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MEET BRYAN MICHIE (ON PAGE 435)

Popular Wireless & Television Times

THE FIRST TRANSATLANTIC SIGNAL

EVERY WEDNESDAY PRICE 3D

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"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?

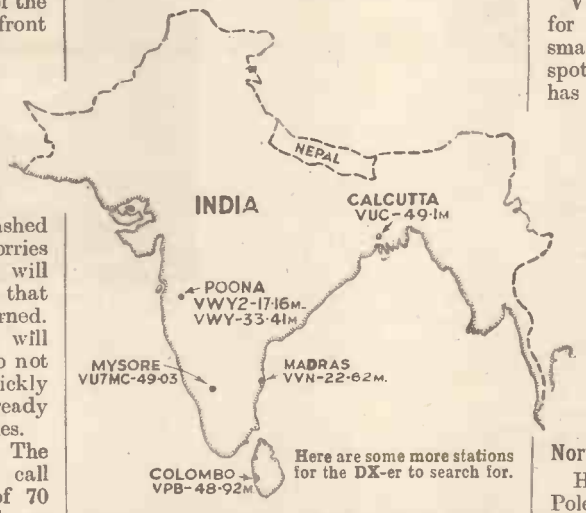
South and Central American reception has been excellent of late and I've a swell bag to my credit. L U 9 B R and L U 8 M A, Argentina; Y V 1 A A, Y V 5 A E, and Y V 5 N D, Venezuela; T I 5 N T (sounds almost explosive!) and T I 2 A H, Costa Rica, a 20-watt (input) Cuban whose call I failed to catch, 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.

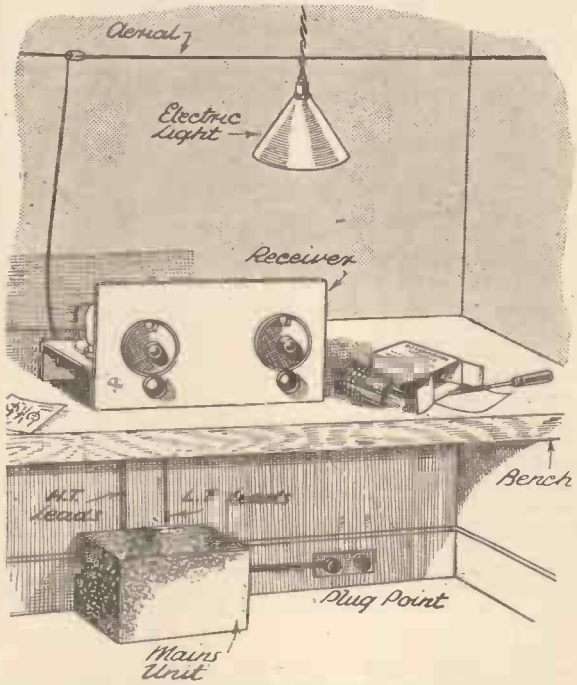
This week I don't propose to talk about the actual circuit arrangements so much as the externals. All sorts of stray combinations of circumstances can assist in drawing the line between success and failure—and you know which side of that line *you* want to be on.

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

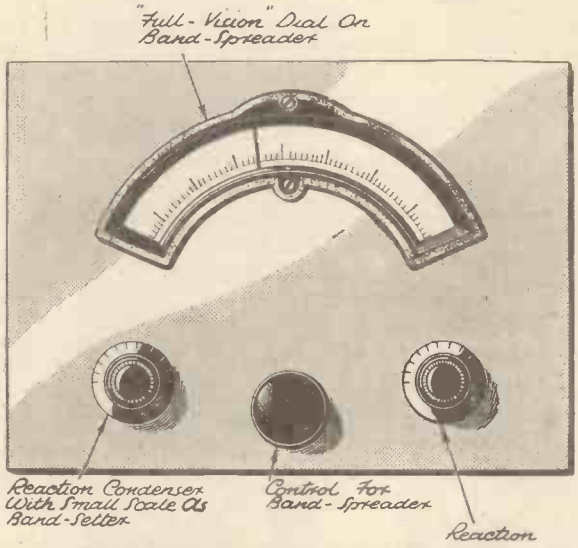
L. C. B. (Coulsdon), who describes his former set as "the famous old H.A.C." Three, has now built a "Simplex" Three, and sends along a very nice log of interesting DX. It includes West Indies, South America, Africa, Asia and the States—mostly on the speaker—so he hasn't much to worry about.

