

SHORT-WAVE CONVERTERS By HOWARD BARRY

Popular Wireless & TELEVISION TIMES

WAYNE AT
ONE-TREE HILL

By L. CHESTER

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JAMBOREE
FIELD DAYS
WHAT IT COSTS

RADIO NOTES & NEWS

RECORD IN RECORDS
BEFORE OUR TIME
TELEVISION VISION

Romance at Reykjavik

ABOUT twelve months ago the Icelandic broadcasting authorities arranged a special attraction—a broadcast by the famous Swedish singer, Mr. Sigurd Björling.

I do not know if the broadcasting station staff had been instructed to make the singer's visit specially memorable, but one young lady, a member of the announcing staff, seems to have succeeded in doing so, for Mr. Björling fell in love with her.

Now they are married; and I am sure my readers will join with me in wishing them long life and happiness.

Jamboree

MY recent story of the two South American Scouts who walked for eighteen months to attend a jamboree should have contained some reference to another pair of long-distance travellers who broadcast from station W 2 X A F.

This stout-hearted pair cycled nearly all the way across North America from British Columbia to Washington, a stretch of some 3,000 miles, with the Rocky Mountains lying right across the fairway. Undismayed by the ups and downs of the journey, they arrived on time in Washington, where another 25,000 Scouts had assembled.

When the Dauntless Two broadcast they surprised listeners by saying that in the whole journey they had had only one puncture, so three of their tyres were still tight on British Columbian air.

Radio Field Days

ANEW meaning to the term Radio Field Day seems to be developing in Russia. The system of collective farming has given rise to a scheme of travelling post-offices and radio stations, which take to the fields with the workers, and enable them to keep in touch with their homes and headquarters.

In one province of the Ukraine it is claimed that there are more than 500 of these radio field-stations, which accompany the tractors and other agricultural machinery wherever they may be needed.

I hope that somebody has worked out proper schedules for these fellows to go on the air, for if they all try at one and the same time it will certainly be a field day for

the chaps receiving the messages from the farms.

The New Western Regional

WORK may start at any moment on the new West Regional station which the B.B.C. is erecting at Start Point, Devon. And it is hoped that the station will be on the air within about eighteen months, which would mean that the Christmas, 1938, programmes of the

MY WORD

By THE EDITOR

HIGH HAT!

"IT is a very great pity when a public service like the B.B.C. feels itself bound, if it does feel itself so bound, to give the public more stuff that is poor and less stuff which is good because the public seems to like better what is not good than what is good. I protest. I speak now of mature persons, and I would say this, that any mature person who prefers crooning or jazz to the music of Handel or Schubert is badly educated."

Thus, the Dean of Rochester, Dr. Francis Underhill, perpetuating the fallacy that public opinion can be ignored in the assessment of artistic values. That aesthetic judgment is the monopoly of experts and college graduates.

The right reverend gentleman should read what some of the contemporary experts and critics said about his Handels and Schuberts. Age certainly "lends enchantment"! For example, Wagner had a very thin time with his Tannhäuser at the hands of some of those who regarded it as their duty to guide the public opinion of their day.

So who is there to say what judgment posterity will pass on present-day music? May it not well be that the compositions of Noel Coward and Gershwin will be reverently withdrawn from gramophone record archives a century hence, and their so-called "jazz" renderings by Ambrose and Paul Whiteman played with ceremony to, and listened with awe by, music high-brows of the future.

While, of course, the man-in-the-street of the future will give the biggest hand to as yet undreamed-of musical compositions and remain sublimely indifferent to the pipings of his would-be instructors in taste.

West Country stand a good chance of being radiated by the new transmitter.

In a spirit of Christmas generosity, the B.B.C. has decided to give the West a decent present while it is about the job, so the newcomer will have a power of 100 kilowatts, and will be definitely in the tip-topper class.

An interesting innovation will be the reflector system, which will screen aerial radiations from the sea and turn them back to the expectant aerials inland.

It looks as though the West Country is to have a square radio deal at last.

Thrills for Grandfathers

THANKS to a Slough reader, I have been reminded that it was in 1837, exactly a century ago, that the first telegraph instrument, under the Wheatstone and Cooke patent, was put to work. It linked Euston with Camden Town railway station, and the Great Western Railway adapted the idea the following year between Paddington and West Drayton, whence an extension was later made to Slough.

This telegraph line became famous. A murder was committed and the suspect was seen to leave Slough in a Paddington train, so the new telegraph line was used to send a description of the criminal to London, where he was caught.

This incident thrilled our forefathers in much the same way that, sixty-five years later, people were stirred by the use of radio in the capture of Dr. Crippen; he was trying to escape to Canada, and the murder for which he was wanted had occurred in Camden Town, quite near to where that first telegraph instrument had been installed.

It Pays to Advertise

SHORT-WAVE listeners who keep a receptive ear on the U.S.A. broadcasting stations must have often wondered how much it costs the advertisers to proclaim the merits of their wares in a radio programme. Here are some recently issued figures.

To book Cincinnati W L W for one hour costs an advertiser about £240; but rather smaller-powered stations, such as New York W E A F, will set him back only to the extent of £200 an hour. To book the whole N.B.C. network, including the above-named stations, would cost nearly £5,000 an hour.

The rival network, Columbia Broadcasting System, charges £3,635 for one hour's night broadcast over the whole chain of stations. But you can have an hour of the evening programme at a small station like Reno for as little as £25.

(Continued overleaf.)

Next Week: A COMPACT TWO-VALVE ALL-WAVER

THEY PLAYED A COMPLETE SYMPHONY BACKWARDS

Just a Reminder

ALTHOUGH your natural tendency at the moment is to think of cool seas breaking on the beach at Bali Bali, Tenby Tenby, Margate Margate, or other fashionable resorts,



you must allow me to remind you that this is July, and next month is Radiolympia time. The Radio Exhibition, which will run from August 25th to September 4th this year, is now being transformed

from a mere skeleton of ideas into full-blooded facts and figures.

Mr. Jack Swinburne, of the Gaumont-British Picture Corporation, has been deputed by the Radio Manufacturers' Association to handle the arduous duties of producer of the variety entertainments. He is full of ideas on the subject, and I was glad to hear that one project is to televise an act from the Radiolympia stage to televiewers in their homes.

Pretty work, Mr. Swinburne; the public is expecting much from Radiolympia television this year.

Checkmating Crocodiles

BENEATH the scaly skin and behind the wicked eye of the wily South American crocodile there lurks a curious experimental tendency. To give him his due, the average "croc" will sportily try anything once—especially anything to eat.

This redeeming trait in an otherwise revolting character brings the croc into the radio news, for—unlikely as it may seem—it is good for the wireless trade. Recently a large order for radio-telephone installations was placed with a South American agent, to whom it was explained that they were to be used to communicate across a river full of crocodiles.

"Wire tellyfun, he no good," said the customer. "Dem crocs, they likum wire, smell um out, eat um up."

Record in Records

ONE of the queer achievements of the B.B.C. has been to amass a vast library of gramophone records which cannot be equalled elsewhere in the world.



The mere number of the records is impressive enough—80,000, including the cracked one. But it is in the variety of noises, of "s o u n d - pictures," and of voices, as well as in the wide range of music, that the

B.B.C.'s collection is so remarkable. They can reproduce any sound, ranging from gear crashes on all the popular makes of car to the whip-poor-will of the whip-poor-will.

It has been disclosed that on one occasion, by some accident, a complete sym-

phony was played backwards. The low-brows didn't even notice it; the high-brows either wept or thought it was a New Movement. But who cares what the high-brows think, anyway?

Before Our Time

I WAS mentioning some months ago the curiously apt descriptions of wireless which were written long before it was invented; various energetic readers contributed to the interest by digging up quotations which had escaped my notice, and when these met the eye of a New South Wales reader he "came back" with a challenge to "P.W." readers.

