventry	G8AM	Penarth
G2LB	Birmingham	G8NP	Cardiff
G5LP	Wellingborough	G5BI	Cardiff
G6BF	Rushden	G2JL	Newport
G6VQ	Lytham	G6ZN	Keighley
G6LK	Peterborough	Etc., etc.	

Among the other stations co-operating are some in Egypt, Sweden and Ireland.

Clubs Co-operating

But the transmitting "hams" aren't having it all their own way. There will be such a batch of listeners that if they all tuned to W 2 X A F that station would be absorbed and consequently unheard. Oh yeah?

I wonder whether a list of the leading clubs co-operating would bore you very much? Well, I'll risk it, and so here goes: Clubs co-operating include the Anglo-American Radio and Television Society; Blackpool and Fylde S.W. Club; British Short Wave League; Cardiff and District S.W. Club; Cars and Coventry Amateur Radio Society; Midland Amateur Radio Society; National Radio Society; Newcastle Radio Society; Newport and District S.W. Club; Southall Radio Society; Swindon and District S.W. Club; World Friendship Society of Radio Amateurs and the Wellingborough Radio and Television Society.

I hope I have made it clear what you have to do to obtain one of our souvenirs. Receive as many of the stations participating in the test as you can, and send in an accurate report.

"OVER THERE"

A feature devoted to various aspects of American radio, giving interesting sidelights on the artists and microphone methods of that country

"QUINS" ON THE AIR

THE Dionne quintuplets were heard over all networks on the celebration of their third birthday.

The little girls recited nursery rhymes and sang songs in Canadian-French. On their last two birthdays they made incoherent noises. Dr. Defoe opened the fifteen-minute broadcast with a few remarks on how the "quins" have been doing lately.

* * *

GIANT RADIO TOWER

ERECTED on a 300,000-lb. concrete base, a new radio transmitting tower just completed for a New York broadcasting station stands 640ft. high. The giant mast rests on a porcelain insulator built to bear a maximum weight of more than 1,000,000 lbs.

* * *

MORE RADIOS IN U.S.

THIRTY-THREE million radio sets are in use in the United States to-day, a survey completed by the Columbia Broadcasting System reveals.

Receivers are being bought at the rate of 28 sets a minute, 140 every five minutes. In the first three months of this year, 1,300,000 outfits were purchased for homes and automobiles.

At the beginning of 1937, the survey reports, 24,500,000 families owned radio sets and listened to them on an average of five hours a day. Five years ago the average daily period for each family listening was 4·1 hours.

* * *

HATS OFF!

MARY LIVINGSTONE wears such rakish hats that Jack Benny makes her take them off before they go to the microphone for their Sunday broadcast on N.B.C. He admits he is afraid the audience in the studio might be distracted from what they are saying.

* * *

"YOU AIN'T HEARD NOTHIN'"

AT a benefit for charity held at the Hippodrome Theatre in New York the great Caruso had just finished one of his famous operatic arias, and the audience went wild with applause. They demanded "Encore! Encore!" But time wouldn't permit; the show had to continue. The next act to appear was Al Jolson. Poor Al was sort of pushed on to the stage to face an audience that demanded Caruso. He held up his hand, called for silence, and said, "You ain't heard nothin' yet!" The crowd roared out its good-natured approval, and thus was started a typically American slang expression that is still going strong.

* * *

OVER 3,000 "SOUNDS"

WHAT scenery is to the stage, sound effects are to radio broadcasting. Seven years ago the business of providing illusory background noises was a minor part of broadcasting. At N.B.C. to-day it is the responsibility of an entire department under the supervision of Ray Kelly. Kelly once had a part-time assistant; now he has a staff of fourteen experts. Besides a heap of original apparatus (some of which was described on this page a short while ago), the N.B.C. has a library of 800 discs on which are recorded 3,000 different sounds—from the sizzle of a frying egg to the crash of a thunderstorm.

TEACHES THE BLIND

VIRGINIA PAYNE, talented radio actress heard over N.B.C. networks on Oxydol's Ma Perkins' programmes, finds recreation from her duties before the microphone in the pursuit of an interesting and unusual new hobby.

She assists in coaching Chicago Braille Theatre Guild actors and actresses. This enterprising group of blind people stages its own plays and playlets regularly for Chicago audiences, learning lines by Braille and finding stage locations by the position of the rugs.

* * *

CANADIAN STATIONS READY IN OCTOBER

CANADA'S two most powerful broadcasting stations, each of 50,000 watts, to be located at Montreal and Toronto, will be completed by the Canadian Broadcasting Corporation about October 1st, along with an international short-wave station designed to transmit Canadian programmes to other parts of the world. Although there are several dozen 50,000-watters in the United States, these are the first of such power ever to be built in Canada.

* * *

WHAT LISTENERS HAVE WRITTEN

To Phil Baker: "We used to have a Phil Baker in this town who ran the lunch cart across from the station and he played the accordion, too. We're wondering if you're the same one, because if so we'd like to claim the honour of being one of your old neighbours."

* * * *

To Major Bowes: "I was born in Russia, educated in this country and then moved with my family to France. I have travelled extensively in Europe, and am sort of a Spanish harp player. Don't you think you could give me a chance on your programme?"

* * * *

To Al Pearce of "*Watch the Fun Go By*": "I want you to do me a favour. My sister is quite a talker, and she is coming to visit us in Miami, and since she has not been to Florida for several years I know she will have lots of visiting to do. Please won't you dedicate your Arlene Harris 'Human Chatterbox' part of your programme to her next week? I'm sure it will be lots of fun and save me much annoyance. Many thanks."

* * * *

To the Saturday Night Swing Club: "We've been having swing dowo here for years and years at every neighbourhood party, and as old-timers we believe you'd be even better if you'd add a couple of ocarinas."—Signed, 'One Who Knows, Shreveport, La."

HE FALLS TO RISE!

ANNOUNCER George Watson is never the one to let a horse get the better of him. Thrown on Saturday, he was back on the same horse Tuesday. The horse has complained to C.B.S. officials.

* * *

NOT COMPETING!

VIRGINIA CLARK, of "Helen Trent," is getting up these days at 6.30 so that she can make her days longer. She cuts six vases of roses a day from her gardens. Janet Logan, of the same programme, claims that she could do just as well with her dandelions if she had the urge!

* * *

GARBO STILL WON'T TALK

GRETA GARBO has just turned down an offer of £1,000 to say a single word into the microphone in a sponsored programme.

Shep Fields, exponent of Rippling Rhythm, which has swept U.S. by storm. He broadcasts regularly with his orchestra from W 3 X A L, the N.B.C. station at Bound Brook, New Jersey.

16-YEAR-OLD STAR

NANCY Kelly, sixteen-year-old N.B.C. actress, who will star with Gertrude Lawrence in "Susan and God," the play to be produced by John Golden in September, played the lead in the True Story Court of Human Relations dramatisation recently.

"I Married a Bad Girl" was the title of the True Story broadcast.

* * *

MIKE MAKE-UP

ARCH D. SCOTT, producer of the N.B.C. Jamboree, believes that a radio performer seasoned in the theatre, works better on the air if he is in costume or make-up.

"If the radio actor is a beginner," he says, "I believe it puts him on his toes to 'dress up.' Our N.B.C. Jamboree artists get almost as much fun out of building and putting on the show as we hope our visible and invisible audiences get from seeing and hearing it."

Scottie—as his co-workers call him—speaks from experience. He started his career in a St. Louis vaudeville house, danced with the Glee Club at Washington University, dubbed around in a comedy vaudeville act, went into amateur producing business with LeRoy Prinz, now a Paramount dance director, produced shows for Shubert when he took over the Municipal Theatre at St. Louis and put out vaudeville acts by the score.

Scott's colleagues credit him with introducing to the stage the "via-light" and "chameleon" lighting effects. The former involves the use of luminous paint to show up in darkness in the glare of a quartz lens spotlight. The chameleon effects are achieved by means of colour vibrations.

TECHNICAL JOTTINGS

Varied aspects of radio discussed from a general standpoint

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

Testing a Set

I WAS examining a set the other day belonging to a friend of mine; it was a mains set, in which something appeared to have gone wrong with one of the H.F. amplifying stages. It was necessary to test the different stages and we soon found the cause of the trouble. But what I want to mention is that when you have a case like this, you should be careful not to pull out one of the valves while the set is in operation or, what amounts to the same thing, to switch on the set whilst one of the valves is removed. If you operate the set with one of the valve sockets empty you are reducing the load on the H.T. supply unit and consequently increasing the voltage applied to the other valves. The extent of this increase due to a reduction of the load depends on circumstances; in some cases it may be relatively small, but in some cases it may be quite large, large enough to cause damage. So you want to remember this, more particularly with a mains set or with an ordinary set operated by means of an H.T. mains supply unit.

Mains Operation

Many people have the idea that a mains set is something essentially different from a set operated with a mains unit. Actually, of course, although there are minor differences, the principle is the same. The mains set derives its H.T. current from a unit which is, for all practical purposes, a mains unit, only in this case it is incorporated in the set itself. At any rate, apart from constructional details, the effect mentioned above is the same in both cases, that is, the voltage delivered varies with the load.

Dropping Resistances

This variation is due in reality to the employment of dropping resistances which are necessary to obtain the different voltages from the one output voltage from the transformer. A more satisfactory, although more elaborate method is to have a number of tappings on the transformer, so that the correct voltages are obtained without the use of dropping resistances. In this case (assuming the regulation of the transformer to be good) there will be very little change in applied voltage when one of the valves is removed and the load consequently varied. But you will see that with dropping resistances there is bound to be a considerable variation. A resistance does nothing until current starts to flow through it, and its effect on the voltage at its extremities depends upon the amount of current flowing through it. A little consideration of the application of Ohm's Law will show you that quite appreciable variations are to be expected when the load is varied, using dropping resistances for obtaining the different voltages.

Variations of Applied Voltage

The same thing does not apply, however, if a high-tension accumulator battery or an ordinary dry battery (assuming the latter to be in good condition, that is, of low internal resistance) is employed instead of the H.T. mains unit. The reason here is simply that the resistance in question is relatively small and so an increase in the current load produces only a relatively small drop in the applied voltage. If an accumulator battery or a good dry battery is used as the H.T. source, then you can check up each stage by removing the valve and connecting a milliammeter between H.T. negative lead and H.T. negative socket.

Filament Life

In the early days of valves when we used to use bright emitters and regulate current by means of a rheostat for each valve, running the valve filaments pretty near incandescence, it was no uncommon thing for a valve to end its life by the burning out of the filament; in fact, that was how most valves finished up.

Since the introduction of dull emitters, however, the burning-out of the filament is a comparatively unusual event, especially as adjustable resistances in connection with the filaments have become unnecessary. When a valve ends its useful life in these days it is generally due to the decay of the emissive power of the filament. Valve manufacturers have devoted a great deal of research work to the problem of producing a highly emissive filament and, what is perhaps even more important, a filament which will maintain its emissivity reasonably uniform over a suitably long life.

Uniformity of Emission

It is no use having a filament which is highly emissive to start with, but which rapidly loses its emission. Far better to have a filament which is not so grand to begin with, but which keeps up a more or less uniform level over a long period, say, the conventional 1,000 hours. The life of the cathode of a valve depends on the running temperature and also its resistance to "poisoning" by evolved gas. In the case of oxide filaments the oxides evaporate, and barium oxide in particular is more volatile than some of the others. The oxide cathode when it fails usually does so because it takes in gas and is so "poisoned." One of the factors which contributes to poisoning is the gas evolved from the electrode system. It is true that we have the "getter" still present, to cope with such evolved gas, but its capacity is limited and it takes only a very little of a gas such as oxygen or carbon monoxide, both of which are readily absorbed by the cathode coating, to poison the emission.

Failure of the Filament

Another factor which influences the life of the valve is the design of the heater

(*Please turn to page* 431.)

QUESTIONS AND ANSWERS

By K. D. ROGERS

USING CLASS B VALVES IN PARALLEL

J. B. (Ben-Rhydding).—*Some weeks ago I saw a circuit in "P.W." using two Q.P.P. valves in parallel. I have tried a similar arrangement with Class B valves, but the result is no better than with one valve.*

Can Class B valves be used in parallel to increase the power?

Theoretically, yes. Practically, it depends on your Class B driver transformer and your output transformer. You see both these have to carry current, in the former there is the driver anode current and the Class B valves' grid current. Incidentally this current will be greater with two valves than with one, and THE POWER THE DRIVER HAS TO PROVIDE WILL ALSO BE GREATER. Thus it may be that your driver valve is not large enough, or that your transformer is not suitable, being saturated with the current that is asked to pass through its primary (whence comes the power for the grid circuits) or the resistance of the secondary may be too great to allow of the correct value of grid current needed by the two Class B valves.

It must not be forgotten that in Q.P.P. there is no grid current to bother about, so the same input transformer can be used for one, two or more Q.P.P. valves. With Class B the same thing does not hold; for the input transformer has to handle power, and it may be quite suitable for one valve yet totally hopeless when it is asked to handle the power required by two or more valves.

With regard to the output transformer the same thing holds. You must have a transformer that is capable of handling the additional anode current pulses which accrue from the use of two Class B valves instead of one.

Do not forget that provided the input arrangement is O.K. you will be getting twice the current flowing through the anode circuits of the valves; that is, you will be asking the output transformer to handle twice the anode current swings, and moreover you will be asking your source of H.T. to provide gigantic swings of current.

Where the one valve might take you up to 50 milliamps. every now and then on a loud passage, your two valves will take you to 50 milliamps. quite often and the maximum swing now will be in the neighbourhood of 100 milliamps.!

I expect it is the driver valve and transformer that stand between you and success, limiting the energy that is provided to the grids of your Class B valves on loud signals, and that is the time when you would be disappointed with the output power obtained.

Thank you for your compliments. I feel quite bashful about them, and I can only hope that you will find the same satisfaction in this reply as you have in others.

CAN'T BOTH BE RIGHT

A. M. (Crediton) *has a new battery with floating specific gravity indicators in it. They show "full charge," yet his own "ninepenny hydrometer" shows "dead battery." He asks which is right, and goes on to say that the hydrometer seems to work all right on his other accumulator and on his car battery.*

I should say without doubt that the new battery is at fault, but I am not going to let myself into a row with the makers. So, let's be a Solomon. I won't suggest that you cut the battery in two, but I do suggest that you take it round to a charging station and get them to test it, and to test your hydrometer at the same time. They cannot both be right, and if the hydrometer has worked properly before with other batteries, it certainly appears as if the new battery has faulty floats in it.

In answer to your other question, it should not be difficult to find a two or three-valve design in "P.W." that will be "foolproof" enough for your family, but a blue print may not be available. As you do not say what you want to enable them to get in the way of stations I cannot recommend any particular set design.

THAT GRAMOPHONE RECORD

In a rash moment I suggested a few weeks ago that a gramophone record that has been charged electrostatically by rubbing with a duster and is therefore collecting dust from the atmosphere can be discharged by touching it at various points with the hand. I have been told by R. D. C. (Romford) that I am wrong, and that as the record is a non-conductor of electricity it will have to be touched all over to discharge it. He says, "if it were possible to discharge the record by earthing it by touching with the hand, the very fact of its being held in the hand would automatically do so."

Very true. But I did not say that you earthed it by touching it with the hand. I am sorry to be so awkward, but what I did say was that the disc should be wiped gently so as not to charge it. Then (as an added precaution) you can touch it on various points and discharge it if you like. The inference being that the record has been wiped so carefully that it holds but the slightest charge on it, if any at all.

But, no matter what the amount of the charge, I have not suggested that the touch of the hand will "earth" the record. No, sir, I suggest running the hand lightly over it, or touching it at various places so that the charge shall be so reduced as to render the record non-attractive to floating dust.

I cross swords with the gentleman who says apropos the charged bar of ebonite that a touch at the charged surface only results in slightly discharging it. It might do so from a purely theoretical point of view, and the rod might still affect a gold leaf electroscope, but I warrant it will not continue to pick up bits of fluff after having been well and truly touched by the hand at the charged point. And when I say touched I don't mean a mere angel's kiss.

If touching it does not discharge it, how does my correspondent account for the sparks which fly across between hand and ebonite when it is touched at the point of charge?

But, as the cat said when it saw the remains of the fish, "I'm not going to pick bones with anyone." Just try the record idea and let me know if it works or not. I have tried it and made it work, but others may not be so lucky. Let's leave it at that.

MORE, PLEASE

W. O. McG. (North Ireland).—*Why do I get a carrier wave all round the dial when I switch on, just as if I was tuned-in to a station's channel? On the application of reaction it sometimes goes away.*

More details, please. I cannot tell you from the above few remarks. What sort of set have you? Does it work normally as regards reaction or does reaction make the stations weaker? If the latter, I think you will find the set is in constant oscillation due to H.F. instability, and that reaction is reversed, and when applied damps out the oscillation and allows some sort of reception to take place after stopping oscillation.

But I cannot let you have any sure answer unless I know more about the circuit employed, and the results the set gives as regards stations, and the quality of reproduction.

MATCHING EARPHONES

A. H. (Southampton).—*Is it necessary to match the impedance of earphones to that of the output valve?*

I have an output valve of 8,000 ohms impedance and the earphones are connected through a 1:1 transformer. Would the phones have to have the same impedance or could ones of 4,000 ohms be used?

I am afraid that you are rather mixing up the actual ohmic resistance of the 'phones with the impedance. The 4,000 ohms phones you mention have a D.C. resistance of 4,000 ohms. Their L.F. resistance or impedance will be much higher, dependent on the frequency of the note being reproduced. For all intents and purposes you will find that the 8,000 ohms valve and the 4,000 ohms phones will be quite a good match.

LUXEMBOURG AGAIN

W. P. (Derby) *writes in connection with the query published describing complaints from readers of whistles on Luxembourg.*

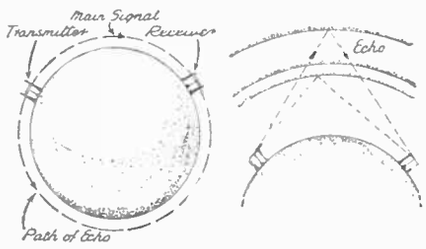
He says, "If your correspondent N. F. (Elgin) would make some inquiries into the different aerials used by the listeners mentioned, it might help you and them and save the rest of your hair! Warsaw 1339 on one side and Leningrad 1293 on practically the same wavelength as Luxembourg will be bound to upset matters. The possible solution to the trouble lies in the direction in which the aerials are pointing: with about 60 degrees difference at least in their positions it is quite possible that while one favours Luxembourg another will favour one of the interfering stations. A change in the direction of the aerial in a case of interference so that the aerial becomes directional to Luxembourg may work wonders.

"Perhaps your readers will try it."

Perhaps they will. If so, please let me know what happens. Remember that the aerial should preferably be long and low to gain directional properties, and also should be of the inverted L type, with down-lead at the end pointing to the required station.

TECHNICALITIES EXPLAINED—No. 58

Radio Echo



This is the term used when a signal which has been sent out from a station is received twice by a receiving station, or when a signal is sent out by a transmitter and is reflected back to it from some reflecting medium.

Echo devices which reflect radio waves from the sea bed are used to test the type of bed over which a ship is passing, and to determine the depth of the water.

A simple form of so-called echo is that which is sometimes received on short waves by a station which picks up the signal from two different directions—the signal passing round the earth by two different paths. The signal which goes the long way round gives rise to the echo.

One of the most famous echos is that known as the Oslo echo. This was received by scientists who projected a radio wave into the sky. They received the reffected ray from one of the ionised layers above the earth, and then received another reflection from some source farther up. This echo bas been the subject of much speculation concerning a further layer of ionised gas outside the two known layers—Heaviside and Appleton layers.

TECHNICAL JOTTINGS

(*Continued from page 429.*)

cathode system which determines the temperature distribution along the cathode. If the temperature difference between the ends and the centre is great, the ends will become poisoned and the valve will eventually fail because part of the cathode has been rendered useless.

A curious mechanical defect which sometimes develops in a valve is the fracture of the heater of an indirectly-heated valve, more especially when this is of the hairpin type. This is usually due to the fact that the tungsten expands and contracts much more rapidly, when the heater temperature is varied, than the insulator coating which adheres tightly to it. This condition is particularly severe when the valve is switched on and off several times a day, as is often the case. To avoid this defect it is desirable for the coating, instead of forming a smooth shell, to consist rather of a series of beads. Valve-makers have now found out how to put the coating on in this form.

Extra Long Life

Where very long life, say 20,000 hours or more, is required (as in valves used for Post Office telephone repeater circuits), it is essential that the cathode be operated at a relatively low temperature in order to avoid poisoning during life. In the case of these valves the pumping treatment is lengthened to an extent which would be quite impracticable for the ordinary manufacture of valves for broadcast reception. This lengthened pumping treatment is necessary in order to ensure that the evolution of gas in the valve during subsequent operation shall be reduced to the very minimum.

What Size Loudspeaker?

The size of loudspeakers seems to be influenced very largely by considerations of space and is not based entirely on considerations of acoustic efficiency. There has been a tendency for a number of years past to make radio receivers more and more compact, especially since the introduction of high efficiency valves and the extensive use of screening. The compressing of the components of a radio set into a very small compass is, of course, a thing to be aimed at. The same applies to an outfit of any kind: it is no use having it all spreadeagled if you can have it compact without losing too much in other ways.

Compact Modern Sets

By far the largest single component in a radio set is the loudspeaker, and unless this can be reduced very considerably in size the rest of the components are a mere bagatelle. So it may be said that the compactness of the modern set is mainly due to the placing of the components more closely together (which has been made possible by the factors just mentioned), and the reduction in the size of the loudspeaker.

When loudspeakers were reduced in size some people thought that they would lose much in efficiency.

High Efficiency Achieved

In the old days we always thought of a large trumpet or, a little later, of a large conical diaphragm, being necessary in order to get a sufficient volume to fill a good-size room. That was in the days when the efficiency of diaphragms was much inferior to what it is to-day. As diaphragms have been made smaller so it has been necessary to improve their efficiency, and this has been done with such remarkable success that to-day a loudspeaker with a diaphragm of no more than five or six inches in diameter will give results much better than those of a speaker with a diaphragm two or three times that size a few years back.

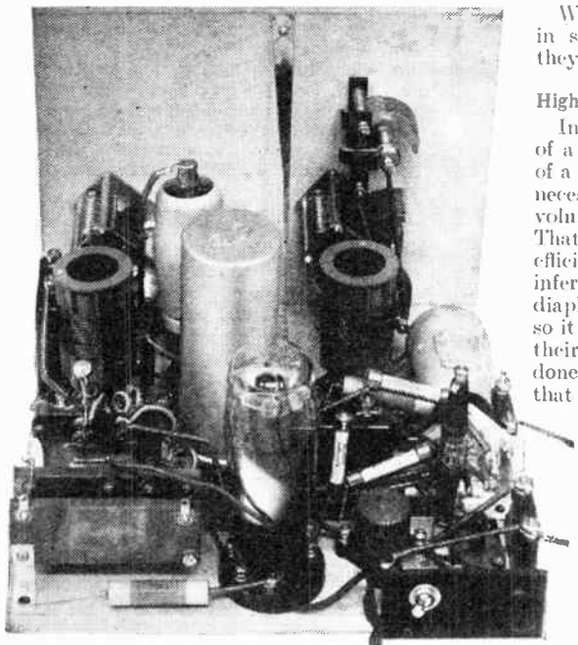
Those Large Baffles

The main thing to guard against with a small diaphragm is shrillness in the reproduction. Generally speaking, a large diaphragm tends to give a low boomy tone and a small diaphragm a high-pitched one. But, as I say, diaphragms have been so improved that they will give a remarkably uniform response over the required range, and that without anything worth talking about in the way of a baffle plate. I expect many of you remember the enormous baffles, three or four feet square, that we used a few years ago. We would not have had much chance of making a compact portable set if we were tied to baffles that size or anything like it!

Never Really Natural

As regards the boomy tone which used to be so fashionable, people seem to have become "educated" away from this. The boomy tone was never a really natural tone, but it gave an impression of depth and power to the reproduction which some people liked, and so it became fashionable. There was precious little similarity between this kind of reproduction and the original.

FOR A.C. OR D.C.



The All-Mains "Reacto" in its completed form and ready for connecting up to an existing receiver. This splendid unit is suitable for either A.C. or D.C. mains operation.

MARCONI—THE MAN AND HIS WIRELESS

(*Continued from page* 418.)

And as he looked about he said, "I'm not frightened that your big steel buildings will stop wireless."

It was on this occasion that he had his first experience with New York reporters. Most emphatically he declared he did not like the ordeal. In fact, it took considerable persuasion to induce him to talk. At last he consented to see the reporters at his headquarters in the Hoffman House. His room was near the skyline, where the noise, turmoil and crowds, which he detested, could not disturb him.

The reporters were quick to observe that he was very sure of himself—a man convinced that he was destined to pass into history, else he could not have been so "glacial" and inflexible despite his modesty.

One news man referred to him as "a serious, somewhat self-centred young man who spoke but little but then always to the point."

"He is no bigger than a Frenchman and not older than a quarter century," wrote a reporter in the news. "He is a mere boy, with a boy's happy temperament and enthusiasm, and a man's nervous view of his life work. His manner is a little nervous and his eyes a bit dreamy. He acts with the modesty of a man who merely shrugs his shoulders when accused of discovering a new continent. He looks the student all over and possesses the peculiar semi-abstracted air that characterises men who devote their days to study and scientific experiment."

That night there was an explosion in the hotel, and there were some who wondered if the wireless apparatus from Europe had anything to do with it. Marconi smiled and with his assistants began to unpack the trunks containing the equipment. One trunk was missing. It contained the coherers and other essential parts. Search by Custom officials was futile. The temperamental Marconi declared he would return to England on the next ship out of New York.

Bradfield, Marconi's chief assistant, recalled that another Cunarder had sailed from Liverpool to Boston on the same day that the Aurania left. He had a hunch that the missing trunk might be on that boat. Robert E. Livingston, a *Herald* reporter, was sent to Boston to search both ship and dock. Bradfield was right; the trunk was in Boston.

Quickly the work of installation proceeded. The Highlands of Navesink in New Jersey was selected as the site of the receiving mast. Lighthousekeepers and Signal Corps men on the lighthouse reservation at Navesink were frankly sceptical.

"When Marconi explained buildings and hills would not interfere with wireless," said Snyder in recalling the event, "the Signal Service men spat scornfully and gazed at the inventor as they would at a madman."

The steamship Ponce of the Porto Rico Line and the ocean-going steamer Grande Duchesse were chartered, and Marconi installed his apparatus while Bradfield manned the receiving station at Navesink.

Then came the day for the race. Public interest was at fever heat, chiefly due to efforts to keep secret the details of the challenging yacht. The first few meetings ended in a "becalmed" contest because of light winds. Marconi, however, flashed a few bulletins to silence the scoffers. They were sent by wire from the Highlands to the *Herald* office in Herald Square for display on bulletin boards. Broadway in sixty seconds knew what was happening off the New Jersey coast.

The "drifting contests" continued. Marconi was impatient. Admiral Dewey had cabled he would bring his flagship the Olympia up New York harbour on a certain day and the metropolis prepared to welcome the hero of Manila Bay. Some one with a news sense suggested "Why not install wireless on a craft and meet the Olympia at sea, get the news and flash it back to the Highlands long before the Olympia could be boarded by newspapermen inside Sandy Hook?"

The idea pleased Marconi. An 8-ft. mast was erected on the after deck of a Luckenbach ocean-going tug. The plan was frustrated because Dewey steamed into New York two days ahead of schedule. He had no wireless to report the ship's progress.

Attention was again directed on the Columbia–Shamrock. On the day of the first race 2,500 words were sent from the Ponce at an average speed of fifteen words a minute. From beginning to end, 1,200 messages, about 33,000 words, were sent through the air.

Eventually the Columbia won the series, and by that time Marconi was a national hero. The practical value of wireless at sea and as an agency for quick dispatch of news was apparent. No longer would the sea be a region of silence. No longer would ships sever communication with shore when they pulled away from the docks. Wireless robbed the ocean of much mystery, uncertainty and death.

Let us return to the steamer Ponce, and see how a newspaper reporter observed the inventor:

When you meet Marconi you're bound to notice that he's a "fo'ner." The information is written all over him. His suit of clothes is English. In stature he is French. His boot heels are Spanish military. His hair and moustache are German. His mother is Irish. His father is Italian. And altogether, there's little doubt that Marconi is thoroughly a cosmopolitan.

From where we sat we could hear sounds coming from the chart room, as if somebody in there were striking parlour matches as rapidly as possible one after another. That was Marconi's operator sending Columbia-Shamrock telegrams by the Morse code, but without wires to the receiving station at Navesink, many miles away.

The "Beware of Live Wire" sign was excused by the fact that such a wire actually did run from the chart to the top of the mast, where the messages spread out into the air as Hertzian waves, after the fashion that ripples spread in a pond when a stone causes a splash.

"Fine day, Chevalier."

"Thanks," said the Chevalier. "That's the first time I've been given a title in this country. But mister's good enough for me."

"What do you think of New York?"

"Well, America may be all right but New York is simply purse-breaking. A New York cab costs me four times as much as a London cab. I guess I am not unlike tens of thousands of Europeans. I'd like to live here, but I cannot afford it."

Marconi's triumph was overshadowed in the news by the arrival of Admiral Dewey; that was the big story. Then, too, the steamer Oceanic, heralded as "the latest wonder and new giantess of the sea," had just reached New York on her maiden voyage. She was the biggest thing afloat, and measured 704 feet! Peary in an attempt to reach the North Pole also occupied columns of space.

There was plenty of news in 1899 other than wireless, the value of which many doubted, but the *Herald* declared: "The possibilities contained in the development of telegraphy without the use of wires are so important that any step tending to bring the system before the public and to show what it is capable of accomplishing in a commercial way must be of interest not only to those interested in science, but also to everyone who sends a telegram.

"The tests stimulate the hope that the man of the coming century may be able to 'halloo his name to the reverberate hills' and irrespective of distance or material obstacles 'make the babbling gossip of the air cry out' in intelligible speech."

The United States Navy became interested in the Marconi contraptions. Wireless was installed on the cruiser New York and on the battleship Massachusetts. Signals were exchanged up to thirty-six miles and that seemed to be about the limit! The earth's curve was blamed for restricting the range.

The United States Army was interested, too. The Signal Corps established communication between Fire Island and Fire Island Lightship, a distance of twelve miles, and later in 1899 between Governor's Island and Fort Hamilton.

(*Continued on next page.*)

NEXT WEEK

Chapter VIII

THE FIRST TRANSATLANTIC SIGNAL

A vision at the turn of a century—Marconi as he looked in 1900—Selecting sites for transatlantic tests—Fleming designed the stations—Fessenden announces his high-frequency alternator—Pulsen introduces the arc transmitter—Ships begin to boast of wireless service—Fleming explains the science of tuning—A big station is built at Poldhu—Marconi arrives in Newfoundland—He prepares to make history—Kites hold up the aerials—December 12, important in the annals of wireless—Marconi picks up the first transoceanic signal—Scene of his success—His story of the achievement—The world doubted—What the Press thought about it—Tesla's comment—What Edison thought—Three dots that cost £40,000.

MARCONI—THE MAN AND HIS WIRELESS

(Continued from previous page.)

England was busy, too. The warships Alexandra, Juno and Europa exchanged messages at sea up to seventy-five miles. Perhaps wireless could skirt the earth's curve after all.

When the sceptics laughed at the feeble signals and derided the thought that from them might evolve a new communication system, competing with the dependable telephone and telegraph, scientists who recognised the possibilities of Hertzian waves smiled and "painted" a bright future for wireless.

Over in England Sir William Preece in a speech, on November 22nd, 1901, reviewed the progress of wireless:

An immense sensation has been caused in these days by the facility we have acquired of transmitting messages across space to ships in motion at great distances.

The completion of an electric circuit through water was effected by Morse in America in 1844, and by Lindsay in Dundee in 1854, and it has been in regular practical use in India, for bridging rivers, for many years. In 1884 the distance to which electrical disturbances upon telephone were conveyed attracted my attention, and I reported the result to the British Association at Montreal.

In 1893, at Chicago I was able to announce the transmission of messages across three and a half miles to Flat Holme, in the Bristol Channel. In 1894 I reported to the Society of Arts that speech had been transmitted by telephone across Loch Ness. My paper ended thus: "If any of the planets be populated (say Mars) with beings like ourselves having the gift of language and the knowledge to adapt the great forces of nature to their wants, then if they could oscillate immense stores of electrical energy to and fro in electrical order, it would be possible for us to hold communication, by telephone, with the people of Mars."

In 1896 Mr. Marconi came to England, and the resources of the Post Office were placed at his disposal for experiment and trial. They were successful.

The conclusion I came to was that while his system was practical, the field for its use was limited. In the navy it would be of great service and in lightship service it might be beneficial, but that it was going to dispense with submarine cables or with poles and wires was quite chimerical.

It is still quite in an experimental stage, but it has attracted an immense amount of attention in connection with the highly successful tour of the Prince and Princess of Wales.

It is impossible to predict what will happen in the twentieth century. Progress is slow; anticipations are wild. Mr. Marconi, personally, is to be congratulated on what he has already done, and everyone wishes him continued success.

For the indefatigable inventor there was much ahead. At odd moments in the solitude of his workshop his thoughts roamed across the ocean. Wireless across the Atlantic! That was a new goal.

"Do you think wireless messages will ever cross from the Old to the New World?"

"I see no reason why it should be otherwise," replied the pensive man from Italy, "providing the transmitter has sufficient power to hurl the waves across the ocean."

And it would take no longer to leap that 3,000 miles than to span the English Channel.

The Atlantic was the slogan of his hopes.

Marconi, in the words of Keats: "Doth tease us out of thought as doth Eternity."

MY SHORT-WAVE ADVENTURES

(Continued from page 415.)

my original choke was efficient. My home-made affair worked quite well—but not as well as the original.

Varying Grid-Leak Value

Reading others on the subject, one gathers the impression that a fairly high value of grid leak is desirable for the detector action on short waves. I myself have settled down to a 3-meg. leak connected from grid to positive low-tension; but it occurred to me that possibly the blind spot could be due to just that.

I therefore changed over leaks, using all values from 1 to 5 megohms, and also switched from positive to negative low-tension. The last move certainly made reaction smoother but did *not* get rid of the blind spot: it simply reduced volume.

It is often implied that blind spots are due to too close an aerial coupling. I don't wish to be dogmatic, but how anyone can get rid of my blind spot with a four-pin coil beats me. No matter how I unscrew that pre-set, it persists.

I am told the only real way out is to use a high-frequency stage as a "buffer" between the load of the aerial and the reacting circuit. My extra set of coils have now arrived, and I am sallying forth with hopes high that at least I shall get "all round the scale" reaction.

Effect of H.F. Stage

I can quite see the point. With a high-frequency stage, the aerial tuning is free of reaction altogether, and the reaction is applied to the grid winding of the detector that follows the high-frequency coupling.

I think I shall start off with a tuned grid coupling, with a high-frequency choke and pre-set between the amplifier and detector. It will be rather odd having two condensers to tune—more difficult, perhaps? This article seems to strike a somewhat negative note, I realise. But from negative results one learns positive facts. Don't tell me about blind spots any more.

Hi, hi!

"P.W." LIST OF EUROPEAN BROADCASTERS

This list contains the more important European medium and long-wave stations which are likely to be received in this country. There are some relay stations working on very low power and sharing common wavelengths. These have been omitted because their programmes are usually too weak or badly interfered with to be of value to British listeners.

Wave-length.	Station Medium Waveband.	Country	Power kw.	Wave-length.	Station Medium Waveband.	Country.	Power kw.
203·5	Plymouth	Gt. Britain	0·3	356·7	Berlin	Germany	100
203·5	Bournemouth	„	1	360·6	Kiev (No. 2)	U.S.S.R.	35
206	Eiffel Tower (Paris)	France	7	364·5	Bucharest	Rumania	12
215·4	Radio-Lyons	„	25	368·6	Milan (No. 1)	Italy	50
233·5	Aberdeen	Gt. Britain	1	373·1	Welsh Regional	Gt. Britain	70
236·8	Nürnberg	Germany	2		Penmon	„	5
238·5	Riga	Latvia	15	377·4	Lwów	Poland	50
240·2	Saarbrucken	Germany	17	382·2	Leipzig	Germany	120
242·9	Cork	Irish Free State	1	386·6	Toulouse (P T T)	France	120
243·7	Gleiwitz	Germany	5	391·1	Scottish Regional	Gt. Britain	70
245·5	Radio Marconi (Bologna)	Italy	50		Burghead	„	60
247·3	Lille (Radio P T T Nord)	France	60	400·5	Marseilles (P T T)	France	100
251	Frankfurt	Germany	25	405·4	Munich	Germany	100
253·2	Nice Cote d'Azur	France	60	410·4	Tallinn	Estonia	20
255·1	Copenhagen	Denmark	10	415·4	Kharkov	U.S.S.R.	10
257·1	Monte Ceneri	Switzerland	15	420·8	Rome (No. 1)	Italy	50
259·1	Kosice	Czechoslovakia	10	426·1	Stockholm	Sweden	55
261·1	Scottish National	Gt. Britain	20	431·7	Paris (P T T)	France	120
	North National	„	20	443·1	Sottens	Switzerland	100
	London National	„	20	449·1	North Regional	Gt. Britain	70
263·2	Trieste	Italy	10	455·9	Cologne	Germany	100
265·3	Hörby	Sweden	10	463	Lyons (P T T)	France	100
267·4	Newcastle	Gt. Britain	1	470·2	Prague (No. 1)	Czechoslovakia	120
269·5	Radio Normandie (Fécamp)	France	15	476·9	Lisbon	Portugal	15
269·5	Moravska-Ostrava	Czechoslovakia	11·2	476·9	Trondelag	Norway	20
271·7	Kuldiga	Latvia	10	483·9	Brussels (No. 1)	Belgium	15
274	Vinnitsa	U.S.S.R.	10	491·8	Florence	Italy	20
278·6	Bordeaux-Lafayette	France	35	499·2	Sundsvall	Sweden	10
283·3	Bari (No. 1)	Italy	20	499·2	Rabat	Morocco	25
285·7	West Regional	Gt. Britain	50	506·8	Vienna	Austria	100
288·5	Rennes-Bretagne	France	120	514·6	Madona	Latvia	50
291	Königsberg (No. 1)	Germany	100	522·6	Stuttgart	Germany	100
296·2	Midland Regional	Gt. Britain	70	531	Athlone	Irish Free State	100
298·8	Bratislava	Czechoslovakia	13·5	539·6	Beromunster	Switzerland	100
301·5	Hilversum (No. 2)	Holland	60	549·5	Budapest (No. 1)	Hungary	120
304·3	Torun	Poland	24	559·7	Wilno	Poland	50
304·3	Genoa	Italy	10	569·3	Viipuri	Finland	10
307·1	Northern Ireland Regional	Northern Ireland	100		**Long Waveband**		
312·8	Poste Parisien	France	60	1107	Moscow (No. 2)	U.S.S.R.	100
315·8	Breslau	Germany	100	1153·8	Oslo	Norway	60
318·8	Goteborg	Sweden	10	1250	Kalundborg	Denmark	60
321·9	Brussels (No. 2)	Belgium	15	1293	Luxembourg	Luxembourg	150
325·4	Brno	Czechoslovakia	32	1339	Warsaw (No. 1)	Poland	120
328·6	Toulouse	France	60	1379	Novosibirsk	U.S.S.R.	100
331·9	Hamburg	Germany	100	1389	Motala	Sweden	150
335·2	Helsinki	Finland	10	1500	Droitwich	Gt. Britain	150
338·6	Linz	Austria	15	1571	Deutschlandsender	Germany	60
342·1	London Regional	Gt. Britain	70	1648	Radio-Paris	France	80
345·6	Poznan	Poland	16	1744	Moscow (No. 1)	U.S.S.R.	500
349·2	Strasbourg	France	100	1807	Lahti	Finland	150
				1875	Radio-Rumania	Rumania	150
				1875	Hilversum (No. 1)	Holland	150

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S.S.

POPULAR WIRELESS, July 17th, 1937. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

MEET BRYAN MICHIE (ON PAGE 435)

Popular Wireless & Television Times

THE FIRST TRANSATLANTIC SIGNAL

EVERY WEDNESDAY PRICE 3D

No. 789.
Vol. XXXI.
July 17th, 1937.

"I DON'T LIKE CHAMBER MUSIC!"

Which, normally, would mean that he'd have to climb out of bed and paddle downstairs in the dark (stubbing his toes on the dog's box), in order to switch off the set.

But, instead, he just presses a sixpenny bell-push, millionaire fashion, and gets on with his story about a young man who invented a marvellous pocket television set, made a fortune and then married a crooner's daughter. (The last chapter is all about his trial for patricide.)

And how does our pyjamaed friend accomplish his switching-off trick? He does it with the little easy-to-make, cost-hardly-anything

REMOTE-CONTROL SWITCH

Which is fully described in this issue of "P.W."

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

OUT FOR A WALK
THOSE "FLEAS"
FRENCH FIRES

RADIO NOTES & NEWS

LIVING SETS
AIR DRAMA
FICTION BEATEN

The Atlantic Airway

AS I write these lines the 20-tons flying-boat Caledonia, Captain A. S. Wilcockson, is lying at the moorings all tuned up for the first British trans-atlantic commercial flight. Her opposite number, a Pan-American Airways machine, is champing on the bit in New York, all set for her trip to Europe. And by the time you read these lines the newspapers should have had a stirring story to tell of the exploits of these pioneer craft.

The two aircraft, and their terminal radio stations on either side of the Atlantic, operate on a common wavelength of 900 metres, so that they will be able to hear each other, and keep contact continuously.

The Caledonia carries radio gear that enables her to work on shipping and commercial wavebands, as well as on the aircraft wavelength. I dare say that the American air liner—a big Sikorsky—is also multi-wavelengthed, and I shall be glad to hear from readers, afloat or ashore, who have tuned-in the transmissions on this historic occasion.

Short-Waver on the Shelf

MY recent reference to lucky laddies who have spare radio sets (or components) tucked away in odd corners has brought me a line from an Erdington reader of "P.W." who would like to meet with one of those shelved short-wavers.

He tells me he is twenty years old, but has been an invalid for the last four years and has just recently returned from ten weeks' stay in hospital.

In such circumstances short-wave reception can do wonders for the alleviation of boredom, so if this note meets the eye of anyone in the neighbourhood of Erdington who feels like emulating the Good Samaritan I shall be pleased to pass on the address.

Out For a Walk

SHORT-WAVE listeners who happened to hear W2XAD on June 16th at 11.15 p.m. were able to listen to a pair of hikers who had just completed a world-record-breaking walk of 10,000 miles.

Starting one fine morning in January, 1935, from the old home town of Caracas in Venezuela, they kept putting one foot in front of the other until they had arrived at Washington, D.C. They had worn out twelve pairs of boots on the journey and three pairs of tennis shoes.

The number of blisters which they had seen come and go in that eventful eighteen months could only be enumerated on an up-to-date listing and adding machine, with multiplier attachment. Being Boy Scouts, they hardly noticed the blisters, but they will always remember Honduras, where local revolutionaries took them for the advancing enemy.

That, my hearties, is what you may call HIKING.

My Word — By the Editor

BROADCASTING VALUES

AT the present moment those B.B.C. officials who are not enjoying Continental holidays are planning the programmes for the Autumn.

And it is to be hoped that they will keep more in mind the eight million licence-holders than the odd few thousands of London's higher-browed listeners—who don't listen much, anyway.

There is plenty of money available, but what can one think of men who will pay £3,000 to a foreign orchestra conductor and who would not offer more than £50 for a Farr-Neusel broadcast?

Only that they have an entirely wrong idea of National Broadcasting values.

It may be a matter for regret on the part of the pundits of the "Big House" that more people should prefer the broadcasts of boxing matches to those of symphony concerts.

So also must it be painful for a vegetarian to witness the activities of Smithfield Market.

But the very essence of the idea of Democracy is that the needs of the majority must freely be served.

Yet in this democratic country our ether entertainment continues to remain in the hands of a virtual dictatorship. Admittedly there *were* advantages, but the apatby that is creeping over the listening public (as proved by certain irrefutable facts) clearly reveals that some drastic reorientation of Broadcasting control has become essential.

Those "Fleas"

MY friend J. W. G. of Southampton, whose feats of "flea-power" station reception I told you of a few weeks ago, is still dexterously roping in the low-kilowatt transmissions, even in broad daylight.

His latest capture was one recent Sunday afternoon, about 5 p.m. While more mundane mortals were putting on the kettle ready for tea, and asking why there wasn't any strawberry jam in the pot, J. W. G. was hovering like a hawk over a faint carrier-wave that presently resolved itself into an identifiable programme, namely Radio Cité, Paris.

This station uses only 0·8 kw., but even so he is not safe from the clutch of J. W. G.

Warning me that Arieline should stand by with the smelling salts, this reader then goes on to say that the set on which he scores such notable successes is a 4-valve A.C. superhet, which has been in use since October, 1935. Can any owner of a similar set claim results equal to those I outlined on page 337, June 19th issue of "P.W."?

French Fire-Fighters Use Radio

TAKING a leaf from the book of the Canadians, who have developed fire-fighting to a fine art, the French have lately begun to equip their look-outs with radio transmitters.

In the south of France hundreds of acres of forest and woodland are devastated every summer, but this year six of the look-out posts, equipped with wireless, will mobilise all the fire-fighters in the affected area as soon as the smoke appears, by effecting communication with a Marseilles station in touch with the Forestry Department.

Already the system has proved its worth, and France has plenty of scope for development, there being nearly 75,000 acres that require watching in one Department alone.

His Little Jest

READERS who understand the German language may stumble upon a thrill in the neighbourhood of twenty-eight metres if they tune-in the unauthorised broadcaster who has been giving the Nazi authorities so much trouble with his propaganda transmissions.

He usually comes on about 8.45 in the evening, but he is necessarily "chancey," for he knows that if he is caught he will get short shrift; so his location, times, and wavelengths are all liable to change.

(*Continued overleaf.*)

Next Week: MARCONI'S AMAZING "PHILADELPHIA" TESTS

WORKING A LOUDSPEAKER WITHOUT A SET

His precarious programmes seem to provide him with a certain grim satisfaction, for he generally winds up by asking his listeners if they do not hear him again, or if he should be suddenly interrupted, to observe a two minutes' silence in his memory.

Living Radio Sets

BOYS, I want you to meet two new chums from Czechoslovakia—Franz Sykora and Rudolf Vitavsky. According to a foreign correspondent of an evening newspaper Franz and Rudolf are living radio sets!

"All they need do is to grasp the wires of a loudspeaker and close their eyes. They and their friends thereupon hear the programmes of any nearby station."

Franz is a welder and Rudolf a mechanic; neither has any special radio training that might account for his extraordinary powers, and apparently any suggestion of trickery has already been ruled out.

These two radio marvels are to be tested at the Technical Institute of Prague, where they have been invited to give demonstrations. It has been estimated that they can muster up about 300 volts between them.

I shall await the results of these tests with great interest. Meanwhile, I extend the glad (but heavily insulated) hand of fellowship to Franz and Rudolf.

Hollywood—Would You?

WE ought not to be covetous, ought we? So the wisest thing to do is not to think about Dick Powell.

Having married Joan Blondell—no hardship, you will agree?—Dick takes up radio work and becomes Master of Ceremonies on one of the national hook ups. Then his studio thinks it might put out a programme of its own, starring Dick; *so they pay him to keep off the air.*

Every week, for *not* working, he gets a cheque that he can spend on Joan.

To get back to where we started: "We ought not to be covetous, ought we? So the wisest thing to do is not to think about Dick Powell."

Fact Beats Fiction

FAR-OFF readers who listen-in to the Empire programmes with some regularity will be familiar with the name of Mr. F. H. C. Piffard, who produces the light entertainment in the Empire Department. They may not know, however, that in his own experience Mr. Piffard has encountered a situation too fantastic to be acceptable in a play.

No playwright would allow the victim of a motor accident to break his neck and then go on living—yet that is precisely what happened to Mr. Piffard. The medical profession despaired of him when he lay in hospital with broken neck and displaced vertebræ; but somehow he emerged, got his spine correctly set, got better, and finally got busy on the Empire wavelengths.

Other producers have to rely on the imagination for "impossible" situations, but Mr. Piffard can call up the almost-unbelievable from memory.

"MIKE" SLIPS AND QUIPS

During a Cookery Talk

Take your kidneys, cut them open like a book, and put a skewer through them to keep them flat.

* * *

Advertiser Speaking from Sponsored Station

Brains and bacon—what a dish! But you must remember to use your own brains with the bacon—er, I mean when choosing the bacon.

* * *

Advertising a Dress Cleaner

Just rub it on the dress, and it will cease to exist—the stain, I mean.

* * *

During a Sales Talk

Three hundred and twenty pigs will be offered. I shall not be there.

* * *

Announcer Advertising a Frock Shop from one of the Sponsored Stations

A customer entered the shop and said, "I want to try that dress on in the window."

* * *

Cricket Commentator

That was one of those balls you either hit or miss.

Drama of the Air

A CURIOUS chain of circumstances recently led to another of those situations which must seem, to the persons concerned, to be not less than miraculous.

The wireless operator of an Air France liner flying on the Prague–Warsaw route happened to pick up an S O S stating that the famous German surgeon, Professor Bauer, was wanted to perform a life-and-death operation at Breslau.

The surgeon, who was travelling as a passenger in the plane, was informed in mid-air, and it was agreed that the liner should fly back with him to Breslau. This was done, and the operation which had appeared impossible was performed and proved successful.

Radio Betters Rumour

PORT OF SPAIN, Trinidad, reports a remarkable instance of the value of Empire radio in connection with the riots there. With the death roll at nearly twenty, people a little way out of town were afraid to leave their homes, and were at the mercy of wild rumours about the strike situation in their own neighbourhood.

From Port of Spain, however, reliable news was being sent to Britain, 4,000 miles away, and when this was broadcast from Daventry it was picked up again in Trinidad.

Isolated settlers with short-wave radio sets were therefore able to keep in touch with the situation only two or three miles from their own doorsteps in Trinidad by news which had travelled some 8,000 miles to reassure them.

Somewhere a Voice is Calling

YOU remember that I told you of an American radio station that puts out real-life problems, such as "What Can I Do About My Wife's Cold Feet?" Well, there has been so much interest in them (the programmes, not the cold feet) that it has become necessary to prevent the voices from being recognised.

So the technicians have gone into a huddle and produced a voice-disguiser, which enables a husband to talk freely about his wife, or vice versa, without anyone who may listen being sure of the voice of the broadcaster.

Even the craftiest mother-in-law, hearing the doctored voice, cannot swear that it belongs to that "blight-on-the-life-of-my-child - who - ought - never - to - have - been - admitted-to-OUR-family."

Many a spouse, now able to recite his grievances in safety, has sworn that this voice-disguiser is the biggest radio invention since the valve!

Drama in the Pacific

THE need for wireless equipment on planes which make long-distance flights was never more strikingly illustrated than in the case of the gallant round-the-world flight attempted by Miss Amelia Earhart.

Unfortunately, her machine met with disaster in a part of the world where the radio-receiving network is extremely scanty; but, even so, it was radio that played the vital part in that dramatic search of the Pacific.

"I Beg to Announce——"

APPEARING in a newspaper the other evening was another of those delightfully worded applications for the job of radio announcer in India.

"It is my impestuous earnest to speak at the microphone, and hence this letter. What I want to know is the qualities wanted if a fellow wishes to speak before the microphone. To be distinctly clear I am a grand musician and know much of this art. . . .

"If you anticipate that I will ask for much pay you are completely incorrect and remote from reality. We shall mutually settle the pay. It is my fervent hope that you will agree to this plan without a little stammering. Contrary to expectations, I am merely a chap of 15. I now solicit a reply sooner than possible (of course a favourable one)."

Of course.

ARIEL

MEET BRYAN MICHIE—

THE "EFFECTS" CHIEF WHO BECAME PRODUCER

BECAUSE this is the story of Bryan Michie, fair-haired, Falstaffian producer of the B.B.C. Variety Department, it must also be the story of a Voice.

Compèring, producing and presenting countless radio shows of the light variety-cabaret-musical type, has made it the friend of a million families in all parts of the country.

Bryan Michie's voice, however, has thrust him into and saved him from many a curious situation.

Time was when young Michie—he is still young, really—was a schoolmaster, and as a schoolmaster he was great fun.

"Because I was on the unattached teaching staff," he said to "P.W.'s" representative, "I taught in quite a lot of London schools I say advisedly that I taught; what the kids learned is nobody's business, but I don't think it was very much. You see, they amused me and I amused them. I never was a disciplinarian, anyway. I taught history entirely by presenting it in dramatic form.

A Request Answered

"To cut short a long story, I wasn't pleased with myself and I'd always had an overpowering desire to go on the stage. The difficulty was my father, who was a very strict Scotsman.

"However, I read one day on the way home from school that Basil Dean was going to stage 'Beau Geste,' so there and then I made a bee-line for his office. 'Mr. Dean,' I said very timidly, 'I want to go on the stage and——' I never really finished because he took one look at me and said: 'That's fine, here's a part for you.' So, for a day or two I led a kind of double life till I said good-bye for ever, at the end of a week, to schooldays.

"I became a Dutch boy in the show. When my name appeared on the bills I thought I had found fame. Then I remembered father. A little voice said: 'Go to the country and tell him.' I went and spent a day with him and I just couldn't pluck up courage till the taxi was about to whisk me away to the railway station. I leaned out of the window and yelled 'I'm going on the stage.' I distinctly saw my father swoon as I drove away.

Work at Savoy Hill

"After 'Beau Geste' I did some repertory work at Swanage, where I had to do two plays a week—a ninety-year-old doctor one night, a juvenile lead the next, and so on. I was assistant stage-manager, too—yes, and noises off."

Noises off.

It was not perhaps so very strange, then, that the Voice next found itself in the B.B.C. Effects Department. Bryan Michie was in charge of it for four years and incidentally introduced quite a lot of the old effects; most of them have since been superseded by gramophone records.

"The Savoy Hill effects room was a queer place, I remember," he said. "It was almost a lumber room and next to one of the studios. All the effects were done by hand then and one dashed around, script in hand and phones on head. One day a producer said: 'Make a noise like an avalanche.' Well, I sent a boy to Covent Garden for a pound of potatoes; we emptied them into a big drum and rolled them around on the taut parchment. Everyone said that it sounded as they thought an avalanche would sound."

It was Bryan Michie, too, who "invented" the effects table with six different surfaces, so that when coconut shells were clattered upon them the noise closely resembled horses' hoofs pounding upon turf, tarmac, gravel and several other kinds of ground.

Even when it was possible to reproduce before the microphone an actual sound required it did not always "go over" so well as an imitation. Strange but true. There was no difficulty in obtaining an appetising spluttering of frying bacon and eggs in the studio, yet in a transmission it just didn't sound like that. Bryan Michie found, instead, that a tumbler full of water into which a helping of effervescent salts was tipped, in front of the microphone, gave listeners a more lifelike impression of the homely culinary episode!

Bryan Michie demonstrated the "gadgets" of the effects room to King George V. and Queen Mary during a visit they once paid to Broadcasting House.

Turning to Production

There came a time, however, when the relation of cause to effects had been established: and the Voice again moved on, this time to production, in which Michie had always been very interested. That was four years ago, four years during which he has produced and presented numerous shows; a dozen of to-day's well-known radio personalities owe their stardom to the chance that came their way through him.

He likes nothing better than late-night radio cabaret and the quieter, more intimate kind of variety with its sophisticated songs and sayings. Yet it is for his compèring that listeners, perhaps, know him best.

Out of office hours he spends much of his time looking for new radio characters—people with "pep and personality."

Charity concerts and local "socials" are, in this respect, a happy hunting ground. One night, for instance, Bryan Michie saw an advertisement which attracted him to a hall where a show was being given by a boy of fourteen who had borrowed money from his father in order to give an entertainment in aid of hospitals. That boy was Hughie Green, and Bryan Michie so enjoyed the show that he saw him afterwards and arranged for him to appear the following Saturday in "In Town To-night." A few weeks later he did his first show on the air as "Hughie Green and His Gang," in which he appeared with several other children of about his own age.

On another occasion Bryan Michie was dining in a Chinese restaurant when a music publisher sidled up to him and said: "There's a girl here whom I would like you to hear."

The girl was Marjorie Stedeford, Australian singer, whose voice was so attractive at the audition that followed that Bryan Michie booked her at once for the "Air-Do-Wells," a show in which she still regularly takes part.

This fair listener finds the tuning of the latest Ferranti eight-guinea all-wave superhet delightfully simple. The set was reviewed in "P.W." for June 26th.

THE BRITISH SHORT-WAVE LEAGUE

THE above society is still making splendid progress and is rapidly becoming the most prominent organisation for the DX-er in this country. Activities are not restricted to Great Britain alone, however, for members have been enrolled from the Dutch East Indies, Aden, Palestine, India, Egypt, Rumania, France, Italy, Poland, Costa Rica, Cuba, U.S.A., I.F.S., Australia, New Zealand, Gibraltar, Transvaal, South Africa, etc.

"H.A.C." certificates are now available to members, also a league badge, and QSL. Distributing Bureau, which is managed by Mr. L. J. Le Breton, B S W L 538, 95, Bridport Road, Dorchester, Dorset.

The League's "Short Wave Review," resplendent in a new cover, gives DX news each month, and in future it is intended to regularly include articles on transmitting for the "A.A." licence holder.

The secretary, F. A. Beane, Radio 2 C U B, British Short Wave League H. Q., Ridgewell, Halstead, Essex, will be pleased to send full details of membership to any interested listener irrespective of nationality. A free copy of the "Short Wave Review" may be had on application.

THE DIAL REVOLVES — By LESLIE W. ORTON

RADIO'S IMPORTANT PART IN U.S. COASTGUARDS' LIFE-SAVING PLANS

WITH energy almost equal to the fury of the hurricanes they plan to combat, the United States coastguards are organising a service to save lives and ships during the terrifying storms that burst upon the continent at this time of the year, giving news editors many a front page "story."

In the Danger Zone

Radio the life-saver will play an important part in the scheme, and when news of an approaching hurricane is received the coastguard stations will rival ant-heaps with their activity. Warnings will be flashed to ships at sea by radio, whilst lorries equipped with wireless transmitters will race to dangerous parts of the coast so that ships approaching too close may be warned. Aeroplanes and coastguard cutters will speed out to sea to warn ships that do not possess wireless, to race to port as quickly as possible to avoid adding to the already full locker of the renowned Davy Jones.

And here is a tip for you boys: The coastguard stations use the general call N C U and operate in the region of 70 metres—how about keeping a watch up there during the next few weeks?

Tea-cup Reception

Amateur reception has been as exciting as telling fortunes in a tea-cup—but luckily more reliable! Incidentally, I've been rather alarmed to hear a number of French-speaking stations with the well-known trade-mark of the French amateur. You know, distortion and still more distortion! However, so far as I can discover, these stations are not "Froggies," so goodness knows where they are. Perhaps one of you bright lads has some information tucked away. If so, how about spilling the beans?

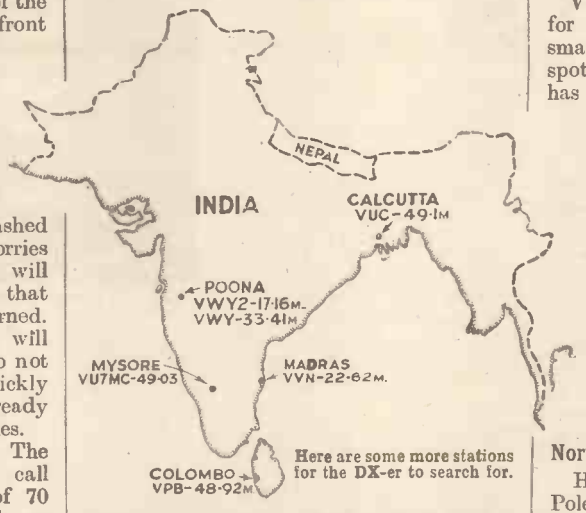
South and Central American reception has been excellent of late and I've a swell bag to my credit. L U 9 B R and L U 8 M A, Argentina; Y V 1 A A, Y V 5 A E, and Y V 5 N D, Venezuela; T I 5 N T (sounds almost explosive!) and T I 2 A H, Costa Rica, a 20-watt (input) Cuban whose call I failed to catch, and a first-rate mystery, Y 5 A M—not bad, is it?

Have you noticed that Spanish stations appear to be taking the air more regularly of late? Two stations that have been particularly well received are E A 3 A J J and a warlike fellow with the call E A 4 R A, "The Military Station." The announcer was a fiery-sounding fellow who might well have been Mars' grand-daddy!

U.S. amateurs continue to pound in, and my log includes W 1 A P V, W 1 J A S, W 1 T W, W 1 A C F, W 1 A L, W 1 B L, W 2 S T, W 2 O J, W 2 D S, W 3 M D, W 4 E O, W 4 D C, W 5 W S, W 7 V P, W 8 Q L, W 8 T C C, W 8 K M L and W 9 B L. I also received a surprise in the form of G 8 X L, London, calling test—how-do, stranger?

Show Boats

Yo, ho, ho! and a bottle of rum! My merriment is created by the news that broadcast programmes are radiated regularly from the liner Awatea. Using the call Z M B J, concerts are broadcast between 11.45 and 12.20 p.m. each Wednesday. No need to book your seats in advance; just give your dial a swing to 33.94 metres at the specified time, and if you are lucky you may hear something to thrill you to the marrow!



Incidentally, I can't guarantee the accuracy of the rumour that this station relays the Loch Ness monster's sea-serpenty friends, but I can assure you that a fine verification card is the reward for a good report.

V K 9 M I is another call to memorise, for it belongs to the ship Kanimbla, a small item in itself, but this ship also does a spot of broadcasting, and, great news, it has a lady announcer! And I'll let you into a secret: the announceress, Miss Eileen Foley, personally answers reception reports—isn't that worth knowing?

V K 9 M I operates on 49·917 metres between 7 and 8 and 8.30 and 9.30 a.m. daily. Programmes consist of special relays to Australian broadcasting stations.

And now for a last-minute flash. The yacht Velveda (not Velveta!) is being heard well on 20 metres. Heard her yet? I picked her up at excellent strength the other day.

North Pole Hot Spots

Have you heard R A E M at the North Pole yet? This is the call used by Comrade Krenkel, an ardent DX-er among the explorers at present at the North Pole. Apparently tiring of playing cards he fixed up 20- and 40-metre transmitters.

(*Please turn to page* 453.)

SHORT-WAVE STATION IDENTIFICATION — By F. A. BEANE

NORTHWARDS TO THE UNITED STATES

POSSIBLY I shall be condemned by the more ardent D X-er for daring to "conduct" an imaginary etheric tour through the U.S.A., and maybe I shall be accused of wasting "P.W.'s" valuable space by referring to identification characteristics of such well-known broadcasters as those found in this country. However, I am going to take the risk since there are beginners amongst us, and I may even reveal an item of interest to the more advanced listener in so doing!

Unfortunately the ultra-short waves, which were arousing considerable interest a short while ago, have petered out since about the 22nd of April and, according to the experts, favourable conditions are not likely again until September, although a friend informs me that the band is frequently stimulated after a thunderstorm. However, as we must progress and the return of good conditions is likely, I will give as many details of the U.S.W. stations as I have available at the moment. Unfortunately I cannot guarantee the authenticity of all of the appended data, since I have heard but few of the stations listed, for conditions failed just as I was getting accustomed to adventuring in the ultra high frequencies!

First we have **W 3 X E Y** of Baltimore, which operates on 9·494 m. and relays W F B R of the N.B.C. Basic Red Network. The station announcement is generally given as "This is the Ultra High Frequency station W 3 X E Y in Baltimore." Reports are verified and should be sent to 7, St. Paul Street, Baltimore. Then there is another station in the same city which is well heard at times, viz **W 3 X E S** of 8·43 m., which relays W C A O. While still on the East Coast we will "visit" some of the better known broadcasters, so stand by, you zealous D X-ers, we'll return to the D X a few paragraphs down.