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

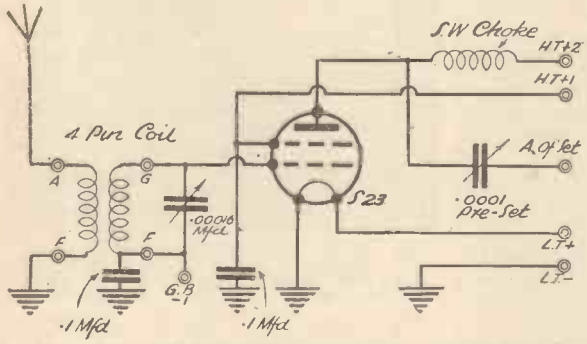


Fig. 1. The circuit of the unit is as simple as it possibly can be.

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

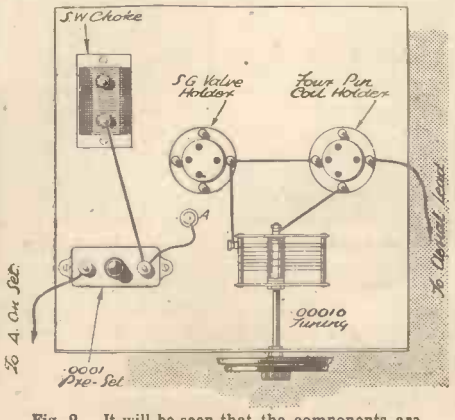


Fig. 2. It will be seen that the components are arranged to give easy wiring.

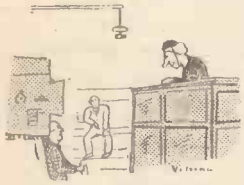
RANDOM RADIO REFLECTIONS

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.

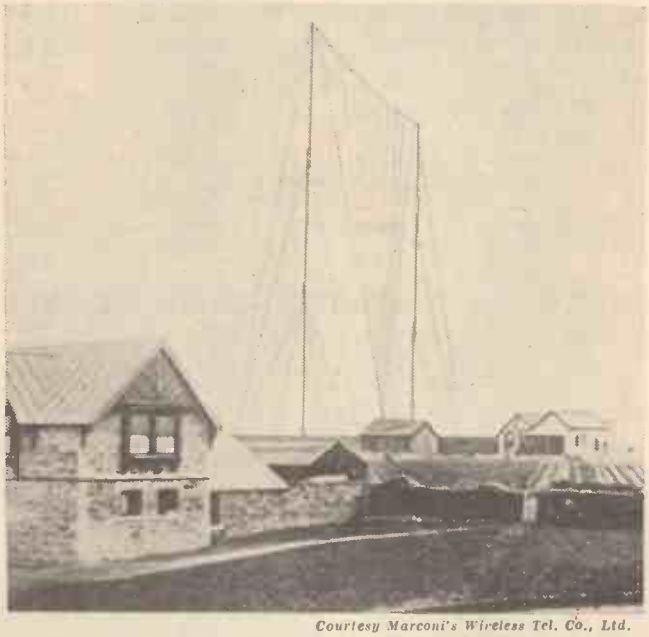
It was not so difficult to comprehend, in view of Marconi's achievements, that a boat 250 miles off the English coast picked up a wireless signal from the shore. But that must have been a freak of Nature aided by extraordinary atmospheric conditions. So argued the die-hards. It was eight times that distance 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

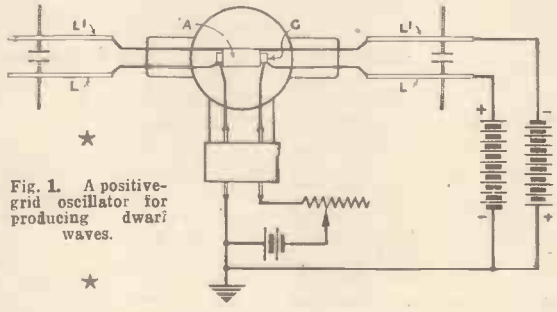


Fig. 1. A positive-grid oscillator for producing dwarf waves.

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.