He says, Can we beat Shakespeare's description of a radio announcer? In one of the Sonnets there is a reference to

"That affable familiar ghost

Which nightly gulls him with intelligence."

I can't think of a crisper description of our News Bulletin friend. Can you?

"MIKE" SLIPS AND QUIPS

DURING ADVERTISING TALK

When you buy one of their used cars you become a walking advertisement for them.

SPORTS ANNOUNCER

Last night began the ice-skating season, and we saw many new faces on the ice.

CALL TO SICK LISTENER

And here's wishing you a speedy recovery from the family.

A WEATHER FORECAST

There will be shattered scowlers.

IN A TALK

He was preparing to be a barrister, but his people lost a lot of money, so he had to work instead.

IN AN ADVERTISEMENT

Yes, X—'s ice cream will just add that finishing touch to your party.

Deciphering Those Codes

IN a cheery letter from Melsetter, S. Rhodesia, R. E. W. H. tells me how much he enjoyed those articles in "P.W." about the deciphering of codes.

The other day he thought of a grand stunt for coding. It consisted of two concentric discs with letters of the alphabet (in opposite directions) round each rim, fixed in the centre so that the small upper disc could rotate and "pair off" with the lower disc. Talking over this gadget, however, with an ex-U.S. Army man, he said that the method was already old, and was used regularly in the U.S. Army for the less serious communications.

Too true, I fear, R. E. W. H., for I can remember it being used in the Great Unpleasantness of 1914-18, and the Editor tells me that he knew of it before then!

Flying Start to Atlantic Service

IT is generally admitted that the triumphant two-way crossing of the Atlantic by the Caledonia and the American flying-boat, between Foynes, I.F.S., and Botwood, Newfoundland, was in large measure due to the radioed weather reports.

Please don't imagine, for one moment,

that I mean a flight of this sort is now so well prepared for scientifically that the rest is easy; that's what the fellows who do it will tell you, perhaps, but they know darned well that radio seems a trivial matter when you are alone in a sky full of clouds with an Atlantic full of water below.

There is a sense, however, in which the meteorological preparations are the foundations of a successful flight of this kind. And I think all the radio men concerned on this epoch-making crossing should know that "P.W." admires the way in which they handled their jobs, and congratulates them on a fine piece of work.

Television Vision

IT may be that we have not yet appreciated all the surprises that television has in store for us. Have you heard about the trousers incident?

Somebody had the good idea that a demonstration of the latest type of fire escape would interest the television public. So the electric eye was trained on the announcer, who heroically allowed himself to be shot up



skywards in the appliance, just as a fireman would. But, unlike the practised fireman, the announcer caught part of his trousers in the machinery. "That tore it!"

Not having seen the incident I cannot say how much damage was done—or how much of it was visible. But it makes you realise what a truly surprising thing this television may become one day.

Serenade Up to Date

A MYSTERY which has been worrying many listeners of the Far West has recently been cleared up satisfactorily to all concerned.

It took the form of a solemn and impassioned voice, droning on night after night, rather like a preacher who had forgotten his text. The speaker, who was evidently in dead earnest, went raving on about Beauty, Music, Light, Charm, Grace, and so forth; but he never came to the point, and you could listen for half an hour without gaining much idea of what it was all about.

A local doctor, who specialised in psychology, got so interested in these meanderings that he investigated the transmissions. He discovered that they were sent out by a young man who was in love with the doctor's daughter, but was too shy to tell her so in the ordinary way! A meeting was arranged, the ice was broken, the young lady approved her suitor—and now he whispers into her ear the raptures that he formerly confided to the microphone.



ARIEL

DOUBLING THE PICTURE

J. C. Jevons explains how the appearance and detail of a picture reproduced by television are improved by a combination of two different sized scanning spots

THERE are various ways in which the idea of "doubling" a picture can be used to improve quality in reception. In the well-known method of interlaced scanning, for instance, separate scans are made along different lines to produce two distinct pictures. These are then sandwiched together on the fluorescent screen, so that they appear as one. In this case, the main object is to increase the rate of picture repetition, so as to avoid any suspicion of flicker.

But there are other advantages to be gained from "doubling." In any animated scene there is always one part which shows more movement than the rest. The main "action" usually takes place in the centre of the picture, whilst the background remains practically stationary. Accordingly if one wants to make best use of the band of frequencies available, most of the signals should be devoted to scanning the centre of the scene, and comparatively few to the almost "still" background.

Two Separate Scans

During transmission two separate scans are taken, one of which is confined to the background, and the other to the centre area in which most of the movement occurs. The line and frame frequencies of the first scan need be only a half or even a quarter of those used in taking the second scan. At the receiving end the two pictures are superposed, with the result that the really "vital" parts of the scene are shown in much higher detail than the background. As the latter is of secondary interest to the observer, a lower standard of definition is easily tolerated.

The same principle may also arise in connection with the size of the spot used in scanning. The smaller the spot is made, the clearer is the detail, because the size of the spot determines both the number of scanning lines and the size of each picture element. In the case of mechanical scanning there is an obvious limit to the extent to which the scanning aperture in the disc can be reduced, because we soon reach a point where the light which gets through is not enough to energise the P.E. cell.

A Practical Limit

In actual practice, the limit for high-definition work is about 0.002 inches. This size of aperture gives satisfactory detail, but owing to the small amount of light reaching the photo-electric cell, the "contrast" between the high and low lights in the picture is not so good. The overall effect is, in fact, too much of a general "grey" to please the eye.

It might be suggested that the lost contrast could be restored by applying more amplification to the output from the P.E. cells. Here, however, one comes up against the fact that the current from the P.E. cell is too minute, in the first place, to stand up to very intense amplification. Any attempt to boost it up beyond a certain level is bound to fail, on account of valve "noise" which, in the long run, simply swamps out the picture signals.

On the other hand, if one uses a scanning aperture of comparatively large dimensions, the resulting picture will be too coarse-grained to show the finer details, but because of the increased light available it does preserve the broad distribution of high lights and low over the picture as a whole.

Securing Contrast

It is clear that the idea of "doubling" can again be applied to advantage. One scan is made through a small aperture, to give a picture of clear detail, whilst a second scan is taken through a larger aperture to secure the required "contrast" values. The two pictures are then superposed on the viewing screen, where they naturally give a result which shows much nearer perfection than either taken alone.

This scheme has recently been applied to the well-known Farnsworth system of television in which the picture is first focused on to the photo-sensitive screen of a cathode-ray "image-dissector" of the kind shown in Fig. 1. As the action of the "dissector" is rather different from that of the ordinary cathode-ray tube it will be briefly explained.

The picture to be televised is projected through a top "window" W on to a photo-sensitive cathode P, situated at the lower end of the tube. Electrons are accordingly set free from each elementary area of the cathode according to its illumination. They are attracted by the high-potential on an open-mesh anode A, situated close to the cathode, and pass through the anode into the open part of the tube.

Here they are subjected to the magnetic field from an external winding (not shown), which focuses them into a parallel stream, as they flow upwards, so that the relative light-and-shade values of the original picture are preserved throughout the length of the stream. Simultaneously the stream is subjected to the action of two pairs of

scanning-coils, which throw it rapidly to and fro across an aperture O in a screen S at the top of the tube.

Actually the scanning action is similar to that used in the ordinary cathode-ray tube, in the sense that there are both a rapid "line" movement and a slower "frame" movement. The difference lies in the fact that the whole electron stream—representing the original picture—is moved bodily past the scanning aperture O, which remains stationary. This is the reverse of the usual method, where the scanning aperture is moved over a stationary picture—though the final result is the same in both cases.

Inside the aperture O is a "target" which emits secondary electrons under the action of the scanning stream, and it is these secondary electrons which form the source of the picture signals.