Briefly the chief characteristics of two of the well-known stations are as follows:

W 1 X A L (19.68, 25·45 and 49·67 m.) Boston, is best heard on 25·45 m. with its news bulletins, but often heard at other hours with educational talks arranged by the University Club. Talks concerning Christian Science also may be heard. Before "signing on" at 23.00 B.S.T. a 6-chime signal is used, and at the hour the playing of the march, "Blaze Away," heralds the "Monitor News Broadcast," or "World Wide News" as it is usually styled.

W 3 X A L (16·87 and 49·18 m.) Bound Brook relays N.B.C. Blue Network; employs familiar N.B.C. chimes (G.E.C. on piano), and announces as "W 3 X A L, Bound Brook, New Jersey." Occasionally this is repeated in French, German and Spanish.

I have now completed my allotted span, but as promised to the DX-ing fraternity I will mention a real DX "catch" to search for, namely **W 1 O X G Y**, situated on board the yacht Iorano in Pearl Harbour, Hawaiian Islands. Listen on 6,425 kc. around 02.00 in the morning; it's "loggable," for I heard it with my trusty O-V-2 a short while ago!

ON THE SHORT WAVES

TROUBLES WITH THE MAINS

By W. L. S.

MORE and more short-wave listeners seem to be turning to the mains for their source of H.T. and L.T. This is all to the good, for it has been the fashion in broadcast receivers for many moons, and there is no reason why short-wavers should lag behind. Some of the fellows who have made the conversions, though, expecting everything to be moonlight and roses at the first try-out, have had a nasty jolt.

It's perfectly true that there *are* one or two particular snags about obtaining really silent operation with the mains as motive power on short waves. Strange to relate, though, most of the people who run into trouble haven't actually hit these snags at all—they have just made silly bloomers or omissions which would have caused them an equal amount of trouble on any wavelength.

For some little time I have been receiving letters from readers who have substituted H.T. eliminators for their high-tension batteries without making any further change. Many of them get away with it right from the first, but quite a few express themselves dissatisfied with the degree of silence they obtain. You see, short-wave listening involves so much work on really weak signals (if you're keen enough to make it really interesting) that 1 per cent. of hum in the background is far too much to tolerate.

Three Categories

A broadcast receiver working on a local station can have quite a high hum level without the listener ever knowing it. A short-waver—particularly one working on headphones—has got to be as quiet as it is humanly possible to make it.

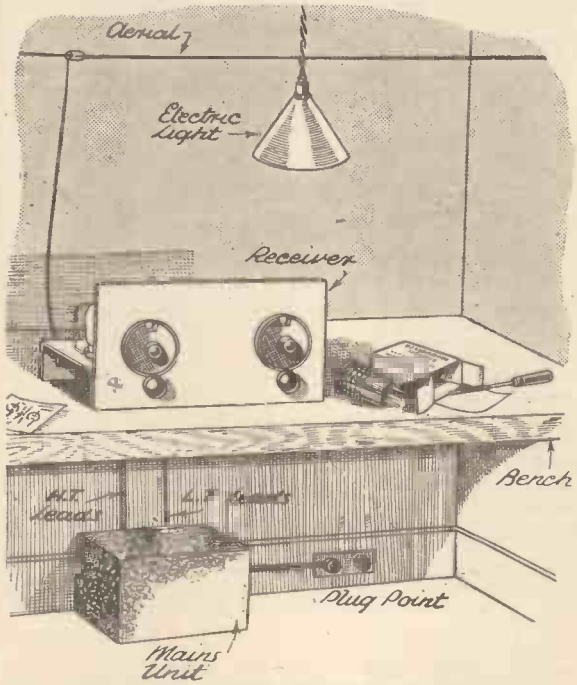
This week I don't propose to talk about the actual circuit arrangements so much as the externals. All sorts of stray combinations of circumstances can assist in drawing the line between success and failure—and you know which side of that line *you* want to be on.

Imagine that you have a good short-waver that has proved its worth with a battery H.T. supply. Fed-up with buying new batteries, you have got hold of a mains unit of the right voltage, plugged it into a mains socket, and connected it to the set.

You will be in one of three categories: (*a*) everything in the garden lovely; (*b*) lots of hum; (*c*) not much to grumble about, but just a *little* hum that you'd like to dispose of.

If you're in batch (*a*)—good-bye! I shan't be wanting you any more. If you're in (*b*) you've got something radically wrong, and had better look round. How about the earth connection? Got one at all? Try taking it off if you have, or putting it on if you haven't! Is the mains unit O.K. or is it some junk you've picked up somewhere? If it's the latter, I can't help you much more, because probably the trouble's inside.

What are your mains like? Have you run the leads from a point a long way off?



Hum may be caused by the proximity of the aerial lead-in to the mains wiring. Keep the leads from the mains unit as short as possible, and screen them if you can.

If you have, use lead-covered wire and earth the casing. If there are various tappings on the mains unit, make sure that those you use are giving about the same voltages as you formerly used from your battery. If, on the other hand, it only has one output voltage, and all your voltage-dropping is done inside the set, just check up some of the voltages and make sure that they are roughly right.

A big change of voltage on the screen of an H.F. pentode, for instance, is quite enough on its own to send a set off into an apparently unaccountable hum. Next point—aerial. Does it go very near an electric-light fitting or anything of that sort? It may seem funny to you, but many a battery set will work well in such circumstances, only to go right off the deep end when it is converted to mains operation. I have had it happen more than once.

But by now you're probably in class (*c*). Look at the sketch on this page, and note the relative positions of set and mains unit and mains plug. I've shown the aerial going next to the electric light fitting just to remind you of this possibility. Needless to say, if your bulb is a bad fit in the holder and makes sparky noises, you will have incessant trouble with whatever kind of set you use.

Use Screened Leads

The sketch shows L.T. leads coming from the mains unit, as well as H.T., because it applies to all-mains sets as well as to conversions. Screen those leads, if you have any residual hum, and earth the casing. The mains unit, presumably, is in a metal box—and that, too, should be earthed.

If your wiring to the plug point is as short as that shown in the sketch, you shouldn't have any trouble over that; but if there is a last drop of hum that you can't get rid of, it's worth while to try the effect of screening that short lead.

Other sources may be mentioned—an unmetallised detector valve, for instance. Bad wiring or instability in the receiver may result in hum when the mains are used, even if the thing appears to be perfectly O.K. on batteries. Even length of aerial may have an effect upon it, but this effect is usually to cause a number of dead spots all over the dial, in which a hum is generally heard as the set stops oscillating.

Next week I am going to talk about the conversion of battery sets to work with A.C. Personally, I always recommend that readers should convert their L.T. to A.C. operation first. This only means the provision of five-pin valve holders and slight alterations in the wiring, and you can continue to use a battery for H.T. until you feel inclined to tackle the next section of the change-over. One of the chief troubles, when you change over all at once, is that you never know whether your hum comes from L.T. or H.T.

ON THE SHORT WAVES—*Page 2.*

POINTS from the POST-BAG

W. L. S. Replies to Correspondents

CHEER up, everyone! Cards from Area No. 10 of the "18" Club scheme are forthcoming, after all. R. D. E. (Sawbridgeworth) has produced one from Y I 2 B A, and thereby gains his fifth gold seal, since he has now logged seventeen of the eighteen areas. His only stumbling-block is Zone 7—that horrid affair including Spitzbergen, the North Pole and the frozen Arctic wastes. But someone has a "veri" from that zone—having logged the Oxford University Arctic Expedition a few years ago and received a card from them.

R. D. E. tells me that he has at last heard W6 phone from Nevada. If he gets his card, that will mean all States heard and verified. He has recently received one from W 7 V A, a portable in the Aleutian Islands. His total of ninety-one countries on speech and music is terrific.

Incidentally, Y I 2 B A's address is—c/o Port Directorate, Basra, Iraq.

More Call Illustrations

L. J. C. (Maidstone) has some additions to the recent list of call-sign "illustrations"—to wit, G 5 M M (Mickey Mouse); G 2 O V (Old Vicar); G 2 J G (Jolly George); G M 6 S R (Scottish Radio); V E 1 E I (Electric Insulator) and finally (though now off the air) O N 4 H S, known on both sides of the Atlantic as old "Haggis Sausages" in the shell-hole in Belgium!

W. C. B. (Welling) is intrigued by the "Simplex" Three, but fears that the 10–1 reduction ratio of the dials is not enough for his liking. He also wants to know whether I am going to describe a band-spread version.

I don't think it's necessary to do that. All you have to do is to lengthen the panel and put the band-spread condenser next to the band-setter, preferably changing their positions first so that the band-spreader "falls to hand" nicely. I will draw a diagram illustrating this treatment shortly.

As far as the dial ratio goes, I must say that I was perfectly comfortable with the condensers that I used—I don't like too great a reduction as a rule. Tastes differ, though, and if some readers like to use a plain condenser with a separate two-speed dial on it—all well and good.

A Real Puzzler

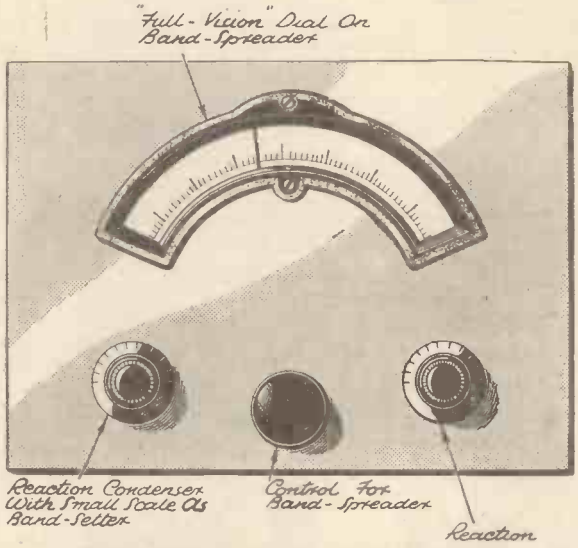
L. C. B. (Coulsdon), who describes his former set as "the famous old H.A.C." Three, has now built a "Simplex" Three, and sends along a very nice log of interesting DX. It includes West Indies, South America, Africa, Asia and the States—mostly on the speaker—so he hasn't much to worry about.

C. S. (Blackburn) says he wishes he could "get me along for an hour or two," which sounds rather threatening until he adds, "only to talk to, of course." He likes the amateur-band aspect of radio and would like to see the personal touch in evidence a bit more. He raises a question about mains hum; possibly the "dope" on the previous page will help him.

He tells an extraordinary story about a broadcast receiver that used to "hum" slightly with a certain detector valve in. He was fiddling with it one day, shone an electric torch on the valve, and the hum decreased most noticeably. Thinking it was a capacity effect, he withdrew across the room, focused the torch on the valve, and again the hum went down. What d'you make of that one? Photo-electric experts, forward.

Experimental But Strong

S. J. (Croydon) mentions reception of W 2 X G B at Hicksville, N.Y., on about 17 metres (17,310 kc.). It is testing experimentally and transmits records with an announcement at the end of each. Strength is better than that of W 3 X A L, a few kilocycles away. S. J. also wants to know what to do with a super-regenerative receiver that doesn't "quench" all round the dial. I think the "quenching" is all right; what happens is that the receiver doesn't oscillate at the *high* (signal) frequency all the way, and when it stops one doesn't hear the "breathing" sound of the quench frequency. Treatment—as for any ordinary dead-spot. In other words, tighten reaction coupling, loosen aerial coupling, squeeze the turns together a bit more, and what not.



W. L. S.'s scheme is to equip the band-spreader with a full-size slow-motion dial, placing the band-setter on one side of it.

It May Be O.K.

E. W. (Puckeridge) has made a coil for reception below 10 metres, consisting of one turn grid winding and two turns reaction. He can get the set to oscillate "up to 50 degrees" with a .00015 tuning condenser, but can't hear anything. Well, it's very difficult to know what range he is covering, especially with a condenser of such a hefty size. But in any event the 10-metre band is pretty dead nowadays, and unless he happens to listen when an experimental broadcast transmission bobs up, he's not likely to hear much just at present.

When the 10-metre band comes back—as it should do in August or September—there won't be much trouble about finding it. You can take that from me!

Short-Wave News

AS one would expect, conditions are still distinctly "summery." This doesn't mean that they are bad—far from it. But stations which roll in night after night in the winter are subject to occasional bouts of high-frequency fading and "night distortion." Even the reliable stand-by stations like W 2 X A D may let one down when a favourite uncle comes on a visit.

Atmospherics have been severe on wavelengths above 50 metres, but they don't seem to have caused much bother below that, except occasionally on the 40-metre amateur band.

Incidentally, the comparative lack of amateur stations is in no way due to conditions, but simply to the rival calls of tennis, swimming and what not—for the "hams" are just human beings like you and me, and they don't spend *all* their time on the key or at the mike.

Some enterprising person has been taking a census—so far as such a thing is possible—of the types of receivers used by amateurs. Doing this is fairly easy if one listens a lot, because every ham says a few words about his receiver at some time or other. The astounding result of this census is that out of 85 amateurs "observed," 67 were using commercial receivers, mostly American superhets. The remaining 18 had home-built receivers, but the types differed so widely that the man who took the census did not specify them.

The fact of the matter is that the amateur transmitter—and, indeed, the really enthusiastic short-wave listener who hasn't the time to build his own superhet—finds it absolutely necessary, in these days of terrific interference, to spend quite a lot of money on one of the best sets that the said money can buy for him.

But don't let that put you off home-construction, for you can still obtain far more miles per penny on a simple home-built receiver than you can on one of these big fellows. The only difference is that you need more patience!

On the subject of home-built receivers, let me refer you to the sketch on this page. Many readers seem to think that when they add a band-spreader it can be put on the set as a sort of "extra." That's all wrong—the band-spreader will be the most-handled control, and it should therefore occupy the position of greatest importance.

The sketch shows my own plan—the band-spreader, even if it *is* only a tiny little condenser, is equipped with a full-size slow-motion dial, and the band-setter on one side of it. The latter may well be a reaction condenser with a slow-motion control and one of those little dials graduated from 0 to 10. You can then set it at each dial-marking in turn, and search the band on the big dial with the little condenser behind it.

W. L. S.

MY SHORT-WAVE ADVENTURES By L. CHESTER

ADDING AN H.F. VALVE

This week Mr. Chester describes his first experiences with an H.F. stage added to his receiver

THIS week I have become an "adder" but not, I assure you, a snake in the grass. I have added a high-frequency stage of amplification to my existing O-V-1 outfit.

I have been wanting to try this idea for some time, but only now have the coils turned up. At the moment I am the proud owner of duplicate sets of four- and six-pin B.T.S. short-wave coils, which tune from 12 to 94 metres—quite enough for me to be going on with.

As you recall, perhaps, my set has been built up in chassis form, with the detector and resistance capacity coupled pentode giving fair to middling results, the only drawback being certain blind spots in reaction that tend to make operation hit and miss.

Another decision I had to make was about the type of coils. Having got rather keen on four-pin coils, I thought I might as well stick to this type for my amplifier. In fact, since I was using the unit with my existing set, which has a capacity coupling between the aerial and the grid tuning of the detector, it seemed as well to standardise.

Four Pins Enough

In any case, I can't see any use for a six-pin coil in the aerial circuit of a high-frequency amplifier. Perhaps, bright thought, there isn't any! A four-pin coil provides with its two windings an aperiodic aerial circuit coupled to a grid tuning circuit.

How the completed H.F. unit appears.

QUITE A SIMPLE CIRCUIT

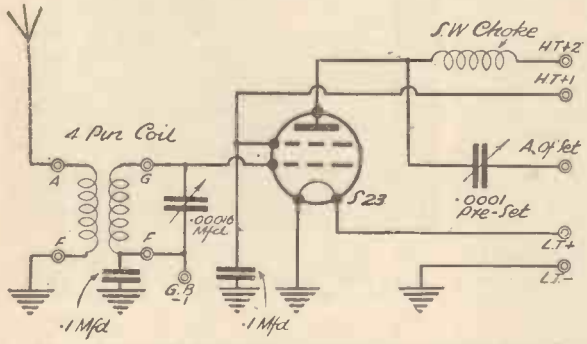


Fig. 1. The circuit of the unit is as simple as it possibly can be.

Fig. 1 shows the simple little amplifier circuit I adopted. As you will agree, it could hardly be simpler. I am using a ·00016 microfarad tuning condenser, matching the one in the two-valver. The screen grid itself is de-coupled with a ·1 microfarad non-inductive condenser. I believe ·01 is the usual value, but I don't happen to have any.

Grid bias is applied to the screen-grid valve's control grid through the "earthy" end of the tuning winding, with another ·1 microfarad non-inductive condenser by-passing the high-frequency current to earth.

In the anode circuit of the screen-grid valve is a short-wave high-frequency choke, which not only diverts the signal voltage through the small variable coupling condenser but also provides the high tension "feed" for the screen-grid valve.

For the variable coupling I have used a ·0001 microfarad pre-set, in fact, the one previously needed, but no longer so, in the two-valver.

It was then a question of how to make up the Fig. 1 circuit into a suitable unit. I felt keen on an all-metal job, so once again I bent into shape a piece of aluminium sheet 16in. by 8in. This is exactly the same as for the two-valver, giving an upright panel 8in. by 6in., a baseplate 8in. square, and a chassis support 2in. high. As before, I screwed a piece of wood to the front panel 2in. by 8in. to provide the final support.

I cheerfully screwed my tuning condenser to the metal panel and fixed on the slow-motion dial before I realised, on looking at my circuit again, that the spindle needed to be insulated from the panel, owing to the fact that the earth end of the condenser goes to grid bias and *not* to earth direct.

Insulating the Condenser

Fortunately, I found the two ebonite bushes supplied by the makers. All the same, it seemed a very small clearance for that spindle, so I enlarged the hole in the panel as much as I dared, and then very carefully centred the spindle while I screwed home the fixing nut.

Layout was naturally a simple job, with two four-pin valve holders, pre-set coupling condenser and short-wave choke more or less falling into place—see Fig. 2. The charm of a metal chassis seems to be that only the vital high-frequency wires need show—with all those untidy battery leads neatly tucked underneath.

There may be better ways of arranging the parts than I have done—and shown by Fig. 2—but it seems almost impossible to get a more straightforward run of leads. I have wired up the two high-frequency de-coupling condensers underneath with the battery leads. Perhaps that's why the unit looks so very bare.

The only drawback—if you can call it that—of an add-on unit is the duplication of all the battery leads. I have made my unit so that, as with the blushing bride, there are two of everything. The high-

(*Please turn to page* 453.)

I began the design—if you can call my "mucking about" design—of the high-frequency unit with some qualms. First I thought of scrapping the existing set—as the old baseboard set had been—and re-making a three-valver with a high-frequency stage. But then it dawned upon me that I might as well experiment with a unit, and if that didn't work I should at least still have a workable two-valver.

I wonder how you should set about such a job? Personally, I got several sheets of paper, a stack of back numbers of "P.W." and—lit my pipe. I drew out all kinds of circuits, some with aperiodic aerial inputs, others with transformer-coupled connections, and so on.

But in the end I thought it better to be humble to begin with—and settled down to the use of an ordinary screen-grid valve—actually an Osram S23, with a four-pin valve holder and the anode connection on the top of the bulb.

An Economical Valve

I felt that heptodes and variable-mu pentodes were not for this child yet awhile. The S23, as you probably know better than I do, is an economical valve to run, taking only a couple of milliamperes, besides being free from microphonic effects.

THE LAYOUT

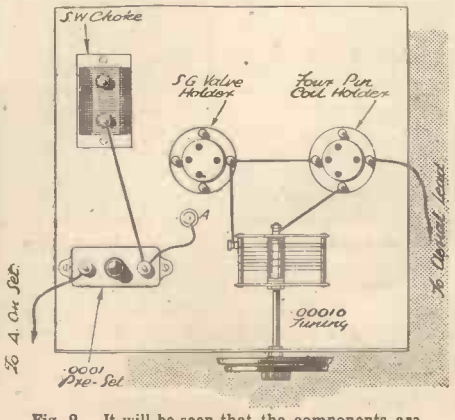


Fig. 2. It will be seen that the components are arranged to give easy wiring.

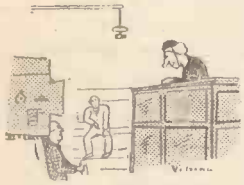
RANDOM RADIO REFLECTIONS

By Victor King

A VISIT TO THE CRICKLEWOOD STUDIOS :: ETHER-INDIGESTION AND ITS RESULT :: THE "MIDGET" PORTABLE :: TELEVISION AT THE RADIO SHOW

ON THE "SET"

SPENT a most interesting hour on one of the sets at the Cricklewood Studios watching them shoot "Old Mother Riley." Arthur Lucan starring in the title rôle. No temperament, no swearing; everybody obviously on their toes to make good shots.



"I was particularly intrigued by the discussions——"

Even when, at the very end of a long and difficult "take," and with only about four words to go, a buzzer crashed in and a message came down from the sound engineers that Arthur had raised his voice a bit too much, the star merely smiled apologetically and the producer grinned back at him ruefully. And that after six or seven solid hours spent in the production of but a few minutes of "running time."

I was particularly intrigued by the discussions which went on every now and then as to the "lines." "Do you stick rigidly to the book?" I had asked the producer previously and was told that very far from doing that he welcomed impromptu gags and any other improvements which tended to pep up the story.

Of course, when the warning red lights flash up and the siren goes to indicate that "shooting" is to commence one has to keep very quiet. Curiously enough, I had no desire to cough or sneeze!

It will be most interesting to see "Old Mother Riley" as a finished film. From what I saw of it in production, it should be first-rate entertainment. Particularly the scenes in the Old Bailey with "Old Mother Riley" (Arthur Lucan) conducting her own defence.

RADIOGRAM POPULARITY!

MANY radiograms are still in use; but not a great number, comparatively speaking, are being purchased these days.

Why is this?

A good theory was propounded to me the other day and that is that, owing to the dullness of the B.B.C. Sunday programmes, people used to go for radiograms in large numbers so that they could bridge the Sabbath gap by means of records. But that since the advertising stations have been pouring floods of records into the ether on Sundays, listeners have tended to turn to these instead.

I believe this may have a lot to do with it, but I think there is another factor at work—ether-indigestion! Broadcasting is too easy; you've only got to flick a switch and turn a dial almost any time during the week in order to get music.

Why bother about records?

Sunday becomes an automatic radio rest day for lots of folk.

For myself, I find the radiogram still quite indispensable.

I'd be quite lost without my favourite recordings. What are they? If I told you, you might laugh! So I'll tell you.

Top of the list is a record I've played dozens and dozens of times. "Little Man You've Had a Busy Day" with some simply marvellous bass in it. Not much behind it comes Ravel's "Bolero." Neck and neck with this is an organ medley by Harold Ramsay.

To be quite fair, I should add that my turntable rotates most often with frequency records on board. I have quite a large collection of these, including all kinds of "Gliding Tones" and what not, which I use for tests of various kinds.

WHEN IS A PORTABLE?

WELL. how did you like my little portable? I know it is being built, because I've already seen two. One was being shoved into the back of a very small car along with a heap of bags, and the other was being carried along the street by a fellow who seemed very conscious of his little possession.

I nearly said "proud"!

Shortly after meeting him a man passed me staggering under the weight of a heavy case. It might have been a portable, but in strict truth I can't say for certain.

"A man passed me staggering under the weight of a heavy Portable."

As a matter of fact, the modern commercial portable is not the clumsy, weighty outfit it has been. Even so, my "Midget" makes some of them seem pretty hefty things.

RADIO SHOW APPROACHING

YET another Radio Show will soon be upon us, and I learn that, despite what the pessimists have said, it will be as large, if not larger, than the last one.

And as you have probably already heard, television is to be very prominent, some sixteen demonstration booths having been planned. A number of firms will give their first public display of television sets.

I wonder if I shall win my wager? I have bet someone a whole half-crown that there will be a fifty-guinea outfit on show!

An Old Bailey scene during the taking of the film "Old Mother Riley"—a Butcher-Hope Bell production. Arthur Lucan, who has the title rôle, is seen in the dock. Note the microphone suspended above him.

ELECTRIC COMBINATION

SAW a neat electric combination lock the other day. Made by a friend and fitted to his garage door.

Four small knobs. Turn each to one particular reading, the circuit is made, a solenoid pulls a bolt back and you can open the door.

So far so good—but not new.

The original touch is provided by a very loud electric bell which rings on practically every other setting and thus gives warning of anyone tampering with the device.

RE-ENTER BE-WHISKERED MITCHELL

SO Leslie Mitchell's little story of face fungus has blossomed again. Perhaps it is the warm weather?

Still, I must admit that it doesn't televise so badly under present conditions. In close-ups it comes out quite clearly and undoubtedly has some ornamental value.

Nevertheless, I still maintain that for complete "telegenicity" (*My* Word!) there ought to be a really good bouquet of whiskers or none at all.

MARCONI—THE MAN AND HIS WIRELESS — CHAPTER VIII

THE FIRST TRANSATLANTIC SIGNAL

A vision at the turn of a century—Marconi as he looked in 1900—Selecting sites for transatlantic tests—Fleming designed the stations—Fessenden announces his high-frequency alternator—Pulsen introduces the arc transmitter—Ships begin to boast of wireless service—Fleming explains the science of tuning—A big station is built at Poldhu—Marconi arrives in Newfoundland—He prepares to make history—Kites hold up the aerials—December 12, important in the annals of wireless—Marconi picks up the first transoceanic signal—Scene of his success—His story of the achievement—The world doubted—What the Press thought about it—Tesla's comment—What Edison thought—Three dots that cost £40,000.

MARCONI at the dawn of a new century caught the vision of a dream. He saw men sitting on the edge of the North American continent listening to what a lambent spark was sputtering across 2,000 miles of broad, curving ocean.

New Year's Day, 1900, ushered in an electrical age of speed and scientific wonders—a Century of Progress.

The question in 1900 was: How can 20 kilowatts spread out to every point of the compass provide sufficient energy to traverse 2,000 miles in one direction? Would America and England be brought in touch with each other without the aid of the submerged cable costing from £900,000 to £1,800,000 or up to £500 a mile?

Marconi thought so, and was working feverishly towards that conclusion.

The cable secluded in the bed of the sea could carry dots and dashes, but the idea that thoughts might pass through the ocean air in less than a second was something to balk human credulity.

How less tedious, less expensive it would be to utilise a free right-of-way in the heavens instead of laying a cable in Neptune's dreary sanctum? The idea had possibilities calling for a miracle man. The sceptics, of course, were countless. It was true, this man Marconi had convinced the doubting world that wireless lifted messages for short distances, but the Atlantic—well it was much wider than the English Channel.

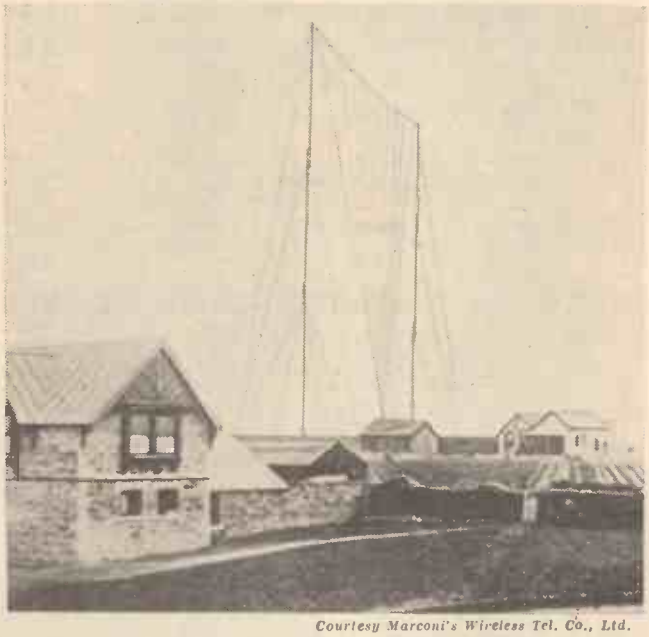
It was not so difficult to comprehend, in view of Marconi's achievements, that a boat 250 miles off the English coast picked up a wireless signal from the shore. But that must have been a freak of Nature aided by extraordinary atmospheric conditions. So argued the die-hards. It was eight times that distance from England to America!

Marconi, a conservative scientist, knew the Atlantic project was fraught with daring—a little too much for the public mind to grasp. He realised the significance of premature announcements.

Wireless across the sea meant the very shrinkage of the earth. It meant new and revolutionary communication between every nation on the face of the globe. Wisdom called for secrecy. If the dream turned out to be a bubble it would be a matter of disappointment only to the dreamer. If successful it would be a signal of progress for mankind. So he would work quietly, unassumingly, with plans unpublicised.

He was looked upon as a modern wizard whose human traits outwardly failed to betray any eccentricities of genius. Londoners who saw him in Piccadilly or Pall Mall observed a rather sad, keen-eyed, thin-lipped young man with unlimited capacity for work and a firm faith in his own ability.

USED IN THE GREAT TEST



Courtesy Marconi's Wireless Tel. Co., Ltd.

The fan-shaped aerial erected at Poldhu, Cornwall, and used for Marconi's first transatlantic experiment in 1901. This aerial replaced the ring of twenty wooden masts which blew down during a storm.

His brown hair was neatly trimmed and carefully brushed; sometimes he shaved twice a day. His attire, if anything, was a little too neat for a scientist. He was fond of a fur coat and was not above afternoon tea. One who passed him in the street would class him with the average club or City man, fond of the good things in life, yet his manner and step revealed he was by no means an idler. He looked like a man faithful to friendship but one who would give it rarely.

Divested of the fur coat he looked frail. His movements were slow and direct, yet there was an odd air of diffidence very apparent when he was in the company of strangers. This shyness was emphasised if wireless telegraphy was the topic. He appeared much younger than his twenty-six years, and more than one great scientist eyed him incredulously when seeing him for the first time.

Superficially, Marconi had little to distinguish him from the average man, but closer acquaintance invariably impressed one with his tremendous energy. The doctrine of strenuous life never had a more faithful follower. He laboured under high pressure and expected his subordinates to feel the same intense enthusiasm that gripped him during experimental periods. He worked by night and day when a problem presented itself.

Such was the calibre of the man intent upon transatlantic wireless; the man who was preparing for what he termed, "the big thing"—wireless between the Old and New Worlds.

Marconi, accompanied by Major Flood Page, managing director of the Marconi Wireless Company, and R. N. Vyvyan, engineer, in July, 1900 went to the barren south-west tip of England and selected Poldhu, near Mullion in Cornwall, as the site for a pioneer transmitter, 100 times more powerful than any station ever built. Construction began in October.

There history would be etched electrically on the blue canopy of the globe. Professor James Ambrose Fleming, of University College, London, appointed Scientific Adviser of the Marconi Wireless Company in 1899, was entrusted to design the installation. He was a specialist in high-tension alternating currents. Mr. Vyvyan was selected to supervise construction. Newspapers printed meagre reports that an Italian inventor hoped to link two far-distant points without the aid of visible wires.

The word "visible" appearing in the accounts of 1896-99 indicated the incredulity of the general public. The Gay Nineties were conservative in regard to

(*Continued overleaf.*)

MARCONI—THE MAN AND HIS WIRELESS—*Continued*

electrical miracles; people shook their heads in doubt and wonderment.

Poldhu was ready to "go on the air" for tests with the Isle of Wight in January, 1901. About this time it was decided to erect a twin station at South Wellfleet, Cape Cod. Trusses and beams for the towers were manufactured and shipped to the scene while Marconi, the creator, watched his two stations M B D and W C C grow with the mingled sensations that only an inventor knows. This was in the Spring of 1901; but events leading up to the sanguine expectations of the Marconi engineers were of the utmost importance. There were several incidents that showed wireless was "going somewhere," and others were in the race for fame with Marconi.

The Channel steamer Princess Clementine, on January 1, 1901, flashed that the barque Medora of Stockholm was aground on Ratel Bank; wireless again performed as Marconi said it would. A tug summoned by wireless pulled the craft off and towed it to port.

When the S.S. Lucania left Liverpool on August 3rd, 1901, equipped with wireless, the spirit of Marconi followed it, and on the evening of the sixth day he was delighted to learn that the operator had communicated with Nantucket Lightship at a distance of seventy miles.

Professor Reginald A. Fessenden, who was experimenting with a chemical detector, had applied (September 28th, 1901) for a United States patent on "improvements in apparatus for wireless transmission of electro-magnetic waves, said improvements relating more specially to transmission and reproduction of words or other audible sounds." He proposed to build a high-frequency alternator to generate the waves instead of a spark apparatus.

Valdemar Poulsen and William Duddell were conducting successful tests with an electric arc transmitter, which they believed would be a boon to long-distance communication, making the signals steadier and more dependable.

The fame of wireless was spreading. The first German wireless station which had opened on Borkum Island (February 18th, 1900) had been constructed by the Marconi Company. Ten days later the S.S. Kaiser Wilhelm der Grosse, equipped with wireless, left port as the pioneer seagoing passenger vessel to carry such service for its voyagers. Borkum Island heard the signals from the ship sixty miles away! Incidentally, the German Norddeutscher Lloyd was the first shipping company to adopt the Marconi service. Belgium's pioneer wireless station had been completed at Lapanne (November 2nd, 1900).

Marconi, on April 26th, 1900, had protected his interests by filing application for a patent on his "tuned or syntonic and multiplex telegraphy on a single aerial." It was the famous patent No. 7777, and over it a long, defensive struggle was destined to ensue. It would have to stand all tests of the courts if Marconi was to be established as the master of wireless!

The importance of this patent was that it covered the use of tuned closed circuits with tuned open circuits in both the transmitter and receiver. It embraced the entire principle of tuning. Marconi, to prove the fundamental significance and practicality of the idea, demonstrated multiplex wireless in 1900 by connecting two or more receivers to one antenna, and when they were tuned to different wavelengths they worked. He demonstrated multiplex transmission in 1901 across 156 miles between St. Catherine's, Isle of Wight, and the Lizard. And so the "four sevens" patent became historic; it revealed the genius of Marconi.

In recounting the event, Professor Ambrose Fleming of University College, London, in a letter published in "The Times," said:[1]

> Two operators at St. Catherine's, Isle of Wight, were instructed to send simultaneously two different wireless messages to Poole, Dorset, and without delay or mistake the two were correctly recorded and printed down at the same time in Morse signals on the tapes of the two corresponding receivers at Poole.
>
> In this first demonstration each receiver was connected to its own independent aerial wire, hung from the same mast. But greater wonders followed. Mr. Marconi placed the receivers at Poole one on the top of the other, and connected them both to one and the same wire, about forty feet in length attached to the mast.
>
> I then asked to have two messages sent at the same moment by the operator at St. Catherine's, one in English and one in French. Without failure, each receiver at Poole rolled out its paper tape, the message in English perfect on one and that in French on the other.
>
> When it is realised that these visible dots and dashes are the result of trains of intermingled electric waves rushing with the speed of light across the intervening thirty miles, caught on one and the same short aerial wire and disentangled and sorted out automatically by the two machines into intelligible messages in different languages, the wonder of it all cannot but strike the mind.
>
> . . . So perfect is the independence that nothing done on one circuit now affects the other, unless desired.

[1] October 4th, 1900.

Yes, this thing called wireless was so simple, but even so how could a layman catch the idea. The engineers liked this simile of a stone tossed into a placid pond: A series of ripples is created which spread out in ever-widening circles; any small bits of wood floating on the surface are bobbed up and down by each successive ripple. The stone is the "transmitter"; the pond is the "ether"; the wood is the "receiver."

But think how complicated the ripples if ten stones or even two were thrown in at once. To detect each ripple clearly, that was the trick—and Marconi could do it; he separated each one by tuning.

* * *

A queer-looking structure, never before seen on the English landscape, or anywhere else for that matter, was attracting attention on the forbidding rocks that jut out into the Atlantic at Poldhu. It was Marconi's latest idea of what an aerial system should comprise. There was to be a ring of

PREPARING TO FLY THE KITE AERIAL AT SIGNAL HILL

Courtesy Marconi's Wireless Tel. Co., Ltd.

The first transatlantic signals were picked up at Signal Hill, Newfoundland, on a kite aerial—the kite being used to support the aerial wire. Here you see some of those who took part in this epoch-making experiment getting the kite ready for flying. The great inventor himself can be seen on the extreme left of the picture.

twenty wooden masts, each about 200 feet high, arranged in a semicircle 200 feet in diameter, covering about an acre. It was designed as the "frame" of a conical aerial consisting of 400 wires.

By the end of August, 1901 the masts were nearly completed, but a cyclone swept the English coast on September 17th; the big masts blew down like so many toothpicks after it had taken eleven months to erect them. Disappointment swept through the Marconi ranks. The engineers said it meant postponement of three months or more to remove the wreckage and build anew.

The "sister" towers on Cape Cod suffered a similar disaster a few weeks later.

Marconi was too anxious, too unconquerable a soul to permit fallen masts to get the best of him. He decided it might be possible to utilize a simpler aerial. So two poles, instead of twenty, each 150 feet high, were erected. A triangular stay was stretched between the masts and from it were suspended fifty-five copper wires. They were about a yard apart at the top and converged at the bottom, forming a fan-shaped aerial.

Everything was ready for a preliminary test.

The fiery spark crashed across the gap, electrifying the makeshift web of wire and the bleak November air.

A wireless outpost at Crookhaven, Ireland, 225 miles away, heard the signals with such intensity that the engineers felt certain the power was sufficient to drive a message across the Atlantic—ten times as far as Poldhu to Crookhaven!

Marconi was sure it would. He decided to conduct the first test in Newfoundland—the nearest point in America to the Old World.

Bound on a historic journey, he sailed on November 26th from Liverpool on the liner Sardinian, accompanied by two assistants, G. S. Kemp [2] and P. W. Paget.

They had odd baggage for three men. Small captive balloons and a number of large kites were in the baggage. They knew the inclement weather in Canada at this season of the year and the shortness of the time at their disposal made it impossible to erect high masts to hold aloft antenna wires. But the kites and balloons might do the trick, thereby saving time and expense and possibly make history.

Undramatically—in fact, unnoticed—the trio of pioneers landed at St. John's on Friday, December 6; and the following day, before beginning operations they visited the Governor, Sir Cavendish Boyle, Premier, Sir Robert Bond, and other members of the Ministry, who promised heartiest co-operation. They cheerfully placed the resources of every department of the government at Marconi's disposal to facilitate his work.

"After taking a look at various sites," said Marconi, "which might prove suitable, I considered the best one was on Signal Hill, a lofty eminence overlooking the port and forming a natural bulwark which protects it from the fury of the Atlantic winds. On top of this hill is a small plateau some two acres in area, which seemed very suitable for manipulation of the balloons and kites. On a crag on this plateau rose the new Cabot Memorial Tower, erected in commemoration of the famous Italian explorer John Cabot, and designed as a signal station. Close to it there was the old military barracks, then used as a hospital. It was in the forum of this building that we set up the apparatus and made preparations for the great experiment.

"On Monday, December 9th, we began work. On Tuesday we flew a kite with 600 feet of aerial as a preliminary test, and on Wednesday we inflated one of the balloons, which made its first ascent during the morning. It was about fourteen feet in diameter and contained about 1,000 cubic feet of hydrogen gas, quite sufficient to hold up the aerial, which consisted of wire weighing about ten pounds. After a short while, however, the blustery wind ripped the balloon away from the wire. The balloon sailed out over the sea. We concluded, perhaps the kites would be better, and on Thursday morning, in spite of a gusty gale we managed to fly a kite up 400 feet.

"The critical moment had come, for which the way had been prepared by six years of hard and unremitting work, despite the usual criticisms directed at anything new. I was about to test the truth of my belief.

"In view of the importance of all that was at stake, I had decided not to trust entirely to the usual arrangement of having the coherer signals record automatically on a paper tape through a relay and Morse instrument, but to use instead a telephone connected to a self-restoring coherer. The human ear being much more sensitive than the recorder it would be more likely to hear the signal.

Before leaving England I had given detailed instructions for transmission of a certain signal, the Morse telegraphic 'S'—three dots—at a fixed time each day beginning as soon as word was received that everything at St. John's was in readiness. If the invention could receive on the kite-wire in Newfoundland some of the electric waves produced, I knew the solution of the problem of transoceanic wireless telegraphy was at hand.

"I cabled Poldhu to begin sending at 3 o'clock in the afternoon, English time, continuing until 6 o'clock; that is, from 11.30 to 2.30 o'clock in St. John's."

As the hands of the clock moved toward noon on Thursday (December 12th, 1901), Marconi sat waiting with the telephone receiver held to his ear. It was an intense hour of expectation. Arranged on the table were the delicate instruments ready for a decisive test. There was no calibrated dial tuner to facilitate adjusting the circuit to a specific wavelength. In fact, the wave of Poldhu was not measured. There was no device to measure it. Professor Fleming thought there should be some method of measuring wavelength but he had yet to invent his cymometer or wavemeter.

The length of Poldhu's wave was a guess. There was nothing precise or scientific about tuning. But based on the fact that the aerial was 200 feet high and that it was linked with a series coil or "jigger," Professor Fleming estimated the wavelength was not less than about 3,000 feet, or 960 metres.

Marconi had to hunt for the wave.

A wire ran out through the window of the building, thence to a pole and upward to the kite which could be seen swaying overhead. It was a raw day. A cold sea thundered at the base of the 300-ft. cliff. Oceanward through the mist rose dimly the rude outlines of Cape Spear, the easternmost point of the North American continent.

Beyond rolled the unbroken ocean, nearly 2,000 miles to the coast of the British Isles; wireless might leap that in one ninety-third of a second! Across the harbour the city of St. John's lay on the hillside. No one had taken enough interest in the experiment to go up through the snow to Signal Hill. Even the ubiquitous reporter was absent.

In Cabot Tower, the veteran signalman stood in the look-out's nest scanning the

(*Please turn to page* 449.)

IN THE RECEIVING ROOM

Courtesy Marconi's Wireless Tel. Co., Ltd.

Marconi with the apparatus on which he received the first transatlantic signals on December 12th, 1901.

[2] Mr. Kemp was one of Marconi's most valued electricians, and his diary of wireless was a great asset to Marconi when in court fighting patent litigation and infringements.

NEXT WEEK

CHAPTER IX

The Hero of the Hour

Public reaction to transatlantic wireless—Canada's aid to Marconi—The cables express a fear—Pupin applauds—Marconi is told his name will stand through the ages—An augury of future conquests—Comment from T. C. Martin—Sir Oliver Lodge praises Marconi—The inventor explains his system to the Canadians—Cables are warned against being short-sighted—Marconi as seen at St. John's—He discusses future plans—Honoured by American electrical experts—A toastmaster's introduction and Marconi's reply—A tribute by *The New York Times*—Marconi praised as conservative scientist—Commercial possibilities outlined—Heaviside offers a new wireless theory—Thoughts Marconi carried back to England.

AMONG THE "DWARF" WAVES

By J. C. JEVONS

Radio waves of the centimetre variety are destined to play a big part in the future, so that much research into methods of producing them is at present being conducted

IDEAS are changing very rapidly as to what is the shortest wave which can be made to play a useful part in wireless. In broadcasting, waves between 200 and 550 metres are called "medium," and those between 15 and 75 "short" or even "ultra-short," though television on 6–7 metres has rather jumped the claim to the last adjective.

Beginning a New Order

But when all is said and done the waves now being used for television are only the beginning of a new order of things. Within a few years we may have to classify them as "long" in order to distinguish them from the centimetre waves which are becoming the focus of interest in most of the big research laboratories. Either that, or we shall have to coin a special set of terms for micro- and dwarf waves.

So far centimetre waves have only been used for point-to-point communication over comparatively short distances, such as the 17-centimetre cross-Channel service between Lympne and St. Engelvert, but it does not follow that this is the end of their usefulness.

Radio-scientists are now showing a more open mind as to the way in which very short-wave signals travel through the ether, and as to the range over which they can be heard. Before the introduction of the new television service, it was held that reception would be limited to the so-called optical range, that is, to the distance at which the transmitting aerial can be seen from the receiver. But experience has shown otherwise. It now appears that such waves are able to travel around the curvature of the earth by some process of reflection or refraction similar to that exercised by the Heaviside Layer on waves above the ten-metre limit.

Exactly how it is done is still somewhat of a mystery, but of the fact itself there is no doubt. Some time ago Marchese Marconi succeeded in transmitting messages on micro-waves over distances three or four times that of the so-called optical range, and he is still carrying on his experiments in this fascinating field of research.

Possible Explanations

One possible explanation of the long "reach" of waves which should, according to the textbook, travel only in a straight line, is that they are "bent" around the earth's surface by an ionized layer situated much closer to the ground than the Heaviside Layer. After all, we know that light waves coming from the sun are bent or refracted to some extent when they enter the earth's atmosphere, and very short wireless waves may be equally susceptible to the same influence.

It may be asked, why, after all, should all this interest be shown in exploiting the very short waves, when the longer ones are far easier to produce and handle. The answer lies in the fact that they open up a part of the ether which is at present bare of wireless traffic whilst the remainder is sadly overcrowded. This applies particularly to the wavebands given over to broadcasting, where the congestion is so fierce that transmitting stations literally have to fight for elbow-room. Meanwhile the designers of receiving sets are almost at their wits' end to produce circuits sufficiently selective to disentangle one programme at a time from all that goes into the ether.

Roughly speaking, there is a band of 6,000 megacycles stretching between the new television service on 7 metres and waves 5 centimetres long. Allowing a separation of 10 kilocycles between each transmitter, this would give room for no fewer than 600,000 different stations to operate without overlap. For broadcasting, this exceeds even the wildest flights of imagination, but on the other hand it opens up a new possibility. Some time in the future we shall have a wireless telephone service, serving the largest towns, in which 600,000 people—or even double that number—will carry pocket sets about with them and talk to each other, through the ether, one wavelength individual to each subscriber.

ONE TYPE OF OSCILLATOR

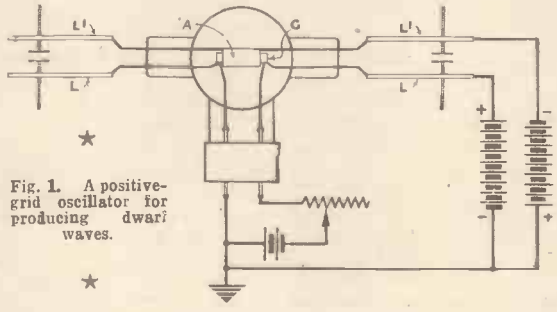


Fig. 1. A positive-grid oscillator for producing dwarf waves.

Special Methods Used

All this, of course, means the development of special methods of using dwarf waves for transmission and reception. The ordinary type of valve will not work on wavelengths below 5 metres, chiefly because of capacity leakage between the electrodes and the leads. Also there is a limit set by the time taken by electrons inside the valve to travel across from the filament to the anode. At very high frequencies this time-lag throws the valve out of step with the signal and so prevents it from working properly.

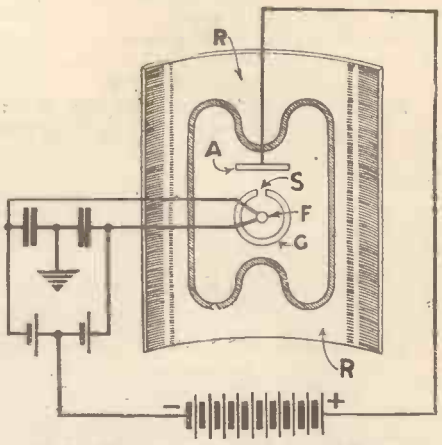


Fig. 2. This magnetron valve can produce one kilowatt of aerial power at 30 centimetres wavelength.

At least two modern methods have been developed for handling such waves. One is to use a so-called magnetron valve, in which a strong magnetic field is applied to the electron stream from outside the glass bulb. The other is to use a three-electrode valve with a high positive voltage on the grid instead of on the plate. The result, in both cases, is to set the electrons inside the valve oscillating at a frequency which is determined by the spacing between the electrodes and by the applied voltages, rather than by any deliberate tuning or back-coupling of the external circuits.

How the Valves Work

Fig. 1, for instance, shows a positive-grid oscillator in which the electrons are kept "dancing" to and fro, at a very high speed, between the highly charged grid G and the negatively biased anode A. The resulting oscillations are drawn off by a pair of tuned Lecher wires L, L^1, which are connected to the grid and anode respectively. This type of valve is suitable both for generating and amplifying waves of the order of one metre and less, which corresponds to frequencies of 300 megacycles and over.

Fig. 2 shows a magnetron valve which is capable of generating waves 30 centimetres long and feeding an output of over one kilowatt to the aerial. The single-wire filament F extends down through the plane of the paper, and is surrounded by a cylindrical electrode G formed with a slot S running along the side facing the anode A.

An external winding, which for the sake of clearness is not shown, is used to create a powerful magnetic field, parallel with the filament, and this forces the electrons to flow in a spiral instead of a straight path. As they sweep round opposite to the slot S, the high potential on the anode A draws them out in a series of gusts or "puffs," at a frequency which depends partly on the strength of the external magnetic field, and partly on the operating voltages and the spacing of the electrodes. In this way a pulsating electron current of enormously high frequency is set up and concentrated by the parabolic reflector R into a beam of waves, which are radiated out directly from the valve.

How to Make

A REMOTE-CONTROL SWITCH

Here are details for making what is probably the "simplest ever" remote control, which, however, provides an answer to one of the commonest problems in receiver operation

Designed and described by the "P.W." Research Department

THE purpose of the device which is the subject of this article is to switch off a radio receiver at some remote part of the house without having to go to it.

Many people like to listen to the late wireless programmes whilst in bed, by means of an extension loudspeaker in the bedroom. Unfortunately, it is necessary, when the programme is finished, to get up and switch off the set, which is usually located in some other room in the house. It was to overcome this particular difficulty that this switch was actually designed.

The switch, with its control battery, is situated close to the set, whilst a twin-flex lead is taken to the room in which the control is desired.

To our more technically-minded readers, the manner in which the switch functions will be obvious from the diagrams. For the sake of others, here is a brief explanation. Two contact strips marked "A" and "B" are connected in series with one of the mains leads or accumulator leads (depending upon whether the set is mains or battery operated). When the setting stud is pressed down it will be seen that the strip A is bent downwards, pushes strip B away from it until the bottom of the projection on strip B is reached, when strip B returns to original position.

On removing finger from stud it will be found that strip A is held down by the projector on strip B. Thus the switch, formed by the two contact strips, is "on." Soldered to the strip B is an iron armature.

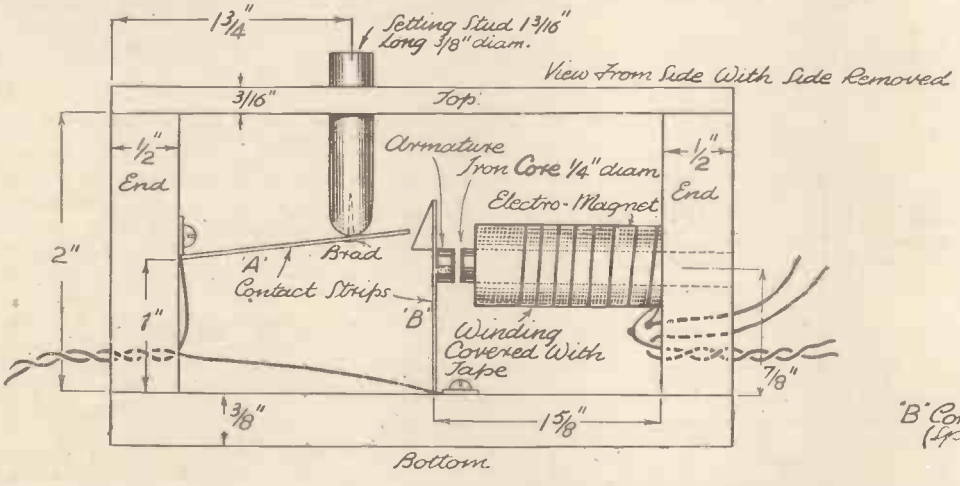
Worked by Press Button

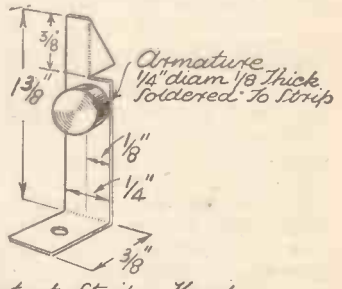
In line with this is the soft-iron core of an electro-magnet. The winding of the electro-magnet is connected in series with the remote press-button type of switch and a dry battery. When the remote switch is pressed a current flows through the winding of the electro-magnet, and causes the iron core to become magnetised. The armature on strip B is attracted by the electro-magnet, and consequently the switch formed by the contact strips is released, or switched "off."

It should be pointed out that this switch cannot be switched on from the remote control. It is switched on by the setting stud, and can only be switched off by the remote control. It was for this purpose only that the switch was designed.

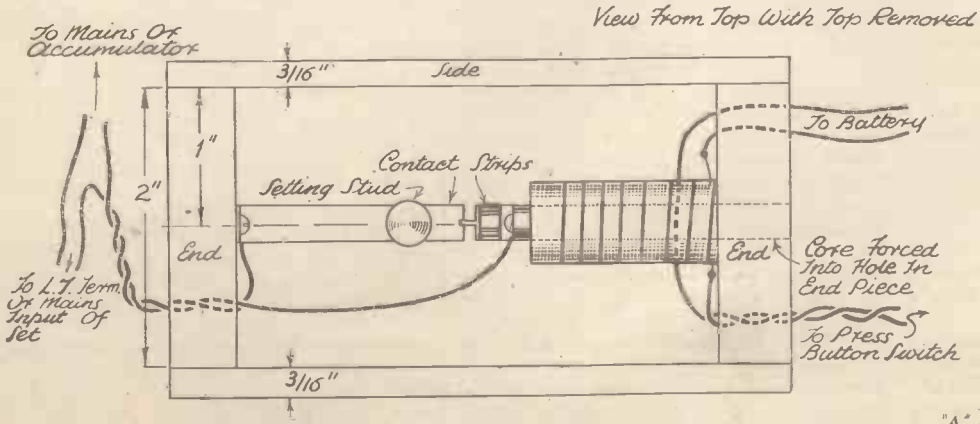
The parts required to make the switch are as follows: Two pieces of ½-in. plywood, 2 in. × 2 in. (ends); one piece of ⅜-in. plywood 4½ in. × 2 in. (bottom); two pieces of $\frac{3}{16}$-in. plywood, 4½ in. × 2 $\frac{3}{16}$ in. (sides); one piece of $\frac{3}{16}$-in. plywood, 4½ in. × 2 in. (top); one piece of ¼-in. diameter soft iron 2 in. long for core of electro-magnet, and one piece of same iron ⅛ in. long for armature; some 30-gauge D.S.C. copper wire; contact strips from old flash-lamp batteries for contact strips A and B; wooden dowel rod, ⅜ in. diameter by 1 $\frac{3}{16}$ in. long; adhesive tape, screws, brad and flex.

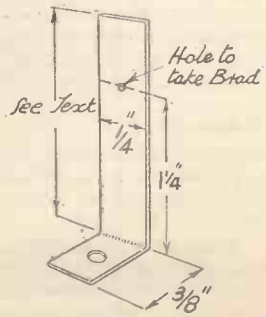
(Continued overleaf.)





"B" Contact Strip - Hard (Springy) Brass.





"A" Contact Strip - Hard (Springy) Brass.

These diagrams contain all the details necessary for building this simple device, but they are further amplified in the text, which also explains fully how the control is used.

HOW TO MAKE A REMOTE-CONTROL SWITCH

(*Continued from previous page.*)

The accessories are a 4½- or 9-volt grid-bias battery, and a press-button type of switch for remote control. An ordinary bell-push was actually used for this purpose.

First prepare the pieces of wood. Drill a hole in one end-piece, $\frac{7}{32}$ in. in diameter, $\frac{7}{8}$ in. from the bottom and 1 in. from either side. This hole takes the iron core. In the top drill a $\frac{13}{32}$-in. hole $1\frac{3}{4}$ in. from one end, and equidistant from the sides. This hole takes the setting stud.

Now make the contact strips. These are made from the long (negative) strips of two old flash-lamp batteries. The dimension on strip B, marked "See text," should be made $1\frac{3}{4}$ in.; it is cut to correct size later.

Winding the Magnet

The electro-magnet is made as follows: Starting ½ in. from one end of the core, wind on one layer of wire (30-gauge D.S.C.), ending at $\frac{1}{16}$ in. from the other end of the core. Now wind back over the first layer a second layer, which ends at the beginning of the first layer. This should be repeated until six layers have been wound. If you possess a lathe, or a lot of patience (!), the number of layers of winding may with advantage be increased to twelve. Bind the completed winding with adhesive tape. The ends of the winding should project about two inches for connections to be made.

Fit the finished electro-magnet to the end-piece. It should be tapped in the hole by means of a hammer. Screw strip B to bottom (4½ in. × 2 in. × ⅜ in.) in position indicated in diagrams. Fit setting stud to strip A by means of a ⅜-in. brad. The brad should not be driven completely home, but the stud should be free to "wobble" on the strip. Screw the strip A to end-piece in position shown in diagrams. Screw strip B to bottom (4½ in. × 2 in. × ⅜ in.). Its position is shown in the diagrams. Fit end-pieces to bottom. Fit top on top of end-pieces so that setting stud passes through hole in top.

Contacts

Now adjust strip B by bending, so that the armature is about $\frac{1}{16}$-in., or rather less, from the end of the iron core. Cut strip A to such a length that it just catches under projection on strip B. Adjust strip A by bending, so that, when released from under projection on strip B, it springs away from the projection and clears it. The diagram of side view shows this clearly. Make sure that the setting stud moves freely in the hole in the top, so that when strip A is released from strip B it will spring up.

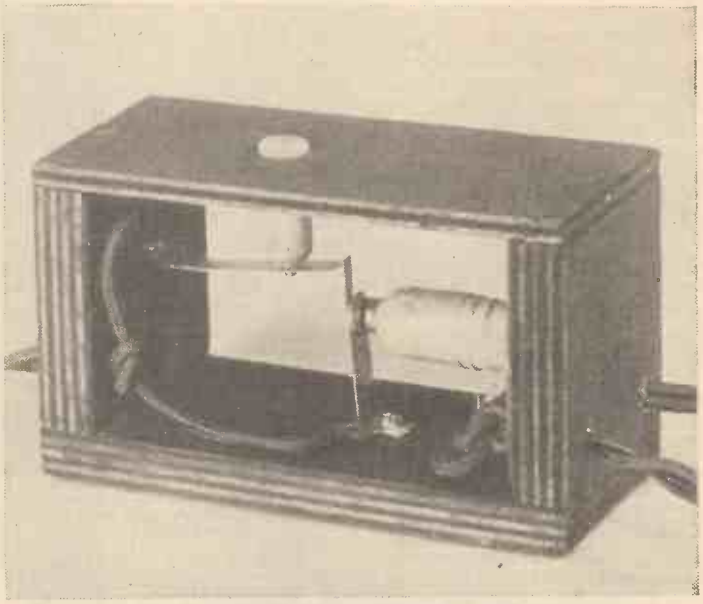
Now drill the holes in the end-pieces to take the three twin-flex leads. There are two holes in the end-piece bearing the electro-magnet—one to take the battery leads, and one to take the leads which go to the remote press-button switch. There is a hole in the other end-piece to take the flex lead in the switch circuit.

The leads marked "To battery," are connected to a 4½-volt or 9-volt G.B. battery. If the leads to the remote switch are very long, it may be necessary to use 9 volts, due to the drop in voltage in the leads. The connections for the other leads are marked in the diagram.

It should be pointed out that the unit should be placed close to the set. In the case of a battery set, the leads connecting the switch to the accumulator should be kept as short as possible.

In order to switch on, press the setting stud. In the case of mains this should be done before the set is switched on, and then unnecessary arcing is prevented.

THE SWITCH WHEN COMPLETED



This view of the switch, with the box sides removed, will enable you to get a clear idea of the general assembly methods employed.

THE GREAT ADVENTURE

A story of one of the first home-constructed radio receivers

WELL do I remember gazing with bewildered awe at the earliest copies of the wireless periodicals. Blue prints and pictorial diagrams flattered only to deceive, for they depicted objects with which we were almost totally unfamiliar.

However, as my brother firmly remarked, "We must have a wireless set." We could look for no help in the matter. The nearest radio shop was some eighty miles away. To buy one—well, you have only to think back to 1923–4 to realise the barrenness of the suggestion. The simplest two-valver cost some £20, and we had somehow learned that two valves were of little use in our district.

A Straight Three

We decided to pin our faith to a constructional article with pictorial diagrams. To-day, of course, I realise that the outfit was a straightforward H.F., Det. and 1 L.F. for phones, with tuned anode coupling, but the agonising doubts and fears that assailed us before we got the thing assembled were almost paralysing. And then I scarcely think the designer would have recognised it.

The first snag was the condensers. These arrived in paper bags, a mass of unassembled vanes, brass rods, spacers, and ebonite discs. After a desperate struggle lasting for hours, we got them together with nothing left over. The holes in the ebonite we bored with the aid of a supply of specially sharpened nails of various sizes, helped in the case of the larger holes by the handle of an old file. With the exception of the rheostats, all the components stood boldly on top of the panel, the variable condensers being housed in snug little boxes with only the knobs protruding. The care we took with the wiring was really pitiful. Check, re-check, counter check, and finally a last run over just to make quite sure. As an aid to fine adjustment we sealing-waxed two very long penholders to each condenser knob.

With flapping coils, extension rods, and wiring all over the place, it looked a really awesome piece of work.

Very carefully we inserted the valves, and plucked up courage to stick the H.T.—plug in. The valves were the old 4-volt ·75-amp. bright emitters, and, we found later, had an insatiable thirst for accumulator juice. Cautiously, very cautiously, we turned the rheostats, and were rewarded with a bright red glow. We grew bolder, and advanced them to a sickly yellow stage. We flapped the coils, and twiddled the condensers. All to no purpose. The set was dead.

Turning Up "The Wick"

To say we were disappointed is putting it mildly. For three solid weeks we pored over diagrams and wiring. Then a ray of hope came—a visitor to the island; a man who, rumour had it, could read those mysterious squiggles as you or I might read plain print. We sought him out, and begged his assistance. Like the decent fellow he was, he gladly came to our aid. We turned on the valves. He smiled. His hand reached out to the rheostats. Our hearts stood still. They would never stand it. Brighter and brighter they glowed, till in their dazzling brilliance they shone like little lighthouses! Carelessly he touched the controls with practised nonchalance. A plop, a whistle, a roar, and Bournemouth, the big noise in those days, came rushing in.

To-day, a far different receiver stands on our table. Its valves no longer dazzle. Its coils are rigid. Its performance is incomparably finer in every way. And yet—alas, "the moving finger writes, and having writ moves on." The glamour of those early days is past recall.

E. O'M.

SEEN ON THE AIR

NEWS AND VIEWS ON THE TELEVISION PROGRAMMES BY OUR SPECIAL RADIO-SCREEN CORRESPONDENT

L. MARSLAND GANDER

WIMBLEDON tennis had the lion's share of the programmes during the week under review, and there were some of the longest transmissions in television's brief history. On two afternoons the B.B.C. station at Alexandra Palace was transmitting continuously for two-and-a-half hours.

I wish that I could congratulate the B.B.C. unreservedly on a memorable feat, but I feel that the programme arrangements left something to be desired. When the sensible thing would have been to cancel the whole of the afternoon studio transmission and reserve the ready-made programmes for some other time, the B.B.C. struggled desperately to wedge in the studio shows.

Trying to Please Everyone

In trying to please everybody the B.B.C. ran the usual risk of pleasing nobody. Thus in the middle of an exciting match between two Centre Court giants we would suddenly be switched back to Alexandra Palace. Tennis fans were irritated, while one assumes that those who hate tennis would not be waiting with stop watches to switch on the minute they thought the tennis commentary was off.

It must have been extremely difficult to dovetail things together with the programmes cut to ribbons, —all bits and pieces. That is why I find it so surprising that the B.B.C. attempted such a feat.

The official view is that as television is intended to be a home entertainment, too much tennis, unrelieved, would be tedious. I think, with great respect, that this is a head-in-the-sand attitude. Television eventually will be a home entertainment. At the moment it is not; it is a semi-public entertainment. Fifty thousand people have visited the exhibition at the Science Museum and seen the demonstrations. Thousands more are seeing daily demonstrations in dealers' shops, cinemas, public houses and restaurants. Many people visited my room at the office to see a few minutes of the play. Some went away disappointed when they saw other items in progress.