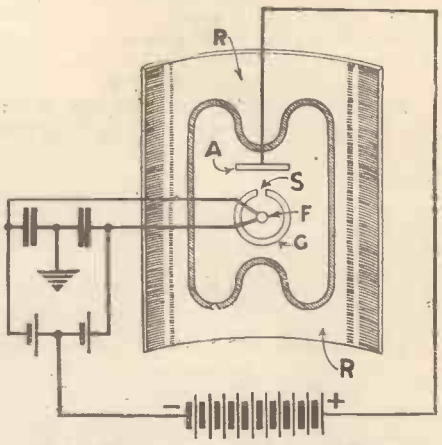


Fig. 2. This magnetron valve can produce one kilowatt of aerial power at 30 centimetres wavelength.

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.

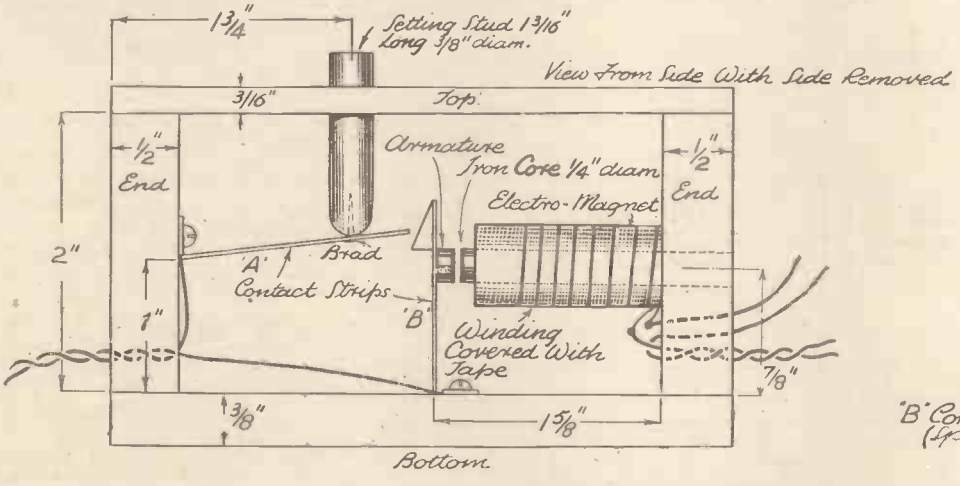
Worked by Press Button

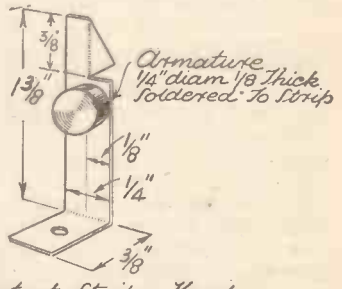
In line with this is the soft-iron core of an electro-magnet. The winding of the electro-magnet is connected in series with the remote press-button type of switch and a dry battery. When the remote switch is pressed a current flows through the winding of the electro-magnet, and causes the iron core to 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.

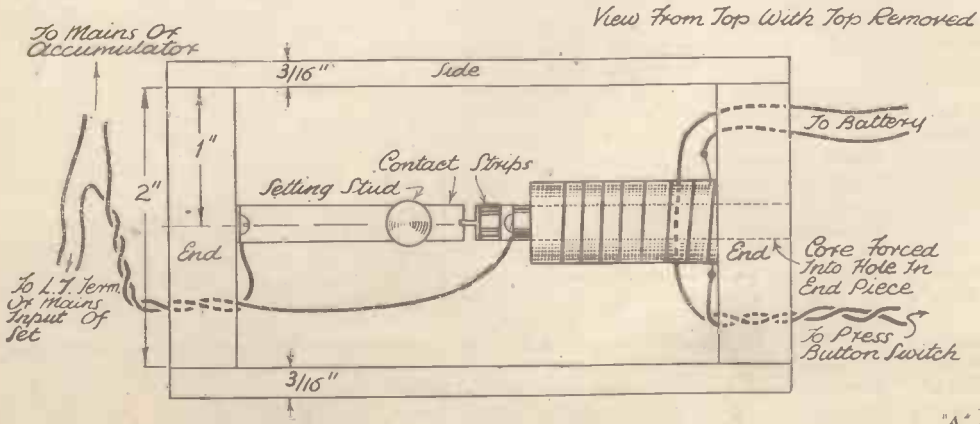
The parts required to make the switch are as follows: Two pieces of ½-in. plywood, 2 in. × 2 in. (ends); one piece of ⅜-in. plywood 4½ in. × 2 in. (bottom); two pieces of $\frac{3}{16}$-in. plywood, 4½ in. × 2 $\frac{3}{16}$ in. (sides); one piece of $\frac{3}{16}$-in. plywood, 4½ in. × 2 in. (top); 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.