Fig. 2 shows on an enlarged scale how a "double" picture is produced. Actually there are two apertures, one within the other. The larger one marked O is rectangular in shape and is partly screened by a wire mesh, whilst the second aperture marked O1 consists of a clear opening in the centre of the mesh.

As the electrons sweep past the top of the tube, they produce two distinct sets of signals by their impact on the target T. The electrons passing through the larger screened opening O give rise to a picture poor in detail but good in contrast value, whilst those which pass through the smaller opening O1 show much better detail, but very little difference between high lights and low. The combined effect is, however, excellent.

"MELODY GIRL" BROADCAST

DURING her first visit to England since she was six, Vera Guilaroff, daughter of a former English diplomat, is to broadcast from her native London on July 22, in a programme—on the Regional and Empire wavelengths—of the kind that has made her known throughout Canada as "The Melody Girl."

Playing the piano, accompanied by Reginald Foot at the B.B.C. Theatre Organ, her programme will include two outstanding works: "On the Trail" and "Deep Purple," which she describes as a beautiful musical pattern in four movements inspired by the rich colours of a rainbow.

"I hope that listeners over here like this type of show as much as they do in Canada," Miss Guilaroff said. "Personally, I think the piano and organ sound admirably together—the piano takes the melody, the organ builds up a rich background."

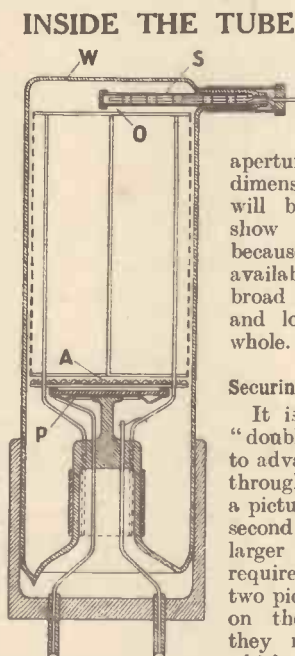


Fig. 1. A Farnsworth image-dissector tube as used for double scanning.

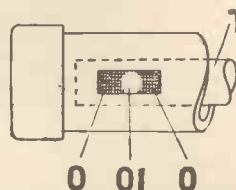


Fig. 2. The two different sized apertures which receive the picture pulses.

THE DIAL REVOLVES

By LESLIE W. ORTON

ARCTIC RADIO TANKS

A BOLD. PIRATE :: RADIO FROM CHANNEL ISLANDS :: A REGULAR G-MAN

A CHAIN of tanks equipped with radio receiving and transmitting apparatus is one of the latest suggestions put forward by a Russian scientist to make trans-Polar air travel safe. Spaced at intervals of approximately 350 miles, they would stretch from the northernmost islands of Russia to Canada's Arctic outposts.

The main trouble of "fixed" stations in the Arctic is that, despite the fact that they haven't legs, they move a considerable distance in a very short time (being on ice-floes). This, as you may gather, is very disconcerting to a pilot, particularly if he is running short of petrol!

POLAR COMMENTARIES

The new scheme would abolish such hair-raising experiences (which would be very upsetting to say the least), for tanks can keep pace with any wily move that Mother Earth may make, and even if the "land" melts the tank doesn't care (though I imagine that its passengers would if the sea were rough!), but just goes on floating and moving as directed—a mechanical Loch Ness monster!

Powerful radio transmitters installed aboard these fearsome affairs would send weather reports to aeroplanes and other stations, straight from the deep-depression's mouth, as it were.

It certainly sounds like a page out of Utopia, but there is every chance of it becoming reality. If so, the possibilities are great. We may even hear running commentaries from the North Pole: "There is a bear on square four," and so on!

A NIGHT AT THE DIALS

Fishing around the amateur band the other night, I received a whale of a thrill when I picked up FA8AR, Guadeloupe, calling a Colombian station. After that I needed no urging to spend a night at the dials, and boy, oh boy, was I thrilled? Daniel had a tame time in the lions' den, in comparison!

Cuba was well represented by CO8OG, CO2RR and CO2EG, whilst other breath-takers were HI7R, Dominican Republic; TI4RO and TI2AH, Costa Rica; K4UC and K4SA, Puerto Rico; YV5AK, Venezuela; and VO4I, VO2C and VO1L, from Newfoundland—enough to cheer a racegoer who has put his "all" on a loser!

Canadians and "Yanks" appeared to rain from the skies, and the following were heard at excellent strength: VE1MA, VE1OR, VE1BA, VE1LR and VE2LY, in Canada; W1ACE (a good start!); W1BGG; W1JUG (I almost expected 2CUPS after that!); W2JS; W2DGY; W2ETI; W3BMA; W3OE; W4BMR; W4EJA; W4AHC; W4NO; W4BYD; W5STA; W7VP; W8MOL; W9WDD—everything but a W6. Now, isn't that just my luck? If I am fortunate enough to go

"Up Above," there is sure to be a broken string on my harp!

At 7.45 a.m. (2.45 a.m. American time) I picked up CO2EG, Havana, and W4AGV, Jacksonville, operated by a young lady. Time you were in bed, isn't it, miss?

COME QUIETLY

We have all heard of pirates, but Captain Kidd and his bristly rascals were tame to the fellows who have grabbed the wavelength and call of the now extinct ZHI at Singapore. That takes the biscuit! Listeners in the United States and England are hearing this pirate transmission regularly, and the result is a frantic search by the Malayan authorities, who are more than anxious to lay hands on the offenders. Come quietly, brother!



How many of Canada's broadcasters have you heard? Here are some of the best received.

ALDERNEY CALLING

I felt inclined to head this paragraph "The Great Revival," for things are looking up no end on the short-wave broadcasting bands.

All the usual, and several new, broadcasters have been picked up at excellent strength.

In this connection, COGF, Cuba, on 25.4 metres, has set everyone guessing. Sounds as if he varies his call!

(Please turn to page 477.)

SHORT-WAVE STATION IDENTIFICATION

By F. A. BEANE

STATIONS OF THE U.S.A.

CONTINUING our somewhat haphazard review of the American stations, we proceed to the second district, where we find a number of world-famous broadcasters. Most famous, perhaps, are the Schenectady "twins," W2XAD and 2XAF, which really need little introduction, since they are heard particularly well throughout the universe.

Normally, the announcement takes the following form: "This is the Red Network of the National Broadcasting Company"; 3 chimes (GEC) and the familiar "W2XAD (or F), a General Electric broadcasting station located at Schenectady, New York," or "This is station W2XAD (or F), an International Broadcasting Station of the General Electric Company at Schenectady, New York, relaying a programme from WGY." The special identification signal used by these stations is, of course, "The Voice of Electricity," consisting of a recording made in the G.E.C. laboratories, of the noise of a ten-million-volt spark! This is usually heard at the commencement of the station's schedule, or prior to the "Mail Man's" programme. No doubt the popularity of these stations has been increased by their promptness in verifying listeners' reception reports!

The C.B.S. stations, however, do not allow the Schenectady broadcasters to enjoy all of the popularity, for W2XE may be heard quite well on 13.94 m., 16.89 m., 19.65 m. or 25.36 m., and in the winter on 49.02 m. At present reception is often exceptionally good on the 13-m. channel, and the announcement, "This is the Columbia International Short-wave Station, W2XE, in New

York, U.S.A.," usually repeated in French, German and Spanish, is becoming almost as well known as that of its better-known compatriot.

W8XK, a household word in the S.W. world, is not heard particularly well on any of its channels at the time of writing; but, nevertheless, does not present much difficulty in tuning whether on 13.93 m., 19.72 m., 25.27 or 48.83 m. They relay KDKA, the "Pioneer Broadcasting Station"; employ the N.B.C. chimes and derive programmes from the "Blue Network," and announce briefly as "Westinghouse Stations KDKA and W8XK, in Pittsburg."