Should Have Been Continuous

When the semi-finals and finals were being played the play should have been televised continuously, as long as the B.B.C. were prepared to keep the transmitter on the air.

What next? Televiewers have missed something through the collapse of the arrangements for the Farr v. Schmeling fight in London. I can now reveal that negotiations had been started with the promoters of the fight. Those who saw the experimental televising of amateur boxing contests from Alexandra Palace will support me when I claim that this is the best sport of all for television purposes. The first essential with television at its present stage is that the camera should be close to the subjects. The confined space of the boxing ring is ideal.

It is useless to lament lost opportunity, but safe to prophesy that boxing will have the close attention of the television programme chiefs.

After Wimbledon the "O. B." vans have gone back to the E.M.I. works at Hayes for adjustments. No doubt this was essential, yet it is a pity that television programmes must continue to progress by fits and starts. The next "O. B." job, it appears, will be from the Regent's Park Zoo during the Olympia Radio Show.

Recently I have been interested in efforts to take photographs of the television picture as it appears on the screen. As my readers probably know, this is not an easy matter. Mr. W. R. Westhead, of Brighton, to whose experiments with television I have made several allusions, has, however, succeeded in taking a number of good pictures.* Difficulty arises chiefly from the fact that the amount of light on the screen is small, much less than it appears to be, and consisting in fact of only one small spot traversing the whole surface at high speed.

It may interest amateur photographers to know Mr. Westhead's technique. He used a sensitive camera with a large aperture and an F2 lens. The camera was held at a distance of eighteen inches to two feet from the screen. He tried exposures of an eighth, a tenth, and a quarter of a second, the most successful being a quarter.

Some Good Close-ups

When enlarged some of the smaller images looked slightly out of focus, but close-ups of Miss Jasmine Bligh and Mr. Leslie Mitchell were surprisingly good. A bright tube, showing a direct picture, is an advantage.

Reference to Miss Bligh reminds me that she will again be lost to television for a week or two, as recently she entered a nursing-home for a tonsil operation.

The television money shortage has reached an acute stage. It is now estimated that £150,000 more is required for programmes this year and £60,000 for capital expenditure on extra studio accommodation and duplicate apparatus. But neither the B.B.C. nor the Government will give a penny more! So what? I don't know how much a destroyer costs, but I should guess considerably less that is required to put television on its feet. Well, one day, and that not very far distant, public opinion will push the B.B.C. and the Government until the money is forthcoming. In the meantime the staff at Alexandra Palace cannot be increased by a single office-boy.

New Developments

I am beginning to look forward with more than ordinary interest to Radiolympia, for we are certain to see many new ideas among the sets shown there to the public for the first time. The Murphy set, now on exhibition at the Science Museum, gives a foretaste, though to be sure this set in accordance with the practice of the firm will not be seen at Olympia.

Then Ferranti's have evolved an extremely brilliant tube. It may be expected that other manufacturers are keeping pace with these developments, and there will be more surprises at Olympia.

* We shall publish some of these pictures in an early issue of "P.W." —probably next week.

EKCO FOR TRISTAN DA CUNHA

The "Bishop" of Tristan da Cunha with the Ekco receiver he is taking back with him in November. It is a "No H. T." set, being run entirely from the L.T. accumulators charged by the windmill generator.

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

"TELEFRAMES"

Items of general interest

MAKING THEM ENVIOUS

THOSE who listened to the tennis O.B.'s from Wimbledon—always amongst the best O.B.'s of the year—will have noticed the special comments at the beginning of some of the transmissions, intended entirely for television lookers. And no doubt in many cases these instances will have been the first on which the listeners have envied the owners of television sets.

How fine, they must have felt, it would have been to have seen the players as well as hearing the commentator's description of the play.

* * *

RADIOLYMPIA PROGRAMMES

Television programme builders have now been busy for some time preparing the items which are to be broadcast during the Radio Show. The aim is to give visitors to Olympia a good idea of the type of entertainment transmitted daily from Alexandra Palace.

The Pets' Corner at the Zoo is to be featured daily with the aid of the new mobile van. The chimpanzees at their tea-party should prove an attractive item.

* * *

STILL KEEPING AHEAD

An R.C.A. official recently said that television expected to borrow a lot from movie technique in the beginning. But any favours which it gets would be returned later in devices and methods which it develops. And while television programmes would rely to a considerable extent on motion picture film, he was of the belief that the "peculiar needs of the new art will necessitate development of its own art."

This is what they "expect" and "believe" in America; in this country we have already proved most of it to be true.

* * *

TELEVISION FOR THE DEAF

The following is an account of a test to find out the reactions of deaf people to television. It brings up quite an unexpected aspect of television.

As a result of suggestions made to the General Electric Company by those interested in the welfare of the deaf, a series of practical tests with television are being carried out. A set was installed by the G.E.C. at the Tower House Home for Deaf and Dumb Men at Erith (run under the auspices of the Royal Association in Aid of the Deaf and Dumb) and the results have been most promising.

The programme was first shown to about thirty men, most of whom have been totally deaf from birth. In order that those conducting the experiment should share to some extent the reactions of the deaf people, the sound was cut out and only the vision shown. The programme consisted of a fashion parade, Zoo animals, a news bulletin and finally a short play. As the vision appeared on the screen the men turned to each other excitedly gesticulating, and one after another they began to put their thumbs up, the sign in their language meaning "good." Only the play appeared to suffer from the lack of sound, but it made little difference to the deaf men who followed it intently and then burst into spontaneous applause at the end.

Afterwards, through an interpreter, the men explained their reactions to television. All of them were delighted with it, and they wanted to know whether they would be able to see important events, particularly football matches. All appreciated the possibility of having this source of news and entertainment continually available in the future.

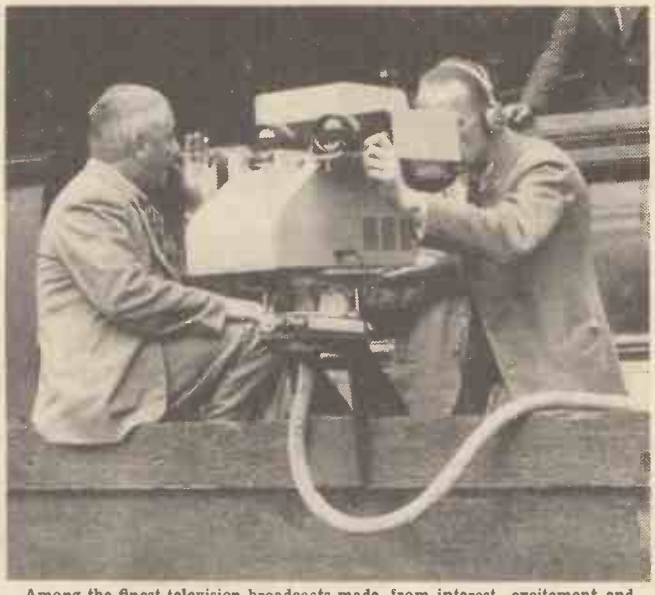
* * *

SLOPING THE TUBE

An interesting point about the new Murphy television receiver is that although the screen is viewed via a sloping mirror on top of the instrument, the tube is not actually vertical. It is arranged to slope from the back of the cabinet at the top towards the front of the cabinet at the bottom.

This enables the mirror to be more nearly upright than the usual 45-degree angle, thus increasing the practical range of viewing heights.

DOWN AT WIMBLEDON



Among the finest television broadcasts made, from interest, excitement and propaganda points of view, were those from Wimbledon showing the championship matches. Here you see the camera being focused on the court. The two lenses are used, one for focusing the scene on to the photo-electric plate, the other for getting the scene properly in focus.

TIME-BASE TERMS

THERE are a number of terms used in connection with the time-base circuits of television receivers not usually met in radio parlance. Some of the more important of these are dealt with below.

The charge condenser, sometimes called **the discharge condenser,** is the one that governs the rate of movement and length of the scanning line in the case of the

Line time-base which is the one that causes the spot to cover the picture with a certain number of lines per frame. The charge condenser in the case of the other time-base controls the number of frames per second and also the depth of the picture. This second time-base is known as the

Frame time-base, and sometimes the **picture time-base,** because in some systems the number of pictures and frames is the same. In the case of the Alexandra Palace transmissions there are twice as many frames as pictures per second.

Interlocking describes a scheme by which linkage is produced between the two time-bases so as to keep them both working in the same ratio of speeds to one another.

The charge condenser is discharged in many cases by a **Gas-filled relay.** This is a triode valve containing gas. The voltage at which it will discharge the condenser across which it is connected, is much higher than that at which it stops discharging. Thus the condenser keeps charging up to a certain point, and then suddenly discharging. The voltage curve of this cycle takes the form of a

Saw-tooth, which is how the shape of the voltage supplied by the time-bases to the deflector electrodes of the cathode ray tube is described.

Hard time-base is a type of circuit which charges and discharges a condenser to give a saw-toothed output, but which does not employ any gas-filled, i.e. soft, valves. All valves concerned have the normal high vacuum.

Oscillator time-base is yet another form of time-base which depends on a particular type of oscillation to produce the "saw-tooth." A squeggering valve is normally employed.

Striking voltage is the voltage at which the gas in a gas-filled valve becomes ionised and starts discharging the condenser. It can be varied by the amount of negative bias applied to the grid of the valve.

In **Magnetic Deflection** a coil is used to move the electron beam instead of this being done by means of voltages on the deflector plates. In this case the time-bases have to supply current variations.

MARCONI—THE MAN AND HIS WIRELESS

(Continued from page 443.)

horizon for ships, little dreaming that mysterious waves might be coming out of the sky from England.

Wireless was ready for the crucial test. Its destiny was at stake. So was Marconi's. Everything that could be done had been done. The receiving outfit was as sensitive as Marconi could make it; he had faith that these instruments would pick up the faintest trace of a signal.

Marconi listened and listened. Not a sound was heard for half an hour. He inspected the instruments. They looked perfect. Had something gone wrong at Poldhu? Had some mysterious force led the signals astray? Was the curvature of the globe a barrier? All these things flashed through his mind, coupled with the fact that it was almost fantastic to believe an unseen wave of intelligence could cross through the ocean air and strike such a slender target as a copper wire. It seemed incredible. It would be so easy for the message to travel off in some undesired direction.

Marconi knew, however, if the signal went east, north or south it would also go west and to that wire antenna dangling from the kite.

Without warning there was a sharp click in the earphones. What caused it? Was some stray static playing a prank? Indeed not! Marconi had at last found the right tuning adjustment to put him in touch with Poldhu!

"Suddenly, at about 12.30 o'clock, unmistakably three scant little clicks in the telephone receiver, corresponding to three dots in the Morse code, sounded several times in my ear as I listened intently," said Marconi, in recounting the day. "But I would not be satisfied without corroboration.

"'Can you hear anything, Kemp?' I said, handing the receiver to him.

"Kemp heard the same thing I did, and I knew then that I had been absolutely right in my anticipation," recalled Marconi. "Electric waves which were being sent out from Poldhu had traversed the Atlantic serenely ignoring the curvature of the earth, which so many doubters considered would be a fatal obstacle. I knew then that the day on which I should be able to send full messages without wires or cables across the Atlantic was not very far away. Distance had been overcome, and further development of the sending and receiving instruments was all that was required."

Wireless had flashed across the Atlantic's sky like "some meteor that the sun exhales."

Again and again Marconi and Kemp listened to be sure there was no mistake. Paget was called in. He listened but heard nothing; he was slightly deaf. What Marconi and Kemp heard must have been Poldhu. There was no other wireless station in the world to send that prearranged signal. And a marvel was that it was noon-time; it would have been so much easier to perform the feat at night when darkness aids the flight of long-wave wireless. Marconi was not aware of that.

It was mid-afternoon. The kite gyrated wildly in the gale that swept in from the sea. The antenna failed to maintain the maximum altitude and the fluctuating height naturally influenced reception. The wind tugged and tugged at the kite; finally at 2.20 o'clock the antenna was lifted within range of the repetitious dots. And that gave further verification.

At dusk the inventor and his companions went down the hill toward the city sparkling with lights. He made no statement to the Press. In fact, he felt rather depressed because he had not intercepted a continuous stream of signals. Possibly the stress of the preceding days had something to do with his disheartened feeling.

It is said that a secret is no longer a secret if more than one person holds it, but that night three men kept a secret from the world. And what they harboured was front-page news—news that would find a place in history books.

They went to sleep dreaming of what they had heard and in hope that a new day would put the stamp of success on their work by further verification. It almost seemed too true for them to believe their own ears. They would listen again for the three elusive dots.

They were up on the hill early the next morning, anxious to lend an ear to space at noon, for that was the appointed time for Poldhu to broadcast.

The signals came on schedule but were not quite as distinct as the day before. The changing weather on a 2,000-mile front could make a radical difference in behaviour of the waves. There was no doubt, however, that wireless had spanned the Atlantic. Nevertheless, the modest inventor hesitated to make his achievement public, lest it seem too extraordinary for belief.

Finally, after withholding the news for two days, certainly evidence of his conservatism and self-restraint, Marconi issued a statement to the Press, and on that Sabbath morning the world knew but doubted.

Under a one-column headline, "Wireless Signals Across the Atlantic—Marconi Says He has Received Them From England," *The New York Times*, on December 15, featured the following story:

St. John's, N.F., Dec. 14th.—Guglielmo Marconi announced to-night the most wonderful scientific development of recent times. He stated that he had received electric signals across the Atlantic Ocean from his station in Cornwall.

Signor Marconi explains that before leaving England he made his plans for trying to accomplish this result, for, while his primary object was to communicate with Atlantic liners in mid-ocean, he also hoped to receive wireless messages across the Atlantic. . . . Though satisfied of the genuineness of the signals and that he has succeeded in his attempts to establish communication across the Atlantic without the use of wires, he emphasises the fact that the system is yet only in an embryonic stage.

He says, however, that the possibilities of its ultimate development are demonstrated by the success of the present experiment with incomplete and imperfect apparatus, as the signals can only be received by the most sensitively adjusted apparatus, and he is working under great difficulties owing to the conditions prevailing here. . . . He will return to England next week and will remain in England until the coronation of King Edward next summer, and he hopes to send the news across the Atlantic by the wireless method,

(Please turn to page 451.)

TELEVISION'S MARVELLOUS METALS

All About Photo-Electric Metals and Their Action

By J. F. STIRLING

THE term "photo-electric metal" is nowadays understood to denote a metal which has the property of generating an electric current when placed under the influence of light. Thus a photo-electric metal is actually a converter of light energy into electrical energy.

Every metal known is slightly photo-electric. That is to say, all metals will, under favourable circumstances, act as converters of light into electricity. Most metals, however, can only exert this marvellous power in a very feeble manner, and in actual working practice the television inventor and photocell constructor have available as their range of light-sensitive materials merely a handful of these photo-electric metals.

The Alkali Metals

The photo-electric metals used in television photocells all belong to a very extraordinary group of metals known as the "alkali metals." Some of the compounds of these metals are highly alkaline and even strongly corrosive in nature. Hence the epithet "alkali" applied to the metals themselves.

The alkali metals are five in number—*Lithium*, *Sodium*, *Potassium*, *Rubidium*, and *Cæsium*. Lithium is the lightest metal of the group. Indeed, it is the lightest metal known, being only about seven times as heavy as hydrogen gas. Unfortunately, however, this metal cannot be used for any constructional, mechanical or engineering purposes because it possesses an enormous affinity for oxygen and rapidly oxidises when exposed to the air.

This powerful affinity for oxygen is a property common to all the alkali metals. Exposed to air, they rapidly become covered with a white layer of oxide and eventually they crumble away, the whole of the metal having abstracted oxygen from the air and become converted into oxide. Likewise, all the alkali metals act on water very powerfully, liberating hydrogen from the water and sometimes setting fire to the latter gas. Thus, when a fragment of potassium metal is flung into water, it immediately takes fire.

Stored in Naphtha

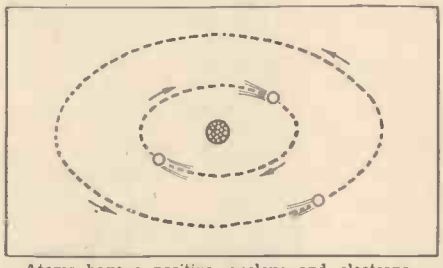
For the above reasons, the alkali metals are always stored under naphtha or some other form of oil. This serves to keep the air out of contact with them and thus the metals are prevented from oxidising themselves away.

The metal sodium is the commonest of all the alkali metals. It is, of course, the element contained in salt and in all soda compounds. Similarly, potassium occurs in all potash compounds. Lithium is abstracted from certain stone-like minerals. Hence its name "lithium," from the Greek *litheos*, meaning "stony."

Rubidium and cæsium are very scarce alkali metals. They both occur in the form of their salts in certain mineral and spring waters, and it is related that the discoverer of rubidium (the celebrated Bunsen of bunsen burner fame) evaporated to dryness no less than forty tons of chalybeate water before he obtained sufficient rubidium salts for the preparation of the pure metal.

A curious feature of these alkali metals is their exceeding softness. Sodium and potassium, for instance, are as soft as cheese and they may readily be cut, even with a blunt knife. Cæsium is only just a solid metal at ordinary temperatures, for it melts at about 28° Centigrade. The heat of a burning match, therefore, would be easily sufficient to convert a mass of solid cæsium metal into the liquid condition.

ATOMIC ROTATION



Atoms have a positive nucleus and electrons revolving around it. In photo-electric materials it is probable that the electrons revolve at a relatively great distance from the positive nucleus.

In their pure and non-oxidised state all the alkali metals possess a lustrous, silvery appearance, and it is in this condition that they are used in photocells.

Comparative Sensitivities

In the table on this page you will notice how the alkali metals increase in photo-sensitivity as we proceed from lithium to cæsium. Lithium is only slightly photo-sensitive. Hence it is never nowadays used in commercial photocells. Sodium, potassium and rubidium photocells have been extensively employed for television purposes, and potassium cells still hold the field for certain types of work. Most of the high-sensitivity photocells, however, contain cæsium as their photo-electric metal, not only on account of its high sensitivity, but also in view of the fact that cæsium is especially sensitive to yellow, orange and red rays, this property making it especially valuable for the construction of photocells intended to be used in artificial light.

SOME PHOTO-ELECTRIC METALS

Alkali Metal	Atomic No	Melting Point (Degrees Centigrade)	Light Sensitivity (Microamps. per lumen)
Lithium ..	3	180°	0·08
Sodium ..	11	97°	0·5
Potassium ..	19	65°	1·6
Rubidium	37	39°	5·0
Cæsium ..	55	28°	24·2

Table showing three characteristics of the alkali metals. Note the increase in light sensitivity from lithium to cæsium.

The photo-sensitive layer of alkali metal is formed on the cathode or negative electrode of the photocell. This cathode usually consists of a plate of base metal which has been coated with silver, magnesium or some other metal or metal compound. The photocell tube is then pumped free of air and a small quantity of the alkali metal is distilled into the tube. It condenses on the cathode in the form of a very thin silvery layer.

Sometimes in order to increase the sensitivity of the alkali metal layer, the latter is treated with hydrogen gas, which is admitted into the tube in small amounts. The tube is re-evacuated and it is then ready for use.

Hydrogen-treated Cells

So satisfactory in its results is this hydrogen treatment of the alkali metal layer that it is said that a potassium photocell can be made more than a hundred times more sensitive by means of this simple hydrogen treatment.

Such hydrogen-treated cells are termed "hydride" tubes, the hydrogen having entered into chemical combination with some of the alkali metal. Unfortunately, however, these hydride tubes are very liable to deteriorate with age. Hence the rapidity with which they are now being superseded by the more expensive but more satisfactory cæsium photocells.

One of the very latest types of cæsium photocells used for television purposes is the "cæsium-on-oxygen" cell. This photocell contains a thin layer of cæsium metal deposited upon a cathode upon the surface of which a film of oxidised silver has been formed. In this way, exceedingly red-sensitive photocells are obtained, and they operate very satisfactorily under artificial lighting conditions.

What makes the alkali metals so especially sensitive to light influence? The question is one which is frequently asked by amateurs, yet it is a query which, truth to tell, cannot be answered.

Physics of the Atoms

Even to glance upon an explanation of photo-electric action we must delve right down into the physics of the atom.

All atoms, we believe, are composed of a sort of central nucleus or close association of positively charged bodies, around which revolve a varying number of electrons. The number of revolving electrons is given by what is now known as the "atomic number" of the atom.

Reference to the table on this page will disclose the fact that lithium, the least sensitive of the photo-electric alkali metals, has an atomic number of 3. This means that the lithium atom contains three electrons revolving around its central nucleus in supposedly the same manner as the planets revolve around the sun.

(*Continued on next page.*)

TELEVISION'S MARVELLOUS METALS

(*Continued from previous page.*)

Sodium (atomic number, 11) has eleven planetary electrons revolving around the central nucleus of its atom, and cæsium, the most sensitive of photo-electric metals, possesses fifty-five revolving electrons.

A metal's photo-sensitivity is not, it is thought, directly associated with the actual number of its atomic electrons, but upon some at present unknown peculiarity of their configuration and arrangement.

It is very probable that the electrons of the alkali metals revolve at relatively great distances from the central nuclei of their atoms. Such electrons, or, at any rate, some of them, are knocked out of their appointed tracks very easily by light energy and, having thus been removed from their atoms, they are readily attracted to the positively charged anode of the photocell, from which they stream away in the form of a minute electric current.

An Important Characteristic

One thing connected with alkali metal photo-sensitivity is very certain, no matter what the precise mechanism of the light action may be. It is that the electron emission from the metal begins immediately the light action commences and ceases instantly the latter stops. Upon this fundamental feature is based the entire present-day success of the television photo-cell, for were not this extraordinarily fortunate property of photo-electric metals forthcoming, television by means of photo-cells as we know them would be utterly impossible.

MARCONI—THE MAN AND HIS WIRELESS

(*Continued from page* 449.)

so as to prove the capability of the system for such purposes.

"... To Mr. Hertz, of course, belongs the distinction of having discovered the electric waves, and by his experiments he proved that electricity in its progress through space follows the law of optics," said Signor Marconi. "Many others have made experiments in the same direction as I, but so far no one has obtained such results at anything approaching the distances I have done with these Hertzian waves. Fog has no effect upon the signals, nor has even the most solid substance. The waves can penetrate walls and rocks without being materially affected.

"It is possible to send many messages in different directions at the same time, but care must be taken to tune the transmitters and receivers to the same frequency or 'note.' I mean they must be in sympathy. And this tuning is effected by varying the capacity and self-induction of certain conductors which are joined to the transmitting and receiving instruments, so that the message intended for a particular receiver is thus rendered quite undecipherable on another. . . . Wireless telegraphy is a possibility anywhere, and it will, I think, soon be a reality in many places."

The scientific world was mindful that Marconi had never released a statement in public until absolutely certain of the facts. He never had to withdraw a notice as to his progress. As soon as the significance of the event was realised star reporters and special magazine writers rushed northward from New York to get the story from the lips of the inventor.

He told them it cost $200,000 (£40,000) to get the three dots across the Atlantic![3]

Newspapers went back into their files to find out more about the evolution of this wireless which seemed to come as a bolt from the blue. *The New York Times* pointed out that Nikola Tesla some years previous in discussing his theories and discoveries hinted at possibilities of telegraphing through the air and earth.[3] Mr. Tesla was quoted:

In pursuing this line of work I have had the good fortune to discover some facts which are certainly novel, and which, I am glad to say, have been recognised by scientific men both here and abroad. I think the probable result of these investigations will be the production of a more efficient source of light, thus supplementing the wasteful process of light productions.

My experiments have been almost entirely confined to alternating currents of high potential. An alternating current is a current changed periodically in direction; and the word potential expresses the force and energy with which these currents are made to pass. In this particular case the force is very great. The fact that a current vibrates back and forth rapidly in this way tends to set up or create waves in the ether, which is a hypothetical thing that was invented to explain the phenomena of light.

One result of my investigation, the possibility of which has been proved by experiment, is the transmission of energy through the air. I advanced that theory some time ago. . . . The plan I have suggested is to disturb by powerful machinery the electricity of the earth, thus setting it in vibration. Proper appliances will be constructed to take up the energy transmitted by these vibrations, transforming them into a suitable form of power to be made available for the practical wants of life.

The outlook for wireless telegraphy is problematical. But one thing is certain, we shall be able to send very important short messages from centre to centre.

To Marconi there was nothing problematical about the future; he had spanned the Atlantic. He had upset the calculations of mathematicians. He began to talk about commercial service. Professor Fleming told him that the diffraction or bending of the waves around the earth would be increased by increasing the wavelength. He urged Marconi to lengthen the wave, and he would design an instrument to measure them, even if they were 20,000 feet from crest to crest.[4]

Lexicologists got busy; they asserted "wireless telegraphy" was a term satisfactory to no one, and pointed to the fact that the U.S. Army Signal Corps had rejected it. After long and profound meditation, the word "aerogram" was suggested for the message; "aerographer" for the operator; and "aerography," instead of wireless—but wireless it would remain.

[3] December 15th, 1901.

[4] Fleming invented cymometer or wavemeter in October, 1904.

FROM OUR READERS

VALVES RUN 20,000 HOURS—STILL GOING

The Editor, POPULAR WIRELESS.

Dear Sir,—I noticed a remark about valve emission in your "Practical Pointers" page of POPULAR WIRELESS dated June 12th. You stated that you had several valves which had passed the two thousand hours mark and were still in good condition.

At the cinema where I work we have four Western-Electric 205D valves which were installed in April, 1929. Since then they have been used eight hours per day, six days per week and three hours each Sunday. This works out at more than 20,000 hours, and there is no sign of them giving up the ghost as yet. Two of the valves are used in push-pull, and at the time of writing are about 1 milliamp out of balance. The other two are used in full wave operation, with the grids strapped to the plates, rectifying the A.C. mains to feed the former with plate current. How's that for long life?

Wishing "P.W." every success.

THOMAS ADAMSON.

106, Wennington Road, Southport, Lancs.

We wonder whether the instance of long valve-life described by a reader this week, is a record

★

"What d'you want, guvnor?"

Clergyman: "I wish to know if you are R.C. (Roman Catholic)."

Husband: "No; we're D.C., and we don't want no —— wireless set!"

L. KNOTT.

57, Acre Lane,
Brixton, S.W.

SOLVING A BAFFLING PROBLEM

The Editor,
"Popular Wireless."

Dear Sir,—I venture to send you two prints [one is reproduced on this page,—Ed.] showing how I have built up and housed my new set. I have never favoured cabinets, and have tried many schemes to obtain good quality output. This idea certainly provides it.

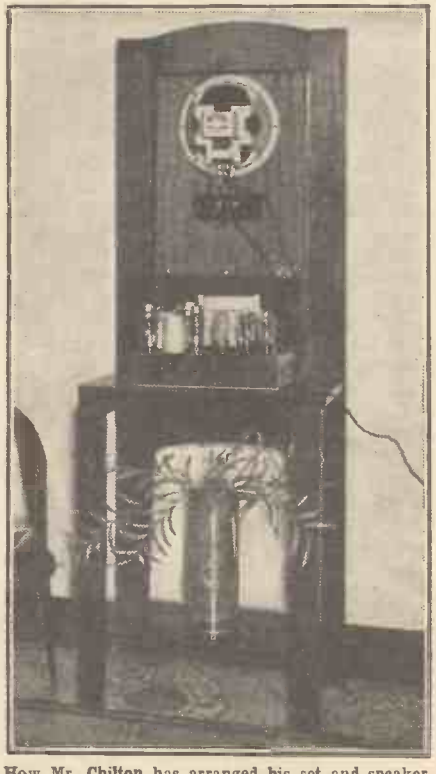
Inch-thick mahogany was used in the building of the (shall I call it) radio stand. Normally, the set is covered by a well-ventilated case, and the speaker by a silk bag.

The set is an Ostar-Ganz seven-valve kit set, with push-pull output; speaker is a "Magnavox" 10-inch energised type.

A GUINEA FOR YOU

We welcome letters from readers on all radio subjects. Long ones, short ones, humorous ones, practical ones, literary ones—we like 'em all. And each week a guinea is sent to the reader who sends the letter which is best in the opinion of the Editor. So post yours right away! The winner this week is Mr. T. Adamson.

A NOVEL LAYOUT



How Mr. Chilton has arranged his set and speaker. The stand is, of course, normally the other way round when working.

I should be glad to have your opinion on the idea. I have never seen anything of the kind before, and should like to know if I can claim originality.

Anyhow, it might interest those of your readers who like to make something "out of the usual rut."

C. W. CHILTON.

35, Coulton St., Barrow-in-Furness, Lancs.

[Certainly a very good idea, and unique so far as our knowledge is concerned.—ED.]

FROM A YOUNG ENTHUSIAST

The Editor, POPULAR WIRELESS.

Dear Sir,—In reading yours and other wireless journals, I have been struck with the number of correspondents and others who are youngsters. As one of fifteen myself, I wonder if this means that wireless is gaining a grip on the younger generation, or is it that it has a fascination that draws youth? You read here of transmitters of seventeen and eighteen, of junior sections of radio clubs, etc.

Here, also, is my opinion on the subject of QSL's. I have had a percentage in four months' listening of about 60·20. This percentage will increase in time, I expect, since some of the cards were only sent off a week or so ago. I have cards from V U B, C T 1 A A, W 1 X A L, W 2 X A D-F, W 3 X A L, P R F 5, T F J, J V M, C O C D and the 35-watt Malayan "ham," V 5 2 A K.

ALAN OWEN.

Cartref, 3, Cawdor Road, Inverness.

SPEAKER SWITCHING

The Editor, POPULAR WIRELESS.

Dear Sir,—We were very interested to read the letter from Mr. Cyril A. Williamson in your issue of June 26th on the subject of provision made in commercial receivers for cutting out the loudspeaker.

We are also surprised to note that you are apparently unaware that this matter has been provided for in McMichael receivers for many years. Almost without exception, every McMichael set has been, and still is, fitted with extra speaker sockets, and a special extra speaker plug which allows a choice of the inbuilt speaker alone, the extra speaker alone or both together. Many listeners have expressed their appreciation of this arrangement, and we trust that you will be able to bring it to the notice of your readers.

C. P. CARLTON,
p.p. McMichael Radio Limited.

Danes Inn House,
265, Strand, London, W.C.2.

CHARGE!

The Editor, "Popular Wireless."

Dear Sir,—One day last year I visited a friend who owns a wireless shop in a small country town in North Wales. While I was talking to him a farmer came in with a battery to be charged, and as he was passing it over the counter he said: "I'll be going back home in twenty minutes, so you will have it ready, won't you?"

Then my friend explained to him that it was impossible to charge it in that time, and that it would take at least twenty-four hours. And then after a brief pause the farmer said: "Can you put the charge in a bag and I'll fix it up when I get home to-night." Then my friend told the assistant to take him and show him how batteries were charged. We could hardly keep a straight face until he went out of the shop. "Some howler, what!"

W. MORRIS.

Cae Rhos, Llanfaglan, Caernarvon, North Wales.

WE PASS IT ON

The Editor, POPULAR WIRELESS.

Dear Sir,—In your small 2 in. x 1 in. "A Guinea For You" announcement, I see that it matters not how small. Would the following pass a smile across your profile?

A clergyman called on a resident in a working-men's area. The wife, opening the door, was surprised to see a clerical gentleman standing there and, in the excitement, called her husband. The husband, being rather an ignorant type, and having been recently engaged by the local electricity company, approached the reverend gentleman in the following way:

SHORT WAVES ON CRYSTAL

The Editor, "Popular Wireless."

Dear Sir,—In my inquiry regarding the possibilities of hearing short-wave stations on a crystal set you state that the station should be situated near the crystal set. That is so we will assume for medium-wave stations, but is it so for short waves? If one can get Australia on a one-valve set or, as Mr. Chester has done, Tokyo, why not Rome or Zeesen, or, if conditions are really good, maybe America! At any rate it's a thing worth considering by your readers. It would seem to be a thing as yet unexplored. I would be grateful if readers would gather together and try their hand at it. It's like a kind of new field of exploration, or isn't it? Just imagine the humble crystal long ago hidden away in the lumber room. Poor little crystal! Why, some day, who knows, you may be worth your weight in gold? At any rate, I did have a try at it the other evening, "just to see." Got out on Monday round the shops and bought a (new?) crystal detector, and with the aid of a Polar ·0005 condenser, an old "P.W." dual range coil stripped to my liking, an Igranic plug-in coil holder, I rigged up my set. Tuned-in the local to its most sensitive condition, unclipped my medium-wave coil and inserted an Atlas coil. I may mention before we go any further, that the bird was covered up and the clock was stopped, and the wife sent to the pictures. Well, to resume: Turning the dial slowly and straining my eardrums, I picked up Morse and more Morse and music. Mind you, it was faint—very faint, but music which meant thrills. You remember the time you tune-in V K 2 M E for the first time? Well, that's the kind of thrill it had for me. I can imagine some or may be most of your readers saying, "Pah!" "Poor fish!" etc., but try it, old man, try it and see for yourself. It may sound puerile, but it's something new after all, isn't it? Having tuned-in the music, then I compared it with my O.V.I. and found it was Rome on 49 m.

F. WARD.

2, Brookdown Terrace, Saltash, Cornwall.

MY SHORT-WAVE ADVENTURES

(*Continued from page 439.*)

frequency unit stands right close up to the two-valver, the two chassis being, of course, almost identical. A very short flex, actually only 3 in., runs between the pre-set terminal of the unit and the tag on the set's tuning condenser.

Well, it works! I must say it was a cheering moment for me when I realised that the existing set was not going all "up the loop" as I brought the unit into action. I feared interaction between the high-frequency stage and the set—but not a bit of it.

Well Spaced Circuits

Of course, the coil unit and condenser are quite a long way from the set's tuning circuit. With the smallest coil, tuning around 16 metres, I did get a spot of unpleasantness in the form of a squawk—a noise that occurred as the two variable tuning condensers came into step. I cured that by de-coupling the detector anode circuit, putting in a 30,000-ohms resistance in series with the 100,000 ohms resistance of the R. C. unit, and wiring in a 1-microfarad condenser to earth.

At 72 degrees I logged Bound Brook, New Jersey, quite loud enough to satisfy me the amplifier was pulling its weight. W 3 X A L is on 16·87 metres, as you know, and came in at 76 degrees on the set's condenser, 71 on the unit's condenser.

What pleased me as much as anything was the smoothness of the detector reaction—released now from the load of the aerial, no doubt. I kept the preset almost wide open, a very small coupling capacity being best for all-round results. No blind spots now, by the way!

I was also glad to note that the two tuning condensers kept surprisingly well "in step" round the greater part of the scale, not more than five to ten degrees difference in readings. Reaction seems to pull the tuning circuits into line. Even though there are three controls and only one pair of hands, operation is by no means tricky.

By the way, I've gone over to a W.B. Stentorian Cadet loudspeaker, which in its cabinet and with its remarkable series of tappings for different matching ratios strikes me as a very fine adjunct for any experimenter. I can get quite a number of signals on the loudspeaker—although for searching I still stick to my phones, of course.

All the same, the unit and two-valver make a loudspeaker short-waver. I get Schenectady (W 2 X A D) on the 19-metre band at good volume on the W.B., the unit condenser setting being 105 degrees, the set's condenser 115 degrees. Possibly, if I put a series condenser in the aerial lead it would equalise these readings still more.

A Change Of Valve

Just one other thing this week. I had by me a Hivac H.P.215 high frequency pentode. Now, the leaflet shows this as a seven-pin valve, but my particular specimen—very new—is a common-or-garden four-pin with a terminal on the top of the bulb. Mystery!

I changed over from my S.23 to my H.P.215 and hoped for the best. And the best was forthcoming right away. It seems to give just a little extra kick to signals, without in any way interfering with reaction or anything else. So, for the moment, then, my hook-up takes the rather imposing sequence of high-frequency pentode, triode detector and Harries power output.

Not bad for a tenderfoot—what?

THE DIAL REVOLVES

(*Continued from page 436.*)

A Norwegian amateur located at Alesund (wherever that may be) had the thrill of his life (anyhow, it should have been!) when he contacted R A E M on 20 metres.

Remember, boys, although "There's No Green Grass Round the Old North Pole" there *is* an amateur station and it's up to you to show your DX abilities by logging it. Comrade Krenkel is a red-hot fan even though he is on top of the world, and so you may expect a decent card.

Incidentally, the Russian scientists have been enjoying the B.B.C. programmes on their radio of late—but then they haven't many alternatives!

The Best Features for

DX LISTENERS
AND
S.W. BEGINNERS

are those appearing regularly in
POPULAR WIRELESS

THE McCARTHY PORTABLE

An attractive design incorporating a special reflex circuit

THE design of a portable set presents greater difficulties than that of a receiver of the normal type. There are two outstanding reasons for this: one being that the component parts have to be arranged in an extremely compact formation, and the other because the whole of the energy has to be picked up on a small self-contained aerial.

The close placing of the components entails the utmost care owing to the risk of instability taking place, and very accurate and cunning positioning is necessary, especially when it is remembered that the last ounce must be obtained from each valve stage, so as to give the highest degree of sensitivity in order to counteract, to some degree, the shortcomings of the small frame aerial.

The new McCarthy Portable which we have just tested is a very fine example of clever design. The makers have used a special reflex circuit, so that with the three valves which are incorporated in the set a sensitivity far in excess of this number of valves used in a normal straight formation is achieved.

This has the advantage not only of simplifying the design but also of reducing considerably the running costs since the current consumption of the three valves is obviously less than the four or five that would otherwise be needed if the circuit were of the non-reflex type.

Actually the measured H.T. current consumption of the receiver submitted for test was a shade under 7½ milliamps, and the L.T. comes out at ·4 amperes.

When the back of the case is opened so as to expose the internals it is at once apparent that accessibility has been given due consideration. The various parts are extremely get-at-able, and it is a matter of but a few seconds to remove any of the valves, should this be necessary. The H.T., grid bias and L.T. batteries can also be removed in a moment.

The loudspeaker is a moving coil of the permanent-magnet variety, and the thought expended in the design is again evident when it is seen that the loudspeaker fret has been duplicated so that the back of the set is "open," thus eliminating the boxiness in the reproduction which is noticeable in some portables. The improvement which results from this feature is very obvious when comparison is made between this set and another having a closed back to the case.

Resistance Reaction Control

There are three controls, namely, the main tuning knob, reaction control and the on-off wavechange switch. The degree of reaction is controlled by a resistance, and in practice it works excellently.

On both medium and long waves the sensitivity of the set is definitely high, and there is a choice of programmes on both wavebands. The efficiency is surprisingly well maintained on the long waves, and we tuned-in each of the stations named on this portion of the tuning scale without difficulty. This point is worthy of mention because normally a frame aerial design

The receiver is available in three colours, viz.: red, blue and green.

tends to lose its efficiency somewhat on the longer wavelengths, but this is certainly not the case with the McCarthy.

There is a noticeable "volume expansion" effect with the set, that is to say, a slight increase in the reaction seems to make a very big difference to the volume. Naturally, this is all to the good and is probably due to the reflexing.

The case is provided with a turntable so that the set can be readily swung in the position giving the best directional effect. There is also a carrying handle, and those who require a detachable waterproof cover can obtain one for an additional ten shillings on the list price.

The set is available in three colours, namely, red, blue and green, and it weighs 16½ lbs., including all batteries. The price of the portable, complete and ready for use, is six guineas, and it is undoubtedly a very efficient set of its class.

A. J. R.

TECHNICAL JOTTINGS

From an Expert's Notebook

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

Television Wavelengths

THE original idea with regard to the range of the television broadcast stations was that an area of about 25 miles radius would be all that could be hoped for. But already reports are coming in of reception, and very good reception, at much longer ranges than this. I see somebody was writing to a daily newspaper, saying that he had excellent reception at a distance of 70 miles, and giving a photograph of the appearance on the television screen. This receiver, by the way, was a home-made one. And, as already stated in "P.W.", reception has been obtained on a G.E.C. set at 90 miles.

Ultra-Short Waves

The fact that television is operated on the short waves, or ultra-short waves, lays open the possibility of all kinds of peculiarities. You know that extraordinary freak transmissions and receptions on short waves have occurred, so much so that they have ceased to be news. The ultra-short waves used for television transmission, however, constitute a new field of which we have not previously had a great deal of experience. From reports which are now beginning to be received it looks as though this ultra-short-wave region will provide plenty of surprises in the way of reception over abnormal distances.

When the B.B.C. talked about a range of 25 miles they were, of course, being very conservative, which was the only right thing to do, but the B.B.C. engineers knew full well that many people outside that range, and probably a great deal outside the range, would be able to get reception.

Talking about ultra-short waves, people often ask me what this means exactly. I don't think anybody has ever defined short waves and ultra-short waves, but I regard the latter as being anything below about 10 metres, whilst short waves are usually considered to be those below about 180 metres. From 180 metres upwards you get the broadcast wavelengths.

Waveranges

Short-wave transmissions from, say, 180 metres down to about 20 or 10, have been used for many years for communication between all parts of the world and have proved their immense value. The very low regions, 10 metres downwards, have not yet, as I said, been fully explored, but it looks as though they are going to turn up trumps just as the short-wave region has done. Here is a wonderful field for experiment and it is quite on the cards that the ultra-short waves will soon be applied to various other purposes besides television.

Those Crackles

A great many listeners whose sets suffer from crackles and bangs and all sorts of interfering noises (and this seems to be extremely common) think that the trouble is due either to interference coming in on the aerial, I mean, from a long distance away, or to electric machinery and electrical appliances in operation in the district.

First of all let me say that interference from a long distance is much more rare than many people think, so much so that in ninety-nine cases out of a hundred you can forget it, and you can bet that the trouble is much nearer home.

Local Causes

As regards interference from local electrical appliances, electric irons, electric refrigerators, motors and so on, these certainly are a very troublesome source, and becoming more so every month. Far be it from me to suggest that this is an impossible

(*Continued on next page.*)

TECHNICAL JOTTINGS

(Continued from previous page.)

source of trouble which should be ignored. In quite a good percentage of cases this *is* the cause of the trouble, and in many of them it is almost impossible for the listener to do anything about it—except just grin and bear it.

Look Within

But what I want to say is that there are lots of interferences which are not due even to local electrical causes, but are due to defects within the set itself. I think this category covers far more troubles than any other. Bad contacts are amongst the primary offenders. I guarantee that if you examine ten sets which are giving trouble due to crackles and banging noises you will find that in eight cases out of the ten these are due to bad switches, bad rheostat contacts, defective valves (electrodes occasionally coming into contact with one another), bad contacts of valves in sockets, or something of this kind.

Before you jump to the conclusion that the interference is coming in on the aerial, try disconnecting the aerial and the earth and then operating the set as before. If you find that the crackles and bangs are still present it is obvious that they are within the set, or at any rate that they are not coming in on the aerial or the earth.

Plugs and Switches

The next thing to look at is the plug which brings in the mains current supply to the set. If you just touch this or attempt to shift it about slightly, without actually removing it, you will soon know whether it is making bad contact. The aerial and earth, by the way, also ought to make good and reliable contact, as you can get plenty of crackles due to a bad contact between the aerial lead-in and the aerial terminal of the set, or between the earth lead and the earth terminal of the set. If you are in any doubt about this, try disconnecting the aerial from the aerial terminal of the set and then just touch the aerial lead against the terminal.

A Special Case

You will see from all this that it is comparatively easy to discover whether the troubles originate within the set itself or whether they are being imported from outside. If they are coming in from outside, either there is no remedy or the remedy is obvious. If they are inside the set, however, the answer may be somewhat more complicated. The first thing to do is to examine the switches, especially the main on-off switch, then the rheostats, then the valve pins in their sockets and so on.

One of the most appalling causes of noise in the set, but one which fortunately does not occur very often, is a valve in which the electrodes occasionally contact together. This makes such a terrific row that I don't think you can possibly mistake it for any of the other troubles mentioned above. Probably most of you have never experienced this particular thing, although curiously enough I have had it occur twice in two different sets.

Screen-Grid Working

I am often asked what is the precise difference in the mode of working of a screen-grid valve and an ordinary valve. Notwithstanding that the screen-grid valve is now so very popular, in fact one might almost say absolutely standardised, there seems to be some mystery as to its working, especially amongst the newer generation.

To understand how it works you want to consider the electrostatic capacity which exists in an ordinary three-electrode valve between the anode and the grid. This electrostatic capacity produces a capacity coupling between the circuits connected to those two electrodes, that is to say, it produces a coupling between the anode circuit and the grid circuit. You will see that when the valve is in operation with high-frequency currents, a certain proportion of energy will be fed back by reason of this capacity coupling and you will then get reaction effects, or what are sometimes called "feed-back" effects. These will put a limit to the amplification you can employ, because when you try to push the amplification beyond a certain point you get instability in the circuit.

Amplification Limit

As I have said, this puts a limit to the amount of amplification per stage which you can get with a three-electrode high-frequency amplifying valve. At one time before the introduction of the screen-grid device, people thought that we were hardly likely to make any further improvements in the way of the sensitiveness of the high-frequency end of the receiving circuit. You can readily appreciate that improvements in this part of the circuit makes an enormous difference to the reception range of the receiver, and it was in view of the extreme importance of this that research engineers concentrated their attention on the high-frequency amplifying valves.

Neutralising

Other methods were used before the screen-grid came along. Many of you will remember the various neutralising methods which were used, these being applied more to the *circuit* than to the *valve*, but nevertheless designed to overcome the electrostatic capacity between the electrodes, which I mentioned above, by neutralising or counteracting it.

Neutralising methods, although claimed to have been devised in this country, achieved a greater degree of popularity in America than they did here, but they had only rather limited application, and it was not long before people turned again to the valve to see whether its amplification could not be increased.

Space Charge

Then someone found that by introducing another grid in between the present grid and the anode, so as to disperse or prevent the formation of the "space charge." the coupling effect could be got rid of. The "space charge," by the way, is the cloud or collection of electrons which are supposed to congregate in the space between the grid and the anode, that is, in the absence of the screen grid.

This additional electrode, known as the "screening grid," is supplied with a suitable high-tension voltage from the high-tension battery, or whatever the H.T. source may be. The presence of the additional grid, with the removal of the space charge and of the consequent capacity coupling, opens the way to an enormous increase in amplification per stage.

QUESTIONS AND ANSWERS

By K. D. ROGERS

RAISING THE TONE OF A SET

P. D. H. (Guildford).—*I have a commercial set, one of the ——— five-valvers, and it is a regular "bonker." Is there any means by which I can raise the tone—cut out the bass—without having to get into the innards of the set?*

Can one get circuits for commercial sets? I have one which is double-Dutch to me, and I should like the circuit.

Why do I get only one station—German—on my one-valve short-waver? It brings in plenty of Morse, but I can get only the German telephony station.

What you must do is to arrange a switch so that the tone control can be cut out at will when you find that the programme is not "bonky," and you can do with some more bass.

There are umpteen methods, or rather variations of methods, for cutting down the bass, but without knowing the full characteristics of your speaker I cannot give you any very close idea of exactly what you require.

I assume you can get to the speaker input wiring, from the set to the primary of the loudspeaker. If so, all you have to do is to connect the gadget I shall describe across the input wiring to the speaker.

The simplest gadget is an L.F. choke in series with a variable resistance. Mount the two components on a small baseboard and panel with the knob of the resistance through the panel so that you can vary the amount of bass cut off that you obtain. You can also include an on-off arrangement—a switch—so that the gadget can be cut out of circuit altogether when you do not want the base to be reduced.

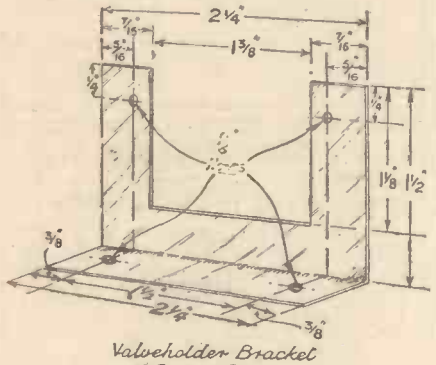
The value of the resistance is about 10,000 ohms and the inductance should be about three henrys. It can be of the nickel-iron type, for it has no current to carry worth talking about; as a matter of fact, you would do well to stop all current passing through the tone control by placing a 1-mfd. condenser in series with the lot. Otherwise when you turn the resistance down to a low value, and perhaps to zero, you will allow quite a considerable current to flow through the choke, and it may not do it any good.

Normally the resistance would be of such a value as to make the shunt path comprised by this tone control much higher in resistance than the actual loudspeaker path, and only a small proportion of the current from the output valve would pass through it.

I would suggest the use of the variable resistance even if you want a permanent non-adjustable tone control, for it is much easier to set the control to the degree required with a variable resistance than it is by the tedious process of changing fixed resistances until you get the one you want.

The control of tone is smooth and easy, the bass being cut down by the simple process of shunting through the choke as the resistance is reduced in value.

FOR THE "REACTO"



This sketch gives all the dimensions needed to make the bracket which forms the mounting for the triode-pentode in the All-Mains "Reacto." described in last week's "P.W." The nine-pin valve holder is bolted to the two ¼-in. holes in the two arms of the bracket.

I think you would be able to get the circuit for your set if you asked the makers. The circuits are normally printed for service engineers, but in many cases owners of sets are allowed to have them. It is worth writing for, anyway.

Regarding the coils, two in the S.G. stage and one in the detector, I expect the circuit is simply a band-pass one. You would then have two coils, or coil units, in the S.G. grid circuit and two condenser sections tuning them. Then on the other side of the S.G. valve, in the detector grid circuit, you would have a third coil unit being tuned by another section of the variable condenser.

The reason why you can get only the German station on short-wave telephony is not easy to explain without more explicit details of the receiver. It sounds to me as if your reaction control is not above reproach; that you are possibly going into oscillation with a plop instead of sliding in gently, and that therefore you cannot resolve any weak carrier which requires the set to be adjusted close to oscillation point in order for the telephony to be audible.

In the case of the German stations the reception is so powerful that they can be received in most cases without the use of reaction. But the same does not hold for most of the other stations; in fact, I doubt if it holds in the case of a one-valve set for any other station. Consequently, if you have poor reaction control you may be prohibited from getting any other station on telephony.

If you find that by very slowly moving the reaction control you cannot go in and out of reaction without a plop you will either have to alter the grid leak or the coil adjustments. I should write to the makers of the kit of parts about it, and get their suggestions. If the worst comes to the worst send the set back to them for test, but before doing so satisfy yourself that the reaction *is* the cause of the trouble, that it does not slide in and out gently. Try with various H.T. voltages, too, for the H.T. makes a very great deal of difference with some sets.

S O S

A blue print for S.T.300 *urgently required by* E. Jones, 3, Islip Street, Kentish Town, London, N.W.5. *That is not how he has put his request to me, but it's shorter that way. Any help, anybody? Thanks. He will pay postage both ways and return print in good working order.*

Here's a different S O S: Does anyone want copies of "P. W." *from Jan. 28th, 1933, to Dec. 15th, 1933? If so, please write to* F. W. Banham, 60, Friar Road, St. Mary Cray, Kent. *And also Mr. Banham would be grateful for assistance re the S.T.600. He wants to beg, borrow, or purchase a copy of "P.W." which describes the A.C. S.T.600.*

So here's to it, you lads.

CLASS B

J. B. ("Cornaa," Promenade, Port St. Mary, I.O.M.).—*I noticed Mr. W. Butterworth's request for details of the "Eckersley National Three" for D.C. in "P.W." for June 19th. I have a copy of "P.W." describing the battery set if that is any good. If so, please will he write to me?*

A few days ago I obtained a Class B valve, but I do not like the quality. Can I use the valve as detector and L.F. in a straight two-valve set?

I see no reason why you should not do so. Look upon the two grids and the two anodes as completely separate, and treat the valve just as you would two separate valves. Be careful when wiring up the components that you do not get the H.F. input wiring to the detector portion of the valve too close to the grid input wiring of the L.F. section. It is an easy thing to do, and might well give rise to trouble especially when reaction is being applied.

ANOTHER S O S

"*Here is an S O S that has just been handed to me——*" *Will anyone who can assist* Mr. T. Steadman, of Carter Street, Fordham, Ely, Cambridge, *in regard to the Eckersley National A.C. Three please get into touch with him? Mr. Steadman would like a copy of "P.W." giving those details. Thank you.*

DECOUPLING

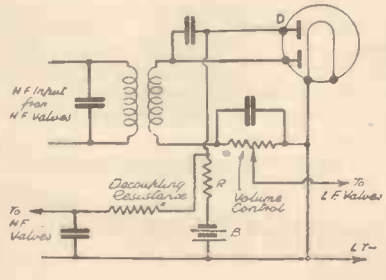
K. L. B. (Brighton.)—*What should the relationship between the decoupling resistance for an L.F. circuit and its condenser be?*

Usually it is about ten to one in resistance at L.F., taking a low value of frequency, one at which trouble is likely to be expected. I like to take 50 as my frequency, and then work with a value of about ten to one. Thus, if the resistance is 25,000 ohms the condenser should have a reactance of not more than 2,500 ohms at that frequency. That gives a condenser of about 1·5-mfd. In practice we use 2-mfd., which has a reactance at that figure of about 1,600 ohms.

If for reasons of H.T. voltage dropping you have to use a resistance of less value, you will have to increase the size of the condenser to make up for it. Thus, if the resistance has to be brought down to 10,000 ohms, you will have to increase the condenser by about the same ratio as the other is reduced. You cannot have too large a condenser, and it is better to err by having a larger condenser than is necessary than by having one that is too small.

TECHNICALITIES EXPLAINED—No. 59

Delayed A. V. C.



Normal A.V.C. comes into operation immediately a signal is received, no matter how weak that signal. Thus, while it controls the amplification of strong local inputs, it also reduces the degree of amplification of weak stations. This is a disadvantage, for we want these stations to build up to full strength and direct or undelayed A.V.C. will not permit this.

So a bias is applied to the diode which is used to develop the A.V.C. voltage in such a manner that it is prevented from rectifying and so producing the voltage until it receives sufficient input to overcome the bias applied. In this way the signal is allowed to be built up without hindrance until the predetermined strength is reached. Then the diode bias is overcome and the A.V.C. gets to work.

The circuit shows a simple A.V.C. circuit in which delayed A.V.C. is employed. The bias is obtained by the battery B, the diode D being made negative in respect to the filament. Until the signal is sufficiently strong to make it positive, no A.V.C. voltage will be developed across the resistance R, and so no volume control will be applied to the H.F. valves in the set. In A.C. sets the bias for the diode is achieved by a resistance through which passes the anode current of one or other of the valves.

WE TEST THE "RADIOCHRON"

A new receiver which performs two distinct functions and has many features which make it an extremely attractive proposition

IN these days of myriads of receiver designs, when thousands of variations in cabinets have been explored, when all manner of tuning dials have been employed to infuse a difference into the sets of various manufacturers, it is most refreshing to have for test a receiver that is unique in its own rights.

Something Really Different

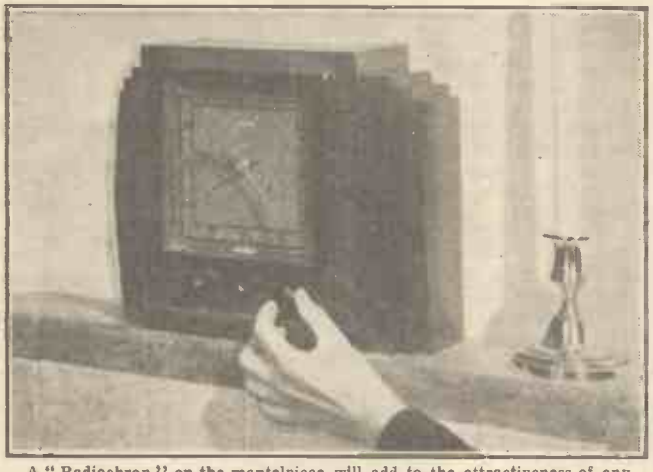
In the "Radiochron" we have something that is so different that it would be fascinating for that reason alone. But it has so many new features that it begets enthusiasm in everyone who sees it. And when they have handled it and heard it working it leaves them with only one thought—"I should like one of those myself."

The chief idea behind the design is that it is an electric clock and radio receiver combined. But, without further description, such a bare statement does not do the instrument anything like justice.

The photograph accompanying this article will give you a good impression of the appearance of the "Radiochron" and some idea of its compactness. The actual dimensions are 10 in. high, 12 in. wide, and just about 4 in. deep.

But the outward appearance is the most intriguing part. Seen on the mantelpiece it is no more than a handsome clock in a finely polished ornamental wooden case. The three controls below the clockface are all the same and pass as mere ornamentation at first sight.

IMPROVES ANY ROOM



A "Radiochron" on the mantelpiece will add to the attractiveness of any furnishing scheme by its imposing appearance.

Very Good Results

On closer inspection it is noticed that there is a third hand on the clock. It might be a second-hand but for the fact that it is not moving.

In view of the receiver's compactness and the ingenious incorporation of the electric clock, you would be justified in expecting results that were in a way a makeshift—just passable. You would in no way expect the every-bit-as-good-as-the-normal-mains-set results that are obtained on switching on. But then you would have no reason to realise that this compact instrument contains a modern five-valve superhet circuit, which it does.

You would no doubt be further amazed to learn that the fifty or so stations received were all picked up without the addition of either an aerial or an earth lead. This is achieved by the built-in aerial and tuning system of revolutionary design which is the subject of several patent applications.

If the receiver is to be used in a very poor locality from the point of view of radio reception, there is provision for the addition of a small aerial, which is all that is required to enable the set to equal the results given in a good locality without the extra aerial. In our tests around the suburbs of London we never once found this additional wire to be necessary.

The "Dial" Settings

The face of the clock is of open-weave material with chromium figures, and forms the outlet for the sound from the speaker. A chart is provided for station tuning, giving the "times" in minutes past the hour at which each station comes in. The third hand moves round the clockface as the tuning control is operated.

The controls, beside the tuning knob, are for tone adjustment and volume. The latter control also switches the receiver on, and on being pulled outwards switches on a concealed light which illuminates the clockface.

A Fine Proposition

The tuning range of the instrument, which is for A.C. mains only, is from 200 to 560 metres. The only criticism we can make after extensive tests is that we noticed a slight background hum during silent points in the programmes.

At fifteen guineas the receiver is indeed a good proposition, and is ideal for fitting in with the modern "bare-room" style of furnishing. In fact, the instrument is most up-to-the-minute in every way.

A. S. C.

Visitors to the Continent should note that the German Radio Exhibition is being held between July 30 and August 8 in Berlin, and will be well worth a visit. Special reductions in rail fares have been arranged.

THE "HIEROGLYPHICS" OF S.W. LISTENING

Facts, Figures, Abbreviations, Symbols, Etc.

SOME AMATEUR PREFIXES

The stations of a country are distinguishable by the first, or first two, letters of each station's call sign. Some of the more frequently heard countries, with their distinguishing letters, are given below. Sometimes colonies or possessions of the countries use the same letters, and listeners should avoid being misled in this way.

Chile—C E
Cuba—C M (for C W)
Cuba—C O (telephony)
Portugal—C T 1
Germany—D
Spain—E A 1–2–3–4–5–7
France—F 3, F 8
United Kingdom—G
Hungary—H A
Switzerland—H B
Ecuador—H C
Haiti—H H
Dominican Republic—H I
Colombia—H J–H K
Italy—I
Japan—J
Norway—L A
Argentine—L U
Austria—O E
Czechoslovakia—O K
Belgium—O N
Netherlands—P A
Brazil—P Y
U.S.S.R.—U
Poland—S P
Egypt—S U
Greece—S V
Turkey—T A
Iceland—T F
Guatemala—T G
Costa Rica—T I
Canada—V E
Australia—V K
Newfoundland—V O
British India—V U
Bermuda—V P 9
Kenya—V Q 4
U.S.A.—W
China—X T–X U
Latvia—Y L
Rumania—Y R
Venezuela—Y V
Albania—Z A
New Zealand—Z L
Paraguay—Z P
South Africa—Z S Z T–Z U

COMMON ABBREVIATIONS

A few of the common abbreviations used by amateurs are given in this list. Many other abbreviations used are quite ordinary and will be understood by anyone.

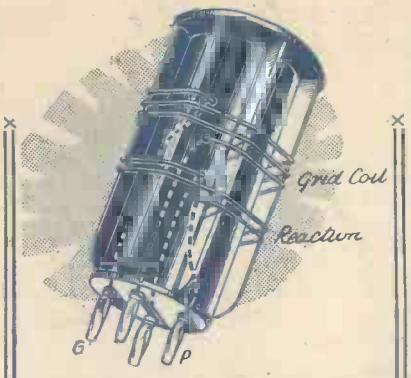
XS—Atmospherics
RPT—Repeat
BCL—Broadcast listener
BUG—Vibroplex key
CANS—Phones
CUL—See you later
CW—Continuous wave
DX—Distance
FONES—Telephones
GB—Good-bye
HI—Laughter
ICW—Interrupted continuous wave
OM—Old man
URS—Yours
73—Best regards
WKG—Working
WX—Weather

THE RST CODE

This is an abbreviated method of reporting on Readability (R), Signal Strength (S), and Tone (T), of a Morse transmission. An example is RST 465. The 4 refers to R, the 6 to S, and the 5 to T, and the degrees referred to by the numbers are as follows:

Readability

1—Unreadable
2—Barely readable
3—Readable with some difficulty
4—Readable with little difficulty
5—Perfectly readable



The following details for a set of 4-pin plug-in short-wave coils incorporate the normal connections for such coils with a 4-pin valve base. In all cases the connections from windings to pins should be made in the manner shown above, namely, top of grid coil to grid pin, bottom of grid coil to one filament pin (you can see which by the perspective sketch), top of reaction coil to other filament pin and bottom of reaction coil to anode pin. The two coils are always wound in the same direction.

The formers are quite standard ones and readily obtainable. They have six or eight ribs and are 1½ in. in diameter to the outside of the ribs. Ribs with serrations to hold the turns are best. If your formers have no serrations, space the turns about 14 to the inch.

The two windings are separated by one serration or its equivalent and 22 or 24 S.W.G. wire is suitable. The following waveranges are given with a 0001 5-mfd. tuning condenser:

12–25 metres—4 turns grid—2 turns reaction.
21–45 metres—9 turns grid—5 turns reaction.
40–90 metres—24 turns grid—12 turns reaction.

In the case of the last coil, the grid winding of 24 turns will occupy nearly the whole length of the former, so you will have to wind the reaction with thin D.C.C. wire in a little pile at the bottom end, as near as possible to the bottom of the grid coil.

Signal Strength

1—Barely perceptible
2—Very weak
3—Weak
4—Fair
5—Fairly good
6—Good
7—Moderately strong
8—Strong
9—Extremely strong

Tone

1—Extremely rough hissing note
2—Very rough A.C. note
3—Rough, low-pitched A.C. note slightly musical
4—Roughish A.C. note moderately musical
5—Musically modulated note
6—Modulated note, slight trace of whistle
7—Near D.C. note, smooth ripple
8—Good D.C. note, slight ripple.
9—Puré D.C. note.

The R (readability) of the RST code must not be confused with the R scale of signal strengths, which more or less corresponds with the S of the RST code. It will be met frequently in connection with telephony transmissions. The scale is as follows:

R 1—Faint signals
R 2—Weak signals
R 3—Weak signals, but all words clear
R 4—Fair signals easily understood
R 5—Moderately strong signals
R 6—Strong signals
R 7—Good strong signals (understandable through interference)
R 8—Very strong signals (heard several feet from phones)
R 9—Extremely strong signals

THE "Q" CODE

The statements to which the various letter groups in the "Q" code refer are given in the second column of this table. If followed by a question mark they are taken to be asking for the information required. Thus, QRA means "The name of my station is ——"; followed by a question mark it becomes "What is the name of your station?" The symbols are also used as abbreviations due to their long and familiar use. Thus QRA can stand for "location." The most commonly used signs of the "Q" code are as follows:

Letter Group	Meaning	Abbreviation
QRA	The name of my station is ——	Location
QRB	The approximate distance between our stations is ——	Distance
QRG	Your exact frequency (or wavelength) is ——	Frequency or Wavelength
QRM	I am being interfered with	Interference
QRT	Stop sending	Silence
QSB	The strength of your signals varies	Fading
QSL	I give you acknowledgment of receipt	Verification
QTR	The exact time is ——	Time

THE INTERNATIONALLY USED MORSE CODE

A ·—	N —·	1 ·————	6 —····
B —···	O ———	2 ··———	7 ——···
C —·—·	P ·——·	3 ···——	8 ———··
D —··	Q ——·—	4 ····—	9 ————·
E ·	R ·—·	5 ·····	0 —————
F ··—·	S ···		
G ——·	T —		
H ····	U ··—		
I ··	V ···—		
J ·———	W ·——		
K —·—	X —··—		
L ·—··	Y —·——		
M ——	Z ——··		

Period ·—·—·—
Interrogation ··——··
Break (double dash) —···—

Wait ·—···
End of Message ·—·—·
End of Transmission ···—·—
Received (O.K.) ···—·
Invitation to transmit (go ahead) —·—
Exclamation ——··——
Bar indicating Fraction —···—· (oblique stroke)
Comma ——··——
Colon ———···
Semicolon —·—·—·
Quotes ·—··—·
Parenthesis —·——·—

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POPULAR WIRELESS, July 24th, 1937.