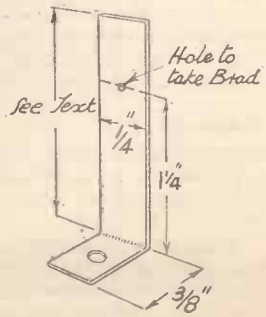
(Continued overleaf.)





"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.

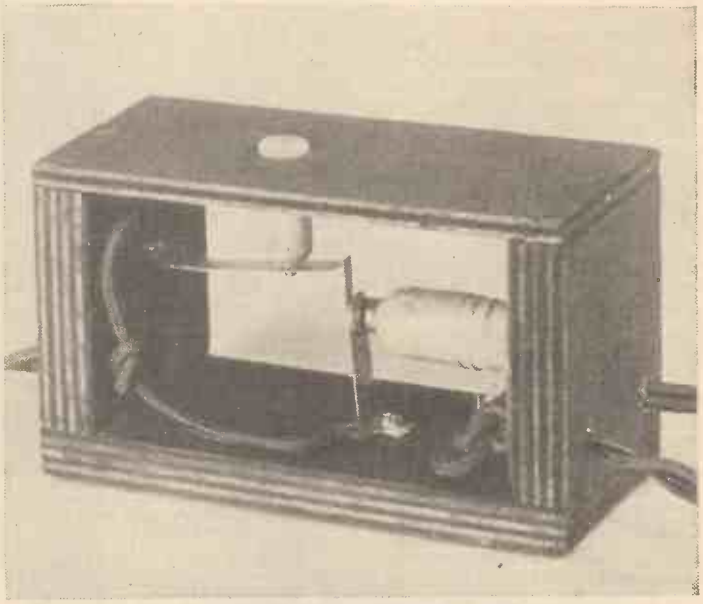
Now drill the holes in the end-pieces to take the three twin-flex leads. There are two holes in the end-piece bearing the electro-magnet—one to take the battery leads, and one to take the leads which go to the remote press-button switch. There is a hole in the other end-piece to take the flex lead in 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.

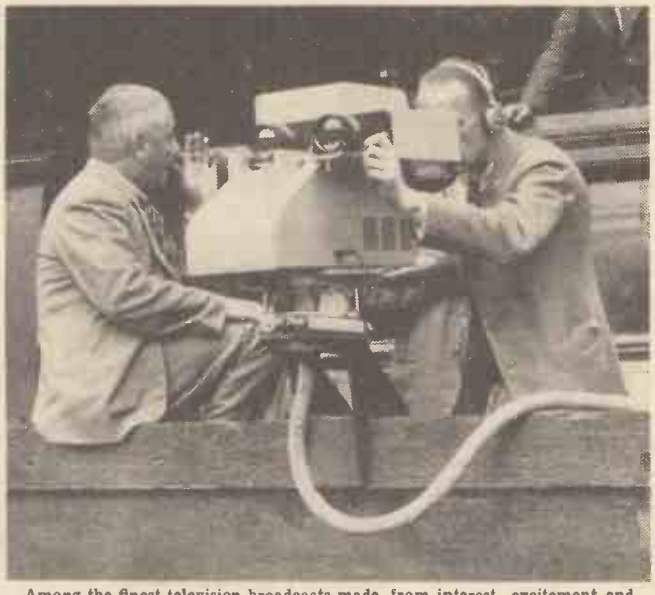
* * *

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

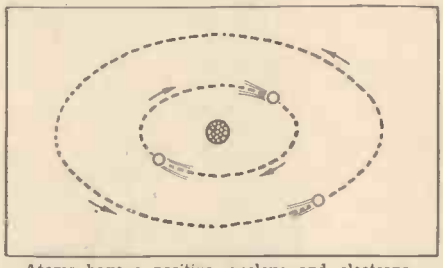
For the above reasons, the alkali metals are always stored under naphtha or some other form of oil. This serves to keep the air out of contact with them and thus the metals are prevented from oxidising themselves away.

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.