Bound Brook is heard particularly well, and, as far as I can remember, always has been. At the moment the 16.87 m. W3XAL is often a remarkable signal during daylight hours; but to obtain really good results on 49.18 m. one must be prepared to listen at the somewhat unearthly hour of 04.00 or so. And, incidentally, very satisfactory reception of the recent Louis-Braddock fight was obtained from this source, although it is at its zenith in the winter. The N.B.C. chimes are, of course, heard from W3XAL coupled to the call "W3XAL, Bound Brook, New Jersey."

I am afraid that the ardent DX-er has been neglected this week in our identification "tour," but we still have much of the U.S.A. left to cover, and there are several ultra-short-wave stations to "visit," and the Dominion of Canada to review, before deserting the American continents altogether. And there is DX to be had in Canada!

ON THE SHORT WAVES

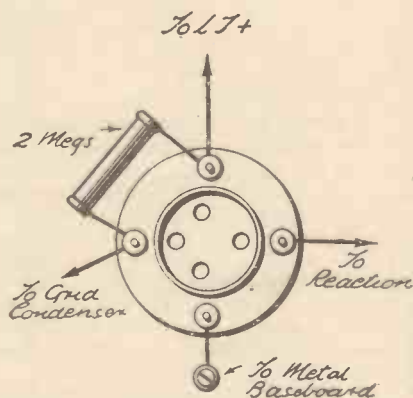
L.T. FROM
THE MAINS

By W.L.S.



I SUGGESTED last week that the easiest way to convert a battery short-waver to mains operation is to start off by attacking the L.T. This is a perfectly simple process, fortunately, and a little patience with what I have to say on this page, with a little study of the diagrams, should put you on the right trail straight off.

The chief difference between a battery valve and an indirectly heated valve is, of course, that in the former type the filament is the cathode. Grid returns and other earthed points are therefore connected directly to one side of the filament—generally the negative side. An exception to this is the grid leak, which is usually returned to positive because this slight positive bias makes for the better operation of a leaky-grid detector.



How the detector valve holder will be wired in a battery receiver.

In the indirectly heated (mains) valve we have a genuine cathode—an electrode all on its own which is heated by the filament or "heater." The heater can thus be operated from an alternating current supply, if a few simple precautions are taken.

Looking at your detector, as shown in the diagrams on this page, you will see that you will have to remove your four-pin valve holder and substitute one of the five-pin variety. I have drawn them as if you are using a metal—or metallised—baseboard, with your negative filament terminal connected to this metal, and therefore to all the earth returns.

When you put in your five-pin valve holder, the extra terminal—the cathode terminal—will take the place of this L.T. negative terminal. The cathode is now connected to earth, and so is the far end

of the grid leak, which previously went across to L.T. positive.

Nothing is connected to the filament terminals proper except the leads going to the 4-volt secondary of the transformer which is supplying your A.C. for low-tension purposes. If you're using an H.F. pentode or any type of seven-pin valve, make the necessary adjustments in your ideas. What it all boils down to is that the filament terminals are cleared of everything except the L.T. wiring. Leads that formerly went either to L.T. or to H.T. now go to cathode instead.

Removing Hum

So far, so good. But if you just do this and connect a length of flex across the 4-volt terminals of your transformer, it's ten to one that you'll have a good round hum spoiling your reception. Your L.T. leads should be twisted, as shown in the diagram. This doesn't mean that they need be flex—if they are it should be heavy flex. But they may be ordinary heavy tinned copper wire insulated with sleeving of some kind.

If your hum arrives, the first thing to do is to connect the centre tap on the 4-volt filament winding to H.T. negative—in other words, to the cathode. This will probably put things in order right away. Perhaps, though, your L.T. winding hasn't got a centre tap. Well, if it hasn't, try first one side of it and then the other, connected to H.T. You may find one side noisy and the other quiet. If there is a quiet side, you're all right.

If there isn't, you'll have to make an artificial centre-tap with one of the centre-tapped resistances that you can buy for the purpose. Our friends over the way call them "humdingers"—or used to before that term became applied to all sorts of other gadgets. A resistance of about 35 ohms with either a fixed centre tap or a slider will do the trick.

If that doesn't, you're distinctly unlucky and had better try shielded wire for the connections from your valve holder to the transformer. Incidentally, these connections should not be yards long—but at the same time you shouldn't have the mains transformer stuck right in among the other parts of your set.

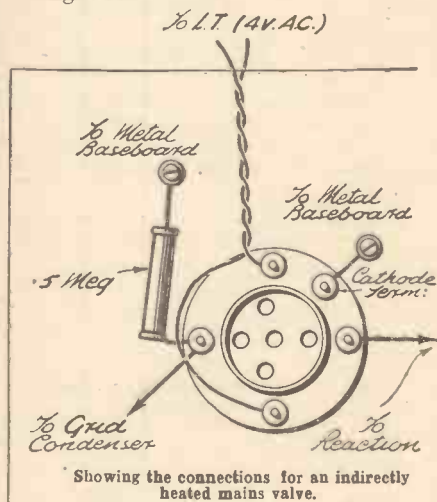
Concerning an L.F. Stage

These remarks apply only to a detector stage. An L.F. stage is a slightly different proposition, as I will show next week, because when you do away with accumulator L.T. it's only rational to do away with battery grid bias as well, and you can

easily provide automatic bias with an indirectly heated valve.

Other points to watch in the detector stage—treat your cathode terminal with just as much care as you previously treated L.T. negative—which is to say, if you took any leads directly to L.T. negative before, instead of on to the earthed baseboard, take them now, direct, to the cathode.

Just by the way, don't switch on and get alarmed because nothing happens—the indirectly heated valve takes some little time to warm up. An obvious point, but one that you might forget completely, being strange to it.



Showing the connections for an indirectly heated mains valve.

Your grid leak may profitably be reduced from its previous value to something considerably less. If you use 2 megohms with an indirectly heated valve, I shouldn't be surprised to learn that you were somewhat worried by residual hum. Come down to about .5 megohms.

Incidentally, although such a low value as .5 megohm may give you poor reaction control with a battery valve, you are almost certain to find it perfect with the mains variety. This, at any rate, has always been my experience.

Play around with your receiver, using just mains L.T. and not bothering about the H.T. until you are thoroughly satisfied with results. You will find that your results are considerably better for the same number of valves, particularly if the set is a single-valver. I used to be astounded at the difference between one mains valve and one battery valve.

As soon as we have settled the conversion of H.F. and L.F. stages, we will get on to the H.T. aspect of things.

ON THE SHORT WAVES—Page 2.

POINTS from the POST-BAG

W.L.S. Replies to Correspondents

J. W. M. (Gainsborough) wants to get in touch with a short-wave society or club in that part of the world, but as he doesn't give me his full address I can't very well ask anyone else to write to him. But if the secretary of a local club will write to me I will publish particulars in these columns.

J. W. M. has built a single-valver from one of my layout diagrams, and finds it very good. He remarks that it doesn't seem to work at all with 120 volts H.T., but it's good with 40 and better still with 30. That, by the way, will probably serve as a hint to a good many people who wonder why their single-valvers aren't all that they should be.

G. W. G. (Ipswich) thinks he's built the perfect set at last. He uses an electron-coupled oscillator and plays with H.F. pentodes of various types, and manages to get 180° bandspread on all bands, and about 10° on the reaction control between "just oscillating" and "really oscillating." **G. W. G.** has always said that he gets more pleasure from building sets than from using them, so it seems rather a pity that such a set as this will probably have to go by the board to make room for something else before it has broken any records!