REGISTERED AT THE G.P.O. AS A NEWSPAPER.

SHORT-WAVE CONVERTERS By HOWARD BARRY

Popular Wireless & Television Times

WAYNE AT ONE-TREE HILL
By L. CHESTER

EVERY WEDNESDAY PRICE 3D

No. 790.
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July 24th, 1937.

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

JAMBOREE
FIELD DAYS
WHAT IT COSTS

RADIO NOTES & NEWS

RECORD IN RECORDS
BEFORE OUR TIME
TELEVISION VISION

Romance at Reykjavik

ABOUT twelve months ago the Icelandic broadcasting authorities arranged a special attraction—a broadcast by the famous Swedish singer, Mr. Sigurd Björling.

I do not know if the broadcasting station staff had been instructed to make the singer's visit specially memorable, but one young lady, a member of the announcing staff, seems to have succeeded in doing so, for Mr. Björling fell in love with her.

Now they are married; and I am sure my readers will join with me in wishing them long life and happiness.

Jamboree

MY recent story of the two South American Scouts who walked for eighteen months to attend a jamboree should have contained some reference to another pair of long-distance travellers who broadcast from station W 2 X A F.

This stout-hearted pair cycled nearly all the way across North America from British Columbia to Washington, a stretch of some 3,000 miles, with the Rocky Mountains lying right across the fairway. Undismayed by the ups and downs of the journey, they arrived on time in Washington, where another 25,000 Scouts had assembled.

When the Dauntless Two broadcast they surprised listeners by saying that in the whole journey they had had only one puncture, so three of their tyres were still tight on British Columbian air.

Radio Field Days

A NEW meaning to the term Radio Field Day seems to be developing in Russia. The system of collective farming has given rise to a scheme of travelling post-offices and radio stations, which take to the fields with the workers, and enable them to keep in touch with their homes and headquarters.

In one province of the Ukraine it is claimed that there are more than 500 of these radio field-stations, which accompany the tractors and other agricultural machinery wherever they may be needed.

I hope that somebody has worked out proper schedules for these fellows to go on the air, for if they all try at one and the same time it will certainly be a field day for the chaps receiving the messages from the farms.

The New Western Regional

WORK may start at any moment on the new West Regional station which the B.B.C. is erecting at Start Point, Devon. And it is hoped that the station will be on the air within about eighteen months, which would mean that the Christmas, 1938, programmes of the West Country stand a good chance of being radiated by the new transmitter.

In a spirit of Christmas generosity, the B.B.C. has decided to give the West a decent present while it is about the job, so the newcomer will have a power of 100 kilowatts, and will be definitely in the tip-topper class.

An interesting innovation will be the reflector system, which will screen aerial radiations from the sea and turn them back to the expectant aerials inland.

It looks as though the West Country is to have a square radio deal at last.

Thrills for Grandfathers

THANKS to a Slough reader, I have been reminded that it was in 1837, exactly a century ago, that the first telegraph instrument, under the Wheatstone and Cooke patent, was put to work. It linked Euston with Camden Town railway station, and the Great Western Railway adapted the idea the following year between Paddington and West Drayton, whence an extension was later made to Slough.

This telegraph line became famous. A murder was committed and the suspect was seen to leave Slough in a Paddington train, so the new telegraph line was used to send a description of the criminal to London, where he was caught.

This incident thrilled our forefathers in much the same way that, sixty-five years later, people were stirred by the use of radio in the capture of Dr. Crippen; he was trying to escape to Canada, and the murder for which he was wanted had occurred in Camden Town, quite near to where that first telegraph instrument had been installed.

It Pays to Advertise

SHORT-WAVE listeners who keep a receptive ear on the U.S.A. broadcasting stations must have often wondered how much it costs the advertisers to proclaim the merits of their wares in a radio programme. Here are some recently issued figures.

To book Cincinnati W L W for one hour costs an advertiser about £240; but rather smaller-powered stations, such as New York W E A F, will set him back only to the extent of £200 an hour. To book the whole N.B.C. network, including the above-named stations, would cost nearly £5,000 an hour.

The rival network, Columbia Broadcasting System, charges £3,635 for one hour's night broadcast over the whole chain of stations. But you can have an hour of the evening programme at a small station like Reno for as little as £25.

(*Continued overleaf.*)

MY WORD **By THE EDITOR**

HIGH HAT!

"IT is a very great pity when a public service like the B.B.C. feels itself bound, if it does feel itself so bound, to give the public more stuff that is poor and less stuff which is good because the public seems to like better what is not good than what is good. I protest. I speak now of mature persons, and I would say this, that any mature person who prefers crooning or jazz to the music of Handel or Schubert is badly educated."

Thus, the Dean of Rochester, Dr. Francis Underhill, perpetuating the fallacy that public opinion can be ignored in the assessment of artistic values. That aesthetic judgment is the monopoly of experts and college graduates.

The right reverend gentleman should read what some of the *contemporary* experts and critics said about his Handels and Schuberts. Age certainly "lends enchantment"! For example, Wagner had a very thin time with his Tannhäuser at the hands of some of those who regarded it as their duty to guide the public opinion of their day.

So who is there to say what judgment posterity will pass on present-day music?

May it not well be that the compositions of Noel Coward and Gershwin will be reverently withdrawn from gramophone record archives a century hence, and their so-called "jazz" renderings by Ambrose and Paul Whiteman played with ceremony to, and listened with awe by, music highbrows of the future.

While, of course, the man-in-the-street of the future will give the biggest hand to as yet undreamed-of musical compositions and remain sublimely indifferent to the pipings of his would-be instructors in taste.

Next Week: A COMPACT TWO-VALVE ALL-WAVER

THEY PLAYED A COMPLETE SYMPHONY BACKWARDS

Just a Reminder

ALTHOUGH your natural tendency at the moment is to think of cool seas breaking on the beach at Bali Bali, Tenby Tenby, Margate Margate, or other fashionable resorts, you must allow me to remind you that this is July, and next month is Radiolympia time. The Radio Exhibition, which will run from August 25th to September 4th this year, is now being transformed from a mere skeleton of ideas into full-blooded facts and figures.

Mr. Jack Swinburne, of the Gaumont-British Picture Corporation, has been deputed by the Radio Manufacturers' Association to handle the arduous duties of producer of the variety entertainments. He is full of ideas on the subject, and I was glad to hear that one project is to televise an act from the Radiolympia stage to televiewers in their homes.

Pretty work, Mr. Swinburne; the public is expecting much from Radiolympia television this year.

Checkmating Crocodiles

BENEATH the scaly skin and behind the wicked eye of the wily South American crocodile there lurks a curious experimental tendency. To give him his due, the average "croc" will sportily try anything once—especially anything to eat.

This redeeming trait in an otherwise revolting character brings the croc into the radio news, for—unlikely as it may seem—it is good for the wireless trade. Recently a large order for radio-telephone installations was placed with a South American agent, to whom it was explained that they were to be used to communicate across a river full of crocodiles.

"Wire tellyfun, he no good," said the customer. "Dem crocs, they likum wire, smell um out, eat um up."

Record in Records

ONE of the queer achievements of the B.B.C. has been to amass a vast library of gramophone records which cannot be equalled elsewhere in the world.

The mere number of the records is impressive enough—80,000, including the cracked one. But it is in the variety of noises, of "sound-pictures," and of voices, as well as in the wide range of music, that the B.B.C's collection is so remarkable. They can reproduce any sound, ranging from gear crashes on all the popular makes of car to the whip-poor-will-ing of the whip-poor-will.

It has been disclosed that on one occasion, by some accident, a complete symphony was played backwards. The low-brows didn't even notice it; the high-brows either wept or thought it was a New Movement. But who cares what the high-brows think, anyway?

Before Our Time

I WAS mentioning some months ago the curiously apt descriptions of wireless which were written long before it was invented; various energetic readers contributed to the interest by digging up quotations which had escaped my notice, and when these met the eye of a New South Wales reader he "came back" with a challenge to "P.W." readers.

He says, Can we beat Shakespeare's description of a radio announcer? In one of the Sonnets there is a reference to

"That affable familiar ghost
Which nightly gulls him with intelligence."

I can't think of a crisper description of our News Bulletin friend. Can you?

"MIKE" SLIPS AND QUIPS

DURING ADVERTISING TALK

When you buy one of their used cars you become a walking advertisement for them.

* * *

SPORTS ANNOUNCER

Last night began the ice-skating season, and we saw many new faces on the ice.

* * *

CALL TO SICK LISTENER

And here's wishing you a speedy recovery from the family.

* * *

A WEATHER FORECAST

There will be shattered scowers.

* * *

IN A TALK

He was preparing to be a barrister, but his people lost a lot of money, so he had to work instead.

* * *

IN AN ADVERTISEMENT

Yes, X——'s ice cream will just add that finishing touch to your party.

Deciphering Those Codes

IN a cheery letter from Melsetter, S. Rhodesia, R. E. W. H. tells me how much he enjoyed those articles in "P.W." about the deciphering of codes.

The other day he thought of a grand stunt for coding. It consisted of two concentric discs with letters of the alphabet (in opposite directions) round each rim, fixed in the centre so that the small upper disc could rotate and "pair off" with the lower disc. Talking over this gadget, however, with an ex-U.S. Army man, he said that the method was already old, and was used regularly in the U.S. Army for the less serious communications.

Too true, I fear, R. E. W. H., for I can remember it being used in the Great Unpleasantness of 1914–18, and the Editor tells me that he knew of it before then!

Flying Start to Atlantic Service

IT is generally admitted that the triumphant two-way crossing of the Atlantic by the Caledonia and the American flying-boat, between Foynes, I.F.S., and Botwood, Newfoundland, was in large measure due to the radioed weather reports.

Please don't imagine, for one moment, that I mean a flight of this sort is now so well prepared for scientifically that the rest is easy; that's what the fellows who do it will tell you, perhaps, but they know darned well that radio seems a trivial matter when you are alone in a sky full of clouds with an Atlantic full of water below.

There is a sense, however, in which the meteorological preparations are the foundations of a successful flight of this kind. And I think all the radio men concerned on this epoch-making crossing should know that "P.W." admires the way in which they handled their jobs, and congratulates them on a fine piece of work.

Television Vision

IT may be that we have not yet appreciated all the surprises that television has in store for us. Have you heard about the trousers incident?

Somebody had the good idea that a demonstration of the latest type of fire escape would interest the television public. So the electric eye was trained on the announcer, who heroically allowed himself to be shot up skywards in the appliance, just as a fireman would. But, unlike the practised fireman, the announcer caught part of his trousers in the machinery. "That tore it!"

Not having seen the incident I cannot say how much damage was done—or how much of it was visible. But it makes you realise what a truly surprising thing this television may become one day.

Serenade Up to Date

A MYSTERY which has been worrying many listeners of the Far West has recently been cleared up satisfactorily to all concerned.

It took the form of a solemn and impassioned voice, droning on night after night, rather like a preacher who had forgotten his text. The speaker, who was evidently in dead earnest, went raving on about Beauty, Music, Light, Charm, Grace, and so forth; but he never came to the point, and you could listen for half an hour without gaining much idea of what it was all about.

A local doctor, who specialised in psychology, got so interested in these meanderings that he investigated the transmissions. He discovered that they were sent out by a young man who was in love with the doctor's daughter, but was too shy to tell her so in the ordinary way! A meeting was arranged, the ice was broken, the young lady approved her suitor—and now he whispers into her ear the raptures that he formerly confided to the microphone.

ARIEL

DOUBLING THE PICTURE

J. C. Jevons explains how the appearance and detail of a picture reproduced by television are improved by a combination of two different sized scanning spots

THERE are various ways in which the idea of "doubling" a picture can be used to improve quality in reception. In the well-known method of interlaced scanning, for instance, separate scans are made along different lines to produce two distinct pictures. These are then sandwiched together on the fluorescent screen, so that they appear as one. In this case, the main object is to increase the rate of picture repetition, so as to avoid any suspicion of flicker.

But there are other advantages to be gained from "doubling." In any animated scene there is always one part which shows more movement than the rest. The main "action" usually takes place in the centre of the picture, whilst the background remains practically stationary. Accordingly if one wants to make best use of the band of frequencies available, most of the signals should be devoted to scanning the centre of the scene, and comparatively few to the almost "still" background.

Two Separate Scans

During transmission two separate scans are taken, one of which is confined to the background, and the other to the centre area in which most of the movement occurs. The line and frame frequencies of the first scan need be only a half or even a quarter of those used in taking the second scan. At the receiving end the two pictures are superposed, with the result that the really "vital" parts of the scene are shown in much higher detail than the background. As the latter is of secondary interest to the observer, a lower standard of definition is easily tolerated.

The same principle may also arise in connection with the size of the spot used in scanning. The smaller the spot is made, the clearer is the detail, because the size of the spot determines both the number of scanning lines and the size of each picture element. In the case of mechanical scanning there is an obvious limit to the extent to which the scanning aperture in the disc can be reduced, because we soon reach a point where the light which gets through is not enough to energise the P.E. cell.

A Practical Limit

In actual practice, the limit for high-definition work is about 0·002 inches. This size of aperture gives satisfactory detail, but owing to the small amount of light reaching the photo-electric cell, the "contrast" between the high and low lights in the picture is not so good. The overall effect is, in fact, too much of a general "grey" to please the eye.

It might be suggested that the lost contrast could be restored by applying more amplification to the output from the P.E. cells. Here, however, one comes up against the fact that the current from the P.E. cell is too minute, in the first place, to stand up to very intense amplification. Any attempt to boost it up beyond a certain level is bound to fail, on account of valve "noise" which, in the long run, simply swamps out the picture signals.

On the other hand, if one uses a scanning aperture of comparatively large dimensions, the resulting picture will be too coarse-grained to show the finer details, but because of the increased light available it does preserve the broad distribution of high lights and low over the picture as a whole.

INSIDE THE TUBE

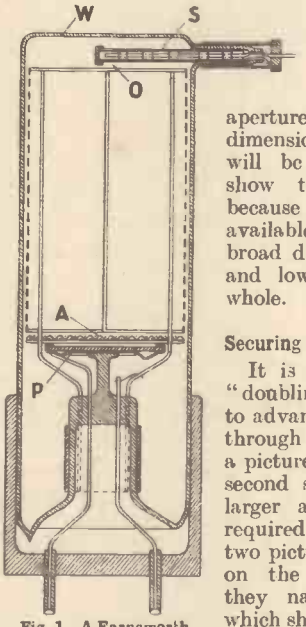


Fig. 1. A Farnsworth image-dissector tube as used for double scanning.

Securing Contrast

It is clear that the idea of "doubling" can again be applied to advantage. One scan is made through a small aperture, to give a picture of clear detail, whilst a second scan is taken through a larger aperture to secure the required "contrast" values. The two pictures are then superposed on the viewing screen, where they naturally give a result which shows much nearer perfection than either taken alone.

This scheme has recently been applied to the well-known Farnsworth system of television in which the picture is first focused on to the photo-sensitive screen of a cathode-ray "image-dissector" of the kind shown in Fig. 1. As the action of the "dissector" is rather different from that of the ordinary cathode-ray tube it will be briefly explained.

THE APERTURES

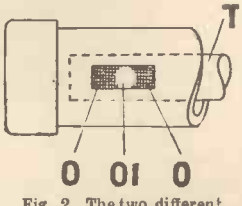


Fig. 2. The two different sized apertures which receive the picture pulses.

The picture to be televised is projected through a top "window" W on to a photo-sensitive cathode P, situated at the lower end of the tube. Electrons are accordingly set free from each elementary area of the cathode according to its illumination. They are attracted by the high-potential on an open-mesh anode A, situated close to the cathode, and pass through the anode into the open part of the tube.

Here they are subjected to the magnetic field from an external winding (not shown), which focuses them into a parallel stream, as they flow upwards, so that the relative light-and-shade values of the original picture are preserved throughout the length of the stream. Simultaneously the stream is subjected to the action of two pairs of scanning-coils, which throw it rapidly to and fro across an aperture O in a screen S at the top of the tube.

Actually the scanning action is similar to that used in the ordinary cathode-ray tube, in the sense that there are both a rapid "line" movement and a slower "frame" movement. The difference lies in the fact that the whole electron stream—representing the original picture—is moved bodily past the scanning aperture O, which remains stationary. This is the reverse of the usual method, where the scanning aperture is moved over a stationary picture—though the final result is the same in both cases.

Inside the aperture O is a "target" which emits secondary electrons under the action of the scanning stream, and it is these secondary electrons which form the source of the picture signals.

Fig. 2 shows on an enlarged scale how a "double" picture is produced. Actually there are two apertures, one within the other. The larger one marked O is rectangular in shape and is partly screened by a wire mesh, whilst the second aperture marked O1 consists of a clear opening in the centre of the mesh.

As the electrons sweep past the top of the tube, they produce two distinct sets of signals by their impact on the target T. The electrons passing through the larger screened opening O give rise to a picture poor in detail but good in contrast value, whilst those which pass through the smaller opening O1 show much better detail, but very little difference between high lights and low. The combined effect is, however, excellent.

"MELODY GIRL" BROADCAST

DURING her first visit to England since she was six, Vera Guilaroff, daughter of a former English diplomat, is to broadcast from her native London on July 22, in a programme—on the Regional and Empire wavelengths—of the kind that has made her known throughout Canada as "The Melody Girl."

Playing the piano, accompanied by Reginald Foort at the B.B.C. Theatre Organ, her programme will include two outstanding works: "On the Trail" and "Deep Purple," which she describes as a beautiful musical pattern in four movements inspired by the rich colours of a rainbow.

"I hope that listeners over here like this type of show as much as they do in Canada," Miss Guilaroff said. "Personally, I think the piano and organ sound admirably together—the piano takes the melody, the organ builds up a rich background."

THE DIAL REVOLVES By LESLIE W. ORTON

ARCTIC RADIO TANKS

A BOLD PIRATE :: RADIO FROM CHANNEL ISLANDS :: A REGULAR G-MAN

A CHAIN of tanks equipped with radio receiving and transmitting apparatus is one of the latest suggestions put forward by a Russian scientist to make trans-Polar air travel safe. Spaced at intervals of approximately 350 miles, they would stretch from the northernmost islands of Russia to Canada's Arctic outposts.

The main trouble of "fixed" stations in the Arctic is that, despite the fact that they haven't legs, they move a considerable distance in a very short time (being on ice-floes). This, as you may gather, is very disconcerting to a pilot, particularly if he is running short of petrol!

POLAR COMMENTARIES

The new scheme would abolish such hair-raising experiences (which would be very upsetting to say the least), for tanks can keep pace with any wily move that Mother Earth may make, and even if the "land" melts the tank doesn't care (though I imagine that its passengers would if the sea were rough!), but just goes on floating and moving as directed—a mechanical Loch Ness monster!

Powerful radio transmitters installed aboard these fearsome affairs would send weather reports to aeroplanes and other stations, straight from the deep-depression's mouth, as it were.

It certainly sounds like a page out of Utopia, but there is every chance of it becoming reality. If so, the possibilities are great. We may even hear running commentaries from the North Pole: "There is a bear on square four," and so on!

A NIGHT AT THE DIALS

Fishing around the amateur band the other night, I received a whale of a thrill when I picked up FA8AR, Guadeloupe, calling a Colombian station. After that I needed no urging to spend a night at the dials, and boy, oh boy, was I thrilled? Daniel had a tame time in the lions' den, in comparison!

Cuba was well represented by CO8OG, CO2RR and CO2EG, whilst other breath-takers were HI7R, Dominican Republic; TI4RO and TI2AH, Costa Rica; K4UC and K4SA, Puerto Rico; YV5AK, Venezuela; and VO4I, VO2C and VO1L, from Newfoundland—enough to cheer a racegoer who has put his "all" on a loser!

Canadians and "Yanks" appeared to rain from the skies, and the following were heard at excellent strength: VE1MA, VE1OR, VE1BA, VE1LR and VE2LY, in Canada; W1ACE (a good start!); W1BGG; W1JUG (I almost expected 2CUPS after that!); W2JS; W2DGY; W2ETI; W3BMA; W3OE; W4BMR; W4EJA; W4AHC; W4NO; W4BYD; W5STA; W7VP; W8MOL; W9WDD—everything but a W6. Now, isn't that just my luck? If I am fortunate enough to go "Up Above," there is sure to be a broken string on my harp!

At 7.45 a.m. (2.45 a.m. American time) I picked up CO2EG, Havana, and W4AGV, Jacksonville, operated by a young lady. Time you were in bed, isn't it, miss?

How many of Canada's broadcasters have you heard? Here are some of the best received.

COME QUIETLY

We have all heard of pirates, but Captain Kidd and his bristly rascals were tame to the fellows who have grabbed the wavelength and call of the now extinct ZHI at Singapore. That takes the biscuit! Listeners in the United States and England are hearing this pirate transmission regularly, and the result is a frantic search by the Malayan authorities, who are more than anxious to lay hands on the offenders. Come quietly, brother!

ALDERNEY CALLING

I felt inclined to head this paragraph "The Great Revival," for things are looking up no end on the short-wave broadcasting bands.

All the usual, and several new, broadcasters have been picked up at excellent strength.

In this connection, COGF, Cuba, on 25.4 metres, has set everyone guessing. Sounds as if he varies his call!

(*Please turn to page* 477.)

SHORT-WAVE STATION IDENTIFICATION By F. A. BEANE

STATIONS OF THE U.S.A.

CONTINUING our somewhat haphazard review of the American stations, we proceed to the second district, where we find a number of world-famous broadcasters. Most famous, perhaps, are the Schenectady "twins," **W2XAD** and **2XAF**, which really need little introduction, since they are heard particularly well throughout the universe.

Normally, the announcement takes the following form: "This is the Red Network of the National Broadcasting Company"; 3 chimes (GEC) and the familiar "W2XAD (or F), a General Electric broadcasting station located at Schenectady, New York," or "This is station W2XAD (or F), an International Broadcasting Station of the General Electric Company at Schenectady, New York, relaying a programme from WGY." The special identification signal used by these stations is, of course, "The Voice of Electricity," consisting of a recording made in the G.E.C. laboratories, of the noise of a ten-million-volt spark! This is usually heard at the commencement of the station's schedule, or prior to the "Mail Man's" programme. No doubt the popularity of these stations has been increased by their promptness in verifying listeners' reception reports!

The C.B.S. stations, however, do not allow the Schenectady broadcasters to enjoy all of the popularity, for **W2XE** may be heard quite well on 13·94 m., 16·89 m., 19·65 m. or 25·36 m., and in the winter on 49·02 m. At present reception is often exceptionally good on the 13-m. channel, and the announcement, "This is the Columbia International Short-wave Station, W2XE, in New York, U.S.A.", usually repeated in French, German and Spanish, is becoming almost as well known as that of its better-known compatriot.

W8XK, a household word in the S.W. world, is not heard particularly well on any of its channels at the time of writing; but, nevertheless, does not present much difficulty in tuning whether on 13·93 m., 19·72 m., 25·27 or 48·83 m. They relay KDKA, the "Pioneer Broadcasting Station"; employ the N.B.C. chimes and derive programmes from the "Blue Network," and announce briefly as "Westinghouse Stations KDKA and W8XK, in Pittsburg."

Bound Brook is heard particularly well, and, as far as I can remember, always has been. At the moment the 16·87 m. **W3XAL** is often a remarkable signal during daylight hours; but to obtain really good results on 49·18 m. one must be prepared to listen at the somewhat unearthly hour of 04·00 or so. And, incidentally, very satisfactory reception of the recent Louis-Braddock fight was obtained from this source, although it is at its zenith in the winter. The N.B.C. chimes are, of course, heard from W3XAL coupled to the call "W3XAL, Bound Brook, New Jersey."

I am afraid that the ardent DX-er has been neglected this week in our identification "tour," but we still have much of the U.S.A. left to cover, and there are several ultra-short-wave stations to "visit," and the Dominion of Canada to review, before deserting the American continents altogether. And there is DX to be had in Canada!

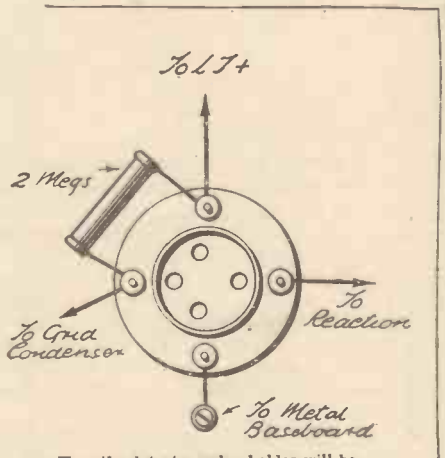
ON THE SHORT WAVES

L.T. FROM THE MAINS

By W.L.S.

I SUGGESTED last week that the easiest way to convert a battery short-waver to mains operation is to start off by attacking the L.T. This is a perfectly simple process, fortunately, and a little patience with what I have to say on this page, with a little study of the diagrams, should put you on the right trail straight off.

The chief difference between a battery valve and an indirectly heated valve is, of course, that in the former type the filament *is* the cathode. Grid returns and other earthed points are therefore connected directly to one side of the filament—generally the negative side. An exception to this is the grid leak, which is usually returned to positive because this slight positive bias makes for the better operation of a leaky-grid detector.



How the detector valve holder will be wired in a battery receiver.

In the indirectly heated (mains) valve we have a genuine cathode—an electrode all on its own which is heated by the filament or "heater." The heater can thus be operated from an alternating current supply, if a few simple precautions are taken.

Looking at your detector, as shown in the diagrams on this page, you will see that you will have to remove your four-pin valve holder and substitute one of the five-pin variety. I have drawn them as if you are using a metal—or metallised—baseboard, with your negative filament terminal connected to this metal, and therefore to all the earth returns.

When you put in your five-pin valve holder, the extra terminal—the cathode terminal—will take the place of this L.T. negative terminal. The cathode is now connected to earth, and so is the far end of the grid leak, which previously went across to L.T. positive.

Nothing is connected to the filament terminals proper except the leads going to the 4-volt secondary of the transformer which is supplying your A.C. for low-tension purposes. If you're using an H.F. pentode or any type of seven-pin valve, make the necessary adjustments in your ideas. What it all boils down to is that the filament terminals are cleared of everything except the L.T. wiring. Leads that formerly went either to L.T. or to H.T. now go to cathode instead.

Removing Hum

So far, so good. But if you just do this and connect a length of flex across the 4-volt terminals of your transformer, it's ten to one that you'll have a good round hum spoiling your reception. Your L.T. leads should be twisted, as shown in the diagram. This doesn't mean that they need be flex—if they *are* it should be heavy flex. But they may be ordinary heavy tinned copper wire insulated with sleeving of some kind.

If your hum arrives, the first thing to do is to connect the centre tap on the 4-volt filament winding to H.T. negative—in other words, to the cathode. This will probably put things in order right away. Perhaps, though, your L.T. winding hasn't got a centre tap. Well, if it hasn't, try first one side of it and then the other, connected to H.T. You may find one side noisy and the other quiet. If there *is* a quiet side, you're all right.

If there isn't, you'll have to make an artificial centre-tap with one of the centre-tapped resistances that you can buy for the purpose. Our friends over the way call them "humdingers"—or used to before that term became applied to all sorts of other gadgets. A resistance of about 35 ohms with either a fixed centre tap or a slider will do the trick.

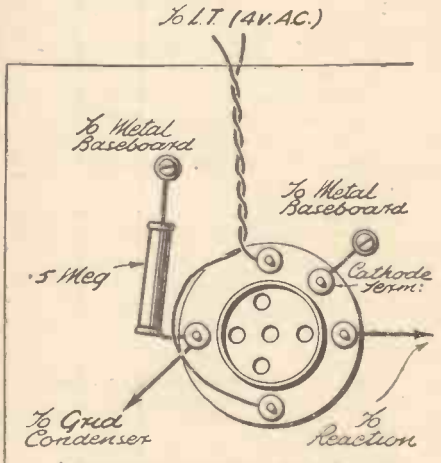
If that doesn't, you're distinctly unlucky and had better try shielded wire for the connections from your valve holder to the transformer. Incidentally, these connections should *not* be yards long—but at the same time you shouldn't have the mains transformer stuck right in among the other parts of your set.

Concerning an L.F. Stage

These remarks apply only to a detector stage. An L.F. stage is a slightly different proposition, as I will show next week, because when you do away with accumulator L.T. it's only rational to do away with battery grid bias as well, and you can easily provide automatic bias with an indirectly heated valve.

Other points to watch in the detector stage—treat your cathode terminal with just as much care as you previously treated L.T. negative—which is to say, if you took any leads *directly* to L.T. negative before, instead of on to the earthed baseboard, take them now, direct, to the cathode.

Just by the way, don't switch on and get alarmed because nothing happens—the indirectly heated valve takes some little time to warm up. An obvious point, but one that you might forget completely, being strange to it.



Showing the connections for an indirectly heated mains valve.

Your grid leak may profitably be reduced from its previous valve to something considerably less. If you use 2 megohms with an indirectly heated valve, I shouldn't be surprised to learn that you were somewhat worried by residual hum. Come down to about ·5 megohms.

Incidentally, although such a low value as ·5 megohm may give you poor reaction control with a battery valve, you are almost certain to find it perfect with the mains variety. This, at any rate, has always been my experience.

Play around with your receiver, using just mains L.T. and not bothering about the H.T. until you are thoroughly satisfied with results. You will find that your results are considerably better for the same number of valves, particularly if the set is a single-valver. I used to be astounded at the difference between one mains valve and one battery valve.

As soon as we have settled the conversion of H.F. and L.F. stages, we will get on to the H.T. aspect of things.

ON THE SHORT WAVES—Page 2.

POINTS from the POST-BAG

W. L. S. Replies to Correspondents

J. W. M. (Gainsborough) wants to get in touch with a short-wave society or club in that part of the world, but as he doesn't give me his full address I can't very well ask anyone else to write to him. But if the secretary of a local club will write to me I will publish particulars in these columns.

J. W. M. has built a single-valver from one of my layout diagrams, and finds it very good. He remarks that it doesn't seem to work at all with 120 volts H.T., but it's good with 40 and better still with 30. That, by the way, will probably serve as a hint to a good many people who wonder why their single-valvers aren't all that they should be.

G. W. G. (Ipswich) thinks he's built the perfect set at last. He uses an electron-coupled oscillator and plays with H.F. pentodes of various types, and manages to get 180° bandspread on all bands, and about 10° on the reaction control between "just oscillating" and "really oscillating." G. W. G. has always said that he gets more pleasure from building sets than from using them, so it seems rather a pity that such a set as this will probably have to go by the board to make room for something else before it has broken any records!

J. McL. (Paisley) has a "Simplex" Two with six-pin coils, and wants me to give particulars of coils for (*a*) the American police (*b*) the British police, and (*c*) aircraft. For the American mobile police you want a coil that goes down below 10 metres—and that means something like 1½ turns grid, 2 reaction, and 1½ or 2 for aerial coupling.

The British police transmissions are between 130 and 180 metres, and you will probably want 30 to 35 turns grid, 12 to 16 reaction, and 15 aerial coupling. As far as "aircraft" are concerned, I don't know whether this reader wants the commercial waveband (900 metres) or the service wavelengths, which are between 50 and 100 metres. For the latter one of the standard coils will serve. For 900 metres you will want such a terrific coil and such a big tuning condenser—compared with the little one in the set—that I don't think the proposition is worth while.

H. D. (Accrington) is trying to run a "Simplex" Three from an eliminator, but has considerable trouble with motor-boating. I am going to deal with all the trials and tribulations of those who get H.T. from the mains in a week or so, and must ask H.D. to be patient until then.

R. C. (Deal) asks whether he can do anything about the racket caused by electric light switches, in the hands of people next door, who take a delight in running up and down stairs about three or four times a minute, switching the light on and off every time! I suggest that the only cure is a tactful interview with the people next door, with a suggestion that new switches probably wouldn't make so much racket.

Judging from R.C.'s log, the switches don't upset his apple-cart completely. He seems to have heard plenty of amateur band stuff from all continents.

L. M. (Clapham Common) wants to build this "Simplex" Three that he's heard such a lot about, but doesn't know where it comes from, being a new reader! He will find all about it in the issue of May 1st.

J. M. (Sherborne) is fed up to the teeth with the general "mush" and "junk" on the 20- and 40-metre bands. I agree, J. M.—I'm just dying for 10 metres to come back to life, although I'm afraid that when it does it will be just about as bad as 20 metres has been this season. J. M. wants to know whether I still recommend the "U.S." Two for 10 metres and below. Yes—I do. It was designed for that work, and I think it will give most modern sets a run for their money.

J. M. passes on a certain amount of 5-metre news, most of which I have already gleaned from other sources—but I may not have mentioned all the items here. A harmonic of J N J (Tokyo) has been heard in the States on 5 metres; one British amateur has been heard by a W 2; and another Britisher has been heard in Latvia. I haven't yet got the full results of R. S. G. B.'s 5-metre Field Day (July 5th), but when they are all collated I will give a summary.

The table on this page gives you another summary of the best times at which to listen on the broadcast and amateur short-wave bands. It should hold good until about the end of August, by which time, we fervently hope, 10 metres will be showing signs of life again. Get your receivers all ready for the ultra-shorts—they're going to be "super" this autumn and winter.

J. O. H. (Carshalton), wants to know if any reader happens to have, stowed away in an old drawer, some of the Datagram cards that "P.W." issued in about 1935. If anyone can oblige, perhaps he will write to J. O. H.—Mr. J. O. Heymeson, 221, Welbeck Road, Carshalton, Surrey.

L. W. J. (Enfield), asks a query that frequently comes my way. He has an old-stager for short waves—an adaptor plus a home-made broadcast receiver. Will he do better to rebuild in the form of a straight receiver, using the same parts where possible? Yes, I definitely think he will, and recommend others to do the same.

BEST TIMES TO LISTEN

TIME (B. S. T.)	10–25 METRES	25–60 METRES
0000–0200	North America South America	North America South America
0200–0400	North America	North America
0400–0600	North America	North America
0600–0800	North America Australasia	Australasia
1000–1200	Australasia Europe	Europe
1200–1400	Europe	Europe
1400–1600	Asia	Europe Asia
1600–1800	Asia South Africa	Asia, South Africa, Europe
1800–2000	Asia North America Australasia	Australasia Europe
2000–2200	North America	North America
2200–2400	North America South America	North America South America

Short-Wave News

A FEW readers have written to ask me what all this "Cairo" talk is about, and how it affects the amateur transmitters. One or two have enclosed "scare" cuttings from local newspapers, one bearing the headline "Amateurs to Fight for Their Lives at Cairo Next Year."

Next year there is to be held in Cairo one of those international conferences at which all sorts of matters concerning the allocation of frequencies to the various services are discussed; and naturally the amateur is interested as much as any other user of the ether.

It is improbable that he will have to "fight for his life," but he will certainly have to justify his existence.

The R.S.G.B., representing amateur radio in Great Britain, has submitted a long statement to a G.P.O. sub-committee outlining the work of the amateurs in this country and giving reasons why certain of the amateur bands might profitably be increased in width. It seems unlikely that any increases will be granted but, with luck, the amateur bands may remain more or less as they are at present.

A check on commercial activity, taken on frequency-bands adjacent to the amateur 14-mc. and 7-mc. (20-metre and 40-metre) bands has revealed that although 373 commercial stations are registered as using these frequencies, only 66 appear to be doing so. Thus, right next to the overcrowded amateur bands, are commercial bands with very few stations occupying them. This may be a strong point in favour of a slight widening of the amateur bands—but, unfortunately, the Powers-that-be in many other countries do not think so highly of the amateurs as does our own G.P.O.

Italy, for instance, wants to reduce the 40-metre and 20-metre bands to about a third of their present width. Japan wants to limit all amateurs to 50 watts. Finland, Norway and Sweden want to exclude amateurs from 160 metres and from part of the 80-metre band.

With all these suggestions it seems probable that if one or two countries suggest an *extension* of the amateur bands they may be allowed to remain as they are.

I might suggest that if *that* happens it is up to the amateurs themselves—preferably by brute-force methods—to clear up the appalling mess into which some of the bands are getting at present. But that is definitely something that must be done by the national radio societies, and they can only start to do that if pirates are wiped out completely.

It is a big problem, and a very important one—for the amateur. Even the keen receiving man can help, if he values the amateur movement at all.

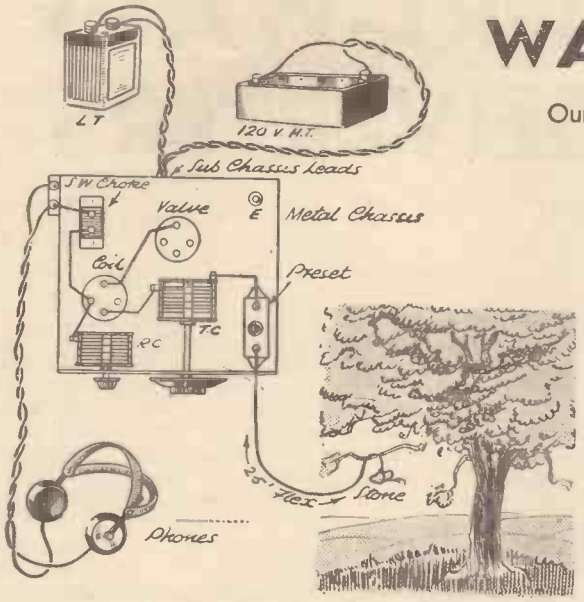
W. L. S.

MY SHORT-WAVE ADVENTURES

By L. CHESTER

WAYNE AT ONE-TREE HILL

Our contributor gets some remarkably good results in the open with the simplest of portable sets



Showing how the components of the receiver were arranged and also how an aerial was provided with the aid of a stone on the end of a length of flex.

WITH the sun so high in the sky—and, for a change, actually shining—I felt the urge to be out and about. Thoughts turned to portables—and I wondered what could be done in the short-wave line.

My first thought was: "Well, a frame aerial is ruled out, unless one is prepared for a far bigger set than I can build." The alternative being, of course, a temporary slung-in-the-trees affair, hooked on to the aerial terminal of the set.

I wondered how small a set would give results with such an aerial on short waves. So I spent an hour or two in my workroom knocking up a one-valver. Having, as it were, standardised on a metal chassis, I turned another 16 in. by 8-in. metal panel into the shape of chassis you are already familiar with in these articles.

I then drew out the simplest possible one-valve short-wave circuit I know—and you see this as Fig. 1. The aerial is capacity-coupled through a ·0001-mfd. pre-set to the grid winding of a four-pin coil. The reaction is (bows to "W. L. S.") series-fed, the reaction winding being in series with the short-wave choke and phones.

Values of grid condenser—·0001 mfd., and grid leak, 5 megohms—are the result of a certain amount of trial-and-error work that stands me in good stead nowadays. And that's about all. The reaction condenser is of course, the usual ·0002 mfd.

Laying-out the Components

One begins to get quite expert at laying out the components for a simple short-waver. The ·00016-mfd. Polar short-wave tuning condenser was fitted on the right of the metal panel, the reaction on the left. Behind the panel on the baseplate I grouped the valve holders for the detector valve and the four-pin coil, with the choke in a handy position on the left and a terminal strip nearby for the phones.

Actually, I doubt if a metal chassis construction is justified for such a set—not, at least, in terms of cleaning up the lay-out or even the wiring. But I'll return to that matter later. One grouse—these short-wave valve holders are deuced fragile when it comes to tightening down with bolts and nuts, aren't they? I have split three already!

The valve pin sockets work loose, too, and the only way I can get valves and coils to fit properly is to insert them first and tighten up the under nuts afterwards. Usually, one finds the under nut loose when the holder has already been screwed down; but that's sheer carelessness, I suppose.

On a rough try out indoors the one-valver behaved perfectly. The real advantage of the metal chassis was then apparent. Beautifully stable control all round the scale, as well as a generally "lively" feel.

Choosing a High Spot

The time seemed ripe to be on my way, so I packed the little set into the car, together with batteries, phones, a few tools in case the whole thing collapsed en route, a log book—and 25 feet of flexible wire for an aerial. I decided to do without an earth, having found on the bench test that quite strong signals could be heard without one.

To give the set a chance, I drove down into Kent and climbed up to a National Trust beauty spot known as One-Tree Hill, a few miles south of Sevenoaks, where I remembered one looked down on the Weald from what appeared to be a great height.

Fortunately, no one else had parked a car in the space reserved for week-end trippers—so I had the place to myself. I picked up a chunk of granite (now preserved in my museum!) and tied the end of the flex to it. I threw the stone over the branch of a tree—and that was my short-wave aerial.

Inside the car, I connected up my batteries and phones, hooked on the free end of the flex—and listened. It was obvious that the spot was really good for reception, for at once I heard dozens of quite loud "chirps."

Using the 22- to 47-metre coil, I found Zeesen at 94 degrees at a good R7, really worth listening to. A lot more carriers and then, down at 65 degrees, Rome burst in at R5. What pleased me was the way these "locals" could be held without a lot of fiddling with the reaction. They were rock steady.

I heard several amateurs at the top end of the scale—and then, as it was early afternoon, I thought I would try the 12- to 26-metre coil, seeing that this tunes the so-called "daylight band." Again a sense of liveliness—and this time a signal that really did give me a kick.

Reception From America

Tuning slowly near the lower part of the scale, I stopped at 56 degrees because I heard quite a healthy carrier. Slacking off reaction, I heard the magic phrase: "This is the Columbia Broadcasting System."

And so it was. Wayne, New Jersey, through W 2 X E on 16·89 metres. At exactly 2·45 p.m. I heard the latest bulletin from the Press Radio Bureau, telling of grave developments in the steel strikes "over there." Strength was about R4, quite remarkable for a one-valver using only 25 feet of flex slung up into a tree.

At least, I think it remarkable that one should be able, with such elementary equipment, to sit in the sunshine on a Kentish hill and hear news from a distance of 3,000 miles.

This little "adventure" seems to me to point to the entire practicability of headphone portables on short waves, always assuming one is prepared to sling up some kind of aerial. But the beauty of the short waves seems to be that quite a modest length of wire will serve the purpose.

THE SIMPLEST POSSIBLE

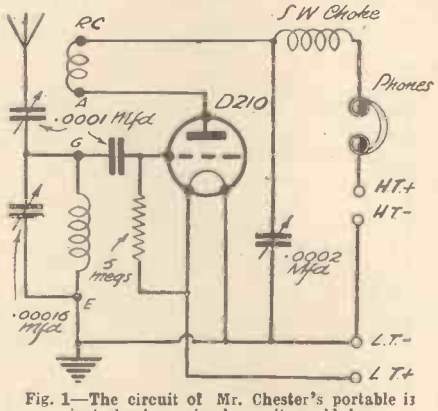


Fig. 1—The circuit of Mr. Chester's portable is just about as simple as it could be.

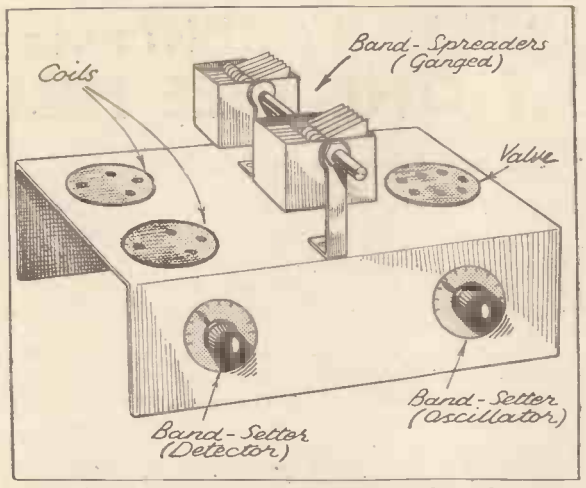
No Cabinet

Of course, I have made no attempt to encompass my set, batteries and phones in a portable cabinet. But obviously there is nothing—except my ham-handedness at woodwork—to prevent that being done. And providing one selects a reasonably good spot—as one so easily can in a car—the chances of good DX are bright indeed.

When I come to think of it, I have a two-valver (detector and resistance-capacity coupled pentode output) built up on the same size chassis as this one-valver. The moral being that while you are building a portable one you might just as well get a little more punch and build a portable two.

After all, it is the batteries that take up the space, not the set itself. I found, by

(*Please turn to page* 477.)



A convenient method of arranging a ganged band-spreading condenser and separate band-setters.

SHORT-WAVE CONVERTERS

PRACTICAL HINTS FOR THE EXPERIMENTER

By Howard Barry

SINCE I have been struggling for the last two days with a short-wave converter that would do everything except convert, it occurred to me that I might pass on some of my troubles and their solutions to readers. I also have an accumulation of random thoughts on the subject of converters (quite apart from those more recent ones, which are *not* printable) which I should be glad to scatter upon the receptive air.

There's nothing quite so disheartening as the combination of a good short-wave converter and a broadcast receiver with a rotten H.F. side, and that is the combination that I came up against recently. Having promised faithfully that I would get something out of the beast, or die in the attempt, I had to put in most of my work on improving the broadcast receiver. It was either that or the addition of an external screened-grid stage between it and the converter.

Using a Triode-Hexode

Although many readers will be extremely indignant with me for saying so, I simply *must* say, at this juncture, that the autodyne converter is a nasty piece of work, as a general rule. Second-channel interference, of course, cannot be guarded against in any way at all; in other respects it's not at all bad, and efficiency is higher than you would imagine it to be, considering that the detector is 450 kc. or so away from the signal-frequency all the time.

But a modern converter using a triode-hexode and two separate tuned circuits is vastly better, although one or two acquaintances of mine don't seem to have had the luck with such arrangements that they managed to get with the much-maligned autodyne.

A triode-hexode seems to be the ideal valve for the job. You have a straightforward screened-grid detector, a separate oscillator triode and electronic "mixing," which could hardly be improved. Many people swear by two separate valves for the job, but I have always found the triode-hexode excellent.

One of the troubles that I have been up against is "pulling," which *should* be almost entirely absent with this type of valve. By "pulling" I mean that nasty effect by which the tuning of the detector upsets the oscillator setting. You beat up against a signal with the oscillator, find the detector not quite in tune, put it in tune and the signal disappears, because the oscillator has been "pulled" off frequency.

If you introduce a small amount of damping into the detector-grid circuit this effect disappears, but you lose a bit of selectivity. In other words, if you loosen off your aerial coupling to get high selectivity, the circuit's resonance curve becomes so sharp that this pulling business starts.

Remedy: don't use loose coupling! That sounds funny, I know, but it's inevitable. If you want high selectivity, you must get it by putting another stage in front. There's a limit to the selectivity you can get from a detector-oscillator only, and it doesn't take you long to get to that limit, either.

With a screened-grid stage in front of it, and parallel-fed tuned-grid coupling from the S.G. valve to the detector grid of the hexode, you will have just enough damping introduced into the latter circuit to stop any serious pulling.

Alternatively, you may tune the input to the screened-grid valve, and use *untuned* coupling between this and the triode-hexode. This, of course, won't give you any increase in selectivity, but will definitely cure all suggestion of interaction between detector and oscillator tuning, since you now have two complete valves in between the two tuned circuits.

Of course, if your tuned circuits are ganged together, you'll never know whether one of them is "pulling" or not. It simply won't worry you if it is. Talking of this ganging, too, another problem crops up. If you want to use band-spreading, that seems to mean two complete sets of ganged condensers, which makes the set a bit unwieldy, not to say costly.

Using Separate Band-setters

Why not settle down to the expedient of having your band-spreaders ganged, but leaving the band-setters separate? It works very well in practice, especially as one of the band-setters—the detector—will not be particularly critical.

One of the sketches shows a convenient way of doing it. It is useful both from the point of view of short wiring and for keeping the lay-out down to a reasonable size. The band-spreaders are mounted above the chassis and ganged, while the band-setters are left down below, one on each side of the main control.

They need not be fitted up with full-size slow-motion dials, but those little indicators that are fitted to slow-motion reaction condensers are admirable. So long as you have a scale that is marked in such a way that you know just where your setting should be for each band, that's all you need worry about.

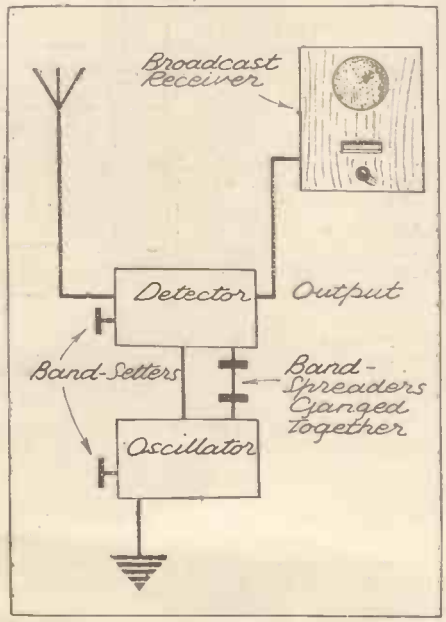
When you want to settle down on any particular band, all that you need do is to set the oscillator band-setter at some pre-arranged figure which you will have found out by experience. The detector band-setter will simply be set to the figure which gives a marked increase in signal strength, so that there is not even any need to remember where this one has to be set for each band. If the frequency-changer is working perfectly, it should act simply as a volume control, and should not pull the frequency of the signal all over the place.

Ideal S.W. Reception

If you have a tuned H.F. stage in front, the business becomes a bit complicated with three ganged band-spreaders and three separate band-setters; but you should have a jolly nice outfit to recompense you for your trouble when you have got it going properly.

Such a converter in front of a broadcast set with a nice H.F. end, a really good L.F. amplifier and A.V.C., should give you real Rolls-Royce short-wave reception without tears.

GIVES EXCELLENT RESULTS



The short-wave converter is connected between the aerial and the existing broadcast receiver, as shown. The band-setters are roughly adjusted, and tuning is carried out on the ganged band-spreader. A converter, such as this, when joined to a good broadcast set, will give first-class short-wave reception.

WHERE DITTIES LODGE WITH SYMPHONIES

How the B.B.C. Music Library has Grown—It Began on the Top of a Kitchen Range

TWO men—old musical friends—met in a London street towards the end of 1922.

"I hear they are looking for a pianist to do some instrumental tests in connection with this new wireless idea . . ."

That was what one of the men, S. Kneale Kelly, the conductor, said to the other, Frank Hook, who had been playing pianos since he was a boy.

So it came about that Mr. Hook made his way to the studio of the old British Broadcasting Company, on the seventh floor of a building in the Strand, and got the job.

The Central Music Library

To-day he is in charge of the central Music Library of the B.B.C. at Broadcasting House, the largest working library of its kind in the world, on whose serried shelves humble ditties and sweet lullabies lodge with great symphonic works.

How that Library has grown under his direction, and the important work that it does, is a story, with its inevitable statistics best told by Mr. Hook himself.

"In the very early days," he told me, "I remember how we started collecting pieces of music, buying a bit and borrowing a bit from some good friends. Later, the Company started making a certain allowance for the provision of music, and we started buying from various publishers in London—items mainly required for the production of light and airy musical programmes of a type played by very small orchestral combinations. Engineers and the programme people took nearly all the available space, and we had the dickens of a job to find a place to keep our music once we had got it. The only thing to do was to pile it on top of an old kitchen range which, fortunately, had long ceased to fulfil its original purpose. But even after six months we had no more than 500 musical items.

Some Figures

"At the end of 1923 I was still playing in the Wireless Orchestra and collecting music in my spare time with the help of a secretary.

"To give you some idea of the way in which the present Library has grown, let me bring you right up to date and give you some figures. I think you will agree that they are pretty stupendous.

"From two the Library staff has multiplied to thirty-four—and everyone has plenty to do. For instance, we now have 20,000 items for orchestra alone—by items I mean titles. They, of course, range from entr'actes playable by three or four people to large symphonic works which may be scored for eighty or more players. It is part of our job to supply the Regions with the music that they require, and in order to cope with their demands—distance and time are important factors—we hold duplicate and even triplicate sets of items; 6,000 works are duplicated, 1,800 are here in triplicate. Our stock of vocal scores is not far short of 200,000, comprising oratorios, cantatas, operas, musical comedies, and so on.

"If the B.B.C. Choral Society are doing a big work, we have to provide them with 320 new scores; that may convey to you an impression of the rate at which the Music Library is still growing.

"The B.B.C. Military Band has its own Library at Maida Vale, and that, too, is part of my charge. To-day it consists of something like 3,000 items.

"In the song section here there are something like 25,000 titles—songs ranging from the throaty pieces for roaring baritones to the type of thing that crooners seem to like.

"Nowadays we make quite a big use of air mail for obtaining material from the Continent. Only recently we have also used it to take as swiftly as possible to Prague a certain work which is being broadcast later in the year, so that the guest conductor may study it at his leisure.

"By comparison, again, let me mention how we used to manage in the old days—when fourteen broadcasting stations in various parts of the country all wanted music, had none of their own and had to have what we could give them. We started a scheme of 'circulation hampers.' We had twenty-eight of them, and into each we put a good selection of stuff and sent them on a tour of the country, going from station to station. Of course, they were at the mercy of transport systems the whole time, but they seldom went astray, and the scheme worked quite well until we were able to tell the various stations that the Library was now big enough to enable us to meet the periodical requests for music which we wished them to make.

Preparing the Parts

"The work of supplying orchestral music for performance in London is now divided into three sections—preparation, performance and ultimate distribution. When the substantiated programme of items to be performed reaches us, the necessary music is obtained either from the Library or, if necessary, from an outside source—even from the composer. Master copies of each group of string instruments are then passed to leading players of each group for the insertion of bowing and expression marks.

These markings are later transferred to the remainder of the groups of string parts. This is a job to be done even as much as a month before the first rehearsal, by which time all the necessary material has been placed in order in covers ready to be put on the orchestral stands. The conductor usually gets his score some time before anyone else. Some member of the Music Library personnel always attends rehearsals and performances ready to deal with any question that should arise at any time. After the performance, all the covers are collected and brought back to the Music Library, the individual items 'dissected' and distributed according to the sources of supply.

Distribution

"About thirty programmes per week are dealt with by a staff of seven orchestral librarians, who also handle the distribution after performance of the hundreds of vocal scores and chorus parts which are used from time to time in connection with large choral works, musical comedies, and other productions.

"Maintenance and repair work is an important phase of our work in the Music Library. It keeps four members of the staff fully occupied. We have to cope not only with normal wear and tear, but with bindings and classes of paper that were never very good.

"There is a lot more that I could tell you about the Music Library. One thing I must not forget: our main stock is carried in the tower of Broadcasting House, and as it weighs something like a hundred tons you can understand why it was that the floors were specially strengthened.

RADIO FAVOURITES ON THE SCREEN

J. Hubert Leslie and Edith Sharpe, who have appeared in many radio plays, in a scene from "Old Mother Riley," a Butcher-Hope Bell film produced at Cricklewood Studios under the direction of Oswald Mitchell.

FROM OUR READERS

A STORY IN VERSE FROM AN S.W. FAN

A spot of good rhyming by one of our followers which makes particularly interesting reading

The Editor, POPULAR WIRELESS.

Although my wife's a Short-Wave Fan detester
And says a wireless widow's life is bleak,
I've followed with devotion, Mr. Chester,
The friendly hints you offered week by week.
I've paid my best respects to my "connections,"
Knowing H.T. with danger may be fraught,
Vowing with many humble genuflexions
That with a burnt-out valve I'd ne'er be caught.

A chassis and a panel I have fashioned
With petrol tins retrieved from neighb'ring tips,
For pocket-money, nowadays, is rationed,
Since British men are barred from British ships
But all my careful work and cute devices
Have failed to yield a single note to-day;
No sound emerged—not even "Fat Stock Prices"—
And that is why I now sit down to say;

If you can make this set bring in the stations
Which short-wave fans oft boast of in the Press,
If you can calm my critical relations
Who swear the thing's a sanguinary mess,
If you can put this set in better humour
And make it bring sweet music flowing in,
If you can tell me where I've made a bloomer,
You're a smarter man than I am, Gunga Din.

TAILPIECE:

I've solved the problem; spare me now your flattery.
I hadn't hitched the durned thing to the battery!!!

W. E. MIDDLETON.
1, Totnes Road, Chorlton-cum-Hardy, Manchester, 21.

THE HAPPY STATION

The Editor, "Popular Wireless."

Dear Sir,—I wonder how many of your readers have a favourite station?

My own favourite is Huizen PCJ, that grand old short-waver which first came on the air in March, 1927, and, under the title of "The Happy Station," has been spreading happiness and good feeling ever since.

After listening to the dictator-like tones and propaganda from Europe, the cold and formal tones of our own B.B.C. announcers, and the snappy wisecracking of the U.S.A., it is like a refreshing drink to sit back in your arm-chair and hear that friendly and cheerful voice announce, "This is PCJ, the happy station." You can then be sure of hearing a programme composed only of what is happy and cheerful.

Peace, Cheer and Jollity—this is PCJ, the happy station. For ten years it has lived up to its slogan, so good luck, PCJ, and may you carry on the good work for many years to come; and I am sure that eventually your cheerful and friendly influence will penetrate, like your programmes, to every corner of the earth.

PETER B. CREEGAN.
67, Powys Avenue, Town Hill, Swansea, Glam.

FROM A READER IN INDIA

The Editor, POPULAR WIRELESS.

Dear Sir,—I have been a regular reader of your excellent journal for the past eighteen months or so, and have derived great pleasure and knowledge from its pages. To say that it is interesting is putting it very mildly, for its pages, from cover to cover, are packed with interest and knowledge for the old hand and the absolute novice, like myself.

I wonder if you ever receive letters from your numerous readers in this part of our little globe? I haven't come across any in your paper; hence, so far, I have been very reluctant to write.

You very recently ran a most interesting S.W. competition, and I feel I must let you know what I consider a very interesting half-hour I spent one evening with my set. Here it is:

At about 6 p.m. (I.S.T.) on February 17th last I had my set "on," and was seated with my back to it, talking to my wife, the while slowly rotating the station dial knob. Suddenly there was a burst of music at tremendous volume. I switched round "ek Dum," i.e. at once, and found that I had bumped into a station coming in on 23 metres. Not knowing whom I was listening to, I was greatly intrigued and waited patiently for the announcer to speak. He did so in a minute or so, and a voice came over the ether telling listeners that they were listening to the Government Experimental Station at Rangoon, Burma, operating on a wavelength of 23·31 metres.

The announcer then told us that after a couple of recorded items we would hear a talk given by a telephone subscriber situated 15 miles away from the studio, and asked us to write in and give our impressions, making comparisons between the speech by telephone and direct speech into the "mike." In both instances reception was quite good, but was interfered with by Morse. However, I wrote in and do hope my letter was of some use. I might mention that this station is now operating on the 49-metre band, and is very severely interfered with by Morse, as are all other stations using this band.

GERMAN POLICE AT WORK

One of the radio equipped cars used by the German police. Note the telescopic aerial which may be extended if desired.

WIN A GUINEA!

Every week we pay one guinea for the best letter, in the Editor's opinion, from a reader on any radio topic. There's no reason why you should not win one. So why not have a shot?

Radio experiences, faults you have found and remedied, programme opinions; these are all permissible topics. If you enjoy reading what others have to say, why shouldn't they find interest in some words of yours?

Anyway, give us the opportunity to decide whether or not that letter you have in mind merits printing. It may even earn a guinea!

The winner of the guinea this week is Mr. W. E. Middleton.

It is extremely difficult to pick out any particular feature of "P.W." for praise, as ALL, without exception, are, in my humble opinion, "top-hole." However, "The Dial Revolves" and "Points From the Post-bag" want beating.

I must wish you, your staff and all who help to make "P.W." so popular the very best of luck in the future. "Vive la Popular Wireless!"

H. STANLEY EARLE.
Block No. 12, Jhajha, E. I. Railway, India.

THE G.P.O. MAGICIAN

The Editor, "Popular Wireless."

Dear Sir,—When I changed my battery set for an up-to-date A.C. model, I had a very curious experience. The first afternoon I rigged up the set I switched on and tuned to an organ recital. Imagine myself thoroughly disgusted when I heard a voice in the background. In vain I endeavoured to rid myself of this "gate-crasher" who insisted on occupying the whole band.

After a few moments came a distinct "click," and the voice vanished. This occurred three times. When I enlisted the aid of a P.O. engineer, he asked me if my neighbour had a telephone. I told him he had, whereupon he said it was a simple matter to rectify, although he explained nothing. He paid a visit to next door, and an embarrassing situation is at an end.

WILLIAM J. CROFT.
Member of V.A.C. Club and "18" Club.
Pendine Villa, 53, Richmond Street, Totterdown, Bristol 4.

OSCILLATING CRYSTALS

The Editor, POPULAR WIRELESS.

Dear Sir,—My earliest acquaintance with POPULAR WIRELESS was in 1922, when I wrote asking for the circuit of a crystal set, and this duly arrived on a small sheet of blue-headed paper, nicely drawn in ink and accompanied by a courteous letter. I was at that time trying to coax signals out of an ex-Army trench set—a cumbersome affair, lots bigger than the present-day portable transmitter—and I remember that it was tuned by small sliding drawers which contained basket coils of about 12-gauge wire embedded in paraffin wax (shades of low loss)!

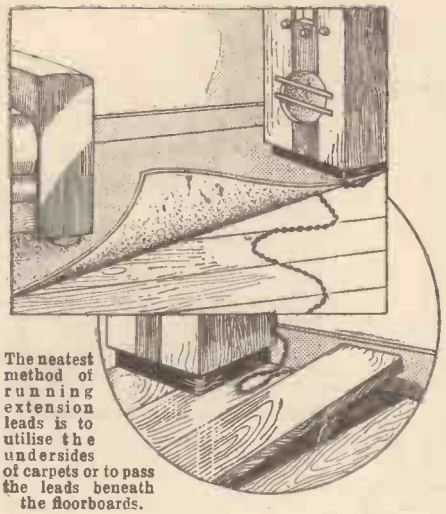
However, I soon graduated to a nice single-valve set, using one of those nice Dutch valves that went blue in the face if more than 25 volts were applied to the anode.

I also used the V24 valves, which, if my memory serves me, used to eat a whole amp. of L.T. at 6 volts each.

(*Please turn to page* 475.)

PRACTICAL POINTERS

HINTS AND TIPS FOR CONSTRUCTORS



The neatest method of running extension leads is to utilise the undersides of carpets or to pass the leads beneath the floorboards.

RUNNING EXTENSION LEADS

EXTENSION speakers are very popular these days, and rightly so, but one of the difficulties is that of running the necessary wires from the set to the room in which the extra speaker is placed. There are various methods of running these leads, and generally speaking you will find it better all round to keep them as near floor level as possible, for there are greater facilities for concealment down there.

Don't be misled by the inviting picture rails, if you have these running round the room. They are fine for getting the wires across the room, but when you get to the doorway or to the point where you wish to bring the leads down again, then you will find it most difficult to hide the evidences of your handiwork.

Under the Floorboards

No, stick to the floor, and when there is no convenient linoleum or carpeting, don't be put off by that, for floorboards are by no means difficult to raise.

If you have noted where the gas, water and electric light wires have been run, you will probably find that the way has been nicely prepared for you, for plumbers and gas-men nearly always only lightly nail those boards which they might at any time have to raise in order to execute repairs.

The problem of getting the leads from one room to another is easily solved in this manner in most houses. But keep your wires as far away from the pipes and power lines as you can.

Sometimes it is rather difficult to get the wires from one floor to another, and it is here that stairways come in very useful.