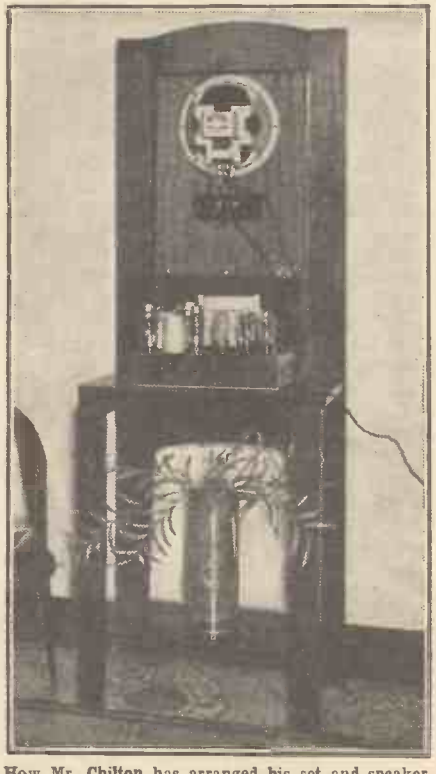
Inch-thick mahogany was used in the building of the (shall I call it) radio stand. Normally, the set is covered by a well-ventilated case, and the speaker by a silk bag.

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.

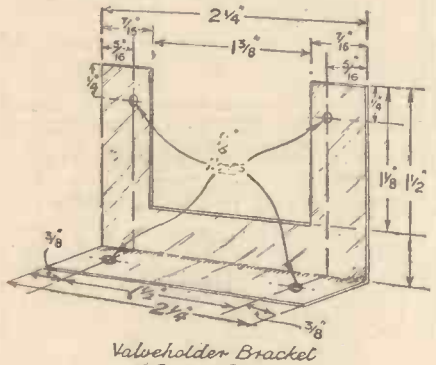
The value of the resistance is about 10,000 ohms and the inductance should be about three henrys. It can be of the nickel-iron type, for it has no current to carry worth talking about; as a matter of fact, you would do well to stop all current passing through the tone control by placing a 1-mfd. condenser 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

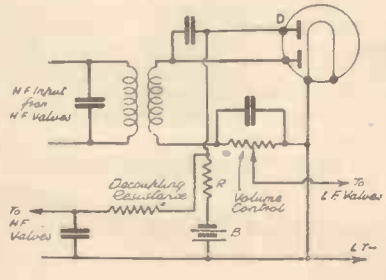
K. L. B. (Brighton.)—*What should the relationship between the decoupling resistance for an L.F. circuit and its condenser be?*

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

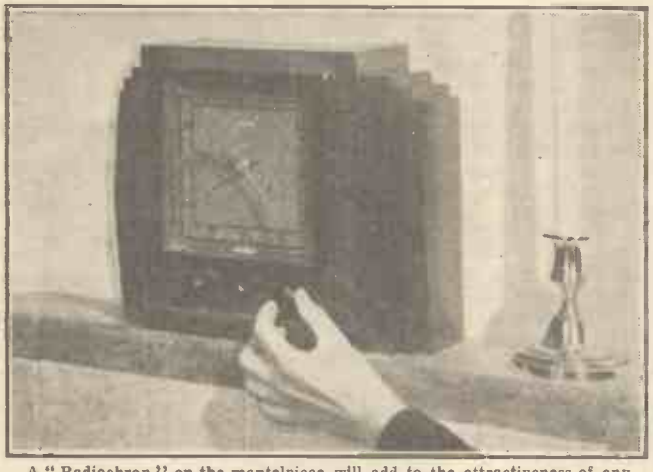
In the "Radiochron" we have something that is so different that it would be fascinating for that reason alone. But it has so many new features that it begets enthusiasm in everyone who sees it. And when they have handled it and heard it working it leaves them with only one thought—"I should like one 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.

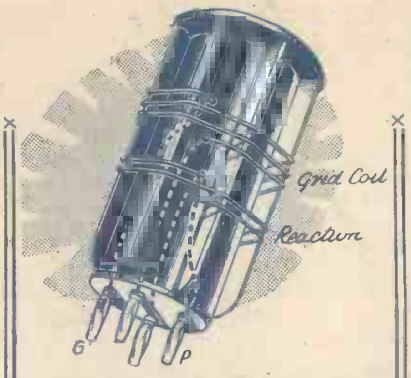
XS—Atmospherics
RPT—Repeat
BCL—Broadcast listener
BUG—Vibroplex key
CANS—Phones
CUL—See you later
CW—Continuous wave
DX—Distance
FONES—Telephones
GB—Good-bye
HI—Laughter
ICW—Interrupted continuous wave
OM—Old man
URS—Yours
73—Best regards
WKG—Working
WX—Weather

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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