J. McL. (Paisley) has a "Simplex" Two with six-pin coils, and wants me to give particulars of coils for (a) the American police (b) the British police, and (c) aircraft. For the American mobile police you want a coil that goes down below 10 metres—and that means something like 1½ turns grid, 2 reaction, and 1½ or 2 for aerial coupling.

The British police transmissions are between 130 and 180 metres, and you will probably want 30 to 35 turns grid, 12 to 16 reaction, and 15 aerial coupling. As far as "aircraft" are concerned, I don't know whether this reader wants the commercial waveband (900 metres) or the service wavelengths, which are between 50 and 100 metres. For the latter one of the standard coils will serve. For 900 metres you will want such a terrific coil and such a big tuning condenser—compared with the little one in the set—that I don't think the proposition is worth while.

H. D. (Accrington) is trying to run a "Simplex" Three from an eliminator, but has considerable trouble with motor-boating. I am going to deal with all the trials and tribulations of those who get H.T. from the mains in a week or so, and must ask H.D. to be patient until then.

R. C. (Deal) asks whether he can do anything about the racket caused by electric light switches, in the hands of people next door, who take a delight in running up and down stairs about three or four times a minute, switching the light on and off every time! I suggest that the only cure is a

tactful interview with the people next door, with a suggestion that new switches probably wouldn't make so much racket.

Judging from R.C.'s log, the switches don't upset his apple-cart completely. He seems to have heard plenty of amateur band stuff from all continents.

L. M. (Clapham Common) wants to build this "Simplex" Three that he's heard such a lot about, but doesn't know where it comes from, being a new reader! He will find all about it in the issue of May 1st.

J. M. (Sherborne) is fed up to the teeth with the general "mush" and "junk" on the 20- and 40-metre bands. I agree, **J. M.**—I'm just dying for 10 metres to come back to life, although I'm afraid that when it does it will be just about as bad as 20 metres has been this season. **J. M.** wants to know whether I still recommend the "U.S." Two for 10 metres and below. Yes—I do. It was designed for that work, and I think it will give most modern sets a run for their money.

J. M. passes on a certain amount of 5-metre news, most of which I have already gleaned from other sources—but I may not have mentioned all the items here. A harmonic of J N J (Tokyo) has been heard in the States on 5 metres; one British

Short-Wave News

A FEW readers have written to ask me what all this "Cairo" talk is about, and how it affects the amateur transmitters. One or two have enclosed "scare" cuttings from local newspapers, one bearing the headline "Amateurs to Fight for Their Lives at Cairo Next Year."

Next year there is to be held in Cairo one of those international conferences at which all sorts of matters concerning the allocation of frequencies to the various services are discussed; and naturally the amateur is interested as much as any other user of the ether.

It is improbable that he will have to "fight for his life," but he will certainly have to justify his existence.

The R.S.G.B., representing amateur radio in Great Britain, has submitted a long statement to a G.P.O. sub-committee outlining the work of the amateurs in this country and giving reasons why certain of the amateur bands might profitably be increased in width. It seems unlikely that any increases will be granted but, with luck, the amateur bands may remain more or less as they are at present.

A check on commercial activity, taken on frequency-bands adjacent to the amateur 14-mc. and 7-mc. (20-metre and 40-metre) bands has revealed that although 373 commercial stations are registered as using these frequencies, only 66 appear to be doing so. Thus, right next to the overcrowded amateur bands, are commercial bands with very few stations occupying them. This may be a strong

point in favour of a slight widening of the amateur bands—but, unfortunately, the Powers-that-be in many other countries do not think so highly of the amateurs as does our own G.P.O.

Italy, for instance, wants to reduce the 40-metre and 20-metre bands to about a third of their present width. Japan wants to limit all amateurs to 50 watts. Finland, Norway and Sweden want to exclude amateurs from 160 metres and from part of the 80-metre band.

With all these suggestions it seems probable that if one or two countries suggest an extension of the amateur bands they may be allowed to remain as they are.

I might suggest that if that happens it is up to the amateurs themselves—preferably by brute-force methods—to clear up the appalling mess into which some of the bands are getting at present. But that is definitely something that must be done by the national radio societies, and they can only start to do that if pirates are wiped out completely.

It is a big problem, and a very important one—for the amateur. Even the keen receiving man can help, if he values the amateur movement at all.

W. L. S.

BEST TIMES TO LISTEN

TIME (B. S. T.)	10-25 METRES	25-60 METRES
0000-0200	North America South America	North America South America
0200-0400	North America	North America
0400-0600	North America	North America
0600-0800	North America Australasia	Australasia
1000-1200	Australasia Europe	Europe
1200-1400	Europe	Europe
1400-1600	Asia	Europe Europe Asia
1600-1800	Asia South Africa	Asia, South Africa,
1800-2000	Asia North America Australasia	Europe Australasia Europe
2000-2200	North America	North America
2200-2400	North America South America	North America South America

amateur has been heard by a W2; and another Britisher has been heard in Latvia. I haven't yet got the full results of R. S. G. B.'s 5-metre Field Day (July 5th), but when they are all collated I will give a summary.

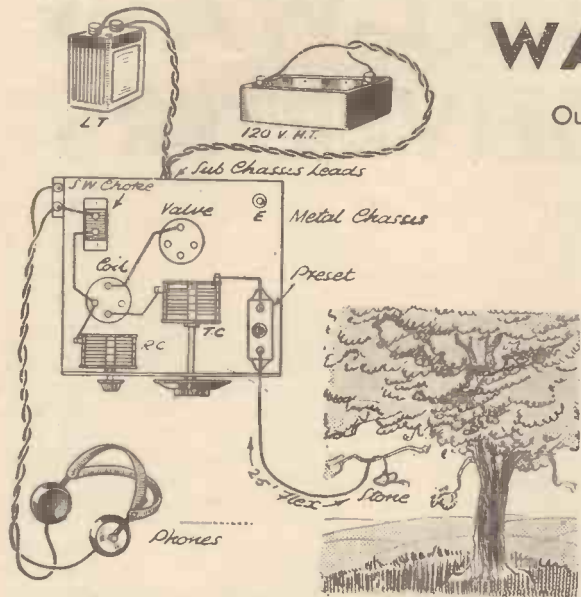
The table on this page gives you another summary of the best times at which to listen on the broadcast and amateur short-wave bands. It should hold good until about the end of August, by which time, we fervently hope, 10 metres will be showing signs of life again. Get your receivers all ready for the ultra-shorts—they're going to be "super" this autumn and winter.

J. O. H. (Carshalton), wants to know if any reader happens to have, stowed away in an old drawer, some of the Datagram cards that "P.W." issued in about 1935. If anyone can oblige, perhaps he will write to **J. O. H.**—Mr. J. O. Heymeson, 221, Welbeck Road, Carshalton, Surrey.

L. W. J. (Enfield), asks a query that frequently comes my way. He has an old-stager for short waves—an adaptor plus a home-made broadcast receiver. Will he do better to rebuild in the form of a straight receiver, using the same parts where possible? Yes, I definitely think he will, and recommend others to do the same.

WAYNE AT ONE-TREE HILL

Our contributor gets some remarkably good results in the open with the simplest of portable sets:



Showing how the components of the receiver were arranged and also how an aerial was provided with the aid of a stone on the end of a length of flex.

WITH the sun so high in the sky—and, for a change, actually shining—I felt the urge to be out and about. Thoughts turned to portables—and I wondered what could be done in the short-wave line.

My first thought was: "Well, a frame aerial is ruled out, unless one is prepared for a far bigger set than I can build." The alternative being, of course, a temporary slung-in-the-trees affair, hooked on to the aerial terminal of the set.

I wondered how small a set would give results with such an aerial on short waves. So I spent an hour or two in my workroom knocking up a one-valver. Having, as it were, standardised on a metal chassis, I turned another 16 in. by 8-in. metal panel into the shape of chassis you are already familiar with in these articles.