Another Way Out

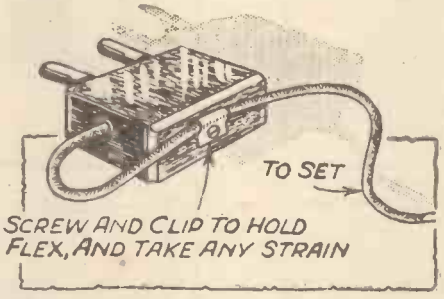
Generally, the undersides of stairs are quite accessible from cupboards or a cellar, but if they are not, then it may be possible to take the leads up or down under the material which covers the stairs. However, you must not forget to see that they are not uncavalierly treated when the carpet or oilcloth comes up for cleaning operations. A little thought given to wiring problems nearly always results in a satisfactory solution.

A MAINS PLUG TIP

VERY often the flex lead to an old mains plug of the wooden type gets strained accidentally and bad contact is caused by the fact that any such "pull" is taken up by the connections to the plug's metal contacts.

A simple modification is shown in sketch, where a wood screw and ordinary insulating fastener hold the flex securely on the plug, allowing the actual connecting-piece to be slack where it passes inside the plug.

If an accidental pull is given by someone tripping over the flex, or any similar mischance, the lead holds firmly, and no strain at all is imposed on the actual internal connections.



Here is a simple method of curing "pulled out" connections with old-fashioned plugs.

BRING YOUR SET UP TO DATE

THERE have been enormous improvements made in radio during the past year or two and owners of old sets might well look at them very critically.

But in these days there is a decreasing number who can afford to scrap a whole set in favour of an entirely new outfit.

However, it may be possible to improve a set a very great deal merely by exchanging certain of its parts for more modern ones.

Probably the greatest progress had been made in loudspeakers. Many three-or-four-year-old sets would sound almost as good as 1937 models if they were fitted with new speakers.

Minor Modifications

When the loudspeaker is separate it is an easy matter to make the replacement. If it is built into the set it may be difficult to replace it without serious constructional alterations.

This is by no means always the case, and it is frequently possible to make the change with only minor structural modifications so long as the new speaker is carefully chosen with this end in view.

But there is no reason why the built-in loudspeaker should not be cut out of circuit and leads taken to an external instrument. The only objections are purely aesthetic.

Modern valves are vastly superior to their predecessors, although it is not always possible easily to use them in old sets.

Special Adjustments

A pentode needs special circuit adjustments before it will act as a satisfactory substitute for an ordinary power output valve.

But a time-worn detector can safely be changed, and probably with very great advantage indeed.

Some of the older components used in their proper condition will be every bit as good as modern alternatives.

The shielding applied to present-day coils does not improve them as coils. It is a development of design intended to make them more readily adaptable to the high-efficiency circuit arrangements in compact layouts.

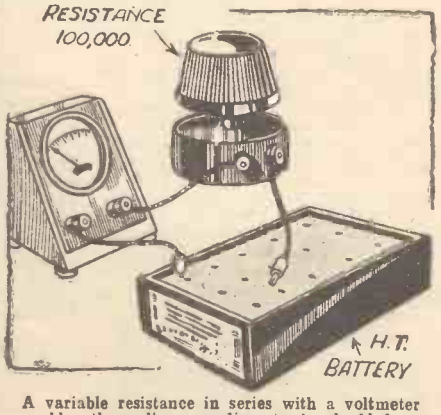
Variable condensers have improved, especially in regard to their dials. And if old ones are scrapped in their favour station-searching will probably be greatly facilitated, although we do not guarantee that, as the listener may have got so conversant with the handling of his old ones that he can do all that could be done with condensers of superior mechanical design.

On the other hand, it is difficult to see how anyone, whatever his skill, could accomplish feats of DX with tuning controls as inefficient as some that were widely marketed a few years ago. Serious slip and backlash negative the skill of the most expert operators.

A DOUBLE-RANGE VOLTMETER

THE range of a voltmeter can easily be doubled by joining a resistance in series with it, but, of course, the resistance must bear a certain definite relationship in value to the resistance of the voltmeter. It is frequently difficult to calculate the correct size of resistance mathematically, but the correct value can very simply be arrived at practically.

A variable resistance should be used for the purpose having a maximum value of 100,000 ohms. This is wired in series with the voltmeter, and should have a switch connected across it, so that the resistance can in effect be cut out when necessary.



A variable resistance in series with a voltmeter enables the voltage reading to be doubled or even trebled.

Then a battery, preferably new, should be joined up to the voltmeter and its series resistance, and in the first instance the resistance should be shorted by the switch. A convenient voltage for the required purpose would be 50, and this value should, of course, be shown on the voltmeter.

(*Continued overleaf.*)

PRACTICAL POINTERS

(Continued from previous page.)

Switch in the resistance, and then turn the knob so that the voltage shown on the meter drops to 25. Thus, the reading in this case being halved, it follows that any reading now obtained on the meter is half the actual voltage. The range of the voltmeter is thus doubled.

When the resistance is shorted it will give normal scale readings, of course.

By taking 60 volts in the first place and adjusting the resistance until the reading is 20, the range will be trebled. Any reading obtained in this case has to be multiplied by three.

CUTTING OUT NOISES

THE six numbered illustrations which appear on this page show the manner in which an expert would go about the solution of the particular problem.

He first hears a crackling, "zizzing" noise breaking through and tending almost to drown the programme. But his first thought is not: "Now what's gone wrong with my set?"

It might have nothing to do with the set at all. Therefore, he tunes-in another station in order to ascertain if the interference is general.

Transmission at Fault?

If he had found that all the other programmes available were quite normal, then he would conclude that the transmission was at fault, and that there was nothing to be done about it except either grin and bear it or listen to another station.

However, in our "story" the noises are heard just as loudly when the tuning is changed. So he takes the aerial off. The noises are still as loud, although the broadcasting has all but disappeared.

He has now checked the above point and also derived the information that it isn't an aerial pick-up of some very broadly tuned interference. (Being an experienced radio man he knows that atmospheric disturbances are liable to cause all kinds of queer ether sounds.)

So he now makes sure that the mains connection between his mains set and the power point is in good order. Perhaps he even hopes that the interference is a warning that it isn't, for a faulty mains connection is not likely to be difficult to put right.

He tries the power plug to see that it is fitting snugly and making good contact, as he doubtless has had experience of mains plugs being accidentally kicked or pulled loose from their sockets.

Before he goes any further he will switch off and withdraw the plug. He is then free to check his connections and ascertain whether or not they are good and tight.

Wire is apt to crystallise, get brittle and fracture after a time, and once one or two strands of a flexible lead break off, the connexion is almost certainly going to loosen.

Sparking and arcing may follow This would cause noises.

Having examined the lead at the plug end, our expert listener will quickly inspect it at the other end, although it is rarely that trouble is experienced there.

Then he will replace the plug and switch on again.

"Bridged Earth"

The reason why he next removes the earth lead is to make sure that there isn't what is sometimes called a "bridged earth."

This is caused by a leakage from the mains through some part of the set to the natural earth, i.e. a water-pipe or buried earth connection if such is used.

In passing it should be noted that a slight "bridged earth" will do no harm. It is very frequently encountered, and evinces itself in the form of a hum rather than as a crackle. Many sets which are otherwise rather noisy can be made quite silent if no ordinary earth is used.

Seldom are the reception results affected, especially in the case of D.C. sets, because the mains themselves will act as an earth.

Our expert eventually discovers that the interference is caused by a faulty electric light switch. There is an arcing due to a faulty contact.

The moral of this "story" is that a mains set is in effect a part of the domestic supply system and that faults in this may affect it considerably.

Battery Sets

Some of the troubles experienced are difficult to deal with. Switch clicks, for instance. Many listeners may have been puzzled and annoyed by these, particularly if they are flat-dwellers.

A faulty electric wire can create havoc with programme reception. Electric motors will at times make a terrible noise in the loudspeaker, but they can be silenced by connecting interference units across their brushes.

These units are quite inexpensive and are easy to instal.

But what about a battery set which suddenly starts to hum badly?

In most cases it will be found that this is due to a broken or faulty grid circuit. You can look first at the grid-bias batteries for this. An exhausted grid-bias battery or a bad G.B. connection will tend to send up the resistance of the appropriate grid circuit until it is in effect "open" and broken.

A mains unit may give perfectly satisfactory service on one set and yet "hum" severely with another.

Sometimes the choke or transformer happens to be of the "uncased" type. If this is the case a cure may generally be effected by tightening up the nuts on the bolts which hold the laminations.

STOPPING ACCUMULATOR SPRAYING

AN accumulator is liable to bubble and froth during and for a short period after charging, and it is the minute particles of acid which are thrown up by this activity which tend to get on to the terminals and cause corrosion.

A Little Oil

The fact that the cells are almost entirely enclosed does not prevent this happening, for so long as the vitally necessary vent-hole is there, acid vapour can result in a "creeping" of acid over the terminals.

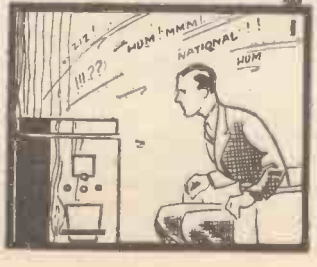
But the spraying and creeping can be reduced to negligible proportions by pouring some hard mineral oil, such as chemically pure paraffin, into each cell. There is a special oil known as "Blancol" which is actually made for the purpose. A layer of an eighth of an inch or so above the acid will suffice.

SLOW-MOTION DIALS

FOR ordinary listening it is not necessary to have a slow-motion dial with a very high ratio. The ratio indicates the number of times the knob will have to be turned for every complete 360 degrees rotation of the vanes.

In the case of a four-to-one ratio, four revolutions of the control knob would be needed. Actually, of course, the vanes can be turned only through 180 degrees.

Ratios of fifty to a hundred to one are needed only for short-wave reception, where it is almost essential to be able easily to make extremely fine adjustments of the tuning condensers. On the medium and long wavebands a four- or five-to-one ratio is quite big enough.

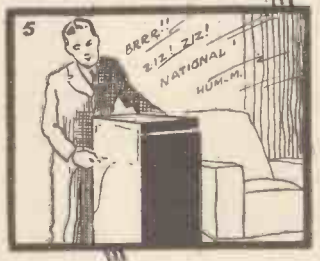


REGIONAL, TOO!

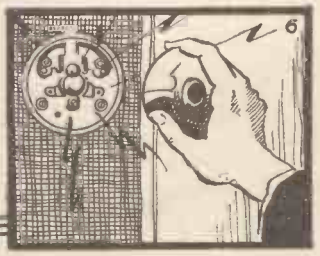
TRY AERIAL OFF

MAINS PLUG RIGHT?

TRY EARTH OFF



IT'S THAT SWITCH!



MARCONI—THE MAN AND HIS WIRELESS

CHAPTER IX—THE HERO OF THE HOUR

Public reaction to transatlantic wireless—Canada's aid to Marconi—The cables express a fear—Pupin applauds—Marconi is told his name will stand through the ages—An augury of future conquests—Comment from T. C. Martin—Sir Oliver Lodge praises Marconi—The inventor explains his system to the Canadians—Cables are warned against being short-sighted—Marconi as seen at St. John's—He discusses future plans—Honoured by American electrical experts—A toastmaster's introduction and Marconi's reply—A tribute by The New York Times*—Marconi praised as conservative scientist—Commercial possibilities outlined—Heaviside offers a new wireless theory—Thoughts Marconi carried back to England*

IT was easy to understand the public reaction. One had only to look back to 1858, when the first cable actually delivered a message. Many had to hear the signals themselves before they would believe. Others were not convinced even by affidavits of those who made it possible. If the popular imagination could not be fired with a direct link between the hemispheres how could wireless, an invisible thread of communication, incite faith and dispel all doubt in a short time, despite the fact that Edison, Bell, Morse and other notables of science had taught the world to be chary of disbelief?

Congratulations poured in on Marconi. He dined with Sir Cavendish Boyle, Governor of Newfoundland, prior to departure for Cape Spear to select a site for the erection of a pole 200 feet high, which he believed would give the best results possible under existing conditions.

A report from St. John's, on December 15th, 1901, stated: "On Tuesday the inventor proposes to have Governor Boyle, Premier Bond and other Colonial dignitaries examine his tests so that they may satisfy themselves of the absolute genuineness of the proceedings. There is much speculation here as to the practical possibilities of wireless telegraphy. Signor Marconi is satisfied from his previous experiments that great surprises are in store for the world. He has the warmest support in this colony, where he is generally admired owing to his achievements at so young an age."

Marconi returned from St. John's to Spear on December 16th and was served with legal documents from the solicitors of the Anglo-American Telegraph Company. The papers notified him that the company possessed a monopoly of the telegraph business within Newfoundland and its dependencies, and demanded that he cease his experiments and remove his apparatus forthwith else the company would apply to the Supreme Court for an injunction restraining further trials.

All was not sunshine. At Cape Spear the inventor experienced poor luck. The weather was rendered extremely unpleasant by fog, wind and a rainstorm, making it impossible for Marconi to decide upon a site for a new station. And while his hopes were being dashed by inclement weather, he received a report, which afterwards proved to be incorrect, that Edison discredited the announcement of signals having been received from Cornwall. He replied that the signals were received by himself; they were absolutely genuine.

"I fully believe that Marconi succeeded in signalling between the coasts of Newfoundland and Cornwall, England, by his system of wireless telegraphy," said Michael I. Pupin, Professor of Electrical Mechanics at Columbia University.[1] "According to the newspaper reports I have read, the signals were very faint, but that has little to do with it. The distance, which is about 1,800 miles between these two points, was overcome, and further development of the sending instruments is all that is required. . . . This new system, if it is adopted, will not affect the cables as far as I can see at the present time, for it must be understood that the cables are being perfected constantly. At the present time there are fourteen cables between Europe and America. . . . One point which is of great value and interest to the scientific world is that Marconi has proved conclusively that the curvature of the earth is no obstacle to wireless telegraphy. . . . Marconi deserves great credit for pushing this work so persistently and intelligently, and it is only to be regretted that there are so many so-called scientists and electricians who are trying to get around Marconi's patent, and thus deprive him and his people of the credit and benefits of the work to which they are fully entitled."

"If Marconi says that he has communicated across the seas I know of no reason," said Professor A. E. Dolbear of Tufts College, himself a wireless enthusiast, "why I should not fully believe that he had solved the problem."

Editorially, under the caption, "The Epoch-making Marconi," *The New York Times* on December 17th, said:

If Marconi succeeds in his experiments with intercontinental wireless telegraphy his name will stand through the ages among the very first of the world's great inventors.

The thing he is attempting to do would be almost transforming in its effect upon the social life, the business and political relations of the peoples of the earth. The animating spirit of modern invention is to overcome the obstacles of time and space, "to associate all the races of mankind," by bringing them nearer together. Commerce, of course, has done more than any other agency to make that association intimate and lasting.

The electric telegraph, in the form of ocean cables, was a great step in advance. The sending of messages without wires through natural media of communication will be a

(*Continued overleaf.*)

MARCONI'S KITE AERIAL

Courtesy Marconi's Wireless Tel. Co., Ltd.

A drawing of the kite-suspended aerial, by means of which the first transatlantic wireless signals were received by Marconi, at Signal Hill, Newfoundland, on December 12th, 1901.

[1] December 16, 1901.

MARCONI—THE MAN AND HIS WIRELESS—*Continued*

still longer and more wonderful advance, if it shall prove that the art can be perfected and made practicable up to the measure of present confident predictions.

Everything depends on that. The cables are too slow and too costly for these modern times. Professor Pupin in his comment upon Marconi's experiment says that "nobody doubts at the present time that the cable will soon be made from forty to fifty times as fast as it is at the present day."

If the capacity of ocean cables is not very soon increased by such electrical improvements as he has in mind the inventive genius of this age will be open to accusation of not keeping up with its urgent requirements. We understand that at twenty-five cents a word the fourteen Atlantic cables now in operation are fully occupied during the business hours of the day. That means that in this matter demand has outrun supply. It would be better for the world if communication between the countries that ocean divides could be much increased in volume through a saving of cost and time.

The initial success of Marconi appeals powerfully to the imagination. It will be the fervent hope of all intelligent men that wireless telegraphy will very soon prove to be not a mere "scientific toy," but a system for daily and common use. The men of science point out the obstacles. They have commonly been deemed insuperable. The first triumph is an augury of future conquests.

T. C. Martin, editor of *The Electrical World*, said:

I believed that Marconi would be successful, but did not anticipate it so soon. . . . I am sorry that Mr. Tesla, who has given the matter so much thought and experimentation, and to whose initiative so much of the work is due, should not also have been able to accomplish this wonderful feat.

I have talked with Professor Fessenden, who is now engaged on the subject for the United States Government, and with Dr. Kennelly, at one time an expert for Mr. Edison, and they agreed as to the feasibility and near possibility of the achievement.

Although Mr. Marconi is to be heartily congratulated on his magnificent results the idea is not to be jumped at that cables are any less useful than heretofore. So far as is known, there is no means of preventing successfully the interference of wireless signals, and until they become automatically selective it would mean that only one station on each side of the Atlantic, or even on each side of New York Bay, would engage in business. Even should this difficulty be overcome, as it doubtless will be, I find it hard to believe that it will be so entirely removed as to involve the complete supercession of cables.

Leaders in science the world over concurred on the remark:

"Marconi's creation, like that of the poet who gathers the words of other men in a perfect lyric, was none the less brilliant and original.

"The present is an epoch of astounding activity in applied science," said Sir Oliver Lodge. "Progress is a thing of months and weeks, almost days. The long lines of isolated ripples of past discovery seem blending into a mighty wave, on the crest of which one begins to discern some oncoming magnificent generalization.

"The suspense is becoming feverish, at times almost painful. One feels like a boy who has been long strumming on a silent keyboard of a deserted organ, into the chest of which an unseen power begins to blow a vivifying breath.

"Astonished, he now finds that the touch of the finger elicits a responsive note, and he hesitates, half-delighted, half-affrighted, lest he should be deafened by the chords which it seems he can now almost summon at his will."

Sir Oliver Lodge in his book "Talks About Wireless," commented:[2]

"When Signor Marconi succeeded in sending the letter 'S' by Morse signals from Cornwall to Newfoundland, it constituted an epoch in human history, on its physical side, and was an astonishing and remarkable feat."

Later in the same book he remarks:

"It is needless to emphasize the world-wide character of Mr. Marconi's subsequent developments; his discovery of the power of ether waves to curve around the earth to immense distances, his discovery also of the adverse effect of sunshine, and the more recent discovery that short waves can travel efficiently to the Antipodes."

Sir Cavendish Boyle, who had cabled reports on the achievement to King Edward, arranged a luncheon in honour of Marconi. Among those present were Premier Bond, the Cabinet Ministers and the heads of departments. The affair was practically a State function. In expressing his appreciation for the courtesies of the Dominion, Marconi said:

"If my system of wireless telegraphy can be commercially established between the different parts of the earth, in regard

SIR AMBROSE FLEMING

A photograph taken a few years ago of the great inventor of the valve who wrote the letter reproduced on the facing page.

to which I may state I have not the slightest doubt, it would bring about an enormous cheapening in the methods of communication at present existing.

"The system of submarine cables of to-day fulfils the demands of communication to a great extent. But the great cost of the cables themselves, and their heavy working expenses, cause the existing methods to be beyond the reach of a majority of the people inhabiting the various countries of the world. But could this new method be applied, I believe the cost of what we now call cabling to England might be reduced at least twenty fold. The present rate is twenty-five cents a word. I do not see why eventually, with the wireless system this cost should not be reduced to one cent a word or less."

Discussion everywhere centred around wireless versus the cables. A dispatch from London read:

The fall in the securities of cable companies which commenced with the announcement of the success of Marconi's experiments in having signals transmitted across the ocean by his wireless system of telegraphy has been continuous throughout the week.

"Marconi and the Anglo-American," was the title of an editorial in *The New York Times* on December 19th:

The more the incident of the proceedings of the Anglo-American Cable Company against Signor Marconi is considered, the more evident it becomes that the management of that company is in the hands of short-sighted, narrow-minded, unprogressive persons who are much in need of supplementing the Lord's Prayer with a petition to be taught to know their daily bread when they see it.

Pending an adjustment of the "disagreement," Signor Marconi has gone over to Nova Scotia, where he will continue his experiments. If he should find that he can transmit intelligible signals as well from there as from Newfoundland, and that the slightly greater distance does not complicate his system or increase its difficulties in operation whatever advantage has been supposed to reside in the Anglo-American's telegraph monopoly of Newfoundland will be at an end, thus destroying another highly prized asset of the company.

People have begun to think that the cagerness manifested by the cable companies to discredit Marconi and embarrass his experiments warrants a suspicion that the profits of the present tariff are more satisfactory that the representatives of these companies are desirous the public shall believe.

Marconi could have been helped in no better way than by recognizing his system as a dangerous competitor before he had ventured to make that claim for it himself.

On second thoughts that is the way Marconi reasoned. At first he was amazed at the warning, but as he reflected upon it he wondered, "Is this not evidence of the belief of practical men in the future commercial importance of wireless?"

For the ether to be a formidable competitor of land wires was not so easy since telegraph lines cost approximately $100 a mile, whereas the ocean cables cost $1,000 a mile, and require expensive steamers to repair and maintain them, so figured P. T. McGrath, editor of the *Evening Herald*, St. John's, Newfoundland.[3]

"A transatlantic cable represents an initial outlay of at least three million dollars, besides the cost of its maintenance," explained Mr. McGrath. "A Marconi station can be built for $60,000. Three of these bringing the two worlds into contact will cost only $180,000, while their maintenance should be insignificant. What his success will mean can best be grasped by considering the extent of the property

[2] "Talks About Wireless," by Sir Oliver Lodge, Cassell & Company, 1925.

[3] *The Century Illustrated Monthly Magazine*, March, 1902.

which would be displaced thereby, although it is only since August 5, 1858, forty-three years ago, that the first Atlantic cable was laid. There are now fourteen along the Atlantic bed, and in the whole world 1,769 telegraph cables of various sizes, with a total length of almost 189,000 nautical miles, enough to girdle the earth seven times.

"These require a great number of ocean-going cable steamers for their laying and repairs, and while the total value of the cables cannot be computed easily, it is known to be a fact that British capitalists have $100,000,000 invested in cable stocks."

As the word spread that Marconi had stopped testing, he was deluged with offers of sites for experimental stations. Alexander Graham Bell, inventor of the telephone, offered him use of his property at Cape Breton. The Finance Minister of Canada extended on behalf of the governmentevery facility for the location of a station in Nova Scotia. Marconi accepted. Before resuming work, however, he decided to return to England to consult business associates, chief among them Jameson Davis. He said he was sailing on December 22nd on the steamer Sardinian for England, and would return to New York in January.

* * *

As the train pulled away from the scene of his triumph in Newfoundland, across the island on the way to Nova Scotia, it seemed that every farmer and fisherman came to the depots to catch a glimpse of the wizard of wireless. He was only twenty-seven years old. The boyish smile and youthful appearance coupled with the magnitude of his achievement won the admiration of the throngs.

Ray Stannard Baker, who interviewed Marconi at St. John's several days after the trans-atlantic triumph, described him as somewhat above medium height and deliberate in his movements despite a highly strung temperament.[4] He observed Marconi unlike the inventor of tradition. Those who visualised him unshaven, dishevelled and unkempt, with trousers unpressed and collar and tie missing after a long siege in the laboratory, never hold such a picture in their minds once they have met the man. He is scrupulously neat in dress and in work. No photograph or painting could portray the peculiar lustre in his countenance when he is interested or excited.

Those who have the pleasure of meeting him are immediately impressed that they are in the presence of a man of intense nervous activity and mental absorption. He talks little; is straightforward and unassuming, submitting good-naturedly although with evident unwillingness to being lionised. In his public addresses he has been clear and sensible. He is reluctant to write for any publication; nor does he engage in scientific disputes, and even when violently attacked he lets his work prove his point.

One factor that has endeared him to the world is his acceptance of success with a calmness, almost unconcern; he certainly expected it. Boastfulness is not in his make-up. Opposition is his keenest spur to greater effort.

He speaks English as perfectly as he does Italian. He speaks little French, but with an English accent. Indeed, his blue eyes, light hair and fair complexion give him decidedly the appearance of an Englishman, so that the stranger who meets him would never suspect Italian blood in his veins. One of the first messages conveying news of his success at St. John's went to his mother and father in London, where they divided their time with the Marconi estate in Italy.

"There has never been the least doubt that Marconi embarked on experimental research because he loved it," said Mr. Baker. "No amount of honour or money could tempt him from the pursuit of the great things in wireless which he sees before him. Besides being an inventor, he is a shrewd business man with a clear appreciation of the value of his inventions and of their possibilities when generally introduced. What is more, he knows how to go about the task of introducing them."

This was the man the Canadians applauded.

* * *

After a brief consultation with his English associates, Marconi was back in New York on January 12th. Reporters found him at the Hoffman House, and although he said his time was very limited he consented to an interview.

"I will be in New York until Wednesday, when I expect to sail for England on the Teutonic," said Marconi. "As soon as I reach the other side I will start to work to get stations in readiness for the transmission of messages, commercial and otherwise, across the Atlantic. There will be two stations on each side: those in Europe being located at Cornwall and Belgium, those on the American side will be at Nova Scotia and on Cape Cod."

"Were your recent tests in Newfoundland satisfactory to you?" he was asked.

"Eminently so," was the quick response; "not so much on account of the transmission of the letter 'S' as that is the letter generally used in telegraphic testing, but because the letters were received according to a pre-arranged plan both as to the number of times they were to be sent and at the speed agreed upon."

His attention was called to the suggestion of anchoring steam vessels at convenient places on the Atlantic, equipped with wireless apparatus, thus enabling messages to be relayed to ships and to the other shore.

"That is ridiculous," he replied. "There is no use for any such system. I have absolutely no sympathy with any such proposition. Messages can be sent across

(*Please turn to page* 480.)

[4] *McClure's Magazine*, February, 1902.

"RECENT ADVANCES IN WIRELESS TELEGRAPHY"

This letter was written by Sir Ambrose Fleming to "The Times," wherein it appeared on Oct. 4th 1900, and from which it is reproduced by kind permission. An extract from this letter appeared in our last week's instalment of Marconi's Life Story.

To THE EDITOR OF "THE TIMES."

Sir,—As the subject of wireless telegraphy has not yet apparently lost interest for the general reader, I venture to ask a little space to make known for the first time some recent achievements by Mr. Marconi which have astonished those who have been allowed to examine them. Everyone is aware that in his system of electric-wave telegraphy an important feature is the employment of an elevated conductor, which generally takes the form of a wire suspended from a mast. When Mr. Marconi attracted attention by his feat of establishing communication across the Channel without wires, critics raised a not altogether valid argument against its commercial utility, that a wave or signal sent out from one transmitter would affect equally all receivers within its sphere of influence, and hence the privacy of the communication would be destroyed.

No one felt the force of this objection more strongly than the distinguished inventor himself, whose original work has caused so many others to attempt to follow in his steps. For the last two years he has not ceased to grapple with the problem of isolating the lines of communication, and success has now rewarded his skill and industry. Technical details must be left to be described by him later on, but, meanwhile, I may say that he has modified his receiving and transmitting appliances so that they will only respond to each other when properly tuned to sympathy. I am well aware that other inventors have claimed to be able to do the same thing, but I do not fear refutation in saying that no one has given practical proof of possessing a solution of this problem which for a moment can compare with that Mr. Marconi is now in a position to furnish.

These experiments have been conducted between two stations 30 miles apart, one near Poole in Dorset and the other near St. Catherine's in the Isle of Wight. At the present moment there are established at these places Mr. Marconi's latest appliances, so adjusted that each receiver at one station responds only to its corresponding transmitter at the other. During a three days' visit to Poole, Mr. Marconi invited me to apply any test I pleased, to satisfy myself of the complete independence of the circuits, and the following are two out of many such tests: Two operators at St. Catherine's were instructed to send simultaneously two different wireless messages to Poole and, without delay or mistake, the two were correctly recorded and printed down at the same time in Morse signals on the tapes of the two corresponding receivers at Poole.

In this first demonstration each receiver was connected to its own independent aerial wire hung from the same mast. But greater wonders followed. Mr. Marconi placed the receivers at Poole one on top of the other, and connected them both to one and the same wire, about 40 feet in length, attached to a mast. I then asked to have two messages sent at the same moment by the operators at St. Catherine's, one in English and the other in French. Without failure, each receiver at Poole rolled out its paper tape, the message in English perfect on one and that in French on the other. When it is realised that these visible dots and dashes are the results of trains of intermingled electric waves rushing with the speed of light across the intervening 30 miles, caught on one and the same short aerial wire and disentangled and sorted out automatically by the two machines into intelligible messages in different languages, the wonder of it all cannot but strike the mind.

Your space is too valuable to be encroached upon by further details, or else I might mention some marvellous results, exhibited by Mr. Marconi during the same demonstrations, of messages received from a transmitter 30 miles away and recorded by an instrument in a closed room merely by the aid of a zinc cylinder, 4 feet high, placed on a chair. More surprising is it to learn that whilst these experiments have been proceeding between Poole and St. Catherine's, others have been taking place for the Admiralty between Portsmouth and Portland, these lines of communication intersecting each other; yet, so perfect is the independence that nothing done in one circuit now affects the other, unless desired. A corollary of these latest improvements is that the necessity for very high masts is abolished. Mr. Marconi now has established perfect independent wireless telegraphic communication between Poole and St. Catherine's, a distance of 30 miles, by means of a pair of metal cylinders elevated 25 or 30 feet above the ground at each place.

I need not enlarge on the possibilities thus opened out for naval and military purposes. The importance of this practical solution of the problem of independent electric wave telegraphy, in which each wireless circuit is as private as one with a wire, is obvious without comment. My desire is solely to mention the above facts for the benefit of general readers, whose minds will thus, perhaps, be eased of any doubts lest this brilliant application of electrical discoveries should, like some others, fall short in satisfying the requirements of practical use and be relegated to the region of imperfect inventions or unfulfilled hopes.

I am, Sir,
Yours obediently,
J. A. FLEMING.

University College, London. Sept. 28th.

RANDOM RADIO REFLECTIONS

By Victor King

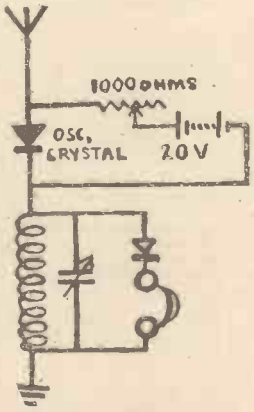
A TRICKY CIRCUIT TO GET GOING—BUT WHEN IT WORKED IT WORKED WELL :: REASONS FOR BEING UP EARLY :: PASSING BY AN OLD ACQUAINTANCE

OSCILLATING CRYSTALS

I HAVE had several letters about this fascinating subject, the most useful one being from Mr. S. M. Rowe, of Mutley, Plymouth. He says:

"In answer to your query *re* oscillating crystal sets ('P.W.,' July 3rd, 1937, page 400), I explored the possibilities of that principle rather thoroughly (about 1926–28, I think), and am only too happy to pass on any information.

"I tried several circuits—single and double oscillating crystal circuits of Captain Round of Marconi's—but without success; also finally a circuit (Russian, I think) which *did* work, and which certainly proved the principle up to the hilt. The design hasn't the complication of the Round circuits, but as results are the thing here it is.



A Russian oscillating-crystal circuit which worked in the hands of a reader.

"You will notice the oscillating crystal is directly in the aerial circuit, and that the oscillating circuit is separate from the receiver.

"Results: Here in Plymouth, approximately 220 miles from London, I used to receive London Regional well, and on occasions several foreigners (not identified) and at good phone strength. The local was tremendously amplified, and my only regret is that at the time I hadn't a loudspeaker—but with phones laid down my wife and I have heard *in the next room* (words not distinguishable, of course, but singing very clear).

"I threw it up for two reasons: (1) It's the trickiest thing on earth to 'get going.' (2) My neighbours complained of terrible oscillations in their sets—I believe I disturbed most receivers for half a mile radius.

"Finally, the oscillating crystal assembly must be Zincite–Tellurium, and fit a very smooth resistance of about 1,000 ohms. I used Burndept spring-loaded crystal holder and adjuster (beautifully made), and maybe that helped, too.

"Regarding the recent arguments in your columns about patentees, which the Editor has now forbidden, I am sorry it has been dropped, because I do believe that every radio amateur has, at the back of his mind, the hope that he may strike some improvement in radio design, which will put *him* 'on the map.' This applies to even the veriest tyro, else why do we all struggle with expensive bits and pieces when excellent mass-produced receivers can be purchased so cheaply? If you tell me I am wrong—I don't believe you."

Thank you very much, Mr. Rowe. I felt I ought to publish your letter for the benefit of any other experimenters who may be interested in the fascinating crystal "squealer."

You are wrong in another matter, though, I think. The Editor certainly closed the particular correspondence battle concerning patents and inventions which was being waged in "P.W." a few months ago. But it did not mean that, given new angles, the subject could never be re-opened.

You will know I am right about that if these words are allowed to get into print!

I SEE THE SUN RISE

FOR the first time for a considerable number of years! I wonder why it is that one does one's all-night listening in the winter? Or does one? Anyway, I do. And I get off to bed just before the sun appears—if it does appear on a cold, wintry morning.

Since January or February the latest I've been up with a short-wave radio (or should it be earliest?) is about four o'clock, and that's some while back.

But the sun was pushing its dial up from the horizon at 3.30 a.m. a week or two ago. I know. I saw it. Sitting in my car on a country road. Feeling pretty blue over the first breakdown on the road I've ever had.

The curious thing is that I had said to some people I'd been visiting that very evening that I'd never been stranded on the road. And was told to "touch wood," and so on. In a most superior manner I refused to do so. And I'm still not superstitious—very!

But there I was, with black hands and a blue mind, greeting the golden dawn. At last I managed to get the engine to turn over. Extremely slowly and with just enough power to propel the car at a speed (!) of about one mile per hour. Going up hills was a trying experience.


"Greeting the golden dawn."

At long last, fivish, I crept into a village. And as I rounded a corner a policeman dodged back into a doorway like a frightened hare. I pulled up opposite him and asked him where I could find a garage that might be open. Obviously shaken he came forward. I thought this strange, until he spoke.

"Do you know, sir," he said, "I imagined you was going to break into the post office, or something, the way you snuck round the corner."

Whereupon I explained that my "snucking" was enforced upon me.

The big sting in this adventure has yet to be related. For the first time in years I had taken the car out with neither car radio nor a portable on board!

It was sure an evil spirit that poured water in my petrol that night!

THOSE WHO PIONEERED

THE report in the newspapers that Mr. T. N. Cole has returned to the arena of the radio industry did not surprise me. Mr. Cole retired some few years ago, after about a decade of tremendous battling in the wireless trade.


"We were attracted by the figure of an elderly man standing at the roadside."

I never knew such an enthusiastically hard worker. And such an enterprising genius in all aspects of manufacture and marketing. He built Lissens up and up till he was able, still comparatively a young man, to pile up a personal fortune credited to be in the neighbourhood of a million pounds.

And he earned every penny of it. He worked harder than anyone else in his great organisation. I remember him telling me that he often slept at the factory and hardly ever saw his family.

Obviously his energetic nature could not indefinitely be reconciled with retirement.

But continued success did not accompany the efforts of all the pioneers of the Radio Industry. Recently, I was motoring with the managing director of one of the large electrical companies.

Passing slowly through a little fishing port on the South Coast we were attracted by the figure of an elderly man standing at the roadside.

He seemed to be waiting for a 'bus. Seedily dressed in a badly fitting, ready-made suit, he still had an air of dignity, but looked a real down-and-out for all that. Old, tired and depressed.

"Let's give the poor old beggar a lift," said my companion as we rolled towards him. But as the car drew near I saw who it was, and signalled my friend to keep straight on.

That old chap would have found it embarrassing to meet us, for at one time he had been a veritable Mogul in Radio-land, with cars—and very posh ones at that—of his own. Plus a team of smartly uniformed chauffeurs, and a big country house. He even ran a large and luxurious sea-going yacht.

He paid the penalty of thinking that the initial big boom in wireless would continue, that high prices for jerry-built apparatus could be maintained indefinitely, and that the public would never learn to discriminate between his practices and productions and those of the firms who genuinely endeavoured to serve it and which, incidentally, are the ones that survived.

Well, well! He had his day, and I'm shedding no tears for his past glories.

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

"TELEFRAMES"

Items of general interest

CONSTANT CURRENT DEVICES

READERS who appreciate that the "charged" condenser in a television time-base needs charging at a constant current may wonder how a pentode valve enables this to be done. Charging through a resistance, or saturated diode, seems clear enough, but at first sight it seems that as the voltage of the condenser charged through the valve changes the anode voltage and therefore anode current must also change.

The answer to the apparent puzzle is in a characteristic of the pentode valve, namely, that its anode current is to all intents and purposes unaffected by the anode voltage so long as this is above about 50. The current is almost entirely dependent on the control-grid and screening-grid voltages.

* * *

CATHODE-RAY TUBE INSURANCE

The Commercial Union Assurance Co., Ltd., of Cornhill, London, E.C.3, we learn, have introduced insurance for cathode-ray tubes in television receivers. The premiums are 5 or 15 per cent. of the cost of a new tube.

Nearly every eventuality is covered, but loss or damage through wear and tear, gradual deterioration or wrong use of the tube are excluded.

* * *

IMPROVING G.E.C. RECEIVERS

The G.E.C. have produced a new cathode-ray tube for their television receivers, which not only gives a larger picture but also a brighter one.

It is an easy matter for this new tube to be fitted into the present receivers, and we understand that the G.E.C. are prepared to do this free of charge for present owners of their television receivers.

* * *

TWO INTERESTING PATENTS

A recent patent on cathode-ray tube improvement provides for the provision of a movable cathode, the idea being that different parts of the cathode may be brought immediately adjacent to the gun in order to ensure that emission is maintained at the desired level over a long period of use.

Another patent, bearing the name of M. von Ardenne, suggests the joining of the sides of pairs of deflectors with a high-resistance material to form a kind of open-ended box. The object is to screen the space between deflectors and electron beam from stray fields which sometimes otherwise upset the trueness of the scanning operation.

* * *

PETO-SCOTT TELEVISION KITS

All constructors will be interested in the Peto-Scott Kits of Parts for building a modern television receiver. The kits for the complete instrument are available "in one go" or separate kits for building up the separate chassis of the receiver may be purchased independently. Ready drilled chassis and ready-wired resistance and condenser boards make the assembly simplicity itself.

We shall shortly be giving full details and a report on the actual results obtained.

* * *

FIRST TELEVISION PLAY

Pirandello's unusual play, "The Man with a Flower in his Mouth," which is to be televised in the evening of July 22nd, made television history on two previous occasions. It was the first play to be televised by the low definition system in 1930, when it was produced by Lance Sieveking, with Val Gielgud as The Man; shortly afterwards it was seen on the same flickering screen in a puppet presentation by Jan Bussell, who, incidentally, is now a television producer at Alexandra Palace.

In this presentation the part of The Man will be played by William Devlin.

Viewers who can remember the early television production of the play will be impressed by the contrast in production methods. In the old days only one camera could be used and it could not track forwards or backwards. In producing "The Man with a Flower in his Mouth" Royston Morley will employ all the devices of modern television and will introduce a concealed camera taking shots through the window.

CATHODE-RAY AUDITIONS

Quite apart from television, the cathode-ray tube is being used for more and more scientific purposes every day. Here you see a device erected by an N.B.C. engineer to assist at auditions in checking up the tonal qualities of notes produced by aspiring broadcasters.

FOR HIGH SPEED

IN order to get very bright though small pictures on a cathode-ray tube screen so that the picture may be enlarged by projection, special electron-gun arrangements have to be made. The following brief details of the gun system used in the American tube for projection are of interest.

A particularly fine beam is required, and as a "kick-off" the electrons are first passed through three guns in the form of discs with centre holes about the size of a pencil's lead. But the beam is still too wide after this, so that it then has to pass through a fourth disc in which the hole is so fine that it compares with the thickness of a human hair.

The resulting bombardment on the screen of the tube is so intense and at such high speed that special fluorescent materials are required to stand up to it.

CIRCULAR-SCAN C-R TUBE

A CATHODE-RAY tube with novel features has recently been devised. Although at present intended for circuit investigation, the method of operation is interesting and might easily in the future find some application directly to television.

The normal oscillogram is produced on a straight axis, and in circuits of great frequency it is possible for some effect to be missed during the fly-back of the spot. In the new tube a completely circular axis is utilised so that the effects of the circuit to be examined are continuously visible.

The first feature of the tube lies in the production of the circular movement of the beam. This is achieved by means of what has been termed an electron motor.

The essentials of the electron motor are two deflecting plates opposite one another on either side of the beam and two external electro-magnets arranged at right angles to the deflectors. When connected up to a suitable time-base circuit these produce the necessary revolving field to cause the electron beam to make its circular scan. The diameter of the circle is variable by means of a resistance in the time-base circuit.

On its way to the screen the circular-moving beam has to pass through the plates of a cone-shaped condenser of co-axial design. It is to this condenser that the potentials of the circuit to be examined are applied.

Apart from removing any chance of missing anything during the fly-back time in a normal straight-line oscilloscope, the circular path is also about three times as long as the straight-scan path that could be obtained on the same size of tube.

SEEN ON THE AIR

NEWS AND VIEWS ON THE TELEVISION PROGRAMMES BY OUR SPECIAL RADIO-SCREEN CORRESPONDENT

L. MARSLAND GANDER

I WONDER how many televiewers saw Mr. George Bernard Shaw when he made his first brief appearance as a television artist? Very few, I am afraid.

The mistake was that Mr. Shaw appeared unannounced at the end of a transmission. This, perhaps, would not have mattered so much had it not been for that fatal word "Interval," which, sprawling across the screen inopportunely led most people to assume that the programme was at an end. Mr. Shaw's play "How He Lied to Her Husband" had just concluded, and it appeared as if the engineers were only awaiting the closing announcement. Most viewers, I suppose, switched off.

I only labour the point because it shows how essential it is to tighten up the programmes by elimination of all unnecessary pauses and intervals.

Mr. Shaw, paying a visit to Alexandra Palace on the occasion of the first television broadcast of one of his plays, saw the production on a receiving set. Towards the end he walked down into the studio with Mr. Gerald Cock, the Television Director, and agreed to come before the camera. I happened to be in the studio

SNAPPED AT BRIGHTON

No, Mr Leslie Mitchell was not on holiday. This untouched photo was taken by a Brighton viewer as the announcer appeared on his television screen.

when the veteran figure of Shaw stepped briskly through the door, an active stride making light of his eighty years. The idea was that he should appear through a "property" door at the back of the "set," and advance towards the camera to say his piece. Mr. Shaw scorned Mr. Cock's suggestion that he should rehearse the manœuvre.

The consummate actor, he peered furtively round the door, and then marched into close-up. I made a hurried note of his speech. "I hope you will pardon this intrusion," he began. "You might not suppose it from my veteran appearance, but the truth is that I am the author of that ridiculous little play you have just heard.

"This is a very special occasion, because as a writer of plays I never come before the curtain and accept a call. But, you see, on this occasion you have not called me. You are not like the unfortunate people in the theatre, who, no matter how much they are bored, cannot get up and go away. You who are still listening show your interest by that very fact. I myself very nearly went to sleep in the middle of it."

Mr. Shaw went on to say that he thought it a good idea that people watching a play should know something of the man who wrote it, and should be able to see him. He also made some allusion to the "millions" who were listening and watching, thus, I am afraid, greatly over-estimating the magnetic attraction of his play and the number of persons equipped with receiving apparatus.

A Disappearing Trick

Mr. Shaw then did a disappearing trick which caused considerable amusement in the studio. He made an exit through the property door and closed it. The transmission having ended, tension was relaxed, and Mr. Cock stepped forward to open the door and release the captive. Television has such cramped quarters that the three sides of the "room" in which the play had been performed were close up to the walls of the studio.

When Mr. Cock opened this door expecting to disclose Mr. Shaw, he stepped back hurriedly with the air of a disconcerted conjuror. Mr. Shaw had vanished. There was an astonished silence, and then a general laugh.

Presently Mr. Shaw, having squeezed with some difficulty round two sides of the "room" in between the scenery and the wall, negotiating stray wires and paraphernalia, emerged into the light. No doubt he thought there was a danger of bursting out of the door before the transmission had ended.

I have a fancy that if "G.B.S.," the pioneer, were a young man now he would be a television critic, or, at least, a radio critic. Woe betide the B.B.C. if the clock could be set back a generation! Yet I know nobody else who can launch barbed shafts that cause so little hurt.

When Mr. Shaw emerged from behind the scenery I spoke to him and found that the "burning" question uppermost in his mind was "Who chose this particular version of 'How He Lied to Her Husband'? It ought to be burned."

I tried to steer Mr. Shaw, with partial success, to other topics. Television he thought would be all right when we had a full-sized screen. Yet he admitted that after a short time one got used to the small screen. "So you were impressed with television?" I said. "Not in the very least," he flashed back.

All Too Short

It is a source of very great regret to me that at this point I had to end the conversation, as somebody tugging at my elbow tactfully reminded me that I had promised not to pester Mr. Shaw with questions. And, besides, the cast were being introduced.

Mr. Shaw was scathing about his play, but I would remind him that it was the successful "curtain-raiser" of 1904. We may regard "ridiculous little television" of 1937 as lifting the curtain to a new era of entertainment not so far ahead. His reply to me was, after all, nothing but the expected Shavianism.

And, by the way, it is Mr. Shaw's own fault if the radio audience cannot hear and see more mature specimens of his work. His well-known objection to cutting and adaptation makes the majority of his plays unmanageable in length and verbosity.

During the week under review there have been a number of successful programmes. "Derby Day," the A. P. Herbert–Alfred Reynolds opera, made a delightful entertainment. Tessa Deane as Rose, Frederick Ranalow as John Bitter, George Baker as Sir Horace Waters, and Frank Drew as Bert Bones, made a strong cast.

I found the television version much superior to the radio version. This is no reflection on the radio producer, but merely another glimpse of the obvious. Comic opera and musical comedy are not, in my view, ideal subjects for sound programmes. Vision makes a world of difference.

SEEN ON THE TUBE

Another television snap taken at Brighton. The two photographs were referred to by Mr. Gander in his notes in "P.W." last week.

A special word of praise also for "Douanes," a bright, lively show, with Eric Wild and his Tea-Timers, Valerie Hobson, Ernst and Lotte Berk.

Like our old, old friend the schoolmaster who professed to be hurt more than the boy who intercepted the cane with his bare flesh, may I say that I hate to end on a discordant note. But I cannot avoid further lament about the closing of Alexandra Palace transmitting station between July 24th and August 16th.

Naturally, the manufacturers are annoyed, and the B.B.C. have begun to hedge. Who can be expected to invest in a set at this moment when the station is about to shut down for three weeks? Stop the transmission and stop sales, you also stop research. So now the Davis Cup matches will be broadcast for a couple of days during the hiatus, and for the rest of the time the black cross tuning signal will be radiated.

FROM OUR READERS

(Continued from page 466.)

I see this week that Mr. King mentions oscillating crystal sets. Had a lot of fun out of this idea about 1924 or 1925. The circuit used was, I believe, invented by a Russian, and employed two crystals—one for signal location, an ordinary galena—and the other, the oscillation generator, was of specially fused zincite with a steel catswhisker.

There were two battery supplies to the idea, 4½ and 9 volts, and a potentiometer made from curtain-rod, 4 B.A. studding and "Concordin" wire was used to get the oscillation to commence.

The method was to locate a station on the galena crystal, throw over a S.P.D.T. switch and wangle the steel catswhisker till oscillations commenced, and then search, usually higher up the dial, for the station. Presumably, this was caused by a beat frequency between the natural one of the zincite crystal and that of the received signal.

Anyhow, I used to get real results from 2 L O (120 miles) and from one or two Continentals, the only fly in the ointment being that the affair was gloriously unstable, and would howl its head off if one so much as breathed on it.

I was also able to introduce reaction after a good many efforts.

I believe that the circuit, which I have no longer got, could be obtained at that time from Messrs. Russell (of Hertzite fame), who supplied the specially fused zincite. The appreciation of nearby listeners was not too great when they received the howls on their sets.

Wishing you and all "P.W." staff all the best, and continued success for "our paper."

HAROLD G. CHAMBERLAIN.

46, South Street, Draycott, nr. Derby.

TEST EVERYTHING !

The Editor, "Popular Wireless."

Dear Sir,—Having read Mr. Chester's very interesting articles on building a short-wave set, and its attendant troubles, I thought the following experience of mine might interest other readers. An O.V.O. was rigged up, using home-made coils suspended on beehive insulators, the circuit following the lines of the Hartley. Using a power valve as detector, results were very good and 20-metre amateurs flocked in.

The set worked well for a few days ; then trouble began. A grating noise such as a loose wire gives was heard. Everything appeared to be O.K., but I spent a considerable amount of time locating the fault. First the aerial was disconnected—still the same. "A little dust in the condenser vanes," I thought. Each one carefully dusted, but no better. Every wire tested for continuity, including earth return wires ; still no difference. Valve, grid leak, grid condenser, H.F. choke and valve holder legs carefully inspected, but the noise just the same.

By this time I was getting exasperated. Was it the phones ? No ; practically a new pair ! Was it the accumulator ? Another was tried, but still the irritating rustling sound in the phones. Could it be the H.T. battery ? "No," I thought. "It is nearly new, having only used it a few times."

But, to satisfy myself, I procured another, and the result—everything as clear as a bell ! The volts were there, but some internal fault had developed whereby this annoying noise could be heard.

Moral : TEST EVERYTHING !

R. HOPPER.

130, High Street, March, Cambs.

A SUPER CIRCUIT LOST ?

The Editor, POPULAR WIRELESS.

Dear Sir,—A few weeks ago I constructed a three-valve resistance-coupled set consisting of a detector and two low-frequency valves. The output valve was a pentode. The results were quite good, but on very heavy notes, such as a loud chord on the piano, there was a certain amount of distortion.

By inserting a milliammeter in each H.T. lead in turn (it is a battery set), I was able to trace the distortion to the first low-frequency valve. This was evidently caused by the voltage being too greatly reduced by the anode and decoupling resistances. I changed over the valve holders, cut out the last stage of amplification and inserted the pentode in the second valve holder, thus making a simple two-valve detector set.

On switching on, I was astonished to find that I was getting superlative results. Many more stations than before came in quite free of interference, and much greater volume and of beautiful quality.

Splendid, I thought ; everything in the garden's lovely. Why have a three-valve when I can get such results with two ?

As a precaution, I put the milliammeter in circuit, to see if the valves were receiving their correct current, and was shocked to find that the reading was 25 m/a, whereas the old three-valve took under ten. Anyway, I thought, to get range and tone like this is worth a bit of extra juice. Strangely enough, putting up the bias did not alter the consumption or affect the volume and tone at all.

I therefore pulled the set to pieces and re-built it as a two-valve, taking care to place the components in the same positions as before, naturally expecting to get the same wonderful results. Not a bit of it. The results were very weak and feeble, and the H.T. current had fallen to 7 m/a. The only explanation I can think of this mysterious business is that in some way I must have made some connection which caused a feed-back. Several times since I have tried to duplicate this circuit, but have always failed. I have called it "my inadvertent circuit."

I am afraid this reads a little like a fairy-story, but I guarantee every word of it. As a correspondent in your paper said the other week, "strange things sometimes happen in the world of radio." Perhaps some reader will be able to explain what happened.

C. CASTLE.

Orchard Bungalow, Riverwoods, Marlow.

PIRATING A CALL

The Editor, "Popular Wireless."

Dear Sir,—We shall be obliged if you will give publicity to the fact that the call sign of the Experimental Station at these Works (G 6 S L) is being illicitly used on the 7 m/c. amateur band. Some time ago Morse contacts were reported and recent information indicates telephony transmissions of particularly bad quality.

The transmissions from G 6 S L are confined to the 56 m/c. band, and at present the station is in the process of reconstruction.

If any readers will give us information which will enable us to trace the offender, we shall be most grateful.

A. C. EDWARDS
(For Stratton & Company, Ltd.),
Eddystone Works, Bromsgrove Street,
Birmingham, 5.

THE THREE-FOLD CORD

The Editor, POPULAR WIRELESS.

Dear Sir,—In these troubled times, when many countries seem to be looking towards the English-speaking peoples for disinterested help and guidance, it is encouraging to note that English-speaking youth is preparing to offer a lead. In the movement known as the Three-Fold Cord, which seeks first to unite in close friendship the youth of Great Britain, the British Commonwealth, and the United States of America, we see an opportunity to build up a world unity of all nations respecting justice and loving freedom. Membership of the Three-Fold Cord should prove a real education to young people of all ages, and particularly to those who want guidance in establishing the new world on Christian principles. We recommend all parents and teachers, as well as all grown-up children, to write for particulars of membership. Donations, which are urgently required, should be sent to E. R. Appleton, Founder Three-Fold Cord, The Guildhall, Barnstaple, Devon, England.

(Signed)
WILLIAM EBOR (Archbishop of York).
MALCOLM CAMPBELL (Knight).
L. W. GRENSTED (Nolloth Professor of the Philosophy of the Christian Religion, Oxford University).
CYRIL NORWOOD (President of St. John's College, Oxford, formerly Headmaster of Harrow School).
B. SEEBOHM ROWNTREE. C.H.
E. S. WATERHOUSE (Professor of the Philosophy of Religion in the University of London).

QUESTIONS AND ANSWERS

By K. D. ROGERS

SEPARATING THE L.F. FROM THE H.F.

HOW IT IS DONE

A. W. (Torquay).—*Will you tell us how the H.F. in a set is finally separated from the L.F.? I have always been given to understand that the A.C., after passing through a valve, became D.C. I take it this is so, but it's a pulsating D.C.*

Readers must forgive me if I take up rather a lot of space with this, and the technically-minded ones must overlook the loose expressions and rather unscientific language. It is only by everyday description that we can get this sort of explanation over in a comparatively few words.

Let's start at the speaker. What do we want to operate it? The answer is that the *diaphragm* must move at A.C., i.e. at speech frequency, or, in other words, at frequencies between, say, 50 and 10,000 cycles per second. These give musical notes, and the strength of the notes depends on the amplitude, or "size," of the A.C. cycles.

It is the diaphragm that matters. If we can get that to move at A.C., it does not matter if we have A.C. or *fluctuating* D.C. going into the speaker.

How do we obtain our movement? At the transmitting station a wave of high frequency is sent out, modulated or controlled in strength from time to time by A.C. at speech frequency.

Two Sets of Waves

We therefore get two sets of waves at the receiving station in effect. We get the H.F. and we get the effect of the L.F. wobbles on it, there being perhaps only one complete A.C. cycle for every 10,000 H.F. cycles, giving a note of, say, 100 cycles on a transmitting frequency of 1,000,000 or 300 metres.

The effects of the 100 cycles A.C. are applied on both positive and negative half-cycles of the H.F., and we have to rectify this in order to get the A.C. sorted out from the H.F. We therefore cut out either the top or bottom part of the H.F. cycles, and are left with the half-cycles containing on them the A.C. modulation which is *not* cut in half.

This fact is difficult to explain, but perhaps the diagrams will help. (1) Shows the H.F. without any L.F. (2) shows the L.F. which is going to be modulated on to the H.F. (3) shows the H.F. with the effect of the L.F. on it. Note how it rises and falls in amplitude above and below a mean line. Then (4) and (5) show the rectified H.F. (top and bottom halves) with the complete L.F. effect still there.

Actually, of course, there are slight time gaps between successive H.F. halves, but as they are merely matters of perhaps 500,000ths of a second they do not matter. The whole crux of the thing is that we have got the true L.F. form, and can use either the top or bottom halves of the H.F.

We rectify the H.F. so that we shall get the whole L.F. form above that mean line (which I have marked A), for then we get in the valve's anode

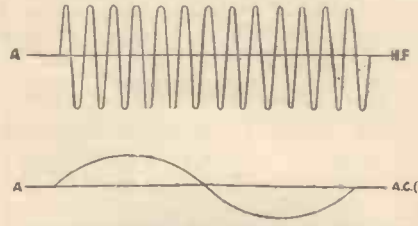


Fig. 1 (top), shows the H.F. carrier wave without any modulation. Fig. 2 (lower diagram) depicts the L.F. which is going to be modulated on to the H.F.

circuit a complete control of anode current, rising and diminishing, but always positive, as it were, or always negative.

If we were to let the whole H.F. through, we should get both positive and negative effects, and the result would cancel out.

I hope that, in spite of the loose description, you will see what I mean. It is not an easy thing to explain at the best of times, and in a short space it is even worse.

Now we have got in our detector-valve anode circuit fluctuating D.C. (the anode current controlled by the A.C. of the L.F.), and we have got the H.F. component as well. That is, the halves of the H.F. cycles. We don't want them. They simply lumber up the valves and prevent us from giving as much L.F. amplification as we would like. For you must remember that, though shown as a strong cycle in the diagram, the L.F. is often but a tenth of the strength of the H.F. and never rises in British transmitters to more than 80 per cent. of it.

We get rid of the H.F. by means of by-pass condensers which will pass the H.F., but will offer high resistance to the passage of L.F. Then we pass the L.F. by means of a transformer (remember that, in fact, it is D.C. rising and falling, for it is merely the anode current of the detector) or through a condenser to the grid of the amplifying valve.

Now, if you apply fluctuating D.C. to a condenser or a transformer, you do not get D.C. "out of the other side." You get perfect A.C. bearing on both half-cycles the exact characteristics of the fluctuating D.C. you have "put in." That is what we want, so that at the grid of the L.F. valve we have A.C. low-frequency and no H.F.

From then on we keep the valves from rectifying by operating them on the middle points of their grid

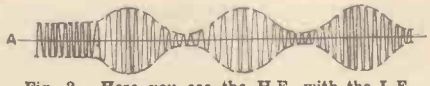
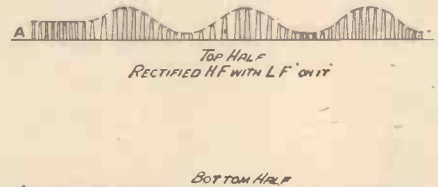


Fig. 3. Here you see the H.F. with the L.F. modulations.

voltage-anode current curves, with the result that the anode currents are controlled at A.C. Once again, however, we have fluctuating D.C. in the anode circuit, although it is amplified. So we apply it to another transformer or condenser, and turn it into A.C. again. This goes on until we reach the loudspeaker.

Then we apply the output of the last valve to the speaker. If we do it through a transformer or a condenser, we get A.C. in the speaker. If we pass the anode current right through the speaker itself, as in the case of the old-type magnetic speaker and in the case of headphones, we get the anode current D.C. with its rise and fall in value in accordance with the A.C. caused by the music.



Figs. 4 & 5. The rectified H.F. (top and bottom halves) with the L.F. effect still there.

In either case, the effect is the same. The diaphragm of the speaker is made to be attracted to a more or less degree to the magnetic field of the speaker, or is attracted and repelled alternately, and that results in the diaphragm wobbling in an A.C. manner. That is, it goes in and out, and we get the A.C. air wave, or compression and rarefaction.

I hope this is clear. The anode currents of the valves are certainly fluctuating D.C. in that they never reach zero and reverse *direction*; but the effect on the speaker at the end of the chain is one of A.C., and we turn the impulses into A.C. at each step in order that we shall be able to amplify the signals.

OH, THAT ROW!

P. S. (Glynde, Lewis) *has to put his fingers to his ears every time he tunes his set above Droitwich or to the upper ends of the other tuning scales. It crackles and hisses, probably won't oscillate properly, or if it does the row is ten times worse. Yet the set is perfect lower down.*

I am not going to pretend I *know* what the trouble is, but I should not be surprised if either the tuning condenser was dirty between the vanes or one or more of those vanes was trying to touch the fixed vanes—and succeeding. Possibly the touching is done through the agency of a little dirt—a speck of solder, metal dust, or even common dirt. Or it may be that the spindle has a certain amount of play and allows intermittent touching when the condenser is meshed to a certain extent.

You can soon prove it, P. S. Turn the condenser until the noise starts on the long wavelength. Then switch the wavelength of the set to another band. Probably the noise will be there also, and if you turn the condenser back it will stop immediately. In other words, find out if the trouble starts with the condenser at the same point, or practically the same point, on each wavelength.

If it is not that, the cause is an obscure one, probably bound up with instability of the set at certain tuning points, and it will need a careful overhaul by an experienced man to find it.

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

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

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

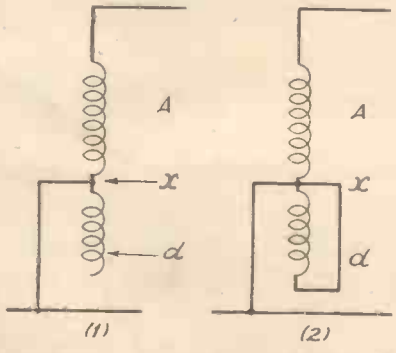
The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in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

FOR BACK NUMBERS

Readers requiring back numbers of Popular Wireless should apply to The Back No. Dept., Amalgamated Press, Bear Alley, Farringdon St., London, E.C.4. Back numbers in print cost 4d. each post free.

TECHNICALITIES EXPLAINED—No. 60

DEAD END



When an inductance coil is not wholly used and the unused part is left with a free end as in Fig. 1, that free end is said to be a dead end. It is capable of causing serious loss of efficiency owing to its capacity and its power of absorbing energy owing to the coupling with the active part of the coil. The dead end will resonate due to its own self-capacity and may cause serious tuning troubles, being in effect a tuned coil tuned to one fixed frequency hanging on to and being coupled with another tuned coil. It is best always to short-circuit any dead end, Fig. 2, if it is impossible to arrange matters so that a dead end is avoided altogether.

THE DIAL REVOLVES

(*Continued from page 460.*)

H P B, Geneva, on 38.47 metres, provided me with a pleasant surprise the other night; but more to my liking was T I 8 W S, Punta Arenas, Costa Rica, on 39.47 metres, a station that came in at moderate strength.

By the way, have any of you boys heard the new Alderney station yet? I picked up a powerful station testing on approximately 49 metres the other day which appeared to be Alderney Radio, as this unlicensed station is called (our G.P.O. will give 'em socks !).

WILL YOU HELP?

Remember my remarks about mistaking G 8 K L for an "Aussie," and my subsequent disillusionment? Mr. William Sturmey, operator of that station, has written apologising right royally for "being the unwitting cause of your anguish!" Granted, my dear sir, but don't let it occur again!

Actually, G 8 K L sent me one of the most interesting letters I've had for some time. It's his contention that to pick up a 10-watt "G" on 20 metres out of a 15 miles radius is rarer than pulling in a VK. Well, that's another way of looking at it, I admit.

And now, boys, I'm inviting you to do a little detective work in the name of—no, not Sherlock Holmes, but science! I'll be delighted to hear how many of you have heard "G's" on the 20-metre band (and their power, if possible). This information will be passed on to our mutual friend, G 8 K L, who is interested in the matter. Indeed, he's a regular G-man!

MY SHORT-WAVE ADVENTURES

(*Continued from page 463.*)

the way, that I could still hear Wayne quite clearly when I had dropped down to as little as 45 volts. Perhaps with a two-valver even less "juice" might suffice—and then the batteries would be a less weighty problem, especially with a very small jelly-acid accumulator for the low-tension supply.

For the summer holidays, it seems to me a portable short-waver is a far more exciting proposition than an ordinary broadcast portable. One can usually listen-in on the hotel or boarding-house set away, but why be denied the joys of real DX when it is so easy to have short waves wherever you go? Why, indeed.

Trying Lower Down

Just for fun, I dropped down on to the Weald afterwards—and parked the car in a truly rural scene, with cows chewing the cud and all. Whether Wayne had then gone off the air I don't know—but nary a sausage could I get.

The "locals"—Rome and Zeesen, as well as Daventry this time—were quite strong, so perhaps Wayne had just gone. All the same, I do think it best to get up as high as you can when perambulating the countryside.

It is a bit of an obsession with me, this height business. I have even gone to live 700 feet up above sea-level to make sure I get good DX on the short waves. Could the DX bug bite deeper than that?

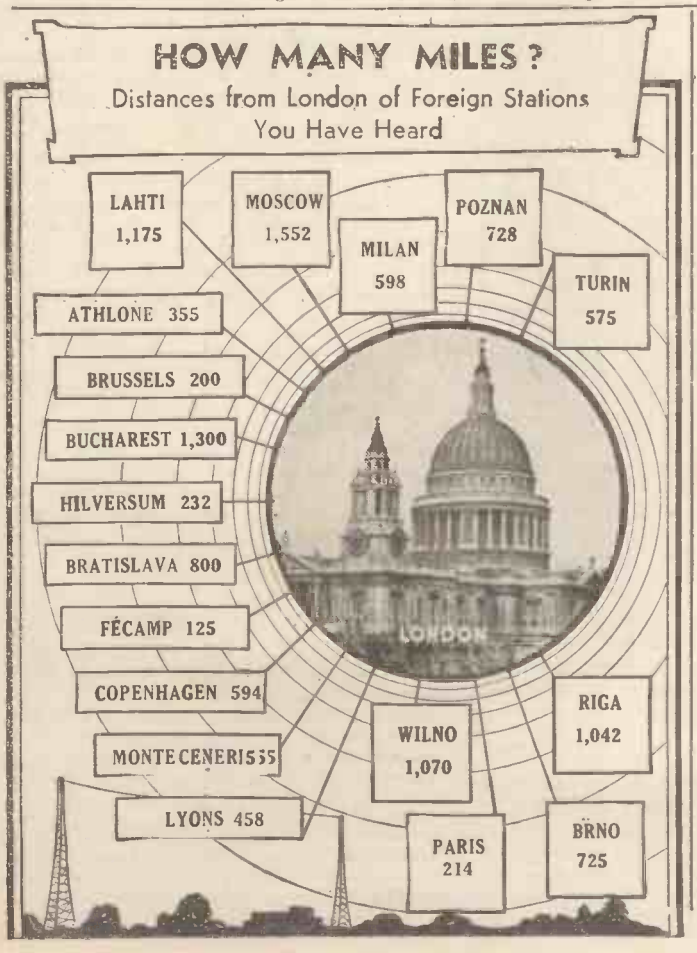
OUR CLUB CORNER

THE Southend and District Radio and Scientific Society held a very successful direction-finding contest on June 27th, when twenty-three members scoured Essex with portable receivers in an endeavour to trace a hidden transmitter, operating on a wavelength of 155·8 metres. The transmitter was well concealed, and only one competitor—Mr. Maurice Tapson, G6 I F—succeeded in finding it.

A series of similar events will be held during the summer months, and the hon. secretary, Mr. F. S. Adams, of 27, Eastern Avenue, Southend-on-Sea, will be pleased to hear from any members or other societies who would like to take part. Indoor meetings are also being held at intervals during the summer, and the full programme of lectures will be resumed in September.

NEWCASTLE RADIO SOCIETY

Excellent commodious headquarters have been obtained at 2, Duke Street, Newcastle-on-Tyne, where prospective members will be welcomed at the meetings on Thursdays, 7 to 10 p.m., Sundays, 6 to 9.30 p.m. A programme has been arranged for newcomers to radio, which is also a refresher course for the experienced. Morse instruction is given in the final half-hour of every meeting. Non-members are invited to attend, moreover. A visit to the Newcastle studios and transmitter is being planned and additions to our party can be arranged.—The Hon. Sec. is Geo. C. Castle, 10, Henry Street, Gosforth.



WE TEST
THE "WAYFARER" MAJOR PORTABLE

An excellent, really small portable characterised by superior finish.

THE small size of the majority of modern portables is largely responsible for their fascination. So that there is something doubly fascinating about the "Wayfarer" Major model since it is smaller than most.

But in spite of its extra smallness the results given are most excellent, reproduction being particularly attractive as provided by the moving-coil speaker. Excellent finish is another of the outstanding points about this portable.

The circuit, a straight one, has four valves. These are a screen-grid H.F., leaky-grid detector which is R.C.-coupled to a triode L.F., and a Harries output valve filter-transformer coupled to the triode L.F.

Air-spaced Condenser

An air-spaced gang condenser is employed, and this is separately trimmed on the medium and long wavebands. An attractive large-diameter slow-motion dial is fitted and is calibrated in wavelengths and station names. A permanent turntable is fixed to the underside of the cabinet.

The weight of the receiver is 14 lbs. and the dimensions as follows: 12¼ ins. high, 8½ ins. wide and 6¾ ins. deep. The leather carrying handle is instantly removable if desired.

The photograph accompanying this article will give a good impression of the general arrangement of the receiver. The three controls—volume, switching and tuning—are arranged under a small lid which lifts on the top of the case. This lid can be locked in the closed position with a key provided, but in doing so the back of the receiver is also locked on. This is achieved by a spring loaded plunger which is pushed in by closing the lid. Incidentally, this spring also partly lifts the lid when the catch is undone, making the lifting of the lid very convenient.

The instrument is covered with leather cloth which may be in one of seven different colours. The particular model we had for test was in polished wood, since it was intended to match up with the interior of a caravan, and no doubt other polished wood ones are available if specially specified.

The accumulator, an unspillable one, should give about thirty hours running for each charge.

Although the high-tension battery is of only 75 volts, the volume is ample and, as already mentioned, the quality excellent.

Sensitivity is extremely high; in fact we did not find any point in making use of the sockets provided for an external aerial and earth. This high sensitivity was maintained on long waves as well as medium.

On local stations it proved necessary to turn the direction of the portable away from the station to keep volume to a desirable level, while the calibration of the dial was remarkably accurate. Tested both near London and at the side of Southampton Water, many foreigners were received with excellent volume, good station separation being another noticeable feature.

At Southampton Water, on quite low ground, some of the Continental stations came in almost like locals. Several alternative programmes were always to hand, both in daylight and at night.

READY TO USE

The controls are covered by a neat lid on top of the set.

Good Value

The Major is a portable that we can recommend with every confidence, and at its price of seven guineas it is good value for money. There is a seal on the chassis so that a guarantee of one year, exclusive of valves and batteries, may be given with the instrument.

The "Wayfarer" Major, a British set, is handled by The High Vacuum Valve Co. Ltd., 111–117, Farringdon Road, London, E.C.1.

TECHNICAL JOTTINGS

Items from a Radio Expert's Notebook

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

Interference From Lightning

LIGHTNING is one of the main causes of the form of wireless interference known as atmospherics, and those of you who go in for long-range listening well know the crackle of the lightning flash in the receiver.

In this country we have comparatively few lightning storms, and listeners sometimes wonder how it comes about that lightning is so frequently heard in a receiver when the storms appear to be so rare.

This is because lightning is continually occurring in different parts of the world and a long-range receiver will pick it up even though it may be a great distance away.

Frequent Electrical Discharges

Electrical discharges in the atmosphere are, in fact, exceedingly numerous, far more so than you would imagine if you judge merely by the relatively scarce appearance of lightning storms in the British Isles. Lightning is much more prevalent in some other countries than it is here: it occurs very frequently in some parts of South Africa, also in Italy, some parts of Spain and in some of the more easterly parts of Europe. In certain parts of South Africa brilliant lightning storms are almost a nightly occurrence.

You will see that although lightning may occur infrequently at any particular place in the British Isles, there is always plenty of lightning going on in some part or other of the world within range of a modern receiving set.

A well-known German meteorologist has recently been making some calculations about all this, and he tells us that something like one hundred lightning flashes occur throughout the world every second. There are some three thousand observatory stations, including the official stations and a large number of private ones, spread out over the globe and, from the information which is gathered by these stations, scientists are able to get a bird's-eye view, so to speak, of world weather, in which thunder-storms are one of the most important factors.

Thunder-clouds

Thunder-clouds will carry up to 30,000 tons of rain, sufficient to fill 6,000 large railway trucks. The reason for the sudden heavy shower of rain which accompanies a thunder-storm is that there is often a very powerful upward current of air, produced by thermal effects, and this prevents the rain from falling, but the rain accumulates and the moment the upward current ceases down comes the rain in a terrific shower.

I dare say you have read of experiments in England and America in connection with the artificial production of very high electric voltages, as much as a million volts having been so produced. The voltages in thunder-clouds, however, are estimated to be vastly greater than anything we can produce by artificial means. An electric tension of 5,000 million volts is believed to be the kind of condition reached sometimes in a severe storm. This electromotive force, with a current from 20,000 to 50,000 amperes, would be sufficient, as you can easily work out, to supply electric power for industrial purposes on a large scale.

Power From the Sky

Two scientists of the Berlin Institute of Physics have lately been making attempts to collect large quantities of energy from thunder-clouds and to use it for power purposes. One experiment was carried out in a rocky valley in the North of Italy, noted for very severe thunder-storms. An elaborate wire-netting arrangement was hung up between the slopes of the valley and the electric energy from the air was brought to an arrangement of electrodes. In this way a spark over 50 feet long was produced, the electromotive force behind

(Continued on next page.)

TECHNICAL JOTTINGS

(*Continued from previous page*)

it being calculated to be in the region of ten million volts.

It is obvious that experiments of this kind are attended with great danger to the observers, as the apparatus has to be erected at a time when it is believed—or hoped—no lightning flashes will occur. Any manipulation of the apparatus is extremely hazardous, as it is impossible to know with any certainty when the atmospheric conditions may be considered to be safe.

The Radio Passenger

You may remember we were talking in these Notes some time back about the effect of car radio upon the attention of the driver. When car radio was first mooted, a lot of people thought that it would be a distraction to the driver and he might not be able to give his attention to the road.

At first sight this would appear to be a pretty reasonable criticism. We all know that driving in these days, especially in the crowded streets of London, or any other large city, needs every bit of attention on the part of the driver, and nothing is more irritating or distracting than to have someone sitting in the car pestering the driver with a forced conversation.

Keeps You Awake

But as regards a radio set in the car, curiously enough this has quite a contrary influence. As soon as you begin to consider it more carefully, and especially when you have any actual experience of it, you find that it has a soothing effect on the driver and, so far from taking his attention away from his job, seems to act as a screen which shuts out other causes of distraction. For one thing it merely talks or sings *to* him and demands no particular response on his part.

Unlike the living passenger it can be listened to with varying degrees of attention or ignored altogether. On a long journey it is a very definite benefit because in these circumstances, as every car owner knows, the tedium is inclined to make you sleepy or to make you so engrossed with your own thoughts that you may get almost oblivious to your driving.

This is a very real danger, and it has been found that the companionship of a radio set keeps the driver fully awake and alive to what he is doing, and completely obviates that peculiar form of day dreaming with which he is otherwise so apt to be overcome.

The Amenity of Radio

Another important factor in connection with long road journeys is that the amenity of the radio makes the journey, if not enjoyable, at any rate much less irksome, and consequently relieves the driver of the well-known temptation to "step on it" and get the journey over. The temptation to speed and scamper on a long journey is a great danger, and one which we have all experienced; radio-in-the-car largely does away with this and, if it does not give us a reason for drawing the journey out, it makes us tend, at any rate, not to over-hurry it.

These observations are not entirely my own; they are based on careful observations of some of the leading manufacturers of car-radio sets both in Great Britain and the United States. I must say that from my own experience I endorse them, and I expect most of you will do the same.

Worth Considering

There are still a very large number of cars in use which are not equipped with radio, and I can only recommend those of you who run cars not so equipped to give attention to this question, as it is one really worth looking into.

Car radio sets can now be obtained at quite reasonable prices; they are designed for very easy fixing into the car, and the old trouble of interference from the engine ignition system has been effectively overcome by the use of suitable suppressors.

In fact, radio-in-the-car is now a really good proposition from every point of view, and the various objections raised to it, whether on psychological or practical grounds, either do not exist or have been overcome.

Commercial Superhets

A large percentage of commercial receivers sold nowadays are built on one variety or another of the superheterodyne circuit and the proportion of home-made superhets is probably much less. At one time the superhet was the plaything of the advanced amateur constructor, and there were relatively few superhets commercially made. But with the improvements in the superhet circuit, it has now come into great favour as a commercial unit, whilst the construction of the set by the amateur constructor requires very careful attention to arrangement and adjustment to avoid instability.

When a set of this type is tuned to a powerful station you sometimes get a background of noises, whilst in other cases, although the instability may not be so bad, you get a curious form of distortion of signals, especially when these are loud.

The Pentagrid Stage

The pentagrid stage is one of the places to look for trouble, and if you find it you might try introducing a condenser and high-frequency choke, so as to decouple the pentagrid valve—the condenser should have a capacity of one microfarad.

Another dodge which is worth trying is to screen the valve by a suitable cover. These simple precautions will as a rule get over the difficulty mentioned unless, of course, there is something seriously wrong with the set or the layout, or with the matching of the components.

The outstanding features of the superhet circuit are its great range and its extraordinary selectivity. In the old days the construction and operation of a superheterodyne receiver were relatively complicated, but nowadays this type of set has been greatly simplified and the operation is comparatively straightforward. The construction is still rather tricky but, inasmuch as most of the sets of this kind are now commercially manufactured, that does not need to trouble the owner of a set.

MARCONI – THE MAN AND HIS WIRELESS

(*Continued from page* 471.)

the Atlantic without any intermediate stations."

The American Institute of Electrical Engineers arranged a Marconi celebration in the uniquely decorated Astor Gallery of the Waldorf-Astoria.[5] On the wall, back of the guests' table, was a black tablet framed in smilax and studded with electric lights that spelled "Marconi." At the eastern end of the gallery, above the 300 diners, was a tablet on which, traced in electric lights, was the word "Poldhu," and on the western end was the word, "St. John's." These tablets were linked by a silken cable festooned along the wall of the gallery, and on the cable tiny electric lamps were distributed to make at intervals the letter "S" in the Morse code.

The guest table was ablaze with tiny electric lights peeping from banks of smilax and surmounted by bouquets of American beauty roses. On the menu cards was a half-tone picture of the inventor in the centre of a scene representing the transmission of the first wireless message across the ocean. The galleries were jammed with spectators.

The cue for the first applause of the evening was the entrance of a long procession of waiters bearing aloft the ices which were surmounted by telegraph poles, steamships and sailing vessels fitted with wireless. The telegraph poles were made of solid ice.

"Frozen out," was the prophetic cry of the diners as they saw the crystal poles—did they signalise the end of the telegraph? Marconi rose and clapped his hands in glee. Then the signal "S" began to flash from the tablet, "Poldhu," as Dr. Charles Proteus Steinmetz, president of the Institute, called the diners to order, and turned the meeting over to T. C. Martin, toastmaster for the occasion.

A letter was read from Thomas Alva Edison: "I am sorry not to be present to pay my respects to Marconi. I would like to meet that young man who has had the monumental audacity to attempt and succeed in jumping an electric wave across the Atlantic."

"I was talking with Mr. Edison within the last ten days," reported Mr. Martin, "and he said that he thought that some time there might be daily signals across the Atlantic without wires, but that he did not know when, and being preoccupied he did not think he would have time to do it himself. (Laughter.) He said to me, 'Martin, I'm glad he did it. That fellow's work puts him in my class. It's a good thing we caught him young.'" (Laughter.)

There were more cheers when the toastmaster turned to a letter from Nikola Tesla, who said that he felt he "could not rise to the occasion. . . . . Marconi is a splendid worker and a deep thinker . . . . and may prove one of those whose powers increase and reach out for the good of the race and the honour of his country."

The toastmaster's presentation of Marconi was brief: "For an introduction to such a man, look about you!"

Amid a salvo of applause the young inventor rose, and began to speak in a low but distinct tone without gestures; with a modesty almost amounting to diffidence he told of the various disappointments leading up to his triumph:

"I can hardly find words to express my gratitude and thanks for the reception I have received here to-night. I thank you very much for the appreciation of the work which I have been fortunate enough to carry out. I feel myself to be highly honoured to be entertained by such a great body as the American Institute of Electrical Engineers. I think it is well known all over the world that Americans stand first in applied electrical engineering. I feel myself greatly honoured to be in the midst of so many eminent men, whose names are household words in the whole civilised world.

"With your permission I will give you a brief description of what my system has at present accomplished, especially in reference to use on ships, and what I hope it will accomplish in the future.

"Wireless telegraphy is now attracting very great attention all over the world, and its progress is not slow. Five years ago the system with which my name is identified was working over a distance of about two miles, but its range has been rapidly increased until a few months ago it was quite possible to communicate by means of an improved and attuned system over a distance of more than two hundred miles. The commercial application of the system has been given serious consideration, and improvements of importance have been made.

"It may interest you to know that the commercial application of the system has been tried in Great Britain, its chief base being in England. There are more than seventy ships carrying permanent installations for wireless telegraphy; of these, thirty-seven are in the British Navy, twelve in the Italian Navy, and the remainder are on the large liners, such as the Cunard Line, the North German Lloyd, and the Beaver Line. There are more than twenty stations in operation on land in Great Britain, and more are in course of construction.

"I regret very much that it is impossible for me in a brief address to go into the scientific details and the scientific developments of my system. I would like very much to do so, but I cannot at this time. I think it is right that I should correct some of the popular opinions which prevail as to the subject of wireless telegraphy.

"It seems to be the general opinion that when a message is sent into space anyone with a necessary apparatus can intercept that message and read it. Of course, this would be very awkward and would hurt the system from a commercial standpoint. No one would wish to have his private affairs made public in that way. For instance, stock quotations or other matters of secret could be found out. By experiments and improvements which have been made, messages can be read only when the receiver and transmitter are attuned.

"The perfected system is not at present in use on the ships. It has been deemed necessary that each ship should be equipped with apparatus which will permit of its reading a message from any other ship, because of the possibility of aid being required. Therefore, all ships are attuned so that one ship can call up any other ship, but it is practicable to have all the apparatus so attuned that the messages transmitted can in no way be received by any other apparatus except that attuned to receive the message."

Marconi then reviewed his early experiments in England and expressed appreciation for the aid rendered to him by the British Government.

"Also I have been very greatly encouraged by the Government of Canada," he continued, "and the sympathy they have given has encouraged me in my work. I think it will be admitted that one of the greatest features of civilisation in all the world is the facility with which people can communicate with each other living long distances apart. My hope is that in no great distant future I shall bring my system to the point of perfection of allowing friends and relatives to communicate with each other across the ocean at small expense.

"At present by the existing cable system the sending of messages across the seas is put out of reach of people of moderate circumstances. The cost of laying the cables is so large that cable companies have to charge a high price for the service. My system will cheapen the cost very greatly.

"I have built very largely on the work of others, and before concluding I would like to mention a few names. I may miss a few of them, but I would like to mention Clerk Maxwell, Lord Kelvin, Professor Henry and Professor Hertz. I do not know if you are aware that the message received at St. John's was heard through a telephone receiver, and in connection with the telephone the name of Professor Alexander Graham Bell is inseparable.

"I hope that I may bring this work to a successful completion. As a stranger here I thank you very much for your kind expressions and for your hospitality—I drink to the health of the American Institute of Electrical Engineers!"

Marconi lifted a glass from the table, holding it high above his head, lowered it to his lips and began to drink before the diners grasped the situation. Quickly all picked up glasses and drank in silence a toast—in a few seconds cheers resounded through the banquet hall while Guglielmo Marconi bowed acknowledgment to the plaudits. There was no doubt that Americans believed in him and in his achievements.

Two days later a glowing tribute to the character and conservatism of the young man was printed by *The New York Times*[6]:

Signor Marconi is not a stranger to the representative men of his profession in the United States, but it may be truthfully said that he leaves our shores with the respect and good wishes of every electrical engineer and the confidence of every one financially interested in the telegraph business.

At the banquet given in his honour Monday evening by the American Institute of Electrical Engineers he made his first specific statement of the results claimed by him as already achieved and of his hopes as to the future of his work. This statement was so modest, so free from every trace of exaggeration for business purposes, so generously just in its recognition of the obligation to the pioneers in experimentation along the lines he has followed, so frank in acknowledging the claims of the living as well as the dead, and withal so conservative in its predicting of what may follow the work he now has in hand, that everyone present

(*Continued on next page.*)

[5] January 13th, 1902.

[6] January 15, 1902.

MARCONI—THE MAN AND HIS WIRELESS

(*Continued from previous page.*)

realised that to Marconi was not only due the honour of his discoveries in the field of mechanics, but the still higher honour which belongs to one who can subordinate all professional jealousies and rivalries to the truth.

From the wreath woven for his own brow he borrowed enough to make wreaths for his predecessors and colleagues in the study of electrical waves—Clerk Maxwell, Lord Kelvin, Professor Henry, Dr. Hertz, Alexander Graham Bell and others—and by what he took from it his own was rather enriched than impoverished.

It cannot have escaped the notice of those for whom the subject of wireless telegraphy has even a news interest, that to establish the fact that the feat of transmitting intelligible signals in prearranged order and frequency of occurrence no other evidence was needed than Signor Marconi's unsupported and unverified statement. Immediately on receipt of telegraphic intelligence from Newfoundland that this feat had been accomplished, representative engineers of the world were interviewed, and without exception their response was: "If Marconi says it is true, I believe it."

There have been few great facts in science thus accepted with unquestioning confidence on the authority of one known to be anything but disinterested. In Marconi's case all that he claimed was conceded even before the details were known. No higher tribute could have been paid by the world of science to an inventor than was paid to Marconi by this unquestioning acceptance of the announcement that he had succeeded in accomplishing the seemingly impossible.

Concerning the commercial value of Marconi's work, his own claims are all that can safely be made at the moment. He hopes to give his system commercial value; if he does it will undoubtedly facilitate and cheapen electrical communication. He makes no boasts, and indulges in no extravagant promises. He does not understand the art of promotion, perhaps, but he has established a character for truthfulness and conservatism, and when he makes the announcement that his system can compete successfully with cables and land wires for business, we venture to say that he will have no need of the services of a promoter to capitalise his invention.

When the steamer Philadelphia pulled away from the wharf on January 22nd, again Marconi was at sea, this time with plenty to read and to think about, for he had been the recipient of a large mail. There were epistles of congratulation from all walks of life: royalty, statesmen, inventors and scientists. Some wanted advice, others asked favours. Within a week he had received offers to write more articles, to lecture and to visit more places than he could in several years.

All the world suddenly became interested in this hero of the hour from picturesque Bologna—and well it might be for he was just beginning!

On the way to England he had opportunity to collect his thoughts and to study the results of the Newfoundland tests. He had been led to believe by his early experiments that long distances could be covered only from high masts and long suspended wires. The transoceanic results, however, seemed to substantiate a theory that the waves somehow follow around the earth conforming to its curve. He was convinced that one of the secrets of long-distance transmission was the use of a more powerful current at the transmitter, and he planned to verify this idea in the next trials between the continents.

The manner in which the wireless waves apparently curved around the globe set many scientists thinking. Old theories seemed to be in error. Oliver Heaviside, an English physicist and telephone engineer who had watched the Marconi experiments with interest, had published a book on "Electromagnetic Theory," in 1893. He was not so sure that the signals clung to the curvature of the sphere as a fly crawls around an orange. He had a theory that a halo-like layer of ionized air high above the surface of the globe acted as a "mirror" reflecting the messages back to the earth.

Professor Arthur Kennelly of Harvard University agreed with Heaviside, so the "mirror" that billows up and down at high altitudes like the big top of a circus in a gale was named the Heaviside-Kennelly Layer or surface.

Marconi found that even those who believed in him still wondered if there was room for more than one or two powerful stations in the world. If a dozen or so began sending, how could any one be understood?

Tuning! That was the secret.

But what does that mean? Well, a Marconi engineer explained, if the transmitter is radiating 600,000 vibrations a second, the receiver in tune with it will take only 600,000 vibrations. The action is much the same as that of the familiar tuning-fork which responds only to another tuning-fork having exactly the same "tune" or number of vibrations a second. That is where wireless acquired the term tuning, the importance of which could not be over-estimated, for it untangled the nerves of the wireless system.

Visionary writers predicted, "the spy of the future must be an electrical expert who slips in somehow and steals the secrets of the enemy's tunes." They foresaw all ships provided with instruments tuned alike, so that they could communicate freely with one another, and have no fear that the enemy could read the message. They visualized telegraph companies each with its own tuned instruments, and each government with special tunes. Predictions were made that the time would come when banking and business houses or even families and friends would each have their own wireless system with individual secret tunes. For example, it was pointed out that since there are millions of different vibrations, there would be no lack of tunes. The British Navy might be tuned to receive only messages of 500,000 vibrations to the second; the German Navy 1,000,000 vibrations; the United States Navy 900,000 and so on indefinitely. This was the forecast in 1902.

Tuning was a great boon to wireless progress, but it was no panacea for secrecy. What it did was literally to divide "the ether" into thousands of narrow channels so a multitude of stations could operate simultaneously without interference. It was soon discovered, however, that unless the messages were coded or scrambled in some unique way there was nothing to prevent a million listeners from tuning-in on the electro-magnetic vibrations of any navy, government or business enterprise, providing, of course, that they all had receiving outfits, the dials of which could be turned from tune to tune or wave to wave.

(*Continued overleaf.*)

CONI—THE MAN AND HIS WIRELESS

(Continued from previous page.)

The public watching this wireless mysticism in the heavens between the continents, unlike a theatre audience gathered to be entertained by a magician, wondered if the transoceanic trick were really possible or just what sleight-of-hand had fooled them.

If Marconi could capture an elusive signal, why not have some sort of machine automatically record the dots and dashes? That would be proof unassisted by the human element. Marconi would do it; he accepted the challenge.

CHAPTER X

On Board the Philadelphia

An attempt to record the messages—Leaving port in a storm—Surprising a sea captain—Dots and dashes on a paper tape—The magic of an electric pen—An old salt endorses the evidence—Proof for the newshawks—Heralding a mid-ocean triumph—The scene at Poldhu 2,099 miles away—Marconi proves the mathematicians were wrong—Old theories blasted—Wireless wins new friends in business and politics—Sim-posts to new advances—Marconi discovers the sun's influence on wireless.

FRONT pages of newspapers dated February 22nd, 1902, featured news of storms on land and sea. Where was the Kronprinz Wilhelm? That was the big mystery story of the day. Somewhere on the Atlantic, tossed by a violent gale, was Prince Henry on board the Kronprinz Wilhelm long overdue at New York.

The Marconi operator of the Cunard liner Etruria at her pier in the North River tried in vain to communicate with the German ship, while agents of the North German Lloyd expressed utmost confidence in the big liner. . . . On the same night, lashed by a fierce wind, the 71st Armory in New York was burned to the ground and seventeen perished in the Park Avenue Hotel blaze. . . . A gale was raging along the Irish coast preventing the Lucania from landing passengers and mail at Queenstown, forcing her to proceed to Liverpool. . . . The White Star liner Teutonic docked a day late in New York after a "boisterous and hazardous voyage." . . . The storm routed all New York street cleaners and the headlines exclaimed "not a man braves the wind or rain." . . . Telegraph and telephone service was stopped by "the unabated fury, the worst storm in at least a dozen years."

Amid all this hurly-burly in the world's news the steamer Philadelphia slipped quietly away from Cherbourg at midnight on February 22nd, 1902. The inventor of wireless was on board en route to Canada to sign the final draft of an agreement for erection of a powerful transmitter at Glace Bay, Nova Scotia. There was too much to be done for a man of Marconi's inventive temperament to lounge idly about the decks. He had a habit of making the most of his time. Life for him proceeded, never paused. Storms ahead did not worry him; in them might lurk an opportunity for his machine!

When he walked up the gang-plank of the Philadelphia a wireless receiving set went with him, also a recording instrument that printed blue-coloured dots and dashes on a paper tape. This was to be no voyage of vacation for Marconi. With him on the ship were: H. S. Saunders of the Marconi Wireless Telegraph Company, of London; two engineers, R. N. Vyvyan and J. D. Taylor; two operators, Messrs. Stacey and Franklin; and Marconi's secretary.

Few among the passengers were aware that this young man of twenty-seven years had the power in several small boxes to talk back and forth with people on the shore, far beyond the horizon, while the ship was rolling and tossing on its way to America. No time was lost in completing the shipboard wireless installation; it was quickly "on the air."

Several test messages were sent and received until the 250-mile preliminary experimental limit was passed. Chief Officer C. Marsden was in the wireless cabin when a message was keyed, the Philadelphia then being about 500 miles from England. He could scarcely believe it, nevertheless, he had seen the miracle performed. Excited he rushed about the ship to tell his fellow officers. But the seafaring men only laughed. Some of them knew what Marconi hoped to do but they doubted he could do it.

The Philadelphia had a pre-arranged schedule with Poldhu, so at the appointed time the next day the sceptical sailors crowded around Marconi's room. There sat the young Italian with his eyes on the clock and the wireless instruments. He lifted a little brake on a roll of tape and the white strip began to move. Tap, tap, tap clicked the inker's metallic finger as it registered what the invisible waves were saying, in fact, it was expressing the thoughts of men 1,000 miles away.

Shortly after midnight on the 24th, scores of signals were intercepted across 1,032 miles. Just before dawn on the 25th, the ship was 1,551 miles from Poldhu and the tape recorded perfectly. No telephone receiver was used. The tape and the telegraph printer told the story in writing.

Now there was no human agency to think or imagine; nothing to fool the ear or cause it to err. Someone remarked that when a machine does a thing humans believe; but as long as a man stands between, humans are likely to doubt.

Captain A. R. Mills, veteran of numerous transatlantic trips, was puzzled. He didn't know what to make of it. To think he could communicate with people on the shore more than 1,000 miles distant—well, that was almost too much for an "old salt" to comprehend!

"Let me show you how accurately these instruments operate," volunteered Marconi, turning to the captain when the ship was in mid-ocean. "Now watch and I will release the brake on the reel of tape just a few seconds before the appointed time, and we shall see when the signals begin, and whether they arrive right on the schedule."

Ten seconds prior to the zero hour Marconi lifted the latch and the tape wiggled along; the coherer ticked and the inker clicked against the paper tape. Calmly Marconi took the message off the instrument and read it aloud: "Stiff southwest breeze. Fairly heavy swell."

"Is that proof enough?" smiled the man who performed the magic.

Captain Mills was smiling too. Enthusiastically, he patted his distinguished passenger on the back and vigorously shook his hand, then took the message and signed it and the first officer too endorsed it with his signature.

"Now let us see if these instruments will get anything during the five minutes' rest period of the Poldhu operators," said Marconi. "You know some of the scientists contend the receiver may be affected by atmospheric electricity. It is possible, too, that some of the other ocean liners equipped with wireless may be operating within range of this ship. If they are we shall not know it, for these instruments are tuned to receive messages from the Cornwall station only. But some people say I cannot tune the messages."

Again the captain and the inventor waited. The tape was allowed to unroll during the Poldhu rest period. Then suddenly, and as strangely as before, the telegraphic inker tapped, leaving a line of blue marks. The operators were back on the job, and Marconi, half-way across the ocean, heard the click every time they pressed the key that released a dot or a dash of energy. Day after day the signals continued, and the last were picked up when the Philadelphia was 2,099 miles from Lands End. The Poldhu to Newfoundland record had been broken and the inventor had printed proof of his achievement.

There were yards of "telegraph" tape dotted and dashed with thousands of signals to bear witness. By way of voucher, the ship's captain and chief officer signed and certified the messages which they saw jotted down by the instruments. This evidence included the dispatches received up to 1551·5 miles and signals which had travelled 2,099 miles.

Reporters were on the dock to meet Marconi when the Philadelphia arrived in New York on March 1st, and he met them again later in the day at the Hoffman House for an interview in which questions flew thick and fast. Here was front page news.

The newspaper headlines of March 2nd featured: "Marconi's Triumph in Mid-ocean." And the reporters had noted that Marconi, although he said he was not at all surprised at the results, was nevertheless a very happy young man.

Proudly he showed them a chart of the Atlantic compiled by Captain Mills, tracing the route of the Philadelphia, and the points at which messages were received from Poldhu were indicated by little red stars. The chart was autographed by the captain and first officer with this notation:

Messages received on board steamship Philadelphia from Marconi station at Poldhu (Cornwall) as follows: No. 1—250·5 miles; No. 2—464·5 miles; No. 3—1,032·3 miles; No. 4—1,163·5 miles; No. 5—1,551·5 miles.

Signals 2,099 miles from Poldhu when we were in Latitude 42·01 N., and Longitude 47·23 W.

"Will they now say I was mistaken in Newfoundland?" asked Marconi with a look of defiance.

NEXT WEEK—Continuing Chapter X—More about the amazing Philadelphia Tests.

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POPULAR WIRELESS, July 31st, 1937. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

HOW THE B.B.C. REBUILDS HISTORY

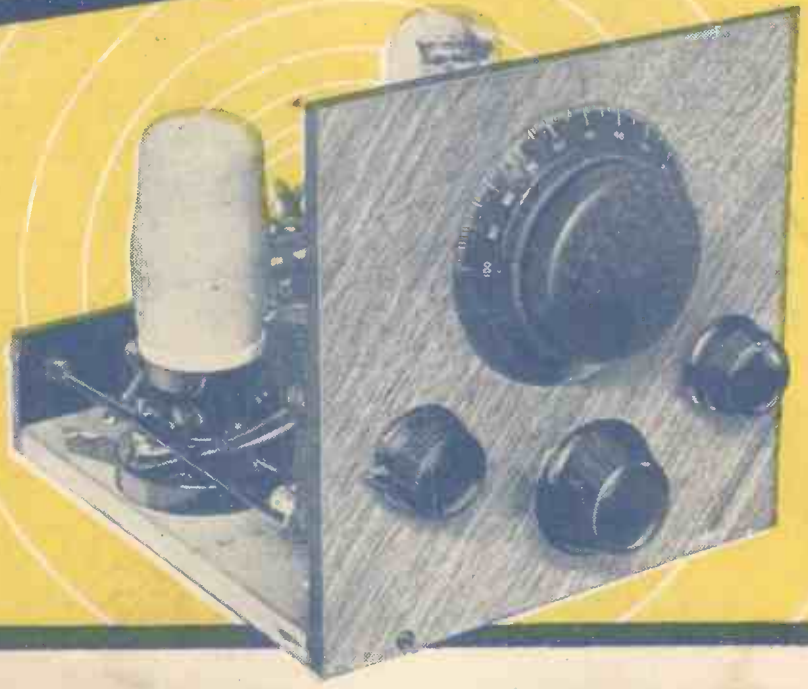
Popular Wireless & Television Times

MARCONI—THE MAN AND HIS WIRELESS
Authorised Life-Story
Appearing Exclusively in "P.W."

EVERY WEDNESDAY PRICE 3D

No. 791.
Vol. XXXI.
July 31st, 1937.

AN ALL-WAVE "MIDGET"!



The All-Wave "Midget," full constructional details of which appear inside, is a highly efficient two-valve set covering from 19-48 metres on the short waves as well as the usual medium and long wavebands. There is no coil-changing, and it is a set that anyone can operate.

ALSO THIS WEEK:—

LATEST TELEVISION NEWS :: SPECIAL SHORT-WAVE FEATURES

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

MODERN BABEL
DEPRESSIONS
THEY SAID IT

RADIO NOTES & NEWS

PERSONALIA
PEN-PALS ABROAD
JUST DROPPED IN

Coming Events.....

DESPITE our natural preoccupation with holidays and other flim-flam we must soon face the fact that summer won't last much longer, and the annual Wireless Exhibition at Olympia, London, W. is getting mighty close. It opens on August 25th, and runs till September 4th.

The trade expects to spend about £50,000 on the Show this year, and the attractions will include a radio museum to remind us of the progress we have made, and to show us once again the awful old junk that we used to think so wonderful.

The financial experts expect that about £20,000,000 worth of business will follow this year's Show, and it is confidently predicted that 2,000,000 sets will be sold —600,000 to new customers and the rest replacements.

Television at Olympia

INSTEAD of arranging for only two stage shows a day, there will be several special programmes daily, and the Exhibition's theatre is being enlarged to accommodate 4,000 people. The stage will be a replica of a B.B.C. studio, while the side-shows will include sixteen special television theatres, each containing two receivers and capable of holding an audience of seventy at each performance.

In general it looks as though past reproaches about lack of television facilities have borne fruit, and this year's Show should be more than memorable on this account alone.

It is reckoned that about 100,000 people will be getting acquainted with television at this Show, and the Trade's idea is, knock 'em back with delight, one and all.

Modern Babel

THE extent to which radio propaganda among the nations has grown is well shown by the following reply by Lord Cranborne to a question in the House of Commons.

He said that according to the information available to the B.B.C., wireless programmes directed to listeners outside the country of origin and given or announced in languages other than that of the country of origin are at present being broadcast from Austria, Bulgaria, Czechoslovakia, France, Germany, Holland, Hungary, Iceland, Italy, Japan, Latvia, Luxembourg, Poland, Portugal, Rumania, Spain, Switzerland, U.S.S.R., U.S.A., and Jugo-Slavia, also Vatican City.

So if the B.B.C. decides to take a turn, nobody can say we began it!

My Word — By the Editor

A GREAT MAN

IT is seldom that genius receives a full measure of contemporary appreciation. History records an unending succession of scientists, inventors, musicians and men of letters whose work met with little but indifference, if not active opposition, during their life-times, and who were given their rightful seats in the Hall of Fame only by posterity.

But our sadness at the passing of Marconi, great man and good fellow, is to some extent lightened by the knowledge that he lived to achieve full recognition for his immeasurably important contributions to science and civilisation.

His was a good life. He enjoyed it. And through it all he remained essentially the same simple and modest man that he was before his universal lionisation.

His death occurred on the Fortieth Anniversary of the formation of the Marconi Company. When this Company was formed the maximum range of wireless was ten miles. To-day radio spans the earth. And all of its myriads of incessant ether vibrations form a mighty requiem in honour and memory of this Great Man.

Get Your Mac Ready

THE long-range weather forecasters who probe the heavens to see what is coming to us haven't a good word to say for 1938. It is going to begin with rain and storms such as we haven't known for many a long day, and in their opinion it is going to play the very deuce with radio communications and telegraph systems, owing to unusual magnetic disturbances.

The prophecies are based on three discoveries reported to the American Association for the Advancement of Science: (*a*) Unusual sunspots; (*b*) remarkable change on the face of Mars, like fine dust sweeping across the planet; and (*c*) a huge new spot on Jupiter.

The sun-spots, well known as radio spoil-sports, are so numerous and large that they suggest that Old Sol has got the spatial equivalent of an attack of horse-measles.

They Said It.....

"B.B.C. broadcasts of plays are being given from as near as possible to the place mentioned in the script. We look forward with some eagerness to hearing 'Man and Superman'—with the Don Juan in Hell scene left in."—"Birmingham Daily Mail."

* * *

"To praise the B.B.C. in general is impossible to one who knows as much as I do about its work."—Mr. E. R. Appleton, formerly West Regional Director.

* * *

"It is possible that the installation of microphones and loudspeakers in our churches would encourage priests to become more natural in their speech, and to use the language of ordinary life; for the idea that there is a special form of speech behaviour appropriate to the Deity is a mediæval idea, and one which must be exploded."—Professor A. Lloyd James.

He Steadied the Wavelengths

THE 1937 award of the Duddell Medal of the Physical Society has gone to Professor W. G. Cady. You may as well confess it, you rascal—you had never heard of Professor Cady. Nevertheless, he well deserves the high distinction bestowed upon him, for he has done much for your radio enjoyment.

Slogging away in the laboratory of the Wesleyan University of Middleton, U.S.A., fifteen years ago, Professor Cady started the train of researches which led to modern piezo-electrics, and the system of crystal-controlled wavelengths which is in general use to-day.

It also led to the development of the quartz-clock, most accurate of all time-keepers, which strays less than a hundredth of a second over a working period of months. Pretty work, Professor.

(*Continued overleaf.*)

Next Week: AERO-RADIO FOR TRANSATLANTIC SERVICE

NEW AND OLD WAYS OF TESTING THE EMOTIONS

One Over the Eight

THE radio columnists of the U.S.A. are chuckling about the latest story of the courts in which the wireless set came into the evidence. It was a case in which a negro wife told how her husband came home drunk and disorderly but the judge insisted on the proof of this.

"Are you sure he was drunk?" he asked.

"Shuah I'se shuah, jedge," was the reply. "He came indaws on his han's and knees, jedge, jest as the lady on the radio started her cookery talk. An' when he heard her, jedge, he chucked the whole radio out in the street, and sed: 'Didden Ah tell yo' mother to keep outa dis house?'"

Personalia

MR. S. D. SPICER becomes B.B.C. staff training director as from October 4th, in succession to Mr. G. C. Beadle, who will be the new Director of the West of England Regional.

* * *

Commander Stephen King-Hall had been broadcasting regularly since 1929, when he recently relinquished his microphone duties. His great success in the Children's Hour was, I consider, due to his perception of the first principle of getting along with children, which is to abandon condescending attitudes and treat them as seriously as though they were grown-ups.

* * *

Mr. E. L. Guilford, Director of the Newcastle station since 1932, is shortly to take up a new appointment as Programme Executive in the Midland Regional.

The Good Old-Fashioned Way

AN eminent Hungarian scientist, lecturing on the possible uses of ultra-short-wave radio transmissions, stated that by placing electrodes on suitable parts of the human body it is possible to detect variations of the emotions.

What's wrong with the older methods? Choosing a moonlight night, you place an arm round her waist and hold her as close as you know how: if she wriggles and tries to get closer there's no need to ask "How am I doing?" or to worry about radio.

The Three-Fold Cord

I HAVE just received some most interesting details of the Three-Fold Cord, the new Youth movement of the English-speaking peoples, from Mr. E. R. Appleton.

The movement started, romantically enough, in the ancient Guildhall of Barnstaple, Devon, when the freedom of the borough was presented to the Hon. Robert Worth Bingham, American Ambassador to the Court of St. James's. His ancestors had left this country 300 years ago to found a new Barnstaple, in Massachusetts, and friendly greetings exchanged between the old town and the new suggested possibilities of closer co-operation between the Youth of the English-speaking peoples. The idea has caught on, and applications for membership are now being welcomed from all parts of the English-speaking world.

Pen-Pals Abroad

THE first step towards Three-Fold Cord membership is the formation of links, each link to consist of three members of either sex, having similar interests; of these three one lives in Great Britain, another in the British Empire, and the third in the U.S.A.

"MIKE" SLIPS AND QUIPS

DURING A TALK

I wish to help as many of my dog listeners as possible—er—I mean dog lovers.

* * *

ADVERTISING A CLEANER

You just sprinkle it on, rub it in, and everything will disappear.

* * *

O.B. OF DOG-RACE MEETING

I don't know if the rain kept the crowds here away to-night.

* * *

IN AN APPEAL

Now don't forget the Legacy Club ball. The Legacy Club, as you know, looks after the deceased sons and daughters of soldiers.

* * *

DESCRIBING AN ASTHMA CURE

Will make you feel ten years younger. I wonder what would happen if a child of nine took it.

* * *

IN A TALK

You go through to Whitehall and there you see the small boys gaping as they have gaped for 100 years.

Members of each link get to know one another by correspondence, by exchanging periodicals, and so forth; and a system of groups within the movement aims at helping the study of the arts, sciences and sports.

Full particulars are obtainable from the Hon. Sec., Three-Fold Cord, Guildhall, Barnstaple, Devon, who will aid applicants to get into touch with potential pals abroad.

"Caledonia" and "Clipper"

MANY thanks to all who responded to my invitation to send particulars of the radio side of the experimental flights across the Atlantic between Foynes, I.F.S., and Botwood, Newfoundland. Not many sets will cover the wavelengths where the transmissions were to be heard, but those who could listen there were well rewarded.

In general, the messages were of the formal and matter-of-fact type that get on with the business in hand and care nothing for effect. But the U.S. radio commentators were not going to be put off with reticent official messages, so they were waiting for the "Caledonia" to arrive at Port Washington, to give a vivid word-picture to listeners of Boundbrook, N.J., and associated stations. They gave a first-class description of the landing, and then persuaded Captain Wilcockson to say a few words to the mike.

Sitting Up and Taking Notice

IN the ordinary way the visiting gipsy is not welcomed at the farmhouse.

Imagine, therefore, the surprise of the gipsies who walked past the dairy door without being turned back, and arrived at the back door of the farm to find a notice on it:

DON'T KNOCK.
We've Tuned-in
to the Wireless.

Imagine, too, the farmer's surprise when he found later that his notice was turned round back to front, and altered to read:

DON'T WORRY
We've Tucked in
to
the Butter.

Just Dropped In

LIKE most short-wave enthusiasts, the owner of amateur station G 2 N H is interested in aircraft. He was going home not long ago when somebody told him that an R.A.F. bomber had crashed in the New Malden district, where he lives. He quickened his pace.

When people told him that the crash was in his own road he accelerated further. And when at last he came in sight of his own house he found that a Vickers-Wellesley had called on him, stripped part of the roof off and flooded the garage with about 200 gallons of petrol.

G 2 N H himself was consequently far too busy to let me know, but K. W. K., one of the "P.W." reader Vigilantes, who was passing, kindly sent me the details, thinking you fellows would be interested. Many thanks, K. W. K., and Vy 73's.

"Hush Yo' Mou'"

REPROVING me for the light-hearted way in which I referred to the new police wireless station at West Wickham, Kent (now transmitting on about 140 metres, call-sign G W W), a reader who lives near by, at Hayes, asks if I realise the importance of this great mystery station.

"Surely you know," he said, "that, for secret reasons, nearly two hundred men were employed on this job? All sworn in."

I didn't know. On the contrary, I believe these yarns about the swearing of oaths arose when the ladder fell across Old Jack's shins. He has a remarkable fund of good old English adjectives, has Jack.

ARIEL

GALVANOMETERS GALORE

Some minute-to-make current-indicating instruments which will serve well in times of need

By J. F. Stirling

"OF the making of books," the sage said, "there is no end." And to the making of galvanometers, I add my humble observation, there is, also, no finality because, somehow or other, these ubiquitous current-indicating instruments seem to be capable of existing in a myriad different forms and patterns.

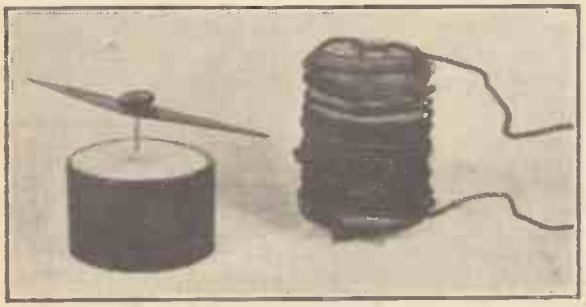
The very simplest galvanometer consists merely of a straight length of wire passing close by a compass needle suitably pivoted. On a current being passed through the wire the needle is set into motion. Even this crude form of instrument is surprisingly sensitive and it is capable of detecting a fraction of a volt. Nevertheless, there are better forms of current-indicators which are quite as easy to make and which can be really highly sensitive. Any of the galvanometers described in this article, although they can be made in a minute, are as sensitive as any orthodox linesman's instrument. Naturally, they will only indicate the presence of current. They will not measure its pressure or quantity like a voltmeter or ammeter.

Costing Practically Nothing

For emergency use, however, and even for more permanent employment, one of the galvanometer gadgets described below can form a convenient and efficient instrument. Moreover, such an instrument will possess the very decided advantage of costing practically nothing.

The first of our galvanometers is made by winding a number of turns of enamelled or cotton-insulated wire on an old cotton-reel. The wire should not be too thin, otherwise it will offer excessive resistance to the passage of the current. 22's gauge of wire is about the best.

PIVOTED ON A GRAMOPHONE NEEDLE



Here the current indicator consists of a compass needle pivoted on a gramophone needle, which is pushed through the lid of a pill box. Current passing through the cotton-reel coil causes the needle to move.

Wind from half a dozen to a dozen and a half turns of wire on the discarded cotton reel, securing the ends of the winding to the cotton reel by means of a dab of sealing-wax. The reel is now placed horizontally on the work-bench and made to remain in that position by a dab of "plasticine" or some other similar putty-like material placed under it. On the top of the reel a cheap magnetic compass is placed. This, also, may be fixed in position and prevented from sliding off by means of "plasticine," wax or other material placed underneath it.

The galvanometer is now complete. On passing a current through the coil the compass needle will be set into motion, its direction of movement depending upon the direction of the current through the coil. The slightest current will produce a movement of the compass needle, always providing that the latter is properly pivoted and does not tend to stick.

The more turns of wire which you put on the cotton-reel the more sensitive will your galvanometer become. Don't, however, make the mistake of putting too many turns on your reel, otherwise you will increase the resistance of the winding and so defeat your own object of increasing the instrument's sensitivity. About a dozen turns is, perhaps, a happy medium.

If the cotton-reel is placed vertically with the compass resting on the end of it, the compass needle will dip on the passage of a current instead of rotating. This arrangement, however, is not very sensitive.

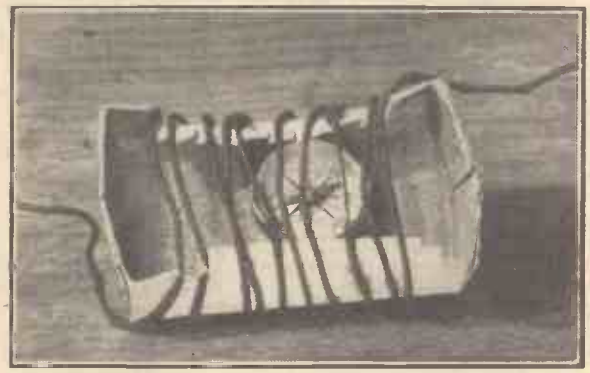
A still more sensitive home-made galvanometer may be constructed by removing the inner compartment from an ordinary matchbox, by fixing a small compass in it and by placing a dozen or so turns of wire around the matchbox drawer.

On passing current through the coil, the compass needle will be set into violent commotion. So sensitive, indeed, is this little galvanometer that it is better not to use it for detecting heavy currents, owing to the risk of the vigorous movements of the needle upsetting its pivoting.

A simple galvanometer consisting of a cheap compass and a number of turns of wire wound round a cotton-reel.

The only disadvantage of the matchbox galvanometer, if I may use that term of designation, is that it is rather difficult to see the compass needle movement, particularly when the latter is slight, owing to the turns of wire passing above it. You can, however, get over this difficulty to a large extent by widely spacing the wire turns just where they pass above the compass dial.

WOUND ROUND A MATCHBOX



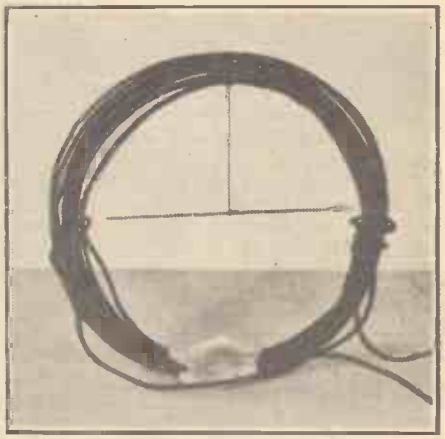
Here is another easily made "galvo." In this case the compass is placed in a matchbox and the turns of wire are wound round the box itself.

Question of Resistance

A small tuning coil with a compass placed in the centre of it forms another good galvanometer. Sometimes, however, in this case, the resistance of the coil is too high and thus the sensitivity of the instrument is not great.

If you possess a spare compass needle you can make a very large number of current-indicators with its aid. Push, for instance, a gramophone needle, point upwards, through the lid of a small pill-box, a match-box, or any other similar container, and pivot your compass needle upon this

CRUDE—BUT IT WORKS



A magnetised sewing needle, suspended from the coil by a short length of silk or cotton, is used in this arrangement.

upturned point. Now bring a small coil of wire, as, for example, half a dozen turns wound upon a cotton-reel, near the pivoted compass needle. Pass current through the coil and note the reaction of the needle.

Even if you haven't a compass needle, a substitute for this article can be made out of a flat piece of steel spring which has had

(*Please turn to page* 504.)

THE DIAL REVOLVES — By LESLIE W. ORTON

THE SEARCH FOR MISS EARHART

AMAZING FAKED REPORTS :: THRILLS ON 20 METRES
A WAR ECHO :: MY FAVOURITE SET "DYNAMITE"

DID a "pirate" transmitter broadcast some of the calls supposed to have originated from Miss Amelia Earhart's plane when it came to grief in the Pacific?

A genuine call for help was the first intimation that the world had of the plight of the fliers, and then, as warships, aeroplanes, and fishing boats rushed to the rescue, the voices of the fliers could be heard calling over K H A Q Q. The U.S. Navy station at Honolulu actually conducted two-way contact.

"Fake" Reports

A rather unusual aspect of the affair was the number of obvious "fake" reports received from this country and America. Whether a "pirate" was impersonating the lost fliers or whether too zealous listeners imagined they heard the words, I don't know, but I'm inclined to believe the first theory correct, for one of the calls heard was K H A Q M, whereas the plane's call was K H A Q Q.

Whatever may be the truth of the matter we cannot tell, but this search gave listeners a chance of realising the news-carrying power of radio as well as its value in mobilising search-parties. Honolulu and coastguard vessels were heard by listeners in this country, whilst several reported hearing K H A Q Q itself.

Unexpected Thrills

Remember the old game of banister sliding? Reception on the 20-metre band reminds me of that, one long thrill with perhaps an unexpected surprise at the end!

Just as the early bird catches the worm, so does the early DX-er pull in a batch of worth-while catches. Conditions between 5 and 7.30 a.m. are marvellous, and I've logged V K 2 L Y, Canberra, C O 2 E G, Havana, and quite a batch of other fellows. How about paying the band a little attention, then? It will give you an appetite for breakfast if you find time to eat it once you get going!

At more reasonable hours, from 11 p.m. to 2 a.m., stations shower on one like leaves during the autumn, and I've logged S A 1 A H, Warsaw, V E 3 H D, V E 2 D Q, V E 2 A A, K 4 S A, Porto Rico, L U 7 A P, Argentina, etc., at excellent strength.

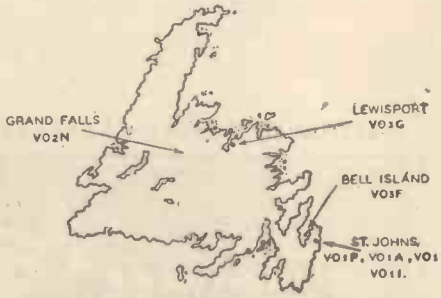
A "hot spot" was W 3 X C A, a forest-fire station! Other "Yanks" heard were W 2 G I Z, W 2 I S Q, W 3 O E, W 3 D Q, W 3 F S D, W 4 M D, W 4 K U, W 4 C Y C, W 4 B B R, W 5 C Y D, W 8 N S F, W 8 G L Y, and W 8 K B L, etc.

Incidentally, I've been surprised at the number of Miami stations coming in—seems this part of the world is favoured at the moment. All told, an exciting week. Fortunately, unlike the banister slider, we can sit down in comfort!

War

The stark reality of war was brought into the homes of many listeners the other night when a Spanish station with the call Radio Santander was heard calling American amateurs from near the fighting lines. I picked him up at 1.30 a.m. recently, and shortly afterwards heard W 2 E T I and W 1 A C E calling, and later in contact with him.

There are many Spanish stations to search for, a few being Valladolid and



"V O's" (Newfoundland) are worth logging. Several of the above amateurs work on 20 metres and are coming in well around 2 a.m.

Madrid on approximately 42 metres; Barcelona on 40 metres, an unknown station on approximately 25 metres (luck never favours me with his call!), and Radio "Nacional" on approximately 20 metres—a fine batch to search for. But, a warning, don't believe everything you hear!

"Dynamite"

"What set do you use?" inquires J. P. of Edinburgh, echoing a query of many readers. Well, my favourite is "Dynamite," so called because it blows the "blues" sky high. When "The Dial Revolves" I can get almost anything but a drink from it.

Years ago, when I was young and innocent (*sic!*), I used to see lists of stations, and promptly set about trying to tune them in. Failure hardened me! I quickly realised that "the other guy" had a far superior set, and so I decided that I would use a set equivalent to the average DX-er's. And that's how "Dynamite" came into the world—no stork brought *him!*

The circuit is simple. A straight two-valver with capacity-coupled aerial and a plain transformer-coupled low-frequency stage. Nevertheless, Dick Turpin couldn't have had more thrills with Black Bess than I with "Dynamite."

Drake the DX-er

If Drake had lived at the present time he would have forsaken his game of bowls, let the Armada go to—where it liked!—and have turned to his radio. And very wisely, too, for conditions are marvellous.

All the old friends, W 2 X A F and so on, are coming in well, whilst V K 3 L R, Lyndhurst, often comes in at reasonable strength in the mornings. On Sundays the Laughing Jackass may be heard serenading listeners from V K 2 M E, Sydney.

But if you want a real thrill, turn to J Z K Tokyo on 19.75 metres after 9 p.m. any night. Volume is amazing.

SHORT-WAVE STATION IDENTIFICATION — By F. A. BEANE

MORE STATIONS OF THE U.S.A.

IT is strange that the West Coast and Southern States of the U.S.A. are not represented by any short-wave broadcaster. Admittedly Memphis has its **W 4 X C H** on 31·6 megacycles and Los Angeles its **W 6 X K G**, a 100-watt relay of K G F J, operating to a 24-hour schedule on 25·9 m/cs., or 11·7 metres, but apart from these rarely heard experimental high-frequency stations there is nothing else to search for.

A few years ago **W 4 X B**, of Miami, Florida, was heard quite well in the early mornings on 49·67 m., but this has, apparently, since been discontinued. However, should it reappear it may easily be recognised by its regular station announcement which, if I remember correctly, is given something like this: "W 4 X B and W 1 O D, owned and operated by the Isle of Dreams Broadcasting Corporation, Miami Beach, Florida." Actually W 4 X B is an experimental transmitter situated on Collins Island in Biscayne Bay.

Chicago presents **W 9 X F** and the lesser-known **W 9 X A A**. The former, operating on 49·18 m., is frequently well heard in the early mornings until 07.00 or so, B.S.T. It relays the N.B.C. programme with 10 kw. power. The station announcement is given often, usually as "W 9 X F, Chicago, Illinois," and repeated, at the commencement and conclusion of broadcasts, in various languages. W 9 X A A, which is usually heard on 25·34 m., is a much rarer catch, and styles itself as "W 9 X A A, The Voice of Labour, Chicago, Illinois." This station normally relays W F C L, but in emergencies, such as floods, radiates instructions on 49·34 m.

Cincinnati can only boast of **W 8 X A L**, a relay of W L W, operating on 49·5 m., where it is often a good signal in the mornings. When W 9 X F is well heard one can almost be certain of hearing **W 8 X A L** also, broadcasting the Blue Network N.B.C. programme. The announcement is generally given as "W 8 X A L, operated by the Crosley Radio Corporation, Cincinnati, Ohio."

There are few other broadcasters, operating on the S.W. bands, in the U.S.A., with the exception of **W 1 X K** (31·35 m.), the Millis relay of W B Z-W B Z A, which are Westinghouse stations; **W 3 X A U** (31·28 and 49·5 m.), Philadelphia, the inconsistent C.B.S. programme outlet, and a number of U.S.W. broadcasters, which are not audible at the time of writing due to the seasonal conditions. However, when good conditions again prevail we will "re-visit" the U.S.A. in order to "discover" and to introduce ourselves to these newcomers.

I am afraid that I have still neglected the DX-er, despite my promise of a week or two ago. However, Canada lies before us and, as I stated previously, presents the listener with a number of low-powered broadcasters which may truly be described as DX!

ON THE SHORT WAVES

MORE ABOUT MAINS L.T.

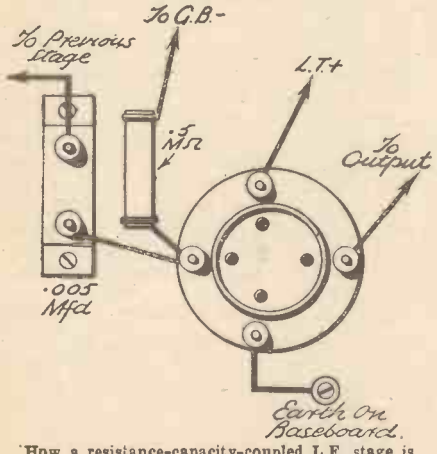
By W.L.S.

CONTINUING our campaign in favour of electrification, we must go into the important subject of converting H.F. and L.F. amplifying stages to an A.C. filament supply. Last week I described the conversion of a detector stage, so that most of you enthusiastic users of single-valvers will have gone ahead and done the first stage of the conversion by now.

Users of larger sets need not imagine that they have a lot of pitfalls in front of them, however, for the procedure with other stages is just as simple—in principle, at least—as that for the detector.

For the sake of simplicity, and also with the idea of helping the greatest number, I have shown in my diagrams a resistance-coupled L.F. stage. The first diagram shows it as it will probably be wired up in its battery-operated state. One of the L.T. wires goes off to the positive terminal, and the other goes to an "earth" point on the metal or metallised baseboard. The lead from the anode doesn't concern us at all; it may go to a choke or straight to the loudspeaker terminals, but it won't be altered when we convert to A.C.

AN R.C. STAGE



How a resistance-capacity-coupled L.F. stage is likely to be wired in the average battery set.

The grid condenser comes along from the preceding stage, and the grid leak is taken to the negative side of a bias battery, the positive side of which (we hope!) goes back to L.T. negative.

Now it's sheer waste of an opportunity to change the L.T. supply over to 4 volts A.C. and to continue to use battery bias. Admittedly, grid-bias batteries don't give any trouble, and they don't need renewing frequently; but you might as well be *all* mains when you get your conversion under way. Automatic bias is so easy to provide that I have included it in the conversion.

As before, you will remove all connections from the filament terminals of your valve holder, and will replace the four-pin type with one of the five-pin variety. Nothing should be connected to the filament pins of the new valve holder except the twin flex or twisted wires supplying the L.T. Their remote ends, of course, will go to the 4-volt secondary winding of the transformer, which may possibly be supplying H.T. as well. That doesn't matter, as long as the ends of your L.T. or "heater" wiring get 4 volts of A.C. across them.

Providing Grid Bias

Your grid leak, at its far end, is now removed from the bias battery and connected instead to a point on the earthed baseboard. The bias is provided, now, by making the cathode positive instead of making the grid negative, so that the grid assumes the same potential as the earthed baseboard and the centre-tap on the heater winding.

The bias is arranged by connecting a fixed resistance between the cathode and earth. I have shown 1,000 ohms in the diagram, and this is a good round figure that applies to many types of valve in common use. But you must study the valve-makers' pamphlets and use the value that they recommend for whatever particular valve you are using. It may be as low as 300 ohms; you must find out for yourself and see that you are using the correct value. The higher the value of the resistance, the higher the bias applied.

By-pass Condenser Values

Short-wave enthusiasts who use a general-purpose type or a small power valve in their L.F. stage will find a 1-watt bias resistance suitable. Larger power valves, working on high H.T. voltages, may necessitate the use of a 2- or 3-watt resistor.

This resistance must be by-passed by a suitable condenser. I have shown an ordinary 1-mfd. variety in the diagram; this is perfectly suitable for a headphone receiver, and, indeed, for most short-wavers in which a little bass-cutting on the L.F. side does no harm. For real quality reproduction, however, you are recommended to use an electrolytic condenser of 50 mfd. or so; and make sure you connect it the right way round!

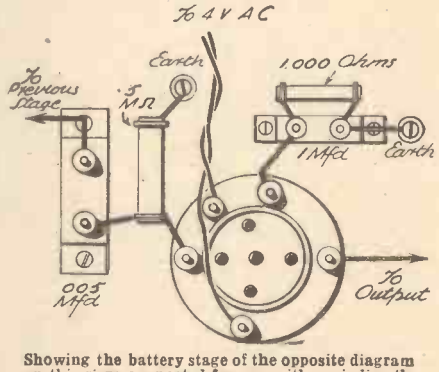
As I mentioned in last week's article, you will probably need to play about with centre-taps and things to get dead silence; but if you have already converted your detector, you will have done the deed. If the centre-tap—actual or artificial—of your 4-volt L.T. winding is already connected to earth, you simply take the L.T. leads from your L.F. stage to the same 4-volt winding and everything is complete.

An H.F. stage is treated in precisely the same way as the L.F. stage, even in the matter of bias. The point that formerly went to grid-bias negative now goes to earth instead, and bias is arranged by making the cathode positive with a resistance, just as in the case of the L.F. stage.

Now, however, you won't need to bother about a large by-pass condenser. One of ·005 or so will be suitable, but if you have a 1-mfd. in stock, use it.

I advise you to take separate pairs of wires from the heater terminals of each stage to the L.T. terminals on the back of the baseboard. By that I mean don't wire them all together underneath the baseboard and take one pair of wires off to the terminals at the back. That will mean that there will be a much greater voltage drop by the time you get to the last valve on the wiring than there is at the first one.