I then drew out the simplest possible one-valve short-wave circuit I know—and you see this as Fig. 1. The aerial is capacity-coupled through a .0001-mfd. pre-set to the grid winding of a four-pin coil. The reaction is (bows to “W. L. S.”) series-fed, the reaction winding being in series with the short-wave choke and phones.

Values of grid condenser—.0001 mfd., and grid leak, 5 megohms—are the result of a certain amount of trial-and-error work that stands me in good stead nowadays. And that's about all. The reaction condenser is of course, the usual .0002 mfd.

Laying-out the Components

One begins to get quite expert at laying out the components for a simple short-waver. The .00016-mfd. Polar short-wave tuning condenser was fitted on the right of the metal panel, the reaction on the left. Behind the panel on the baseplate I grouped the valve holders for the detector valve and the four-pin coil, with the choke in a handy position on the left and a terminal strip nearby for the phones.

Actually, I doubt if a metal chassis construction is justified for such a set—not, at least, in terms of cleaning up the layout or even the wiring. But I'll return to

that matter later. One grouse—these short-wave valve holders are deuced fragile when it comes to tightening down with bolts and nuts, aren't they? I have split three already!

The valve pin sockets work loose, too, and the only way I can get valves and coils to fit properly is to insert them first and tighten up the under nuts afterwards. Usually, one finds the under nut loose when the holder has already been screwed down; but that's sheer carelessness, I suppose.

On a rough try out indoors the one-valver behaved perfectly. The real advantage of

the metal chassis was then apparent. Beautifully stable control all round the scale, as well as a generally "lively" feel.

Choosing a High Spot

The time seemed ripe to be on my way, so I packed the little set into the car, together with batteries, phones, a few tools in case the whole thing collapsed en route, a log book—and 25 feet of flexible wire for an aerial. I decided to do without an earth, having found on the bench test that quite strong signals could be heard without one.

To give the set a chance, I drove down into Kent and climbed up to a National Trust beauty spot known as One-Tree Hill, a few miles south of Sevenoaks, where I remembered one looked down on the Weald from what appeared to be a great height.

Fortunately, no one else had parked a car in the space reserved for week-end trippers—so I had the place to myself. I picked up a chunk of granite (now preserved in my museum!) and tied the end of the flex to it. I threw the stone over the branch of a tree—and that was my short-wave aerial.

Inside the car, I connected up my batteries and phones, hooked on the free end of the flex—and listened. It was obvious that the spot was really good for reception, for at once I heard dozens of quite loud “chirps.”

Using the 22- to 47-metre coil, I found Zeesen at 94 degrees at a good R7, really worth listening to. A lot more carriers and then, down at 65 degrees, Rome burst in

at R5. What pleased me was the way these "locals" could be held without a lot of fiddling with the reaction. They were rock steady.

I heard several amateurs at the top end of the scale—and then, as it was early afternoon, I thought I would try the 12- to 26-metre coil, seeing that this tunes the so-called “daylight band.” Again a sense of liveliness—and this time a signal that really did give me a kick.

Reception From America

Tuning slowly near the lower part of the scale, I stopped at 56 degrees because I heard quite a healthy carrier. Slacking off reaction, I heard the magic phrase: "This is the Columbia Broadcasting System."


And so it was. Wayne, New Jersey, through W2X E on 16.89 metres. A exactly 2.45 p.m. I heard the latest bulletin from the Press Radio Bureau, telling of grave developments in the steel strikes "over there." Strength was about R4, quite remarkable for a one-valver using only 25 feet of flex slung up into a tree.

At least, I think it remarkable that one should be able, with such elementary equipment, to sit in the sunshine on a Kentish hill and hear news from a distance of 3,000 miles.

This little "adventure" seems to me to point to the entire practicability of head-phone portables on short waves, always

IT POSSIBLE

SW Choke



210

PHONES

No Cabinet

Of course, I have made no attempt to encompass my set, batteries and phones in a portable cabinet. But obviously there is nothing—except my ham-handedness at woodwork—to prevent that being done. And providing one selects a

reasonably good spot—as one so easily can in a car—the chances of good DX are bright indeed.

When I come to think of it, I have a two-valver (detector and resistance-capacity coupled pentode output) built up on the same size chassis as this one-valver. The moral being that while you are building a portable one you might just as well get a little more punch and build a portable two.

After all, it is the batteries that take up the space, not the set itself. I found, by
(Please turn to page 477.)

THE SIMPLEST POSSIBLE

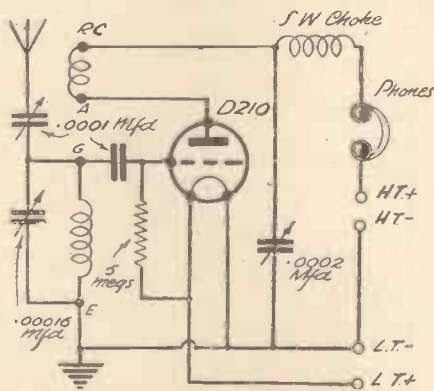
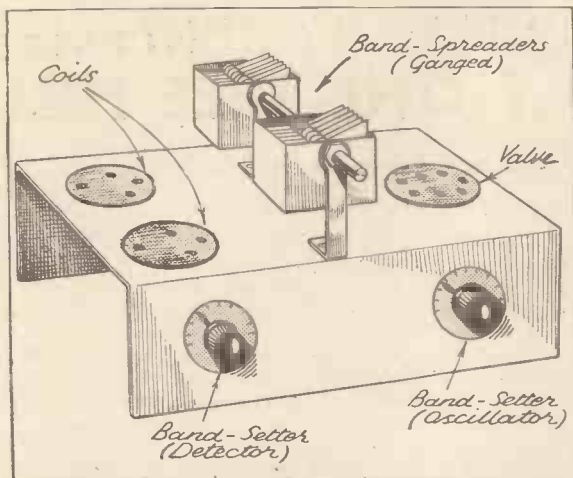


Fig. 1—The circuit of Mr. Chester's portable is just about as simple as it could be.



A convenient method of arranging a ganged band-spreading condenser and separate band-setters.

SINCE I have been struggling for the last two days with a short-wave converter that would do everything except convert, it occurred to me that I might pass on some of my troubles and their solutions to readers. I also have an accumulation of random thoughts on the subject of converters (quite apart from those more recent ones, which are not printable) which I should be glad to scatter upon the receptive air.

There's nothing quite so disheartening as the combination of a good short-wave converter and a broadcast receiver with a rotten H.F. side, and that is the combination that I came up against recently. Having promised faithfully that I would get something out of the beast, or die in the attempt, I had to put in most of my work on improving the broadcast receiver. It was either that or the addition of an external screened-grid stage between it and the converter.

Using a Triode-Hexode

Although many readers will be extremely indignant with me for saying so, I simply *must* say, at this juncture, that the autodyne converter is a nasty piece of work, as a general rule. Second-channel interference, of course, cannot be guarded against in any way at all; in other respects it's not at all bad, and efficiency is higher than you would imagine it to be, considering that the detector is 450 kc. or so away from the signal-frequency all the time.

But a modern converter using a triode-hexode and two separate tuned circuits is vastly better, although one or two acquaintances of mine don't seem to have had the luck with such arrangements that they managed to get with the much-maligned autodyne.

A triode-hexode seems to be the ideal valve for the job. You have a straightforward screened-grid detector, a separate oscillator triode and electronic "mixing," which could hardly be improved. Many people swear by two separate valves for the job, but I have always found the triode-hexode excellent.