THE MAINS VERSION



Showing the battery stage of the opposite diagram on this page connected for use with an indirectly heated valve.

Don't forget that a three-valve set will take 3 amps. Your 4-volt winding should be designed accordingly, and your heater wiring should be *heavy*. Many a user of a home-built A.C.-operated set will probably find that his heaters are getting something nearer to 3 volts than to 4. And it *does* matter, so don't let anyone tell you it's unimportant.

You should find a most noticeable gain in efficiency when you have finished your conversion, and I assure you that you won't want to go back to battery valves again.

ON THE SHORT WAVES—Page 2.

"EAST IS EAST . . ."

How the Amateur Transmitters Differ

I PRESUME that it is unnecessary for me to finish the quotation which begins in the title. It is untrue, nowadays, to say "never the twain shall meet," because they do that, by radio, day in and day out through the years. The conditions by which radio is guided on the two sides of the Atlantic, however, are so completely different that the time has come when a few explanations should be made.

Many of my readers who are very keen on listening to long-distance amateur contacts have asked me why it is that the "Yanks" go on so differently from our own stations. As some listeners say, they seem so much more friendly and informal over the air than the British amateurs.

Licensing Conditions

The answer to that, of course, is that they are licensed under completely different conditions. Here, for instance, is one of the clauses in the British transmitting licence: "The only stations with which messages may be exchanged shall be stations (whether in this country or abroad) of persons co-operating with the licensee in his experiments . . ."

The same clause continues: "Messages sent and received by means of the stations shall relate solely to the licensee's experiments or to his personal (other than business) affairs or those of the person with whom he is communicating and shall be in plain language . . ."

This goes on: "The use of the station for advertising or business purposes, for the sending of news *or the messages of third parties* . . . is expressly forbidden."

And here is the famous "divulgence" clause: "If any message which the licensee is not entitled to receive is unintentionally received the licensee shall not make known or allow to be made known its contents, its origin or destination, its existence, or the fact of its receipt to any person. . . ."

You will see from the above that the British transmitter is not hedged round with unreasonable restrictions, as he is supposed to be in some quarters. Messages that he sends may apply to his personal affairs—such as the weather and where he is going for the week-end—and need not be 100 per cent. concerned with the type of grid condenser he uses, or whether his modulator is a triode or a pentode! Once upon a time the wording was far more strict than that of the paragraph I have quoted.

Third-Party Messages

You will see, however, that the handling of messages for third parties is completely ruled out—and this is the huge difference between British and United States transmitters. The latter are allowed—and even encouraged—to accept a message for Mr. Blank of Blankville, Ill., and to call up a transmitter as near to that city as they can get, hand on the message, and even wait for a reply while the other man delivers the message over the 'phone.

If a British transmitter did that he would certainly find an O.H.M.S. envelope on the mat next morning.

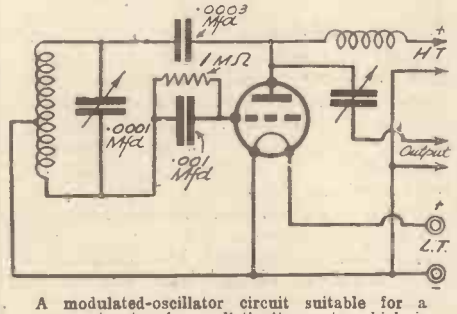
The Americans are compelled to pass a technical test and a Morse test, in the same way as the British amateurs, but once they have qualified for their licence in that way there is no suggestion that the station shall be used for experimental work. And the vast majority of U.S.A. "hams" make no pretence of doing experimental work. They come on the air to get all the fun they can out of a fine hobby.

Broadcasting Their Parties

Thus you can hear some of the high-powered fellows over there "broadcasting" their little parties, and inviting all their guests to come on the air and speak to the crowd at the other end—and so they go on for hours, just chatting about any old thing and not worrying at all about the experimental aspect of radio. Their gear is just a means to an end; they make it as efficient as they can, but then they get some pleasure out of using it, before they scrap it and go one better.

Restrictions vary in every country, but it is safe to assume that the amateurs are allowed more latitude in the U.S.A. than anywhere else in the world. Their marvellous work in times of national emergency has been largely responsible for this state of affairs; they are thought very highly of by the Federal Government, and they are powerfully organised.

FOR DISTINCTIVE NOTE



A modulated-oscillator circuit suitable for a wavemeter to give a distinctive note which is easily picked out on the receiver.

Let it be added, however, that no one has a higher opinion of the work of the British amateur than his brother "across the Pond." Those that have been over here have expressed themselves as amazed at the work that some of the "G's" do with low power, and at the general high standard of operating.

Efficiency versus Brute Force

That leads us on to another important difference between British and American amateurs. By far the most common transmitting licence in Great Britain is the "10-watter." Quite a large number of transmitters use 50 watts, and comparatively few are licensed for 250 watts. Anything above this is rare.

In the States, however, amateur transmitters of 1 kilowatt are as common as flowers in spring. In California there are several "hams" using 6 and even 10 kilowatts—and this with efficiently designed beam aerials! No wonder some of those Californian signals are so beefy.

The Britisher, however, puts some pretty good signals into the States with his 50 watts, just by virtue of sheer efficiency and hard work. When one uses a kilowatt, the transmitter may be quite inefficient without the results being poor. With 50 watts one has to squeeze the last drop out of everything.

POINTS from the POST-BAG

W.L.S. Replies to Correspondents

TWO or three readers want the Q R A of Y I 2 B A, Iraq. I published it a few weeks ago—will they please turn back?

Several more want books dealing with amateur transmission. I recommend, to start with, "The Guide to Amateur Radio" (6d.), obtainable from the R.S.G.B., 53, Victoria Street, S.W.1.

R.D.E. (Sawbridgeworth) suggests that a good task for readers is the identification (and verification) of U.S. Police Radiophones in all the nine districts of U.S.A. He has heard all districts except the 5th and 7th, including 25-watters in the 2nd and 4th districts (W 2 X I O and W 4 X C E). All these stations, of course, are round about 33 m/c. (approximately 9 metres). R.D.E., by the way, remains the only reader to own the "18" Club Certificate with *five* gold seals. How about it, someone?

An Unusual Call

B.C. (Bristol) mentions a funny one—O Q 5 A A. B.C. has received his verification, giving his Q R A as G. W. Westcott, Tondo, via Irebu, Belgian Congo. He works on 75 watts with a beam antenna.

H.N. (Burnage, Manchester) wants to know whether there is a club in the Levenshulme and Burnage district. Can anyone oblige? How about starting one, if there isn't one in existence already? He mentions that he recently heard the Coronation of the Gipsy King, relayed from Warsaw *via* W 8 X K and W 3 X A L. He remarks that one could hear both ends of the transatlantic 'phone before and after the broadcasting of the actual ceremony.

D.H. (Portsmouth) wants to know whether it is possible to make a heterodyne wavemeter which has a "distinctive note," and is therefore easy to pick out on one's receiver. If he rigs up the circuit shown in the diagram on this page I think he should be pleased. It is a modulated oscillator, i.e. as well as producing a local radio signal it generates a low-frequency oscillation which modulates this signal, making it sound like the interrupted C.W. used by most modern ships and several commercial stations.

The frequency of the musical note is governed by the size of the grid condenser and leak. The higher the value of the grid leak, the lower the frequency of the musical tone. The oscillator circuit is an ordinary Hartley.

Considerations of Accuracy

Incidentally, this scheme can be applied to any oscillating circuit. The wavemeter circuit that I recently showed can be made to give a modulated output if you use a larger grid condenser and a higher value of grid leak.

Personally, I don't think it is possible to take such accurate readings with a modulated oscillator of this type, but it certainly has a characteristic note that you can't confuse with the hundreds of signals that come from outside!

W. L. S.

MY SHORT-WAVE ADVENTURES

By L. CHESTER

TRYING A PENTODE DETECTOR

Mr. Chester describes the differences he found between triode and pentode rectifiers

HAVING graduated from one to three valves, I began to realise why so many fans spend a great deal of time, if not money, on "hotting up" the simplest of outfits. For there is surely a greater satisfaction in getting Australia, for example, on a one-valver than on three?

That is how I feel about it, anyway. While admitting the advantages of multi-valve hook-ups for "dead cert." reception of remote programmes, I still believe more sheer fun can be derived from making one valve do the almost impossible.

My little portable one-valver mentioned in the last article could hardly be simpler—either in circuit or layout. I have been

CHANGING FROM TRIODE

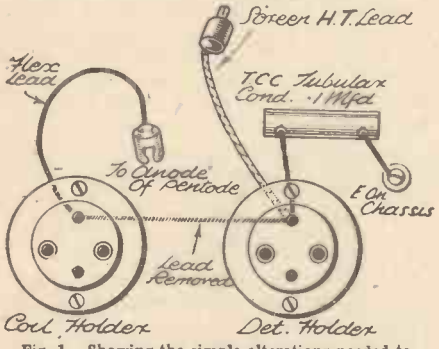


Fig. 1. Showing the simple alterations needed to change over the type of detector used.

trying to make it even more lively than it was when it so magically brought in Wayne on a bit of wire slung on a tree.

Does the type of detector valve make much difference to the results one can obtain from a one-valver on short waves? That was a question I felt needed answering by a few practical tests. And so I have been trying out three different valves: (1) Hivac D210, (2) Hivac H210, and (3) Hivac HP215.

The first two are, of course, triodes, the third a high-frequency pentode. Normally I use the D210, which is a nice valve specially designed for detection, having a metallised bulb and an internal electrode construction that certainly avoids microphonic noises. The impedance is 12,000 ohms, the amplification factor 16.

Smooth Oscillation

What pleases me about the D210 is its smooth oscillation. The easy way the valve slides into oscillation enables it to pull in amazingly weak signals. I think this is an asset far above any slight gain in amplification factor—as given by, say, the H210.

Here's a valve with an amplification factor of 25 for an impedance of 22,000 ohms. Is there any gain in signal strength? Not that I can notice. Whatever gain there may be seems to be offset by a slight loss in the nicety of reaction control.

For example, on Schenectady W 2 X A D I could follow every word with the D210—and no "hold your breath" reaction adjustment. With the H210 signals seemed stronger *when* reaction was just right—but it never stayed put long enough to benefit reception.

And so came the change-over from triode to pentode. An easy enough structural alteration, certainly, as Fig. 1 shows.

All I had to do was to remove the short wire going from the "anode" terminal of the four-pin coil holder to the anode terminal of the valve holder—making this instead a flexible lead to join to the contact on top of the valve. And then the extra high-tension lead for the screen voltage was taken to the erstwhile anode terminal of the valve holder.

Decoupling Needed

Full of hope, as usual, I switched on—and the most awful squawk hit my ear. Then I remembered about decoupling—and quickly connected a ·1 microfarad condenser of the non-inductive type between the screen high-tension lead and the earth terminal—a simple job with one of those wire-ended TCC tubular condensers.

End of squawk! It is always gratifying, I think, to discover that a given effect can be nailed down and a cure not merely specified but carried out. Encouraging to anyone blundering along as I am, certainly!

I sensed an improvement in sensitivity at once. Unhappily, the reaction was so bad I could not enthuse over the change. For one thing, oscillation was decidedly "ploppy." For another, there seemed to be quite a lot of backlash—oscillation did not stop at the same scale setting it started, but several points back.

Voltage Settings

All very distressing—until you find out why. And that need not take long if you study the valve leaflets before using the valve! I see the Hivac HP215 needs only 60 screen volts even with 150 volts on the anode. And I was using 90 volts on the screen with 120 volts on the anode!

I cut down my screen voltage to 60—and reaction smoothed wonderfully. At 45 volts I had oscillation as silkily smooth as with the D210. And the question remained: "Was it worth while?"

A lot of concentrated listening had to be done to answer that. It is so easy to arrive at wrong conclusions by a spasmodic turn at the set. On the whole I have come to the conclusion a pentode or screen-grid valve of some kind can be and is worth while as detector.

For two reasons: First, because signal strength definitely has a "lift." As an example, I might quote my 7.30 a.m. reception of Melbourne, through V K 3 L R on the 31-metre band. With the D210 I could hear the carrier but not the words. With the HP215 I could hear every word—very faint, but a hundred per cent. continuity.

Secondly, the pentode seems to work more evenly over the three main short-wave bands covered by my four-pin coils. Up to now I have got excellent results on the 12-to-26-metre coil and on the 22-to-47-metre coil—but the 41-to-94-metre coil has been somewhat "dud."

Improvement on 40 Metres

Now, with the pentode detector, I find the 40-metre fone signals come through at very good volume on the largest of these coils, at around 20 degrees on the scale of the Polar ·00016 microfarad tuning condenser. The amateurs on the 40-metre band are undoubtedly much louder at low readings of the condenser with the 41-to-94-metre coil than at high settings of the condenser with the 22-to-47-metre coil.

There can be no argument, I imagine, as to the relative merits of pentode and triode for sheer signal strength in a one-valver. But of course it is easy to lose one's sense of perspective over a thing like this.

What I mean is, you have to consider whether the extra cost of the pentode as against the triode—as well as the extra drain of milliamperes—is worth while for a one-valver. Might it not be better to spend the money and current on a O V 1 with triode and resistance-capacity-coupled amplifier?

It well might, of course. I am simply concerned here to report what I found in practice. Given the choice of any one valve for a simple-as-possible set, I think I should plump for a pentode detector. And I should use the circuit shown as Fig. 2 this week—a circuit that has the vast merit, as you will agree, of having brought in Australia.

A SIMPLE CIRCUIT TO USE

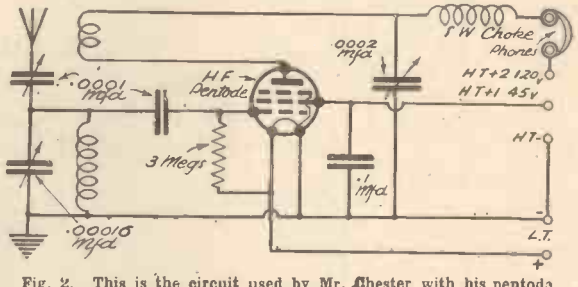


Fig. 2. This is the circuit used by Mr. Chester with his pentode valve.

Used in a simple metal-chassis layout, as I have done, you will get perfectly stable control, beautifully smooth reaction—and signals from the other side of the world. I don't see how you could ask more of any one-valver. Unless, maybe, a message from Mars!

And so, for the time being at any rate, I seem to have reached the ultimate in one-valvers.

MARCONI—THE MAN AND HIS WIRELESS

CONTINUING CHAPTER X—ON BOARD THE PHILADELPHIA
and
CHAPTER XI—MARCONI AT GLACE BAY AND CAPE COD

Last straws of the sceptics—The magnetic detector appears—Italy loans Marconi a cruiser for tests—Glace Bay selected as site for a powerful station—Sending the first west-to-east messages—Sir George Parkin describes a memorable scene—The drama of wireless shifts to Massachusetts—The "voice" of South Wellfleet—Roosevelt and King Edward exchange greetings—A personality sketch of Marconi—The electrolytic and crystal detectors are introduced—The first international radiotelegraphic conference at Berlin—A tiff with the Germans—Fleming invents the valve detector—Wireless when it was ten years old.

THE Poldhu transmitter was practically the same as used in the Newfoundland test, a Marconi engineer explained. The dynamos generated from six to forty horse-power, creating a voltage of 20,000, and this was stepped up to 250,000 volts of high-tension energy. When the operator pressed the long-handled key, a snake-like spark a foot long and as thick as a blacksmith's wrist sprang across the gap. The very room, decorated with danger signs, seemed to quiver and crackle with power. But despite all the power only an infinitesimal amount of the radiated energy struck the Philadelphia's antenna. That was what made the trick of reception so wonderful; it was making something invisible and inaudible talk after the mysterious whisper of science was plucked from space.

"Before I sailed from England," Marconi continued, "instructions were given to the operators at Poldhu to send signals at stated intervals during the week of our voyage. They were to operate two hours out of every twelve, or one hour out of every six, sending messages and test signals in periods of ten minutes, alternating with intervals of five-minute rests.

"This merely confirms what I have previously done in Newfoundland. There is no longer any question about the ability of wireless telegraphy to transmit messages across the Atlantic. As to distance over which messages can be sent, I will say that it is a matter depending solely on the strength of the apparatus used.

"As for the curvature of the earth affecting the currents, as the cable people thought it would, that has been proved untrue. That objection on their part, though, I think, was rather imaginary, than a real one. The wish was probably father to the thought."

"Do you think a message could be transmitted around the world from the same place, the sending apparatus facing in one direction and the receiving apparatus in the other?" a reporter inquired.

"Well, it's possible," was the reply, "but I do not think it is what you would call a paying investment."

This authorised life-story of the Great Radio Pioneer, every paragraph of which was read and corrected by Marconi himself, is running exclusively in Popular Wireless in serial form. The opening chapter appeared in Popular Wireless for June 5th, and those who missed the first parts may obtain copies for 4d. each, post free, from The Amalgamated Press, Ltd., Back Number Dept., Bear Alley, Farringdon Street, London, E.C.4.

When asked what he thought the speed of wireless was, Marconi replied, "I have made no calculations as to that, but assume it travels at the same speed as light, 186,000 miles a second."

Jubilantly, Mr. Saunders of the Marconi Company declared the Philadelphia voyage "a grand triumph for Marconi wireless."

"It confirms," he said, "all that Mr. Marconi has claimed for it and more, too. We are prepared to meet anyone who may dispute our claims on this trip, and confront them with incontrovertible proof of what has been done."

Marconi was asked what Lord Londonderry, the Postmaster-General of Great Britain meant by saying that the operation of the Marconi Company might interfere with the experiments of the British Admiralty.

"Well," he replied, "the British ships are using my instruments. The Government is paying £5,000 per annum for the use of the apparatus on a very few vessels. If the Powers should decide to make me take away my stations and would pay, as they would have to, for the privilege of making my experiments themselves, then I would think I had made a good bargain. The sum they are now paying shows the basis on which they would pay to do what I am doing. The Admiralty's instruments are of the old style and were put in before I solved the problem of attuning to prevent intercommunication. So you see, we might interfere with the Government, but they cannot interfere with us.

"England is not the proper field in which to make great strides in testing the land advantages of the system, which is as adaptable to inland and short-distance service as it is to transoceanic service."

"How about that station in South Africa?" a reporter asked as a parting shot as the interview ended.

"Let's finish the Atlantic first," was Marconi's answer, given with a smile.

It was evident in the Press over the next few days that Marconi by his use of the Atlantic as a laboratory had "challenged attention to the rapid movement of wireless in the direction of complete commercial utility"; signals across 2,099 miles left little room for scepticism.

There was agreement on all

INSIDE THE PHILADELPHIA CABIN

Courtesy Marconi's Wireless Telegraph Co., Ltd.

Marconi's gear in a cabin of the Philadelphia, on which he conducted his long-distance shore-to-ship tests, which proved so conclusively the big distances that wireless could cover.

sides among scientists and laymen, that "the waves of etheric disturbance launched into space from the transmitting mechanism may be compared to a giant voice crying in the wilderness, and needing only an ear sufficiently sensitive to hear it at any distance to which the ever-widening circles of its undulations may reach."

The problem of wireless now resolved itself into making the "voice" loud enough to traverse the Atlantic, and the ear sensitive enough to catch its message—but that riddle no longer belonged to the discoverer; it was on the work-bench of the mechanician and electrician.

The evolution of wireless was seen working radical changes in international business relations and closer political alliances, and the newspapers vouchsafed that "what Marconi has already done will be of lasting benefit," or in the words of the *Electrical Review*, "His work is great in achieved results and greater in its potentialities of new usefulness." Mariners and newsdom were delighted that soon the Nantucket Shoals Lightship would be reporting news of incoming craft fully ten hours earlier than formerly possible, and in storms and fog as well as clear weather.

Those who saw the dots and dashes streaked across the tape from the Philadelphia read more than the actual messages; even greater significance was found in reading "between the lines." There were rumours of lower cable rates, but in the same breath it was predicted that such a move was sure to spell ruin for the undersea lines. However, this figuring on disaster was not sustained by arithmetic, according to those who believed the cable tariffs had been held up too long because of freedom from competition.

"It will be without precedent in the history of progress," said *The New York Times*, "if this step (lower rates), which the cables now affect to regard as disastrous, does not so increase the volume of business to be handled that instead of hurting them competition will result to their immediate and permanent advantage."

There was yet much to be done; but the lessons learned on board the Philadelphia were most valuable sign-posts to new advances.

"It was during the trials on the Philadelphia that I discovered a marked and detrimental effect of daylight on wireless transmission, and the greater ease with which messages could be sent over long distances at night," said Marconi.[1] "I was of the opinion that weak signals during the daytime might have been caused by the loss of energy at the transmitter due to the diselectrification of the highly charged elevated aerial under the influence of sunlight.

"I am now inclined to believe that the absorption of the electric waves during the daytime is due to the ionization of the gaseous molecules of the air effected by ultra-violet light. As the ultra-violet rays, which emanate from the sun, are largely absorbed in the upper atmosphere, it is probable that the portion of the earth's atmosphere which is facing the sun will contain more ions or electrons than that portion which is in darkness. Therefore, as Professor J. J. Thomson of the Royal Institution has shown, this illuminated and ionized air will absorb some of the energy of the electric waves. The fact remains that clear sunlight and blue skies, though transparent, act as a kind of fog to powerful Hertzian waves."

Now the question was how to penetrate the "sunlight fog," but the Marconi men were fully confident that they would succeed completely in putting an end to the age-old isolation and dangerous solitude of the sea. Already they had whirled an invisible electric halo around King Neptune.

Because of Marconi's scientific proof that "there are more things in heaven and earth than are dreamt in our philosophy," man was fast beginning to think in terms of the globe; oceans and continents were shrinking. Wireless was preparing to tap an inexhaustible traffic between the Old and New Worlds, for "all that a man hath will he give for his life, and pretty near all that a man could afford has hitherto been asked for the privilege of lengthening life by saving time which composes it." Wireless, by its annihilation of distance, saves delay; it saves time.

[1] Paper read by Marconi before Royal Institution, London, on June 12th, 1902.

TAKEN AT SIGNAL HILL

Courtesy Marconi's Wireless Telegraph Co., Ltd.

This photograph of Marconi with Mr. Kemp (left) and Mr. Paget (right) was taken at Signal Hill, Newfoundland, where the first transatlantic signals were received.

CHAPTER XI

MARCONI AT GLACE BAY AND CAPE COD

DESPITE the copious evidence that wireless had conquered the Atlantic from continent to continent and from shore to ship, there were some who grasped for the last straws of scepticism by pointing out that the historic signals had travelled from east to west as the sun, but would they go in the opposite direction?

Marconi said, yes.

He would prove that the whirl of the earthly sphere had little or no influence on the waves. Glace Bay, Nova Scotia, was selected as the site for a transmitter to demonstrate that wireless could travel east as well as west.

While installation work was in progress at Glace Bay, Marconi patented a new receiving set. The coherer was still used, but other parts of the circuit were greatly improved. For example, he used earphones, a tuning transformer and variable condensers to vary the capacity of both the primary and secondary circuits of the tuner. This made tuning more selective; stations could be separated more easily to avoid overlapping.

Mindful that the coherer was the weak link in the circuit he turned to develop a detector based on a discovery of Sir Ernest Rutherford in 1895. He had observed that a small, permanently magnetised needle, when suspended at the end of an electro-magnet, was deflected by the rise and fall of the current in the coils of the electro-magnet. In this principle Marconi saw an opportunity to sensitise his receiving set, and he utilised it in designing a magnetic detector. He used a pair of horseshoe permanent magnets, slowly revolved over an electro-magnet, the coils of which were connected to earphones. Fluctuations in the current caused by the incoming signals were audible in the headphones.

Since the engineers supervising the erection of the station at Glace Bay were not ready for Marconi to appear on the scene, he took advantage of the time by accepting an offer of the Italian Government to loan him the cruiser Carlo Alberto to facilitate long-distance tests of the magnetic detector, which had been officially introduced on June 25th, 1902. On the ship a young lieutenant was specially detached, the Marquis Luigi Solari, who assisted Marconi, eventually to associate himself with the inventor and follow him throughout the romance of his career.

During the summer months with the inventor on board, the ship cruised across the North Sea to Kronstadt; to Kiel and along the Scandinavian coast, then to Portugal and southward to Africa, and back to Italian waters. While the cruiser was at Cape Skagen, the novel detector throbbed with signals from Poldhu, 800 miles distant, and at Kronstadt, 1,600 miles away. In fact, the Poldhu signals were never missing at night, but the daylight range was never more than 500 miles.

The Carlo Alberto turned westward with its sensitive "ear" when reports from Canada indicated the stentorian spark of a second-hand 75-kilowatt alternator at Glace Bay was ready for Marconi to be tested. He arrived at Sydney, Cape Breton, on October 31st.

The first transmissions at Glace Bay were disappointing, and Marconi was forced to make numerous modifications. The work was difficult because there was no instrument to measure the length of the waves. Out of the frustration, however, daily the engineers learned something new about wireless.

The first attempt to reach Poldhu from

(*Continued overleaf.*)

MARCONI—THE MAN AND HIS WIRELESS—*Continued*

Glace Bay was made on November 19th, 1902, but the operators in England failed to hear even the faintest tick; on the 28th unreadable dots and dashes were intercepted. Changes were made in the equipment, and on December 5th the signals were deciphered across the ocean.

"Let us see if we can raise Cornwall," said Marconi, as he reached to the pump-handle lever of the sending key, fully three feet long. "Better put your hands over your ears," he warned, just before he pressed the key for the preliminary test.

The noise was deafening—like a machine-gun being fired so rapidly that the sound was almost continuous. Long sparks jumped from the knobs of the immense Leyden jars that filled the centre of the room, and illuminated the surroundings like lightning.

Crash! Crash! Crash! Four or five times Marconi flashed the signal, three short, sharp, staccato dots—"S" in the Morse code. The silence was tomblike when the noise stopped. He turned from the sending key and picked up a telephone receiver mounted on a headpiece. There he stood patiently, with both ears covered by the headphones, listening for signals while others in the room watched the unwinding tape.

"Here they are!" he cried a few minutes later, smiling as the tape confirmed his statement. The inker's needle pressed upon the paper strip for an instant, lifted, pressed again, once more lifted and again transcribed a dot. Then a pause, then a dash, then another dot. That meant "S N," which in the language of the telegrapher means, "I understand."

"The wireless works very much better at night than by day," said the inventor, as he tore off strips of the tape as souvenirs for his visitors. "This is the first really clear signal we have had from the other side in the daytime."

Leaving the station Marconi led the way down the bluff that gives the name of "Table Head" to this outlying corner of North America. As the party stood on the bank of the precipice, facing eastward, 2,150 unobstructed miles of ocean lay between them and the English coast. The smoke of a steamer, hull down below the horizon, was the only thing visible except the sky and restless water.

"A freighter, probably sailing the Great Circle route to a British port," was Marconi's comment. "It is not much beyond where she is now that the La Bourgoyne sank, with a loss of almost all her passengers, less than five years ago. Had she been equipped with wireless, aid could have been summoned from Sydney, from Newfoundland or from other ships, close to the Grand Banks at the time. The day will come when every ship will carry wireless and every port will have a wireless station. When that time comes there will be no more catastrophes as the wreck of the La Bourgoyne. If my invention never accomplishes anything else than to save the passengers and crew of one ship it will amply pay me for all the money I have spent on it."

It was December 17th, 1902. Two weeks had passed since the inventor of wireless celebrated the first anniversary of the transatlantic triumph. A busy year had fled, and it was time for another feat—the inaugural west-east broadcast.

Sir George R. Parkin, a professor at Upper Canada College and correspondent of the London *Times*, was at Glace Bay. Marconi had invited him as the guest of honour, privileged to send the first message, one of congratulations to England and to Italy. Several naval officers delegated by the Italian Government were also there to watch the tests.

Sir George boarded a train for New York as soon as the opening ceremony was over. En route he wrote a complete story of the event. He took his article to the office of *The New York Times*, where two typewritten copies were made, one to be mailed to London, and the other to be published in New York simultaneously with its publication in London.

The "release" of the story from London was anxiously awaited, but weeks passed and it did not come. At last *The New York Times* received, from the dead letter office in Washington, the article which had been mailed to London. Bearing the return address of *The New York Times* on the envelope, it had been sent back because Sir George had underpaid the postage by five cents. With a penalty of the same amount, that made ten cents due on the letter in London, and at that time the London *Times* had an iron-bound rule that all underpaid postage matter should be refused.

Finally the story was printed, and the newspaper files yellowed and made brittle by age have preserved Sir George's account of Glace Bay:

"A little after midnight our whole party sat down to a light supper. Behind the cheerful table talk of the young men on the staff, one could feel the tension of an unusual anxiety as the moment approached for which they had worked, and to which they had looked forward so long. It was about ten minutes to one when we left the cottage to proceed to the operating room. I believe I was the first outsider allowed to inspect the building and machinery.

"It was a beautiful night—the moon shone brightly on the snow-covered ground. A wind, which all day had driven heavy breakers on the shore, had died away. The air was cold and clear. All the conditions seemed favourable.

"Inside the building, and among its somewhat complicated appliances, the untechnical observer's first impression was that he was among men who understood their work. The machinery was carefully inspected, some adjustments made, and various orders carried out with trained alertness. All put cottonwool in their ears to lessen the force of the electric concussion, which was not unlike the successive explosions of a Maxim gun. As the current was one of most dangerous strength those not engaged in the operations were assigned to places free from risk.

"It had been agreed that at the last moment before transmission I should make some verbal change in the message agreed on, for the purpose of identification. This was now done and the message thus changed was handed to the inventor, who placed it on the table where his eye could follow it readily. A brief order for the lights over the battery to be put out, another for the current to be turned on, and the operating work began.

"I was struck by the instant change from nervousness to complete confidence which passed over Mr. Marconi's face the moment his hand was on the transmitting apparatus—in this case, a long wooden lever or key.

"He explained that it would first be necessary to transmit the letter 'S' in order to fix the attention of the operators at Poldhu, and enable them to adjust their instruments. This continued for a minute or more and then, with one hand on the paper from which he read and with the other on the instrument, the inventor began to send across the Atlantic a continuous sentence.

"Outside there was no sign, of course, on the transverse wire from which the electric wave was projected of what was going on, but inside the operating room the words seemed to be spelled out in short flashes of lightning. It was done slowly, since there was no wish on this occasion to test speed. But as it was done one remembered with a feeling of awe, what he had been told—that only the ninetieth part of a second elapses from the moment when he sees the flash till the time when the record is made at Poldhu.

"What gives it direction? 'We send it into space,' Mr. Marconi had remarked during the afternoon, 'and it must find its way to a point in Cornwall.' Mountains in the path of the current do not affect it, the inventor told us, and when we remember that between the point of departure and the point of reception the curvature of the earth represents a mass of land and water more than a hundred miles high, this may be understood better.

"The first west-east message had been sent across the Atlantic. What that means to mankind no one can even guess," said Sir George. "The path to complete success may be long and difficult. Between George Stephenson's Puffing Billy and the great mogul engine which swings the limited express across the American continent, there lies three-quarters of a century of endeavour, experiment and invention. In the great original idea lay the essential thing which has revolutionised the world and the conditions of human intercourse."

(*Please turn to page* 501.)

NEXT WEEK

Chapter XII

WEDDING BELLS—AND WIRELESS

Marconi is married—Names of his children and dates of birth—The cable celebrates its jubilee unafraid of wireless—Wild exaggerations of an Arabian tale—How McKinley's re-election was flashed around the world—Newspapers urge wireless Press service across the Atlantic—Legal battles for wireless begin—De Forest institutes a suit—News by wireless is featured—Marconi plans high-power transmitters for oversea service—The first sheaf of public messages—Marconi praised for his work—A triumph for Empire and Science—What Peter Cooper Hewitt said about it—An indispensable aid to commerce and civilisation.

RANDOM RADIO REFLECTIONS

By Victor King

THE "PERPETUAL MOTOR" :: NEAR AND FAR :: THOSE ANNOYING DUST SHADOWS

MYSTERIOUS INVENTIONS

NO doubt you read about that poor chap who committed suicide—the inventor of a marvellous new radio receiver that, needing neither batteries nor valves, could produce full volume loudspeaker results.

Well, I had some correspondence with him; about two years ago, I believe it was. There was to have been a demonstration for my benefit, but it never came off.

Must admit I was highly sceptical. I still am. It was too reminiscent of another scheme which had crossed my horizon a little while previously, and that was merely just one more successor of a whole spate of "valveless, batteryless radio receiver revolutionary inventions."

A Rumanian with an English manager.

Which didn't cause any of the battery and valve makers to lose any sleep as far as I remember.

I am afraid I grow more and more cynical regarding these wonderful and mysterious inventions which the daily papers seem to delight in publishing. You see, I've made a point for years of following many of them up, and my experiences have proved depressingly similar.

On rare occasions one must admit that the presentation has been interesting. I recollect a new electric motor invented by a Rumanian (romantic touch, that). His manager was English, and the pair of them were wandering about giving demonstrations to all whom they could interest.

They gave me one. The model was quite small. Just a little toy motor and a 1½-volt cell. The idea was that this new electric motor could be driven by an extremely small current. But it developed, proportionately, an extremely small power so what, I asked, was the advantage?

Where, too, was the invention? After long discussion, which wandered all over the place, it emerged that the motor had a separate winding on its armature in which current was generated and fed back to the battery.

"The iron waves about under his nose."

In short, another version of that oldest of all electrical perpetual motion ideas whereby an electric motor drives a dynamo which develops current for driving the motor!

I gave the Rumanian inventor and his manager a little lecture in elementary electricity and mechanics. But my words fell on deaf ears. It was plain to see that they considered me a spoil sport. They may have even thought I was jealous of their brilliant conception.

Inventors are suspicious folk as a rule. Read what Mr. Hardman, an inventor himself, says in his book "Advice to Inventors."

"Reference has been made to the 'Inventor Bug,' but perhaps the title of 'Inventor Bunny' would be nearer the truth. For that is exactly the way to look upon the average inventor—as a rabbit surrounded by many hunters, all armed with vested-interest shot-guns. When the various sportsmen have finished popping at poor little bunny-rabbit, with good eyesight you may be able to find his tail and his whiskers. Frequently, not even those remain." Still, Mr Hardman *has invented*, and made money at it, so we can give *him* his point.

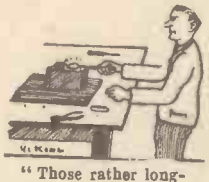
STYLE IN SOLDERING

THE moment I saw my friend Blogson with a large blister on the end of his nose I knew exactly what had happened.

"You ought to wear glasses," I said, "particularly when you are soldering."

I've watched him at it several times. He's so near-sighted that the iron waves about under his nose in an alarming fashion. But he is able to accomplish some really first-rate work—especially on small jobs.

But as a spectacle his style is not so good. Not comparable, for example, with that of one of those rather long-sighted, long-range exponents who stand well back from the work and apply the hot-point with something of the supercilious manner of a medicine-man conducting a mystic rite.



"Those rather long-sighted, long-range exponents."

All the same, I'd back a Blogson joint against anyone of theirs.

By the way, talking about eyesight reminds me of a curious thing I heard the other day. A short-sighted lady told me that when she removes her spectacles her hearing seems to be adversely affected as well as her vision.

Naturally, I at once suggested that this was probably due to the fact that she was unable to see so clearly the moving lips and facial expressions of people talking to her.

But no, she insisted that even in the case of the radio where, often mercifully, faces aren't to be seen anyway without television, the effect was still most marked.

Subsequently, I asked other wearers of thick lenses if they experienced the same sort of thing, and they said that they did.

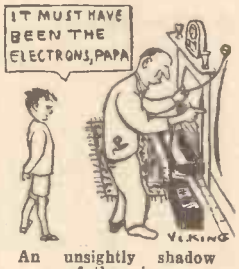
Well, if the effect is, in fact, a common and lasting one, then I suggest that the partially deaf who use deaf-aids might well have their eyes carefully examined. But, personally, I incline to the theory that it is merely a temporary psychological effect. That the sudden dimming of the vision occasioned by the removal of the glasses causes a general momentary bluntening of other senses.

WRITING ON THE WALL

HERE'S something lots of you have come across. For others its telling here constitutes a warning. If you let a wire dangle down close to a wall and that wall has spread upon it a nice wallpaper, there will in time be drawn down that wallpaper an unsightly shadow of that wire in indelible dirt.

It'll even be drawn down it if the wallpaper isn't nice—but that wouldn't be so bad.

No, it's not an electrical effect. Unhappily, I am afraid I cannot say that here is some weird and crafty work on the part of the busy little electrons which are flowing through that wire.



An unsightly shadow of the wire.

You'd get exactly the same kind of unwanted mural decoration even if it were a piece of string.

You see, the air, especially in towns, always contains a certain amount of dust, soot, sulphuric acid, gnats' eggs and what not. This solid content of an otherwise tenuous medium tends to deposit itself on objects. ("Mary, you can write your name on the piano." "Thank you, mum, I've always wanted to do that.")

And, of course, there are always currents in the air which make it go round and around and up and down, normally distributing its largesse in the way of dust, soot, sulphuric acid, gnats' eggs and what not, more or less impartially over pianos, radio sets, tables, curtain rods and all those things which *never* get dusted.

The walls, too, will get their fair share, but not so much will stick on them. And then the drifting air meets an obstruction such as a dangling wire, behind which it will swirl, eddy, blind spot, and so forth. And so the dirt piles up, in a manner of sweeping—speaking, I mean.

And thus the "shadow" which will be noticeable after a time near switches, brackets, and other things as well.

That is, of course, if you don't run an air-conditioning plant in your house. But that's not as cheap as having new wallpaper every now and then.

SHRINKING AERIALS

I recently lent a mains set to a friend who is ill in bed. A mains superhet. I found that it was quite unnecessary to fix up any kind of aerial.

As much volume as was needed could be obtained from the B.B.C., anyway, without a single inch of antenna or even an earth.

Yet only a few years ago a "good aerial" was the prime essential of radio reception. But modern sets are so much more sensitive. Supposing a craze for "good aerials" springs up for all-wavers of 1960. Will listeners pick up the same programmes six times or more on their successive trips round the earth? Who cares, anyway?

HOW THE B.B.C. REBUILDS HISTORY

Researching and Sleuthing for "Scrapbooks"—Summer Work for Winter Programmes

AT his desk in a quiet room high up in St. George's Hall, Leslie Baily is spending the summer months on research work that inevitably precedes every broadcast of a "Scrapbook" programme.

He and Charles Brewer, B.B.C. Assistant Director of Variety, have already been responsible for fourteen "Scrapbooks" in which they have rebuilt and dramatised the history, recalled the songs, and brought back many of the celebrities of the years between the beginning of the century and the present day.

Much Data Needed

"During these weeks in the summer," Leslie Baily said to "P.W." "I have to find out what events in the various years lend themselves to reconstruction in 'Scrapbook,' what songs were popular, what shows were playing to 'capacity' houses, and what personalities who were then prominent are still available and willing to take part in a broadcast. Obviously, it is necessary to collect data for several years before Charles Brewer and I can sit back, review it, and decide which year we shall cover; choice depends, naturally, on the material as well as the people whom we can get to the microphone.

"During the research stage I spend a lot of my time in the Reading Room at the British Museum, going through newspaper files and volumes in search of 'copy'; I have casually collected during past years a large amount of material 'to be used one day.' The B.B.C. library is very useful, too, and stacks of old songs reach me from the Music Library.

"Then I usually listen to about fifty gramophone records before finally choosing the music for one programme—quite often records of celebrities who are now dead.

"One always has to decide in the case of these records whether the value of the celebrity and the value of the sentimental associations recalled by the song that he—or she—is singing is outweighed—or not—by the scratchiness of the record!

When the Gold Cup was Stolen

"Now and again it is necessary to do a bit of private sleuthing, too. For instance, in 1907 the Ascot Gold Cup was stolen, and I have recently been hunting up the facts for a future 'Scrapbook.' We shall want, of course, to cover the theft. That has meant first of all contacting Scotland Yard, getting in touch with the jewellers who were responsible for the custody of the cup, and going to Buckinghamshire to meet the man—he is now living in retirement—who was then their private detective.

"Now and again we have been asked if the celebrities in 'Scrapbooks' are merely recorded voices. The answer is emphatically 'No.' Recorded material of this kind is only used on rare occasions when, for some reason or other, it is impossible to secure the presence of the celebrity or personality concerned. Then we make it quite clear to listeners that they are listening to a recording.

"Let me give you an example: While we were preparing the 'Scrapbook for 1901,' the Marchese Marconi came to England and left again a few days before the programme was due for transmission. Well, it was really important that he should be in the programme, for it was in 1901 that he sent the first radio signal—the letter 'S'—across the Atlantic from Poldhu in Cornwall to St. John's, Newfoundland.

"So we had to record him or not have him at all. We just could not let the opportunity slip by—and he was so busy that the only way in which we could record him was by sending a recording van to his offices on the Embankment, running a microphone into his suite, and getting him to talk without even coming to Broadcasting House.

"Wherever possible we like to get hold of people who actually played some part in an historic event, and with their help present a dramatised reconstruction of the scene. Much depends upon the microphone ability of the people concerned; most of them have never spoken into a microphone before. Nevertheless, we have been able to get quite a number of them to re-live their parts rather than merely to talk about them.

Reconstructing a Great Air Race

"Claude Grahame-White in the 1910 'Scrapbook' played the part of Claude Grahame-White twenty-five years younger, during a dramatised reconstruction of the great air race from London to Manchester in which he and Paulhan competed.

"When we were dealing with the death of Sir Henry Irving in 1905—you remember he collapsed on the stage at Bradford and died later in his hotel—Sir Seymour Hicks played Irving's last part during the programme, and we got down from Bradford an electrician from the theatre who, seeing Irving collapse, dropped the curtain and switched on the back-stage lights.

"But let's keep the sequence of the story. After getting hold of celebrities and personalities, interviewing them, getting their material down on paper, and selecting music, there is 'continuity' to be written and a number of artists have to be engaged for the programme.

"And here some really hard work begins—the production of the whole thing by Charles Brewer. 'Scrapbooks' are the most complicated of all shows to rehearse. You have dramatised material, vaudeville, serious music, straight narrative, gramophone records, all linking up and merging together. Four studios at least are used for each broadcast—often more.

The Biggest Scoop

"Scoops? Yes, we have had several.

"The biggest, I suppose, was when we recaptured the scene at the signing of the Armistice in Marshal Foch's railway carriage in 1918. After a lot of sleuthing we ran to earth the only verbatim note which was taken at that meeting between the Germans, British and French. It was a unique record made at the time by Captain J. P. R. Marriott, R.N., who very kindly lent it to us. . . ."

The next "Scrapbook" programme will be broadcast in October—the fifteenth programme of its kind.

CHARLES BREWER

The B.B.C. Assistant Director of Variety, who, with Leslie Baily, is responsible for the production of the popular "Scrapbook" programmes.

FOR RADIOGRAM USERS

How to keep a clockwork motor running smoothly.

THE vital necessity of maintaining the motor of a spring-driven radiogram in an efficient state of lubrication is recognised by all, since not only does a well-lubricated motor run far more sweetly but it also undergoes much less wear than one which is habitually allowed to function almost in a "dry" condition.

It is not always an easy job to lubricate the various gears and bearings of a radiogram spring motor, since many of these are more or less inaccessible to the nozzle of an ordinary oil-can.

The Best Method

By far the best and certainly the most economical mode of lubricating the bearings of a spring motor is to procure an old steel knitting needle and, about an eighth of an inch from one end of it, file a fairly deep U-shaped notch. Now dip the notched end of the knitting needle in the oil bottle and then touch the bearing to be lubricated with the end of the needle. It will be found that just the requisite amount of oil will be accommodated in the notch of the needle and that when the end of the latter touches the bearing, the oil will at once flow out of the notch on to the bearing. In this simple manner, oil may be conveyed with certainty to the area at which it is required and, what is more, the lubricant will not be wasted on areas on which it is not needed.

Use a good quality freely flowing machine oil and remember that one notch-full is ample at any one time. Little and often is the golden rule to be followed in lubrication.

J. F. S.

AN ALL-WAVE "MIDGET"

By the "P.W." Research Department

An efficient three-band receiver—compact in size—that will give you world-wide station reception. Easy to make and simple to operate.

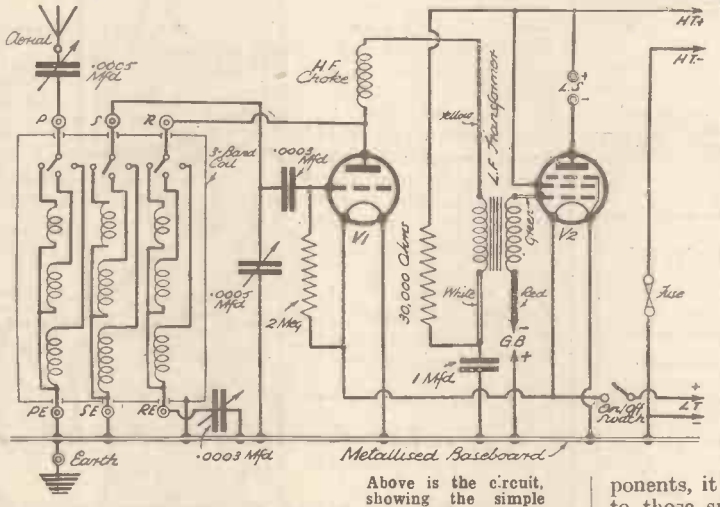
A back view of the completed receiver. Its appearance from the front is shown by our cover photograph this week.

EVEN to-day the two-valve set has its uses, although it may be capable of receiving only the medium and long-wave bands. If the short waves are added to those capabilities, then the little two-valver becomes, in some respects, even more interesting than a more ambitious receiver which is unable to receive the short waves. The little set which is the subject of this article tunes not only to the normal broadcast bands, but also covers the most important short wavebands. Its ranges are : medium, 200 to 500 metres ; long, 900 to 2,100 metres ; and short, about 19 to 48 metres.

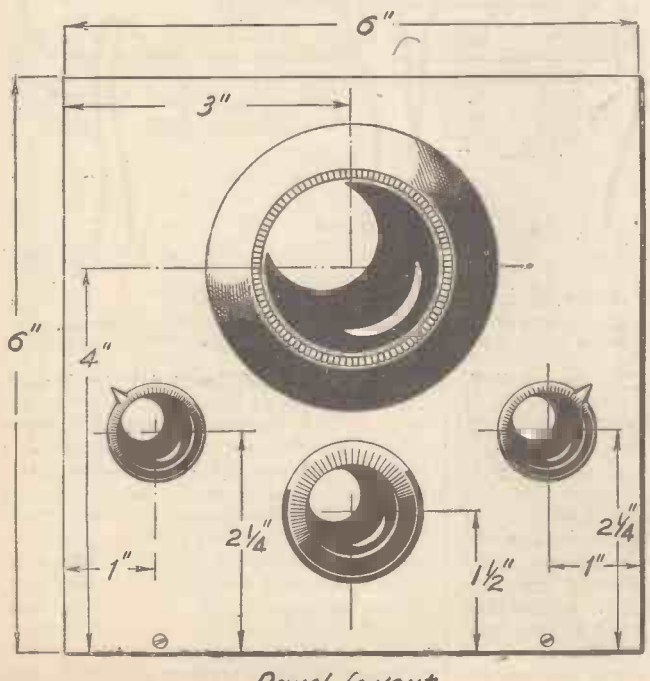
It will be seen that the 19, 25, 31 and 48-metre broadcast bands may be received, and also the 20 and 40-metre amateur bands. Quite a good selection for such an obviously simple set, with no coil-changing to be done.

Stations Receivable

On the medium and long waves the number of stations which this set will receive free of interference will depend upon the locality in which it is used. If used within twenty-five miles or so of a regional transmitter, the signals from this station will, of course, spread over a fair number of degrees of the dial. Even so, it should be possible to receive several of the more powerful foreign stations on wavelengths not too close to that of the "local." Should the set be used in a locality where the local station is about fifty or more miles away, then more stations will be received free of interference from the "local." Now that it has been stated what the set will do, we will proceed with a description of the circuit employed.



Above is the circuit, showing the simple arrangement and the internal connections of the all-wave coil. To the left are the drilling dimensions for the four controls on the panel.



Panel Layout.

The coil is a new Wearite "Triogen," which is controlled by a three-position wave-change switch. Its secondary is tuned by a ·0005-mfd. condenser. The aerial is coupled to the primary by means of a ·0005 variable condenser, to control volume and selectivity. Reaction is applied in the normal way, the condenser being in the earth side of the reaction winding to prevent hand-capacity effects on the short waves. A triode detector is used, and is coupled to an output pentode by means of a "midget" L.F. transformer.

Although the construction of this set is extremely simple—it really can be made in an evening quite easily—there are several points which should be observed.

The lay-out should definitely not be altered. In such a simple set the lay-out is not likely to affect the broadcast bands, but it probably will affect the short waves. So stick to the diagrams. Regarding components, it is ever so much safer to stick to those specified. If you don't, please don't blame us if the set fails to give satisfaction !

We will now describe briefly the construction, pointing out particularly the various things which are not obvious. First, prepare the panel by drilling according to the front-of-panel diagram. The hole sizes for the panel controls are as follows : Tuning condenser, $\frac{7}{16}$ in. ; reaction condenser (on the right), $\frac{3}{8}$ in. ; aerial coupler, $\frac{5}{16}$ in. ; wavechange control (below tuning), $\frac{3}{8}$ in. ; fixing holes at the bottom, $\frac{1}{8}$ in. Next, drill the terminal strip The holes for the terminals are $\frac{5}{32}$, and for the on-off switch, $\frac{1}{4}$ in. Drill two $\frac{1}{8}$ in. fixing holes, $\frac{7}{16}$ in. from bottom edge and 1 in. from the ends.

Mounting the Switches

Fit the terminals and switch to terminal strip. The switch should be mounted so that the "ON" mark is towards the earth terminal. The switch is for universal on-off switching, and is double-pole. Actually only one pole is used in this case. Screw the terminal strip to the baseboard.

Mount tuning condenser, reaction condenser and aerial coupler on the panel. Mount components on the baseboard. Place knob on wavechange control

(*Continued overleaf.*)

AN ALL-WAVE "MIDGET"

(Continued from previous page.)

assembly. Grasp the plate and, with knob towards you, turn knob fully clockwise. Now insert the rod of the wavechange control assembly in the coil, and turn as far as possible clockwise. Screw out trimmers on top of coil two turns. Offer panel to baseboard, and see that the wavechange spindle slips through its appropriate hole in the panel. Screw panel to baseboard. Lock bush of wavechange assembly to panel. Everything is now ready for wiring, which is quite straightforward. The wiring is carried out in 18-gauge tinned copper wire and insulating sleeving. Keep all leads as short as possible, as shown in the diagram.

Preparing for Test

When the wiring has been completed, insert the valves, connect the aerial and earth, loudspeaker and batteries. The connections of the loudspeaker and aerial and earth call for no comment, except that the loudspeaker ratio must be set (if it is adjustable) for pentode output. The actual optimum load of the valve specified is 11,500 ohms.

The battery connections are as follows: L.T. + to positive terminal of 2-volt accumulator, L.T. — to negative terminal, G.B. + to positive of G.B. battery, G.B. — to — 3 volts, H.T. — to negative of H.T. battery via fuse, H.T. + to + 120 volts.

THE PARTS YOU WILL NEED

1 Polar No. 2 S.M. ·0005-mfd. tuning condenser.
1 Polar ·0005-mfd. "Compax" condenser.
1 B.T.S. ·0003-mfd. solid dielectric reaction condenser.
1 Wearite "Triogen" 3-band coil.
1 T.C.C. 1-mfd. fixed condenser, type 50.
1 T.C.C. ·0003-mfd. fixed condenser, type M.W.
1 Polar N.S.F. 2-meg. 1-watt grid leak.
1 Polar N.S.F. 30,000-ohm 1-watt resistance
2 W.B. 4/5 pin, A.C. type, valve holders.
1 B.T.S. all-wave H.F. choke (unscreened).
1 B.T.S. L.F. transformer, midget type.
1 B.T.S. toggle switch, type S.W.2.
4 Clix terminals, type A.
3 Belling & Lee wander plugs.
1 Belling & Lee wander fuse.
2 Belling & Lee accumulator spades.
1 Polished wood panel, 6 × 6 × ¼ in.). (Peto-Scott).
1 "Metaplex" baseboard 6 × 6 × ⅜ in.) (Peto-Scott).
1 Ebonite terminal strip, 6 × 1½ × ⅛) (Peto-Scott).
18-gauge T.C. wire and sleeving for wiring (Peto-Scott).
Screws, flex, etc. (Peto-Scott).

VALVES, ETC.

V_1	V_2
Mazda L2	Hivac Y220

H.T.—120 volts, Drydex.
L.T.—2-volt accumulator, Exide
G.B.—4½ volts, Drydex.
L.S.—W.B. Stentorian.

The on-off switch should be thrown towards the earth terminal to switch on the set. There are three positions on the wavechange switch (below tuning dial), to the left (anti-clockwise) is long waves, central is medium waves, and to the right (clockwise) short waves.

First set the wavechange switch to medium waves, and see if you can pick up the local station. If so, you can be fairly certain that all is well—at least, with the wiring. Now turn to the long waves and try for Droitwich. For both of these tests the aerial coupler (left-hand knob) should be turned fully clockwise. If you find the medium and long waves in order, turn now to the short waves For these you will have to turn the aerial coupler nearly fully anti-clockwise. If you do not do this there may be some difficulty in obtaining reaction, due to the aerial damping being too high. If you can obtain reaction (right-hand knob) on the short waves, on rotating the dial at practically any time of the day or night, you should hear innumerable carriers. This will denote that everything is working satisfactorily.

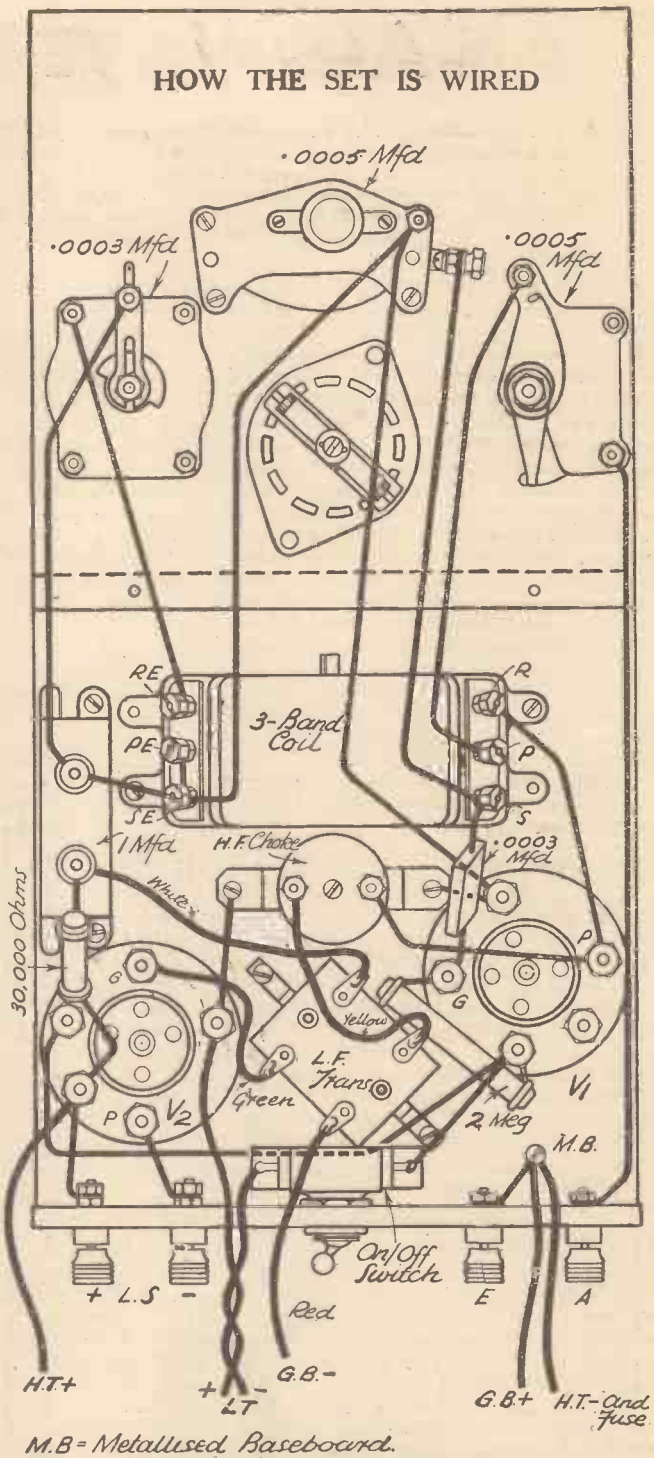
The actual operation of a set of this type has been described so many times that it is unnecessary to repeat it. However, just a few words about the aerial coupler. This serves two purposes. It acts as a volume control on powerful local signals, and also as a selectivity control. The nearer it is to the fully anti-clockwise position, the greater will be the selectivity.

Output Valves

Regarding the short-wave stations, it should be pointed out that stations will not be received on all bands at the same period of the day. Certain bands are received at certain times. Details of these times have appeared in "P.W." frequently in the past.

Whilst almost any type of output valve (V2), triode, tetrode, or pentode may be used in this set, the valve specified gives about the best results as regards quality, sensitivity, and economy. The actual H.T. consumption of the whole set is only about 8 or 9 milliamps. with 120 volts H.T. Of course, if you require a bigger volume, a Z 220 valve of the same make may be used. It should be pointed out, however, that the H.T. current will be nearly doubled, and sensitivity will be decreased somewhat.

The detector valve (V1) has no really satisfactory alternative. The L2 certainly gave the best results of all the valves that were tried. Consequently you are strongly advised to stick to specification here. It may be found difficult to obtain reaction over the whole of the short-wave band, if a different detector is used. There may be an excess of "top" in the reproduction, due to the tetrode output valve. This is common to all tetrodes and pentodes. To overcome this trouble, it will be necessary to shunt the loudspeaker by a condenser and resistance in series. Their values must be found by experiment. Suggested values, for a starting-off point, are ·01 mfd. and 10,000 ohms respectively. This tone-balancing device has not been incorporated in the set, as various loudspeakers require different values. The values suggested above are suitable for the loudspeaker specified.



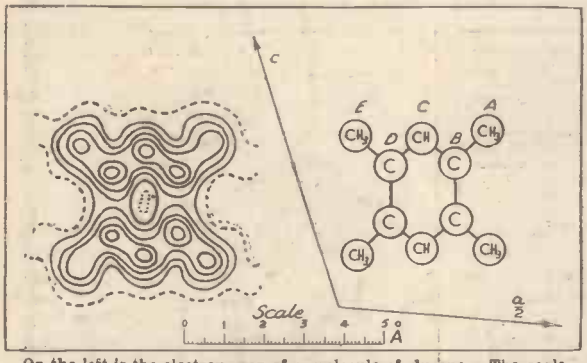
The complete wiring is shown in this diagram. Note that the wavechange switch spindle is broken to enable it to be shown in "plan" on the panel.

WHY IS AN INSULATOR?

Recent advances in electrical science have given us methods of examining the actual molecular and atomic structure of substances, and in this way we have been able to find out some extraordinarily important information which governs the properties of materials used for electrical and other purposes. The method of X-ray spectroscopy has been particularly useful in this direction, and in the following article our Scientific Adviser, Dr. J. H. T. Roberts, gives you a popular account of this very difficult and complicated subject. The Paper is based upon a Kelvin Lecture by Sir William Bragg, the eminent authority on the subject of X-ray examination of molecular structures

TO most people a dielectric is just another name for an insulator, a substance which refuses to conduct electricity. Of recent years, however, with the immense advances in electrical science, we have learned that all manner of effects are due to what takes place in a dielectric medium, and we have found it very important to give attention to the mechanism and functioning of the dielectric. It has turned out to be an extremely complex and in some respects an intractable problem, and we have yet a long way to go before we can claim to understand truly the nature and properties of dielectrics. But we have gone a little way and we have begun to explore the structure of insulating media and to compare them with the structure of better understood, and perhaps more ordered, substances, such as crystals and electrical conductors.

A DURENE MOLECULE



On the left is the electron map of a molecule of durene. The scale is in Angstrom Units (1 Angstrom unit = 10^{-8} cm.)

The X-Ray Spectrometer

These problems—for they are many—have been attacked by a great variety of methods; but one which is singularly beautiful in its technique and which has yielded, over a period of years, the most remarkable results, is the method of the X-ray examination of molecular structure by means of the instrument now known as the X-ray spectrometer. With this science—and it has now become of such importance as to be entitled to be described as a science in itself—the name of Sir William Bragg, Professor of Natural Philosophy at the Royal Institution, is the most prominently associated, and it was therefore very appropriate that Professor Bragg should have chosen the subject of "The Molecular Structure of Dielectrics" when he was invited by the Institution of Electrical Engineers to deliver the Kelvin Lecture for the year 1935.

It is impossible in this short space to give you anything like a comprehensive account of this extremely interesting lecture, and furthermore the subject, as you can imagine, is apt to become very abstruse. I will do my best, however, to give you a short outline of the discourse in as simple and popular way as I can.

A Crystalline Substance

First of all, it would perhaps be best to explain that a crystalline substance, or perhaps I should say a substance in the crystalline form, is differentiated from all other substances by the very definite and orderly way in which its molecules or groups of molecules are arranged. Without going into the details of the reasons for this, it is due to certain forces which operate when such a substance is separating itself out from the state of solution, and, as most of my readers no doubt know, different crystalline substances separate out in definite well-designed geometrical crystalline forms which are characteristic of the substance.

In the earliest investigations into molecular structure by means of the X-ray spectrometer, crystalline substances were generally used, for the reason indicated above. But whilst the X-ray methods are at their best when dealing with the bodies we call crystals, wherein the atoms and molecules are arranged in perfect order, following some pattern which repeats itself in all directions in the space within the bounds of the crystal, at the same time we now find that this orderly arrangement which is carried out to the full in the perfect crystal, is very common, though in less degree, within bodies which show no outward trace of it; for example, in resins, in rubber, and in wool.

There are, in fact, very few bodies in which there is not *some* degree of order, and so long as this is the case the X-ray method of analysis finds greater or less opportunity for employment. Liquids lend themselves to X-ray investigation much less readily than solids.

One of the most useful ways of presenting the results of X-ray analysis is that which depends on the construction of what we may call an "electron map," of which examples are given in the accompanying figures. The molecule in this particular case is that of "durene," an organic molecule consisting of a "benzene ring" in which four of the hydrogens have been replaced by methyl groups, as shown in the ordinary chemical diagram alongside, with which the map is to be compared. Each atom appears as an electron cloud. The positive nuclei do not appear, because they have no appreciable action on the X-rays, and the map is put together from observation of X-ray effects in a special manner. Electron maps have been made of several other important organic molecules, and durene has been chosen as an example here simply because the molecule stands out so well from its neighbours.

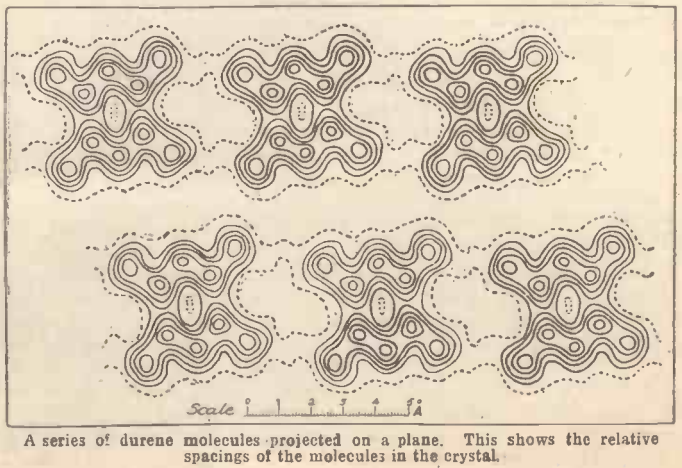
The "Benzene Ring"

By means of investigations like these it is possible to determine with great accuracy the space relations of atoms and molecules. There are, of course, as I have already indicated, other methods than those based on the use of X-rays; such methods are those depending on the determination of di-pole moments, or moments of inertia, or on the use of molecular beams, or again on electron diffraction. The X-ray methods, however, differ from most of the others in that they reveal the arrangement in the interior of the solid body where the molecules are linked up with their neighbours and so give the solid the characteristic peculiar to it.