One of the troubles that I have been up against is "pulling," which *should* be almost entirely absent with this type of valve. By "pulling" I mean that nasty effect by which the tuning of the detector upsets the oscillator setting. You beat up against a signal with the oscillator, find

the detector not quite in tune, put it in tune and the signal disappears, because the oscillator has been "pulled" off frequency.

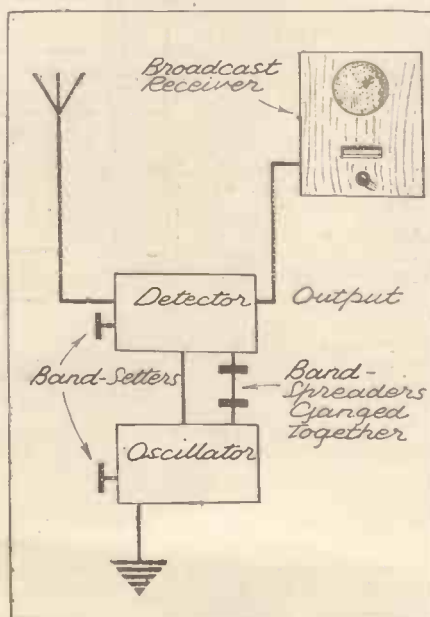
If you introduce a small amount of damping into the detector-grid circuit this effect disappears, but you lose a bit of selectivity. In other words, if you loosen off your aerial coupling to get high selectivity, the circuit's resonance curve becomes so sharp that this pulling business starts.

Remedy: don't use loose coupling! That sounds funny, I know, but it's inevitable. If you want high selectivity, you must get it by putting another stage in front. There's a limit to the selectivity you can get from a detector-oscillator only, and it doesn't take you long to get to that limit, either.

With a screened-grid stage in front of it, and parallel-fed tuned-grid coupling from the S.G. valve to the detector grid of the hexode, you will have just enough damping introduced into the latter circuit to stop any serious pulling.

Alternatively, you may tune the input to the screened-grid valve, and use *untuned* coupling between this and the triode-

GIVES EXCELLENT RESULTS



The short-wave converter is connected between the aerial and the existing broadcast receiver, as shown. The band-setters are roughly adjusted, and tuning is carried out on the ganged band-spreader. A converter, such as this, when joined to a good broadcast set, will give first-class short-wave reception.

SHORT-WAVE CONVERTERS

PRACTICAL HINTS FOR THE EXPERIMENTER

By Howard Barry

hexode. This, of course, won't give you any increase in selectivity, but will definitely cure all suggestion of interaction between detector and oscillator tuning, since you now have two complete valves in between the two tuned circuits.

Of course, if your tuned circuits are ganged together, you'll never know whether one of them is "pulling" or not. It simply won't worry you if it is. Talking of this ganging, too, another problem crops up. If you want to use band-spreading, that seems to mean two complete sets of ganged condensers, which makes the set a bit unwieldy, not to say costly.

Using Separate Band-setters

Why not settle down to the expedient of having your band-spreaders ganged, but leaving the band-setters separate? It works very well in practice, especially as one of the band-setters—the detector—will not be particularly critical.

One of the sketches shows a convenient way of doing it. It is useful both from the point of view of short wiring and for keeping the lay-out down to a reasonable size. The band-spreaders are mounted above the chassis and ganged, while the band-setters are left down below, one on each side of the main control.

They need not be fitted up with full-size slow-motion dials, but those little indicators that are fitted to slow-motion reaction condensers are admirable. So long as you have a scale that is marked in such a way that you know just where your setting should be for each band, that's all you need worry about.

When you want to settle down on any particular band, all that you need do is to set the oscillator band-setter at some pre-arranged figure which you will have found out by experience. The detector band-setter will simply be set to the figure which gives a marked increase in signal strength, so that there is not even any need to remember where this one has to be set for each band. If the frequency-changer is working perfectly, it should act simply as a volume control, and should not pull the frequency of the signal all over the place.

Ideal S.W. Reception

If you have a tuned H.F. stage in front, the business becomes a bit complicated with three ganged band-spreaders and three separate band-setters; but you should have a jolly nice outfit to recompense you for your trouble when you have got it going properly.

Such a converter in front of a broadcast set with a nice H.F. end; a really good L.F. amplifier and A.V.C., should give you real Rolls-Royce short-wave reception without tears.

WHERE DITTIES LODGE WITH SYMPHONIES

How the B.B.C. Music Library has Grown—It Began on the Top of a Kitchen Range

TWO men—old musical friends—met in a London street towards the end of 1922.

"I hear they are looking for a pianist to do some instrumental tests in connection with this new wireless idea . . ."

That was what one of the men, S. Kneale Kelly, the conductor, said to the other, Frank Hook, who had been playing pianos since he was a boy.

So it came about that Mr. Hook made his way to the studio of the old British Broadcasting Company, on the seventh floor of a building in the Strand, and got the job.

The Central Music Library

To-day he is in charge of the central Music Library of the B.B.C. at Broadcasting House, the largest working library of its kind in the world, on whose serried shelves humble ditties and sweet lullabies lodge with great symphonic works.

How that Library has grown under his direction, and the important work that it does, is a story, with its inevitable statistics best told by Mr. Hook himself.

"In the very early days," he told me, "I remember how we started collecting pieces of music, buying a bit and borrowing a bit from some good friends. Later, the Company started making a certain allowance for the provision of music, and we started buying from various publishers in London—items mainly required for the production of light and airy musical programmes of a type played by very small orchestral combinations. Engineers and the programme people took nearly all the available space, and we had the dickens of a job to find a place to keep our music once we had got it. The only thing to do was to pile it on top of an old kitchen range which, fortunately, had long ceased to fulfil its original purpose. But even after six months we had no more than 500 musical items.

Some Figures

"At the end of 1923 I was still playing in the Wireless Orchestra and collecting music in my spare time with the help of a secretary.

"To give you some idea of the way in which the present Library has grown, let me bring you right up to date and give you some figures. I think you will agree that they are pretty stupendous.

"From two the Library staff has multiplied to thirty-four—and everyone has plenty to do. For instance, we now have 20,000 items for orchestra alone—by items I mean titles. They, of course, range from entr'actes playable by three or four people to large symphonic works which may be

scored for eighty or more players. It is part of our job to supply the Regions with the music that they require, and in order to cope with their demands—distance and time are important factors—we hold duplicate and even triplicate sets of items; 6,000 works are duplicated, 1,800 are here in triplicate. Our stock of vocal scores is not far short of 200,000, comprising oratorios, cantatas, operas, musical comedies, and so on.

"If the B.B.C. Choral Society are doing a big work, we have to provide them with 320 new scores; that may convey to you an impression of the rate at which the Music Library is still growing.

"The B.B.C. Military Band has its own Library at Maida Vale, and that, too, is part of my charge. To-day it consists of something like 3,000 items.

"In the song section here there are something like 25,000 titles—songs ranging from the throaty pieces for roaring baritones to the type of thing that crooners seem to like.

"Nowadays we make quite a big use of air mail for obtaining material from the Continent. Only recently we have also used it to take as swiftly as possible to Prague a certain work which is being broadcast later in the year, so that the guest conductor may study it at his leisure.

them on a tour of the country, going from station to station. Of course, they were at the mercy of transport systems the whole time, but they seldom went astray, and the scheme worked quite well until we were able to tell the various stations that the Library was now big enough to enable us to meet the periodical requests for music which we wished them to make.

Preparing the Parts

"The work of supplying orchestral music for performance in London is now divided into three sections—preparation, performance and ultimate distribution. When the substantiated programme of items to be performed reaches us, the necessary music is obtained either from the Library or, if necessary, from an outside source—even from the composer. Master copies of each group of string instruments are then passed to leading players of each group for the insertion of bowing and expression marks.