I have referred to the "benzene ring," which means an arrangement of atoms frequently found in organic compounds and of great importance both in organic chemistry (in which category is included the chemistry of most dielectrics) and in X-ray analysis, and it is interesting and very important to note that in whatever structure the benzene ring occurs it is always found to possess the same form and

(Continued overleaf)

SPACING IN THE CRYSTALS



A series of durene molecules projected on a plane. This shows the relative spacings of the molecules in the crystal.

WHY IS AN INSULATOR?

(Continued from previous page.)

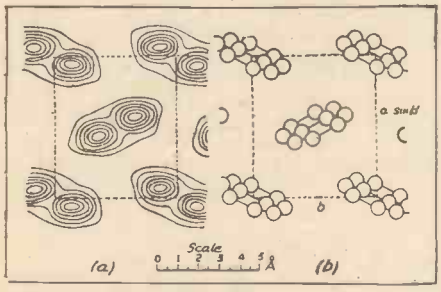
dimensions, the form being uniformly a regular hexagon lying in a plane, the length of each side being 1·41 Angstrom units (one Angstrom unit equals 10^{-8} cm., —that is, one hundred-millionth of a centimetre).

We have to think of this ring (which is only one example of many such arrangements) as a strong framework, unyielding in form and dimensions, no matter of what structure it forms a part. Those of you who have a knowledge of chemistry will remember the single, double, and treble " bonds " of the chemist, that is, particular linkage systems of atoms, and will be interested to know that these are found by X-ray analysis to correspond to differences in atomic distances. Thus a single bond which, in diamond, governs the whole structure, corresponds to a distance of 1·54 Angstrom units between each pair of carbon neighbours. The same bond and the same distance are found in the saturated chains of the paraffins, fatty acids, alcohols and the like.

Organic Origin

These illustrations of electron projection have been chosen from the organic field because, as I have already mentioned, the substances used as dielectrics are so largely of organic origin. The organic molecules are in a great number of cases clearly defined and separate. Their distances from one another in the solid, that is, the distances of closest approach of atoms belonging to one molecule to atoms belonging to another molecule, are generally two to three times the distances between atom and atom in the one molecule. When an organic substance melts, the molecules part company, but not the atoms in the molecules.

IN NAPHTHALENE



Projection along an axis, showing naphthalene molecules almost end-on. The contour lines are here graded by differences of 2 electrons per A³.

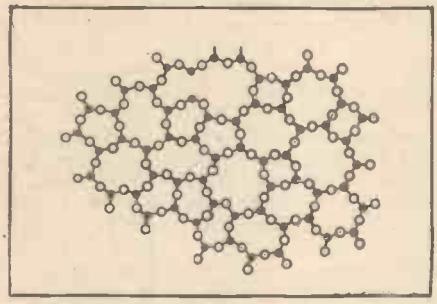
Dielectric materials in ordinary use are generally composed of molecules far more complicated than that of durene, which was taken as an example above, and the arrangement of the molecules is far less regular. Nevertheless, we are able to make a useful study even of such cases.

In Professor Bragg's original Paper an account is given of the method of constructing an electron map, and in the accompanying illustrations you will see the reproduction of X-ray photographs which serve as illustrations of crystals of different degrees of regularity and different composition.

Structure of Glass

It will be noticed that vitreous silica gives a very poor photograph, consisting only of diffuse rings. Many of the substances which are used by the electrical engineer, such as glass or bakelite, give photographs nearly or quite as indistinct. It might therefore be thought that the X-ray methods would consequently have little to say in such cases; but, on the contrary, it has been found that much useful information can still be obtained by X-ray analysis notwithstanding the formidable difficulties met with.

THE ATOMS IN GLASS



A diagram, due to Zachariasen, of the probable ways in which silicon and oxygen atoms are linked together in glass. The diagram does not show the extension in three dimensions, each silicon in the material being linked to four oxygens, whereas only three linkages are shown. The main point is the irregular lacing of the atoms together. (*Journal of the American Chemical Society*, 1932, *vol.* 54, *p.* 3846.)

X-ray methods have been remarkably successful in revealing details of many complicated structures, including particularly those of cellulose and related substances and of the proteins. To these substances many of the materials used in the electrical industry are closely related, or at least are similar in behaviour.

Apart from the practical importance of finding out more and more of the structure, and consequently of the behaviour, of dielectric substances when used merely for the purpose of electrical insulators, it must be borne in mind that we are realising more and more, as science advances, the intimate part played by the dielectric in many electrical phenomena.

Energy in a Condenser

Time was when we thought that the energy stored in an electrical condenser, for example, consisted merely of electrical charges held in some way on the metal plates of the condenser. We know now that the energy resides in some obscure way in the field in the dielectric, and we begin to see why the amount of the energy thus stored or, in simpler language, the electrostatic capacity of the condenser, depends so much upon the electrical properties of the dielectric medium.

A great amount of attention has been given to the study of electrical *conductors*, and our knowledge in this field has advanced immensely during the past decade. The opposite side of the picture, the dielectric or *insulator*, has, however, been somewhat neglected; but with the advances in science, and particularly in radio science, where high-frequency and capacity effects are so important, we have found the need to study and understand the properties of dielectrics and the molecular and atomic structure upon which such properties ultimately depend.

Those of you who are interested in this subject should read Professor Bragg's Paper, which you will find in the Journal of the Institution of Electrical Engineers, Volume 77, No. 468, December, 1935. It is apt, as I have hinted before, to be rather abstruse in parts, but those of you who have some knowledge of chemistry and of atomic physics will find it extremely fascinating.

A FLASHLAMP PRECAUTION

A simple method of preventing the accidental running down of torch batteries.

RADIO servicemen and other technical workers who go out " visiting " ailing receivers and who habitually carry a flashlamp in their pockets for the purpose of inspecting the internals of such sets, will find that a broad rubber band slipped around the body of the flashlamp just above the operating " button " of the latter will entirely obviate the possibility of the flashlamp being inadvertently switched on as a result of being jostled about in the pocket.

When the rubber band is in this position the flashlamp can be safely carried in the pocket.

Wasted batteries will thus be prevented, since the operating button or lever of the flashlamp cannot possibly be moved upwards accidently owing to the presence of the rubber band.

When the flashlamp is wanted for use, it is the occupation of a second to push the rubber band upwards and out of the way of the operating button. Similarly, when the lamp is slipped back into the pocket, the rubber band is instantly pushed back into the " safety " position, as illustrated in the photograph.

VARIETY FROM WORCESTER

On August 3rd theatre variety will be broadcast from the Royal, Worcester (Midland programme), where the bill will include: The Four Aces, harmony vocalists; Mary Fuller, in comedy songs; the Geddes Brothers, musical clowns; and Peter White, comedian.

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

"TELEFRAMES"

Items of general interest

MORE AND MORE SETS

IT would be most unsafe to attempt to estimate the number of firms who will be showing television sets at Olympia, for every day one seems to hear of some new firm going into this market. Invicta Radio has recently announced its intention in this direction.

No doubt the time is not so far distant when almost every maker of radio receivers will list one television outfit amongst his range.

* * *

KEEP STILL, PLEASE !

Miss Elizabeth Cowell had a butterfly settle on her head when announcing the other day. Unpleasant as it may have been, she just ignored it and carried on.

But suppose it had been a big spider dropping from the roof, to say the least, that would not have been so easy to ignore. The possibility conjures up thoughts of some nervous person being televised when a mouse runs up on to the table with her speech notes on ! Or what about one of those who are in fear of their lives where cats are concerned, when the studio moggy peeps round the corner of the door ?

* * *

GREATER SENSITIVITY

We are all hoping for big things from the B.B.C.'s new and super-sensitive television cameras. It is stated that they can be adjusted, possibly by filters, to deal with colours in their subjects better than at present, when two widely different colours can have almost the same monotone value.

Progress is certainly not at a standstill.

* * *

HOW TO PAY FOR IT

It seems that the provision of a television service in America is now held up for the settlement of just one question. How can it be made to pay ?

Those concerned seem pretty certain that sponsored programmes by manufacturers and other firms will be the method. That being so, television, when it is launched, must be done in a big way, otherwise advertisers will not get value for their money.

Interesting discussion surrounds the possible way in which advertisers' announcements will be made. It is considered that, in view of the medium, an aural announcement would not be considered sufficient. Would the sponsors expect their goods to be displayed on the screen ?

Such a break would be more of an intrusion than the verbal announcement ever is. But if the displaying is done by some celebrity it would not be so bad, but expense would again be increased.

* * *

WHERE DOES IT SCORE ?

A scheme for the dissemination of news lines to subscribers by means of television has been developed in America. News items are typed on tape strips at the transmitter, and then run before the television gear. The news is eventually reproduced by mechanical means at the receiver.

But what is the advantage of the scheme ? Surely a telewriter in which the received tape is made to operate letter keys would be just as effective but simpler ?

* * *

THE SCIENCE MUSEUM EXHIBITION

The television exhibition at the Science Museum, South Kensington, is doing useful publicity work for television. It is stated that over 2,500 people have been visiting the show each day.

The crowds attracted have been fifty per cent. greater than those which have been attracted by any other special display staged at the museum.

* * *

SPECIAL TELEVISION PLAYS

Original material specially prepared for the television medium will be more in evidence next Autumn. Already several script writers are busy and at any rate one murder mystery is being evolved in which the television studio is the scene of the crime. Another original play will be concerned with the discovery of chloroform and particularly the dramatic occasion on which a group of doctors, led by Dr. James Simpson, experimenting with the new anæsthetic in 1847, endangered their lives while taking notes on each other's reactions.

Some radio personalities around one of the latest Ferranti television receivers. Seated on the left and second from right are Mr. Loughran and Mr. Lewis, respectively, of the Hazeltine Corporation of America, who recently paid a visit to the Ferranti organisation. The others from left to right are : Mr. Taylor, Dr. Searby (Ferranti television engineers), and Mr. Hall (Chief Radio Engineer of Ferranti's).

TIME-BASE EFFECTS

THOSE who have handled the controls of a double time-base and noted the effects produced on the screen of the cathode-ray tube will soon have found out that there is considerable interdependence of these on one another. This applies whether the double time-base is intended for high-definition television or for purely experimental purposes.

To some it may have seemed puzzling since it is usually stated that the controls of a good time-base should be entirely independent. But it must be remembered that this does not apply to the effect of the controls.

There are normally two principal controls, one varies the rate at which current flows into the "charge" condenser, and the other the voltage to which the "charge" condenser is charged before the discharge system comes into operation. When the *rate* of charge is varied it must not affect the voltage at which discharge takes place, and similarly, altering the voltage reached by the "charge" condenser must not affect the rate at which current flows into it.

Bearing that in mind, we can consider the effect on the screen of these two controls. First of all we will assume that we are dealing with the line or high-speed time-base and that the other is functioning normally.

The object of the control that varies the voltage at which discharge occurs is to vary the length of the lines on the screen. And the object of the rate-of-charge control is to alter the number of lines on the screen, since the quicker the spot moves (quicker charging rate) the less time each line will take, and the more that can be drawn during the fraction of a second taken by the slow time-base "charge" condenser to become charged and discharged again—at which point, of course, it starts a fresh frame.

The Rate of Charge

Bearing in mind that we have only a certain fixed time for each frame, we can consider the effect of the two controls further.

If we increase the rate of charge, each line will be drawn quicker and we shall get more lines, but the length of these lines will not vary, since the same voltage is still attained before discharge occurs. But suppose we lengthen the line by requiring the condenser to charge up to a higher voltage.

The rate of charge will remain as before, so that each line will take a little longer, and consequently we shall reduce the number of lines as well as lengthen them. If we want to increase the length of line and retain the same number of lines, then not only must we charge to a higher voltage, but we must charge at a quicker rate also, in order that the longer line will take just the same time as the previous shorter line.

Thus we see that the number-of-lines control is quite independent of the length control if used first or by itself, but that the length control can never be independent of the rate-of-charge control (number of lines).

Now, if you have followed that you can spend an interesting evening getting clear in your mind how alterations of the slow time-base can also affect the number of lines by giving a shorter time for each frame.

When you have thoroughly appreciated these effects you will be well on the way to a complete grasp of cathode-ray-tube operational technique, and will appreciate why the original setting of the time-bases of a television receiver is such a critical job.

METAL CABINETS

Reviewing some useful lines for the radio constructor

THE illustration shows two Ridco Semi-metal cabinets, and a Ridco Standard Chassis. The cabinets are extremely useful for housing oscillators, small amplifiers, power packs, and other such apparatus, whilst the chassis is suitable for the construction of all types of receivers and amplifiers built on the chassis principle.

The two top items in this photo are metal cabinets, one with ventilating grids, while the lower item is a metal chassis.

Both cabinets are similar in construction, and consist of black enamelled metal sides, clamped, by means of screwed rods, between a base and top of ebonite. In the case of the larger cabinet (type R/C2), two opposite sides are provided with ventilating grids, whilst the smaller one (type R/C1) is unventilated. Consequently, it is desirable to use the larger type when the apparatus to be housed generates any appreciable amount of heat. The metal sides of the cabinets may be earthed if it is desirable to screen the enclosed apparatus. Incidentally, in the case of mains apparatus, earthing the cabinets is a safeguard against shocks when handling.

Type R/C1 measures 6 in. × 5 in. × 5 in., and is priced at 4s. 6d., and type R/C2 measures 12 in. × 6 in. × 6 in., and costs 8s. 6d.

The Chassis

The Standard Chassis measures 12⅝ in. × 8¾ in. × 3 in., and is well made from 20g. aluminium, finished in grey cellulose. The ends are reinforced by heavy brass "U" brackets, and the whole job is perfectly rigid. Normally it is supplied undrilled at a cost of 6s. 6d., but it may be obtained ready drilled to individual specification for an extra charge of 2s. 6d.

All three of these accessories represent very good value for money. We feel that such professional-looking jobs—especially the cabinets—are very welcome to the constructor, who, in the past, has found it very difficult to procure such things.

The manufacturers are Messrs. Radio Industries Development Co., Birch Street, Hanley, Stoke-on-Trent.

A SCREW-SAVING HINT

SMALL screws have an annoying habit of getting lost, or, at any rate, of becoming misplaced just when they are wanted for a job of radio woodwork.

There is, however, one infallible way of overcoming this nuisance. Procure an odd piece of soap and, before commencing the job in hand, stick in the soap all the small screws which you are likely to require.

Safely secured in this manner, screws cannot possibly go astray and lose themselves among the miscellaneous odds and ends of a busy radioman's work-bench.

Keeping the screws together.

There is another advantage, also. The screw threads become lubricated with the trace of soap which adheres to them. Thus they are inserted and screwed up into the woodwork with much greater ease than would otherwise be the case. There is, too, when such "soaped" screws are used, rather less danger of any thin portions of the woodwork splitting. **J. F. S.**

TECHNICAL JOTTINGS

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

Items from the notebook of a radio technician

Applications of Radio Apparatus

THE apparatus of radio is continually finding new applications in different directions. Perhaps the most universally useful are the valve amplifier and the photo-electric cell. These are used for all manner of purposes, some closely and some only distantly related to the science of radio. I have several times in these Notes mentioned different applications of photo-electric cells and, as regards valve amplifiers, you will have no difficulty in thinking up numerous applications of these, some of them not directly connected with radio at all.

The Speaking Clock

A very recent and important service which depends largely upon radio apparatus in this way is the "speaking clock" which has been introduced by the G.P.O. for providing an accurate time service to telephone subscribers in the London area. A subscriber in this area, and connected to an automatic exchange, dials the code TIM and is routed to the clock and hears the time announced every ten seconds. Each note is followed by three audio-frequency pips, the third of which indicates the time mentioned to within errors of plus and minus $\frac{1}{10}$th of a second.

Recording the Phrases

Many of you who have used this service may have wondered how the announcements are recorded and reproduced. They are made, as a matter of fact, by photo-electrically reproducing words or phrases which are selected in the correct sequence from recordings made photographically on four glass discs. The mechanism for rotating the discs for building up the announcement and for changing from one announcement to another is driven by a low-speed synchronous motor. The frequency of the A.C. supply to this motor is directly controlled by a seconds-beating free pendulum. Every hour the clock is checked automatically against a signal transmitted from Greenwich Observatory and any small error is corrected. Should the error exceed the prescribed limits the service is transferred to a duplicate standby clock. Facilities are provided to connect up to 100 simultaneous calls to the installation.

The Development of Timekeeping

As modern conditions of living have created a widespread need for a much more accurate knowledge of the time-of-day than existed a comparatively few years ago, it may be interesting to trace very briefly the development of various time services in this country up to the introduction of the talking clock.

It was not very long ago that in most towns the time was taken from public clocks of some kind, disagreement between which was the rule rather than the exception. This was an obstacle to the smooth working of postal services, amongst other things, and led to the practice on mail coaches and trains of carrying chronometers to synchronise local post-office clocks with a standard clock in London. When the electric telegraph was introduced, various electro-mechanical devices were tried for automatic synchronisation of local clocks by means of telegraphed signals. About the year 1850 experiments began in connection with the synchronisation of the London post-office clocks with the Standard Mean Time clock in Greenwich Observatory. The logical development of this service is the International Time Signal which was introduced in 1927 and is transmitted from Rugby radio station at 10.00 and 18.00 G.M.T. daily.

A Popular Service

From the public point of view these services have the disadvantage of not being readily available where most needed, that is, in the home. This need was partially satisfied when the telephone subscriber could learn "the time by the exchange clock" by asking the local operator. This service was never claimed to be highly accurate, although its popularity may be judged from the fact that in the London area alone over 100,000 inquiries per month were received.

Those B.B.C. "Pips"

The well-known six pips transmitted by the B.B.C. at certain times of the day are, of course, very accurate and are useful for checking the domestic clocks. The B.B.C. time signals, in fact, represent a great step

(*Continued on next page.*)

TECHNICAL JOTTINGS

(*Continued from previous page.*)

forward in providing accurate time in the home.

The best of all way for accurate domestic time-keeping is the electric synchronous clock which keeps in step with time-controlled A.C. mains. The use of these clocks is far from universal at present, although it is rapidly increasing.

In the meantime there was abundant evidence of the desirability of an accurate time service *via* the telephone, and this is what led to the introduction of the speaking clock. This had already been introduced with success in certain Continental towns. A speaking clock was inaugurated in connection with the Paris telephone service early in 1933 and at present calls are made to this speaking clock apparatus at the rate of over 10,000 per day.

Accuracy

I have not the space at the moment to say more about this subject, but if any of you would like more technical details of how the recordings are made and reproduced and how the system is made accurate I will give you some further details in a week or two.

In the meantime, those of you who are seriously interested will find a very comprehensive description of all this in a Paper read before the Institution of Electrical Engineers and published in the May volume of the Journal. The Paper is by Dr. Speight and Mr. Gill, well-known Post Office engineers, who have been largely responsible for the technical development of this service.

Too-Loud Speakers

In spite of much advice to the contrary, there is no doubt that a large percentage of listeners—I think one might almost say the majority—favour a fairly loud reproduction. It is difficult to say just why this is. I suppose it is the same sort of thing as the desire to have a fast and powerful car, even though the conditions on the roads to-day generally make it impossible to utilise the abilities of the car to anything like their full extent. The radio set has to be used, as a rule, in a relatively small room where small power is quite adequate and much more pleasant, but in spite of that people just will have enough power to be heard half-way down the street, when the window is left open—or even when it isn't.

Every owner must be the best judge of the volume he requires from his set. Personally, I prefer a set to be nicely toned down, no louder than is necessary for just hearing it clearly. Your ears soon get used to this, and you hear it quite as effectively as if it were very much louder and, of course, much more pleasantly.

Power-Grid Detection

In their desire for extra loudness many amateurs turn to power-grid detection instead of the ordinary detector stage. Before saying anything further about this, I should warn you that there is often a snag in it in this sense, that the power you are going to get from your loud-speaker depends primarily upon the input signal energy and upon the amplification provided at the various stages of the set. The incoming signal is increased in strength by the H.F. amplifying stages, and eventually a signal of a certain strength is delivered to the detector stage. Assuming the detector stage is well able to handle this strength then all is well, and this is passed on to be further amplified, after rectification, in the low-frequency stages. In circumstances such as this the substitution of a power-grid stage for the ordinary grid stage will not increase the loudness of reproduction from the speaker, because the present detector stage is doing all that can be done.

The Bottle-Neck

Where the power-grid stage will prove an advantage is in the case where the signal energy delivered to the detector is more than the detector can efficiently handle. In this case you have a kind of bottle-neck which not only prevents the proper passage of the energy available, but also introduces distortion in the process. Here is a clear case for the substitution of power-grid for ordinary grid detection.

You will see from this that the power-grid stage does not *produce* more power. It merely enables more power to be *handled* if such power is available. In the same way the ordinary grid stage does not prevent power from getting through, provided the power is within the handling capacity of the stage.

So that the question as to whether a power-grid detector stage is called for or not depends more than anything else upon whether the present detector stage is able to handle properly the power which is delivered to it.

Values of Components

You probably know that the power-grid circuit is practically the same as the ordinary grid-leak-detector arrangement but using different values of grid leak and condenser. These values are usually much lower, the value of the leak, say, ½ megohm, and the condenser ·0001 mfd. The power-grid detector works on a different part of the characteristic curve from the other, and for this reason it is important that a relatively high anode voltage should be applied to it.

Unless you have sufficient high-frequency amplification or unless you are dealing with a powerful local station it is quite possible that you do not require power-grid detection at all.

A Question of Signal Strength

Before deciding to alter your circuit by this substitution you want to consider carefully whether, with the particular aerial you have and the strength of the stations you generally receive, and also with the screen-grid–high-frequency amplifier stages on your set, you are likely to be delivering to the detector an amount of power which is beyond its handling capabilities. If the power delivered is within the capacity of the detector stage, then leave it alone, but if, on the other hand, you calculate that the detector is being overloaded, then it may be worth while to think about a change-over to the power-grid arrangement. But remember that taking a pint out of a pint pot and putting it into a quart pot doesn't make it a quart. Generally speaking, the average broadcast set will give all the volume needed without overloading of the ordinary grid-leak detector.

FROM OUR READERS

A NEW METHOD OF STATION REPORTING

A reader puts forward an interesting scheme for the real enthusiast.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have been extremely interested in reading through the medium of your paper the various letters from S. W. Ls. complaining of the failure of many stations in giving the said S.W.L.'s replies to the reports they are submitting.

I think I can rightly say that the majority of S.W.Ls. are really an enthusiastic lot, and I am sure they would readily understand and accept a possible solution to their present problems. With this in mind I have written the following.

I must at least say that the scheme I am about to suggest will involve considerable time and work, and in view of this will lend itself suitably to the serious listener. The scheme, by reason of the extra trouble involved, will serve to eliminate the S.W.L. who considers it too much trouble and will resultantly leave a clearer course for the listeners who will adopt this method.

There are two items required for this in addition to the usual equipment of the S.W.L.'s den, and that is a good log book, which, unfortunately, many of the S.W.Ls. of to-day don't seem to keep, and in addition a copy of the Radio Amateurs' Call Book, the more up to date the copy the better. An old copy of this is also useful, because by comparison you will be able to find out whether certain stations are newcomers or the old hands.

Making a List

Then commence by logging as many stations as you can, strength and quality to make no difference, detail your log out as far as possible to include stations heard, calling, frequency, time, WRT mod. quality, QRM, QRN, QSB, conditions, and general remarks. Then after a few days, or say about every week-end, list all these calls under their respective countries on special sheets. One sheet will contain perhaps 50 W. stations, another perhaps 25 V.E. stations, and so on. Taking the American sheet, for example, of these 20 different stations were heard, some of them perhaps as many as six times in the week.

Then what you have to do is print 20 copies of this report sheet by means of a typewriter or any other means you have. Then after printing these copies send one to each of the stations heard, if you are able to afford it; if not, just send them to the stations appearing on the sheet the most.

Of course, if you are able to make a sheet of each separate district heard, all the better, but this you will have to decide for yourself. But by means of the QRAs in the call book you will be able to send these direct, and so be certain that they won't be delayed in the bureaux; in any case only cards are dealt with by the QSL bureaux, so these logs wouldn't be accepted. By this means the station to whom you submit a sheet will be able to compare his station's strength, etc., over certain periods, and also be able to compare them with other stations in his locality, by means of the other stations logged on the sheet, and perhaps by means of these sheets he can refer back to any particular adjustments he may have made within that period and note any variations they may have made in his strength.

You will, of course, realise that very few reports of this nature are submitted, and yet you will be well able to appreciate the fact that in most cases they will be well received. You will be rather surprised at the response you will get to your reporting if you adopt this method, and in addition you will find it a pleasant diversion making the comparisons yourself.

Of course, the actual carrying out of this plan is left entirely to you. And the more detailed you can make these sheets the better. If you could make one sheet for W 2, one for W 3, etc., so much the better. But it is left to you to decide this.

The addresses in the call book will help you to work out the various localities, and if you find they are fairly new stations by means of the call book, the chances are the reports will be more useful still. I might add that I tried this plan myself some time ago and achieved quite good results from it, and for that reason I am anxious that you should have a chance to try it also.

C. E. SPILLANE.

22, Burns Road, Harlesden, London, N.W.10.

WIN A GUINEA!

By simply writing to us about any radio subject you like. This sum is awarded each week to the writer of the letter which, in the opinion of the Editor, is the best of the week's batch. Your letter may be long or short, practical or otherwise. It may give an opinion or describe an experience. Why not let us have your views or experiences? This week the guinea goes to Mr. C. E. Spillane.

INCREASED SENSITIVITY

The Editor, "Popular Wireless."

Dear Sir,—A year or so ago I constructed the "P.W." "All-in" frame assembly, a 3-valve portable set consisting of H.F. pentode stage, triode detector, and pentode output. The design was, I believe, published in June, 1935.

Having recently been transferred to a greater distance from the local station, I found that results were extremely weak, Droitwich being the only station received at comfortable listening strength, so I am passing on my experiences for the benefit of those readers who have had the same difficulty.

On substituting an H.F. pentode, viz. Mazda S.P.210, metallized, for the existing triode detector, sensitivity was greatly increased, enabling me to bring in at good strength stations which had hitherto been very weak. A 100,000-ohms resistance and 1-mfd. by-pass condenser were used in the usual way in connection with the auxiliary grid of the H.F. pentode.

Wishing your paper every success.

R. W. COOMBS.

24, Old Tiverton Road, Exeter, Devon.

USING INGENUITY

The Editor, POPULAR WIRELESS.

Dear Sir,—I am fourteen years old and became interested in wireless about four years ago when I built a single-valve broadcast receiver with plug-in coils which I wound myself. Then I became a short-wave fan and, not being well off, I could not afford to buy components, so I made my own.

I made my own coils with the helpful advice of W. L. S.; these, by the way, were wound on cardboard tubes. My fixed condensers were made from silver paper out of cigarette packets. I had to experiment to find the best sizes. My short-wave choke I wound on a test tube, and I did not know how many turns, so I looked in a shop window and counted the number of turns on a short-wave choke they had there.

All these components were mounted on, and in, a cocoa tin.

My aerial consists of a piece of spring curtain wire stretched across my window with a lead-in of flex and insulators consisting of bottle necks.

This set which I made from home-made parts worked, and I listen-in at half-past two, when everyone is asleep. My earphones consist of half a pair, and so as to be able to use both hands I put a strap round my head and jam the earphone under this.

I can remember the first time I got America. Boy, was I excited! I'll say! The person I heard was an amateur from Quebec who was transmitting with a 50-watt transmitter.

F. E. NASH.

28, Wilton Crescent, Shirley, Southampton.

WHERE ARE THEY?

The Editor, "Popular Wireless."

Dear Sir,—Three weeks ago you published a letter of mine in which I made the following request—"I should like to get in touch with any reader in my district interested in S.W. work." I also made a similar request in another wireless weekly a few weeks ago.

Perhaps you will be interested to know that I have received exactly TWO replies, one from a 15-year-old S.W. enthusiast and the other from a local "ham."

According to articles written in various wireless mags., etc., this country is supposed to be bubbling over with S.W. enthusiasts, especially of the younger generation. ARE WE BEING LED UP THE GARDEN? or are the so-called enthusiasts so full up with enthusiasm that they have no time for anybody except themselves? I rather fancy that this is where their enthusiasm is lacking. What do you and other readers think?

Perhaps this letter will bring to life some of the enthusiasts in my district (if there are any). I am anxious to start a short-wave DX-ers' club, so would all interested please write or call at my QRA? I should be more than pleased to meet them. My shack is an ever-open door for anyone interested in radio.

Thanking you for the fine S.W. articles, etc., and wishing "P.W." all the success it deserves.

WILLIAM (BILL) COLCLOUGH.
(Member B.S.W.L. 316.)

31, Lancaster Gardens, West Ealing, W.13.

ALL'S WELL

The Editor, POPULAR WIRELESS.

Dear Sir,—I thought perhaps you would be

(*Continued on next page.*)

SOUND-ON-FILM RECORDING

An interesting German portable recording outfit. It is a sound-on-film system and employs ultra narrow gauge film.

FROM OUR READERS

(Continued from previous page.)

interested in the opinion of a very old reader of your magnificent paper.

When I say an old reader I mean it, because I have been reading radio journals ever since the first issues of the "Wireless World," actually in 1912, and I may say that I was one of the very few persons to own a receiver in the Manchester district at this period. So you see my radio experiences are of long standing and I have read every manner of paper published on this subject, but, believe me, your POPULAR WIRELESS is in my opinion the "top" of the weekly issues. The War put "paid" to my activities, but I started again on resuming my civilian status. Eventually the short-wave "bug" bit me, and now I cannot keep away from the never-ending entertainment and surprises one gets with S.W. radio.

By the way, the article "The Dial Revolves," also the tests made by Leslie W. Orton, are really enjoyable and looked forward to by me. Being a motorist myself I know that with the gear they must have to carry in a car comfort and pleasure must be the very last thing he expects, and he really is a "swell guy" doing this for the benefit of your readers and S.W.Ls. as a whole.

F. A. Beane's articles are also very helpful to all S.W.Ls., and in fact the whole of POPULAR WIRELESS is brimful of interest and help in this wonderful hobby.

ALBERT PARK.

423, Bury Old Road, Prestwich, Manchester.

THE TELEVISION EXHIBITION

The Editor, "Popular Wireless."

Dear Sir,—We have read with interest your contributor's (K. D. Rogers) article, dealing with the Science Museum Television Exhibition, in "Popular Wireless" dated 3rd July. With reference to his criticism of the Baird Cathode-Ray Tube demonstration equipment, however, he has made a gross error.

If he had taken the trouble to read the explanatory caption, and noted the section in which this equipment was housed, he would have seen that its object is to demonstrate the principles of scanning. A rotary switch enables the picture to be built up from a stationary spot, and the number of lines for picture dissection and reconstitution can be adjusted as required. To suggest that it is a "museum piece" of apparatus shows a complete lack of understanding by Mr. Rogers, and we shall be glad if you will correct this in an early issue.

BAIRD TELEVISION LIMITED.

Crystal Palace, Anerley Road, London, S.E.19.

MR. ROGERS' REPLY

The "museum piece" referred to was, during the whole of the evening while I was at the exhibition—some two and a half hours—doing nothing but show a crude 30-line image on a cathode-ray tube. There was no one operating any control to show the build up of an image and the card on the apparatus, as I remember it, stated that the exhibit showed how a cathode-ray image was formed. In view of the fact that there was no demonstration of "forming," one was forced to the conclusion that there, before one, was a formed cathode-ray image, and with that impression was also registered the accompanying one that it was pretty poor.

It was not until one saw other cathode-ray images that one realised (and I am trying to look at it from the point of view of the layman) that the 30-line image must have been a "museum piece," and that it was certainly not an example of how a modern cathode-ray image looked.

I trust that for the rest of the exhibition a demonstrator will be in attendance to show the actual build up from spot to line and from line to frame, with the final modulation which I learn is the purpose of the exhibit. With such a demonstration it is valuable, for 30 lines can show more clearly what takes place than can 240 or more. But as I saw the exhibit it was a misleading affair and the card certainly did not tell one the whole truth.

K. D. ROGERS.

MARCONI—THE MAN AND HIS WIRELESS

(Continued from page 490.)

After that memorable night the atmosphere did not favour wireless for several days, and some difficulties developed in the alternator, so it was not until December 21 that a message from Marconi to the King of Italy and a greeting to England's King were intercepted on the other side of the sea.

Sandy Cape Cod was the scene of the next big act in the drama of wireless.

While Glace Bay far to the northward was winning new laurels for Marconi, lattice-like towers had been rising above the sand dunes overlooking the Atlantic, sixteen miles from the tip of Cape Cod's hook. This was South Wellfleet, Massachusetts, known by its call letters C C.[1] Built to communicate with England it was the first high-power station in the United States. About three weeks after Glace Bay went on the air Marconi left the northland to play the leading rôle in wireless on the Cape.

(Chapter XI to be concluded next week.)

[1] Station C C opened by Marconi Wireless Telegraph Company of America, January 19th, 1903. Call changed to M C C in 1910 and to W C C in 1913, the apparatus of which was dismantled in 1918, hopelessly out of date.

BECAUSE OF THE BIG DEMAND TO READ MARCONI'S LIFE STORY IN POPULAR WIRELESS YOU ARE ADVISED TO PLACE AN ORDER FOR YOUR COPIES.

SEEN ON THE AIR

NEWS AND VIEWS ON THE TELEVISION PROGRAMMES BY OUR SPECIAL RADIO-SCREEN CORRESPONDENT

L. MARSLAND GANDER

SO the television holiday of the B.B.C. is to be a "half holiday" only. Yielding to pressure from the trade and from manufacturers, the B.B.C. have agreed to broadcast special transmissions between July 26th and August 14th.

But viewers are requested not to look! That is the only possible interpretation of the official pronouncement. It is explained that there will be daily transmissions during this period on most days between 11 a.m. and noon, and 2 and 3 o'clock. These will consist of sound films and exterior shots, with records as an accompaniment. All will be prefaced with a caption card saying: "Test Transmissions for the Radio Industry."

Only Gilbert or Lewis Carroll could do justice to the B.B.C., 1937. I do not intend to try except that I should like to ask the rhetorical question: "What becomes of the argument that the holiday was necessary to rest and overhaul the apparatus at Alexandra Palace?"

Improved Programmes

I suppose we must commend the B.B.C. for retreating from an unfortunate decision, and regret that they have not retreated far enough. The worst feature of it all seems to be that the gap again creates the suggestion that the service is experimental.

I dislike continual anti-B.B.C. grousing which, moreover, is apt to become boring. I also have the greatest admiration for the work of Mr. Gerald Cock and his associates at Alexandra Palace. Programmes have improved in entertainment value out of all knowledge. Britain not only leads the world technically, but is unchallenged in television programme building. More is the pity, then, to take any backward step—even a temporary one.

I can hardly credit the current report that a close-down was decided upon to avoid the necessity for appointing deputies to the programme staff. The television staff needed a holiday badly, but it is fantastic policy to give them one all together. We must not have a close season for television. Enough!

Increased Mobility

Among the most interesting of new developments is what I might call the increased mobility of television. For the Wimbledon transmissions the vans were actually 400 or 500 yards away from the Centre Court, in a sports ground, and there were cable connections to the cameras. This means that provided the connecting cables can be controlled and protected properly, cameras may be placed and used anywhere within a very wide radius of the vans. One of the difficulties with outside television has been that the vans are very large and cumbersome. When an encampment has been made and the aerial set up, it becomes a job of some magnitude to move the whole outfit to another point.

Therefore it is most important that the B.B.C. engineers have been able to run out so many yards of cable without appreciable loss of signal strength and quality. Also, of course, it makes possible inter-related relays from a number of scattered points.

A Tour of the Zoo

I hear that the first experiment in this direction is likely to be at the Regent's Park Zoo. It has already been announced that in connection with the B.B.C.'s coming transmissions to Radiolympia between August 25th and September 4th there will be daily transmissions from Pets' Corner. The idea has now been expanded into a tour of the Zoo.

Viewers may expect to see elephants and camels carrying their loads of children, and many others of the Zoo's familiar sights. The *pièce de résistance* is likely to be feeding the sea-lions. Lighting difficulties will probably prevent relays from inside the houses.

By the way, the cable used is not the same as that which connected Apsley Gate with Alexandra Palace for the Coronation Procession television, and the technical problem is a different one. I can see great possibilities in this type of programme.

A second development of equal interest is the enormous improvement in the film transmissions from Alexandra Palace. For a long time the difference between the film and studio shows has been markedly to the disadvantage of the films. Now there has been a sudden change, and sometimes I think that film is better than direct transmission.

New Transmitting Tube

When I first asked the B.B.C. about the improvement they were, for some inscrutable reason, mysterious and attributed it largely to the fact that the films were being taken under summer conditions, for the most part in brilliant sunshine. However, I now learn that a new transmitting tube has been installed. This is not greatly different from the standard types already in use at A.P., except that it has an improved "gun." Still the effect on the film reproduction has been startling.

I have heard the expert opinion that the tube is capable of 1,200-line definition.

Since I was able to reveal, exclusively in these notes, that the B.B.C. synchronising signal was to be adjusted to make possible reception of the programmes by the Scophony system, the statement has been officially confirmed by Mr. S. Sagall, managing director of Scophony.

Personally, I hope that the adjustments can be made in time for demonstration at Radiolympia.

A Good Programme

In my earlier references to the coming Zoo transmission I should have taken the opportunity of congratulating the B.B.C. on the first performance by the larger animals in Alexandra Park. The friendliness of the programme was its principal charm, and it demonstrated once again how actuality scores over the studio item.

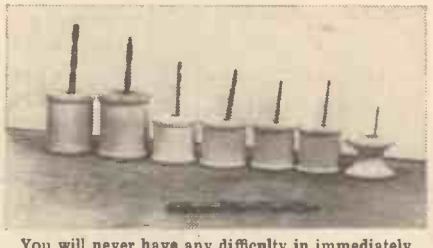
Babar, the young elephant, newly arrived from Calcutta and no doubt bewildered by his week of new experiences, was the "star." Children were seen riding on the llama, the chimpanzees "did their stuff." Elizabeth Cowell, slightly worried by the attempts of the penguin to peck her, nevertheless bore it calmly in the interests of television.

I do not know whether the B.B.C. rehearsed the programme at all, but it had the appearance of "presenting itself" with the easiest informality.

HANDY DRILL-HOLDERS

ONE may, perhaps, be excused for calling the notion illustrated in the accompanying photograph a "reel-ly" good one!

Take half a dozen—or more if you wish—empty cotton reels and glue them down in a row in some convenient position on the permanent radio workbench. Alternatively, the reels may be screwed down to the bench by two screws per reel passing upwards from the underside of the bench.



You will never have any difficulty in immediately putting your hand on the drill you require if you arrange them in this fashion.

A row of reels set up in this fashion makes an extremely handy set of holders for the smaller-sized drill bits employed in radio constructional work. The cotton reels should be marked with the sizes of the bits they hold. The bits may be withdrawn quickly from their holders, and as readily replaced.

The correct size of bit needed for any work in hand is instantly ascertainable; for the bits, supported by the reels, stand upwards in a row, and may be seen at a glance.—J. F. S.

QUESTIONS AND ANSWERS

By K. D. ROGERS

GETTING RID OF THE DOUBLE HUMP

TACKLING THE PROBLEM

J. F. B. (Exeter).—*I cannot get rid of a double hump in the tuning of my set (three gang band-pass) when tuned to the Western Regional and to Droitwich. How should one trim the set to avoid that? I start with the detector and then find that I cannot properly trim the aerial and other trimmer. They have to be all in to give effect, and then I get the double hump referred to.*

Band-pass tuning and trimming are noted for giving one, the hump—metaphorically, I mean. It is not easy to trim unless you know exactly what you are doing. In the first place I would like to get hold of some of the makers who claim to give correct wavelength calibration with their tuners. That is, I believe, one of the main causes for torn hair and shattered married lives among home constructors who try to trim ganged tuners.

On an oscillator unit the tuner may be quite O.K. as regards wavelength calibration, but it is certainly not when it is put into a home-made set.

What happens is this: You blithely go to the tuner to trim it. You know that you should trim the detector section first—that is right and proper—and you are told to trim it so that the wavelength readings on the scale are correct for some station in the middle of the scale. You do that.

Feeling pleased with yourself you proceed to trim the remaining trimmers. You screw and screw and screw. The final result is that either they won't come *out* far enough to let you get the thing in trim, or they won't go *in* far enough.

Hair is torn, the wife rushes home to mother, and the kids hide in the coal shed. What is the matter with the adjectival thing?

Probably nothing! Ten to one it has been designed with insufficient latitude to enable a home constructor to trim it when in a high capacity set. Probably either the detector or the other parts of the set have high capacity wiring and so forth, and the trimming is thrown out. What has happened is that you have had to have more or less than the expected trimming capacity in the detection section in order to get the unit to read correctly on the wavelength scale, or your aerial and H.F. circuits are of lower or higher capacity than expected.

There are two remedies: One is to load those trimmers which will not go in far enough with small condensers; the other is to say a rude word about the wavelength scales, fit a degree scale, and trim to any reading you like.

I prefer the latter method. The rude word is relieving, and the degree scale is just as good as the other when you get to know it. In any case the loading of trimmers with additional capacity is an unclean practice, and is not recommended from the point of view of efficiency and of enabling the tuner to remain in trim over the whole of its range.

In your case I cannot say that this has happened for certain. But it seems possible. You could send your unit back to the makers for test, but the trouble is more likely to be that you have a high capacity detector circuit which is upsetting things, than that the unit is faulty. I am not clear from your letter whether you do get into trim on your aerial and other trimmer, or whether you just do not. What happens on distant stations?

That double hump may not be due to bad trimming. It may be due to detector overloading when you are tuned-in right. Your best test is to trim on distant stations, and then if you get the double hump on the locals, *while being properly trimmed on the distant transmissions*, you can be sure that the trouble is overloading of valves, and not the unit at all.

What happens is that your detector grid becomes too negative when the set is fully tuned-in to the local, so it chokes up a bit and the strength drops. Then, when you go slightly out of tune on either side of the point the strength of the H.F. to the detector drops enough to unchoke the valve and it functions properly, giving as a result louder signals than it did when it was fully tuned-in.

The result is a double hump effect, the detector working to full capacity and giving loudest results on either side of the correct tuning point, and being choked when the set is dead in tune, with the result that at that point the valve is not giving so big an output.

Make sure that it is not what is happening by trying the set's trimming on distant stations. If they are dead in tune you need not worry about the locals. What you must do then is to fit an aerial volume control to avoid overloading when Western Regional and Droitwich are tuned-in. You will get better and louder results on them in that way, for you will avoid the detector overloading.

On the other hand, you may be a victim of that "won't trim" business I have mentioned, in which case it is either a matter for trimmer loading or getting a degree scale instead of the wavelength calibrated dial.

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

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

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

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

OLD COPIES FREE

C. Hillman, 4, Sprowston Road, Forest Gate, London, E.7, *writes to say that he has copies of "P.W." dating back to 1934, which he is willing to let readers have provided they will pay postage. Those who want copies should get in touch with Mr. Hillman to see if he can supply the copy and should forward the necessary postage when "ordering" the copy.*

WORKS WITHOUT SPEAKER

V. P. P. (Liskeard). —*I took the speaker off my receiver the other day to test something, and was surprised to hear the set going on without it. Though the noise was weak I could still hear a programme coming through, the sounds coming from the output terminals. What was happening?*

I do not want to contradict you, but I am afraid the noise was not coming from the terminals. It was probably coming from that end of the set and was most likely coming from the L.F. transformer.

I have often heard that sort of thing, and it is fairly common in a powerful set which has an output choke. The noise is made in that case by the laminations of the choke vibrating in sympathy with the L.F. fluctuations in the winding of the choke.

After all, a pair of headphones is merely a piece of iron (in each earpiece) vibrating in sympathy with the L.F. fluctuations in the windings of the magnet of the phones. If you regard the choke laminations as the piece of iron of the phones, you have a rough-and-ready parallel. The laminations always try to vibrate with the L.F. impulses—they are bound to do so because they have their magnetic field varied by those self-same impulses. The reason why the laminations do not make a noise in every case is that they are too tightly clamped to be able to do so. And they should be tightly clamped, too!

In your case, if the laminations of the L.F. transformer are loose, or if one or two of them are loose, you may get the same thing happening. The variations of L.F. currents in the transformer will cause the iron core to vibrate, and any loose lamination will act as a miniature and inefficient loudspeaker.

There is one more possibility, but it is not likely to be the cause of the noise. That is the condenser across the plate and filament of the output valve. If that condenser has loose plates it may cause a noise, but the transformer laminations are far more likely to give rise to the phenomenon.

WORKS WITHOUT VALVE

"*Have you ever heard of a set working with a valve missing?*" challenges J. W. T. (Farnham). "*I thought the first L.F. valve of my three-valve short-waver was faulty, and pulled it out while the set was on. To my surprise the set went on working, though the signals were very faint. Why was this?*"

My correspondent suggests that the signals were fed from the anode of the detector valve (are you following?) to the grid of the L.F. valve, through the coupling condenser and then through the grid leak to the bias battery. As the output valve was plugged into the bias battery he assumes that impulses walked up through the bias lead of the output valve, through its transformer secondary to the grid, completing the chain of coupling.

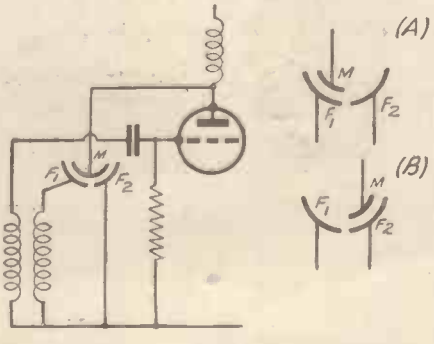
I don't think so. It might have some coupling effect that way if the bias battery were old and decrepit, having a high resistance which acted as a coupling resistance between the two grid circuits. But I fancy that the path was more likely to be through some capacity in the valve holder of the L.F. valve that was removed, and thence on to the grid of valve No. 3 in the usual way.

There is another possibility. That the H.F. from the detector valve was not completely got rid of on the output side and that some of it was applied to the grid of the first L.F. valve. As this valve is not in position, the H.F. (being of very high-frequency

(*Continued overleaf.*)

TECHNICALITIES EXPLAINED—No. 61

Differential Condensers



A variable condenser having two sets of fixed vanes between which the moving vanes move, starting from full mesh between one set and going into full mesh with the other. Intermediate positions constitute partial mesh with both sets of fixed vanes.

The result is that as the capacity between the moving vanes and one set of fixed vanes decreases the capacity between the moving vanes and the other set of fixed vanes increases. The total capacity of the condenser remains approximately the same throughout the whole procedure, the capacity being distributed between the two sets of fixed vanes and the moving vanes.

The condenser is useful in reaction circuits, as it allows the anode-to-earth capacity of the valve to remain constant even though the reaction coupling is varied by movement of the moving vanes.

In the diagram, A, I have shown the moving vanes totally coupled with the one set of fixed vanes, marked F1, to denote that they are in a reaction circuit with the active fixed vanes. In the second diagram, B, I have shown the moving vanes coupled to the other set of fixed vanes, those in a reaction circuit connected to earth.

The circuit diagram on the left shows the condenser marked M and F1 and F2, denoting the moving and the two sets of fixed vanes, and the marking is that usually employed by "P.W." in reaction circuits denoting by the lettering what may be called the "active" set of fixed vanes by the F1 and the earthed set of vanes by F2.

GALVANOMETERS GALORE

(*Continued from page* 483.)

a small depression punched in its exact centre and which has been carefully balanced on the gramophone needle point. The piece of spring is then magnetised by being stroked about twenty times with one pole of a magnet, care being taken to see that the strokes are all made in the same direction.

Set upon the gramophone needle pivot, the carefully balanced and magnetised strip will behave as a magnetic compass and its north pole will point due magnetic north. It will, also, react to the presence of an electric current in just the same manner as a commercially made compass needle.

A Suspended Needle

Another type of home-made galvanometer comprises ten or fifteen turns of insulated wire, the turns being about three inches in diameter. They are not wound upon anything, but are tied together at bottom and top. The coil is placed in a vertical position on the work-bench, being secured to the latter by means of a bent nail, a wire staple, or a small quantity of sealing-wax or "plasticine." Suspended from the top of the coil by means of a small piece of silk or cotton is a magnetised sewing needle, the latter having been magnetised by being stroked with a magnet in accordance with the directions given above.

It will not be found difficult to balance the magnetised needle so that it swings in a perfectly horizontal plane. Like the magnetised steel strip in the last type of galvanometer, the magnetised needle will point to the magnetic north. When, however, the slightest current flows through the coil, the needle will indicate its presence in a very decided manner. A strong current passing through the coil will probably serve to set the needle off its balance. Hence an instrument of this type should only be employed for detecting the presence of small currents.

An Alternative Pattern

The snag in the above instrument is that the needle takes a long time to come to rest and, also, that it is liable to be disturbed by the smallest current of air. Apart from these objections, however, this needle instrument can be made exceedingly sensitive.

Another pattern of the above-described galvanometer takes the form of an orthodox compass needle pivoted horizontally at the centre of the coil. This pivoting is effected by fastening down to the base of the coil a stick of sealing-wax of the requisite length and by sticking an upturned gramophone needle in the upper end of the sealing-wax stick. Upon the gramophone needle the compass needle is pivoted. If you haven't any sealing-wax, make use of a piece of candle as the supporting pillar. It won't look as well, but it will serve just as efficiently, and, after all, appearances are not always of primary import in a testing work-room!

There is one point which, perhaps, I ought to mention in connection with these compass needle pivotings before I leave the subject. That is, that if the pivot seatings are at all rusty (and they often are!), the needle will tend to stick. It is a good plan to place a tiny drop of thin oil in the cup-like depression which is formed in the centre of the compass needle. After you have done this, wipe as much of the oil away as you can. The pivot seating will now be adequately lubricated. It will not rust and, provided dirt does not get into it, it will not stick or resist the slightest tendency on the part of the needle to move under the current's influence.

Using a compass needle—orthodox or home-manufactured—and a few turns of wire, there is any amount of galvanometer patterns which can be treated. The current-indicators described and illustrated in this article are only a few of the current-revealing arrangements which are possible by such means. But printer's space is merciless and I must leave the devising of other galvanometer varieties to the individual ingenuity of my readers.

A CURE FOR DAMP ROT

Try this simple dodge and give your aerial mast a long life.

AERIAL masts and poles which are erected in damp ground very frequently suffer from a species of damp-rot which attacks their bases and gradually but surely brings about their ruin.

All such poles, however, can be rendered completely and *permanently* immune from damp-deteriorating influences of this nature by adopting the very simple procedure illustrated in the photograph.

JUST POUR IT IN

The creosote is poured into the hole in the base of the mast at intervals of a month or six weeks.

Drill obliquely downwards into the aerial mast a half-inch diameter hole, the hole being drilled from a spot about two or three inches above the ground-level. The hole should reach *downwards* to approximately the centre of the pole, and should not go beyond that point.

Take now a small funnel. Insert it into the hole and pour down it a small quantity of creosote until the latter completely fills the hole. Then remove the funnel and stop up the hole in the aerial pole with an ordinary cork.

The creosote will slowly penetrate downwards throughout the aerial pole, completely waterproofing and rot-proofing it. After about a week or so, a further quantity of creosote should be poured into the hole to replace the creosote which has penetrated into the wood.

By pouring a little creosote into the hole in the base of the aerial mast at intervals of, say, a month or six weeks, the pole will be maintained in a perfectly preserved condition for any length of time. Creosote is very readily and cheaply obtainable, and a creosoted base of an aerial pole is not only rendered permanently rot-proof, damp-proof and mould-proof, but it is also made immune from the many species of wood-destroying insects which love to feed upon damp wood near the soil-level.

QUESTIONS & ANSWERS

(*Continued from previous page.*)

at those short wavelengths) got through the capacity of valve holder No. 2 and so to the grid of the third valve. There it was rectified and caused weak signals.

You don't like it? Well, I won't argue. All three theories are possible. There are probably other coupling paths. I think that valve holder capacity is one that cannot be overlooked, however.

THE AMERICAN INVASION

C. K. (Bucks).—*Can you tell me how to use an American* 110*-volt receiver on my* 230 *A.C. mains? Can I use a resistance to break down the voltage?*

Yes sir, you can, but it would be a nasty method, and wasteful withal. (With all the heat dissipation necessary.) Sorry. The best way to do it is to make use of a little gadget called an auto-transformer, and available at various prices from such firms as F. C. Heayberd, of Finsbury Pavement, and C. Ward, of Farringdon Street, E.C.4. Practically any radio dealer will be able to get you a suitable transformer to step the mains down to 110 volts. It is a much cheaper and cleaner method than the resistance, and you will lose practically no power in doing it.

In the resistance scheme you lose the power represented by the difference between 110 volts and 230 volts multiplied by the current taken. Thus, if you take ·5-amp. from the mains at 110 volts, you will be losing 230 − 110 × ·5, which is a matter of 60 whole watts. That's a unit every 16 hours, gone right down the drain, or, more accurately, up the spout in the form of heat.

You get a transformer, and the waste will be the merest fraction of that.

AN "ADDER"

B. T. K. (Amersham).—*I want to add another stage to my S.T.*800, *making it a five-stager with a Q.P.P. or Class B output. Can I do this?*

You can, BUT—don't come to me afterwards and say it won't work. I will not say here that it won't work, but if I was not afraid someone would take me on I would lay ten shillings to a milliamp that when you had done it you would hate yourself, "P.W.," and particularly me for letting you do it.

If you want to mess about with a good set try adding a Class B stage externally. Don't for heaven's sake go and tear the innards of the 800 to bits to get the extra components in. And after you have tried the Class B and have gone back to the original set, drop me a line and let me know what you think of it with the Class B added.

You may think I am trying to put you off it. I am, I stand in fear and trembling at the results you may get. Note the MAY. It is possible to add such a stage, and it is possible to get good results. But I don't want you to try. You will not thank me if it goes wrong, and the cards are that it will. The set was not designed for such additions and—well, you would not try to add a motor bike engine to a car just to get a bit more kick out of it would you. Any kick you got would probably be directed against yourself, anyway.

You remember what happened to the bloke who carried the banner with "Excelsior!" on it, don't you. He was adding to his height up the mountain. You want to add to the length of your set. The result may be the same—metaphorically. So be warned.

The RADIO Bulletin

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

THREE of the 1937/38 season's models have been released by the **G.E.C.** These are an A.C. mains receiver and two battery-operated sets.

Listed at £9 19s. 6d., **the A.C. model** is a powerful five-valve superhet, and is designed to give first-rate quality coupled with simple control. It has the new G.E.C. "Chromoscopic" dial—a sloping edge-lit black scale with the coloured station names standing out in sharp relief.

Another feature is a power-line noise shield which guards the set from mains-borne interference. Fully delayed A.V.C. is incorporated and the energised moving-coil speaker is capable of an output of three watts. On the short waves the waverange is 16–50 metres.

This attractive design is housed in a polished walnut cabinet.

Turning to the battery sets: We have **the Battery S.P.3**, which is a straight three-valve set designed for reception on the medium and long-wave broadcast bands. It has single-knob tuning with a full-vision station-name dial, and also preset reaction. The H.T. consumption is 7 milliamps, and it is priced at £6 15s.

The second battery set is on more ambitious lines and costs ten guineas. It takes in the short waves, covering from 16–50 metres, and utilises a four-valve superhet circuit. A "Chromoscopic" dial is fitted, as is also the new G.E.C. two-speed tuning control.

Other features are fully delayed A.V.C. and automatic grid bias. The H.T. consumption is nine milliamps. The list prices given for these two sets include the necessary Osram valves, G.E.C. batteries and accumulators.

* * *

TWO UNIVERSAL SETS

Those who are on D.C. mains are well catered for these days, since the majority of manufacturers list suitable universal mains models as alternatives to the standard A.C. designs. These universal sets have the advantages that they operate equally well on both D.C. or A.C. mains and, therefore, should the D.C. mains be changed over to A.C., the owner of the universal set is able to go on using his existing receiver exactly as before without any modification whatever.

In the **Ferranti** range the two latest additions are the all-wave model 1037 U, which is a seven-stage superhet with pentode output and an energised moving-coil speaker. It has full A.V.C., manual tone and volume controls, and also the well-known Ferranti "Magnascopic" dial. It costs 10½ guineas.

The other set is the model 1137 U, and is similar to the 1038 U, with the addition of an electric tuning indicator.

The reproduction is superior and the receiver is housed in an attractive wood cabinet finished with veneers of walnut, Australian silky oak and macassar ebony.

The price is 11½ guineas. On the short waves these two receivers tune from 19–51 metres, and, of course, cover the normal medium and long broadcast wavebands in addition.

* * *

OSRAM VALVE RELEASES

Readers may remember that some time ago the **G.E.C.** introduced a new Osram valve embodying an entirely new patented form of tetrode output. This valve, which was designed for A.C. mains, was styled the N 40.

There is now a 2-volt battery valve embodying the same construction as the N40, and it is known as the KT2.

In the A.C. mains range a new output tetrode embodying the same patented design and known as the KT42 replaces the existing N42 pentode. Further releases of output tetrodes to replace existing output pentodes in other types will be made from time to time.

Tests have conclusively established that the new tetrode valves designated KT will satisfactorily replace existing pentodes of equivalent types in sets already on the market, and it is expected that both KT tetrodes and output pentodes will run concurrently in receivers during the coming season.

A new "International" range of Osram valves is now available. The principal features are the adoption of a heater rating of 6·3 volts, ·3 amps., together with a new form of base known as the octal base.

The reasons for the choice of this heater rating and base are: (*a*) 6·3 volts and octal bases are regarded as likely to be adopted as the international standard throughout the world, and it is with the object of achieving standardisation that these have been chosen for this new range; (*b*) The medium slope characteristics of the range facilitate the design of multi-valve sets and should greatly extend the market for British made sets in all parts of the world.

A number of benefits are derived from the heater rating adopted. For instance (1) there is the very low heater wattage; (2) the valves are equally applicable to A.C. or A.C./D.C. sets, as well as in car radio receivers, embracing the 6-volt as well as the 12-volt car battery; (3) Small physical dimensions are made possible by the reduced size of cathode. Also the low heater voltage tends to reduce the level of hum in A.C./D.C. sets, and the octal base with its moulded key simplifies the insertion of the valve into its holder.

Output valves in this range embody the patented form of tetrode system already mentioned. The range also includes a visual tuning indicator operating on the electron beam principle. This will be known as the G.E.C. "Tuneray" indicator.

SOUND RECORDING ON FILM

The use of recordings by German stations for the broadcasting of political speeches has caused firms in that country to pay special attention to the development of systems suitable to all requirements. Sound on film has a number of advantages over the disc and over the steel-tape method, but the cost of films has been one of the great drawbacks in the past. Klangfilm, of Berlin, have now solved this by sub-dividing ordinary 35-mm. film into six strips; each of these takes one ordinary talkie-size sound track. This means a reduction of operating costs, if not by six, at least by a large margin.

The narrow strip does not require perforation, as there is no picture with which it has to be synchronised. Sound is recorded and reproduced in exactly the same way as for the talking film, except that suitable transportable apparatus has been evolved. The recording set is entirely battery-operated, to make it independent of current supplies. The reproducing equipment is mains-fed. A photograph of the apparatus appears on page 500.

A. A. G.

"P.W." LIST OF EUROPEAN BROADCASTERS

This list contains the more important European medium and long-wave stations which are likely to be received in this country. There are some relay stations working on very low power and sharing common wavelengths. These have been omitted because their programmes are usually too weak or badly interfered with to be of value to British listeners.

Wave-length.	Station Medium Waveband.	Country	Power kw.
203·5	Plymouth	Gt. Britain	0·3
203·5	Bournemouth	„	1
206	Eiffel Tower (Paris)	France	7
215·4	Radio-Lyons	„	25
233·5	Aberdeen	Gt. Britain	1
236·8	Nürnberg	Germany	2
238·5	Riga	Latvia	15
240·2	Saarbrucken	Germany	17
242·9	Cork	Irish Free State	1
243·7	Gleiwitz	Germany	5
245·5	Radio Marconi (Bologna)	Italy	50
247·3	Lille (Radio P T T Nord)	France	60
251	Frankfurt	Germany	25
253·2	Nice Cote d'Azur	France	60
255·1	Copenhagen	Denmark	10
257·1	Monte Ceneri	Switzerland	15
259·1	Kosice	Czechoslovakia	10
261·1	Scottish National	Gt. Britain	50
	North National	„	20
	London National	„	20
263·2	Trieste	Italy	10
265·3	Hörby	Sweden	10
267·4	Newcastle	Gt. Britain	1
269·5	Radio Normandie (Fécamp)	France	15
269·5	Moravska-Ostrava	Czechoslovakia	11·2
271·7	Kuldiga	Latvia	10
274	Vinnitsa	U.S.S.R.	10
278·6	Bordeaux-Lafayette	France	35
283·3	Bari (No. 1)	Italy	20
285·7	West Regional	Gt. Britain	50
288·5	Rennes-Bretagne	France	120
291	Königsberg (No. 1)	Germany	100
296·2	Midland Regional	Gt. Britain	70
298·8	Bratislava	Czechoslovakia	13·5
301·5	Hilversum (No. 2)	Holland	60
304·3	Torun	Poland	24
304·3	Genoa	Italy	10
307·1	Northern Ireland Regional	Northern Ireland	100
312·8	Poste Parisien	France	60
315·8	Breslau	Germany	100
318·8	Goteborg	Sweden	10
321·9	Brussels (No. 2)	Belgium	15
325·4	Brno	Czechoslovakia	32
328·6	Toulouse	France	60
331·9	Hamburg	Germany	100
335·2	Helsinki	Finland	10
338·6	Linz	Austria	15
342·1	London Regional	Gt. Britain	70
345·6	Poznan	Poland	16
349·2	Strasbourg	France	100

Wave-length.	Station Medium Waveband.	Country.	Power kw.
356·7	Berlin	Germany	100
360·6	Kiev (No. 2)	U.S.S.R.	35
364·5	Bucharest	Rumania	12
368·6	Milan (No. 1)	Italy	50
373·1	Welsh Regional	Gt. Britain	70
	Penmon	„	5
377·4	Lwów	Poland	50
382·2	Leipzig	Germany	120
386·6	Toulouse (P T T)	France	120
391·1	Scottish Regional	Gt. Britain	70
	Burghead	„	60
400·5	Marseilles (P T T)	France	100
405·4	Munich	Germany	100
410·4	Tallinn	Estonia	20
415·4	Kharkov	U.S.S.R.	10
420·8	Rome (No. 1)	Italy	50
426·1	Stockholm	Sweden	55
431·7	Paris (P T T)	France	120
443·1	Sottens	Switzerland	100
449·1	North Regional	Gt. Britain	70
455·9	Cologne	Germany	100
463	Lyons (P T T)	France	100
470·2	Prague (No. 1)	Czechoslovakia	120
476·9	Lisbon	Portugal	15
476·9	Trondelag	Norway	20
483·9	Brussels (No. 1)	Belgium	15
491·8	Florence	Italy	20
499·2	Sundsvall	Sweden	10
499·2	Rabat	Morocco	25
506·8	Vienna	Austria	100
514·6	Madona	Latvia	50
522·6	Stuttgart	Germany	100
531	Athlone	Irish Free State	100
539·6	Beromunster	Switzerland	100
549·5	Budapest (No. 1)	Hungary	120
559·7	Wilno	Poland	50
569·3	Viipuri	Finland	10
	Long Waveband		
1107	Leningrad (No. 1)	U.S.S.R.	100
1153·8	Oslo	Norway	60
1250	Kalundborg	Denmark	60
1293	Luxembourg	Luxembourg	150
1339	Warsaw (No. 1)	Poland	120
1379	Novosibirsk	U.S.S.R.	100
1389	Motala	Sweden	150
1500	Droitwich	Gt. Britain	150
1571	Deutschlandsender	Germany	60
1648	Radio-Paris	France	80
1744	Moscow (No. 1)	U.S.S.R.	500
1807	Lahti	Finland	150
1875	Radio-Rumania	Rumania	150
1875	Hilversum (No. 1)	Holland	150

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