These markings are later transferred to the remainder of the groups of string parts. This is a job to be done even as much as a month before the first rehearsal, by which time all the necessary material has been placed in order in covers ready to be put on the orchestral stands. The conductor usually gets his score some time before anyone else. Some member of the

Music Library personnel always attends rehearsals and performances ready to deal with any question that should arise at any time. After the performance, all the covers are collected and brought back to the Music Library, the individual items 'dissected' and distributed according to the sources of supply.

Distribution

"About thirty programmes per week are dealt with by a staff of seven orchestral librarians, who also handle the distribution after performance of the hundreds of vocal scores and chorus parts which are used from time to time in connection with large choral works, musical comedies, and other productions.

"Maintenance and repair work is an important phase of our work in the Music Library. It keeps four members of the staff fully occupied. We have to cope not only with normal wear and tear, but with

bindings and classes of paper that were never very good.

"There is a lot more that I could tell you about the Music Library. One thing I must not forget: our main stock is carried in the tower of Broadcasting House, and as it weighs something like a hundred tons you can understand why it was that the floors were specially strengthened.

RADIO FAVOURITES ON THE SCREEN



J. Hubert Leslie and Edith Sharpe, who have appeared in many radio plays, in a scene from "Old Mother Riley," a Butcher-Hope Bell film produced at Cricklewood Studios under the direction of Oswald Mitchell.

"By comparison, again, let me mention how we used to manage in the old days—when fourteen broadcasting stations in various parts of the country all wanted music, had none of their own and had to have what we could give them. We started a scheme of 'circulation hampers.' We had twenty-eight of them, and into each we put a good selection of stuff and sent

FROM OUR READERS

A STORY IN VERSE FROM AN S.W. FAN

A spot of good rhyming by one of our followers which makes particularly interesting reading

The Editor, POPULAR WIRELESS.

Although my wife's a Short-Wave Fan detester
And says a wireless widow's life is bleak,
I've followed with devotion, Mr. Chester,
The friendly hints you offered week by week.
I've paid my best respects to my "connections,"
Knowing H.T. with danger may be fraught,
Vowing with many humble genuflections
That with a burnt-out valve I'd ne'er be caught.

A chassis and a panel I have fashioned
With petrol tins retrieved from neighb'ring tips,
For pocket-money, nowadays, is rationed,
Since British men are barred from British ships
But all my careful work and cute devices
Have failed to yield a single note to-day;
No sound emerged—not even "Fat Stock
Prices"—

And that is why I now sit down to say;

If you can make this set bring in the stations
Which short-wave fans oft boast of in the Press,
If you can calm my critical relations
Who swear the thing's a sanguinary mess,
If you can put this set in better humour
And make it bring sweet music flowing in,
If you can tell me where I've made a bloomer,
You're a smarter man than I am, Gunga Din.

TAILPIECE:

I've solved the problem; spare me now your
flattery.
I hadn't hitched the durned thing to the
battery!!!

W. E. MIDDLETON.

1, Totnes Road, Chorlton-cum-Hardy,
Manchester, 21.

THE HAPPY STATION

The Editor, "Popular Wireless."

Dear Sir,—I wonder how many
of your readers have a favourite
station?

My own favourite is Huizen PCJ,
that grand old short-waver which
first came on the air in March, 1927,
and, under the title of "The Happy
Station," has been spreading happi-
ness and good feeling ever since.

After listening to the dictator-like
tones and propaganda from Europe,
the cold and formal tones of our own
B.B.C. announcers, and the snappy
wisecracking of the U.S.A., it is like
a refreshing drink to sit back in your
arm-chair and hear that friendly and
cheerful voice announce, "This is
PCJ, the happy station." You can
then be sure of hearing a programme
composed only of what is happy and
cheerful.

Peace, Cheer and Jollity—this is
PCJ, the happy station. For ten
years it has lived up to its slogan, so
good luck, PCJ, and may you carry
on the good work for many years to
come; and I am sure that eventually
your cheerful and friendly influence
will penetrate, like your programmes,
to every corner of the earth.

PETER B. CREEGAN.

67, Powys Avenue, Town Hill,
Swansea, Glam.

FROM A READER IN INDIA

The Editor, POPULAR WIRELESS.

Dear Sir,—I have been a regular
reader of your excellent journal for
the past eighteen months or so, and
have derived great pleasure and
knowledge from its pages. To say
that it is interesting is putting it
very mildly, for its pages, from
cover to cover, are packed with
interest and knowledge for the old
hand and the absolute novice, like
myself.

I wonder if you ever receive
letters from your numerous readers

in this part of our little globe? I haven't
come across any in your paper; hence, so far, I
have been very reluctant to write.

You very recently ran a most interesting
S.W. competition, and I feel I must let you
know what I consider a very interesting half-
hour I spent one evening with my set. Here
it is:

At about 6 p.m. (I.S.T.) on February 17th
last I had my set "on," and was seated with
my back to it, talking to my wife, the while
slowly rotating the station dial knob. Suddenly
there was a burst of music at tremendous
volume. I switched round "ek Dun," i.e. at
once, and found that I had bumped into a
station coming in on 23 metres. Not knowing
whom I was listening to, I was greatly intrigued
and waited patiently for the announcer to
speak. He did so in a minute or so, and a
voice came over the ether telling listeners that
they were listening to the Government Experi-
mental Station at Rangoon, Burma, operating
on a wavelength of 23.31 metres.

The announcer then told us that after a couple
of recorded items we would hear a talk given
by a telephone subscriber situated 15 miles
away from the studio, and asked us to write
in and give our impressions, making comparisons
between the speech by telephone and direct
speech into the "mike." In both instances
reception was quite good, but was interfered
with by Morse. However, I wrote in and do
hope my letter was of some use. I might
mention that this station is now operating on
the 49-metre band, and is very severely inter-
fered with by Morse, as are all other stations
using this band.

GERMAN POLICE AT WORK



One of the radio equipped cars used by the German police. Note the telescopic aerial which may be extended if desired.

WIN A GUINEA!

Every week we pay one guinea for the
best letter, in the Editor's opinion, from a
reader on any radio topic. There's no
reason why you should not win one. So
why not have a shot?

Radio experiences, faults you have
found and remedied, programme opinions;
these are all permissible topics. If you
enjoy reading what others have to say,
why shouldn't they find interest in some
words of yours?

Anyway, give us the opportunity to
decide whether or not that letter you have
in mind merits printing. It may even earn
a guinea!

The winner of the guinea this week is
Mr. W. E. Middleton.

It is extremely difficult to pick out any
particular feature of "P.W." for praise, as
ALL, without exception, are, in my humble
opinion, "top-hole." However, "The Dial
Revolves" and "Points From the Post-bag"
want beating.

I must wish you, your staff and all who
help to make "P.W." so popular the very best
of luck in the future. "Vive la Popular Wire-
less!"

H. STANLEY EARLE.

Block No. 12, Jhajha, E. I. Railway, India.

THE G.P.O. MAGICIAN

The Editor, "Popular Wireless."

Dear Sir,—When I changed my battery set
for an up-to-date A.C. model, I had a very
curious experience. The first afternoon I rigged
up the set I switched on and tuned to an organ
recital. Imagine myself thoroughly disgusted
when I heard a voice in the background. In

vain I endeavoured to rid myself of
this "gate-crasher" who insisted on
occupying the whole band.

After a few moments came a
distinct "click," and the voice
vanished. This occurred three times.
When I enlisted the aid of a P.O.
engineer, he asked me if my neigh-
bour had a telephone. I told him he
had, whereupon he said it was a
simple matter to rectify, although he
explained nothing. He paid a visit
to next door, and an embarrassing
situation is at an end.

WILLIAM J. CROFT.

Member of V.A.C. Club and "18"
Club.

Pendine Villa, 53, Richmond Street,
Totterdown, Bristol 4.

OSCILLATING CRYSTALS

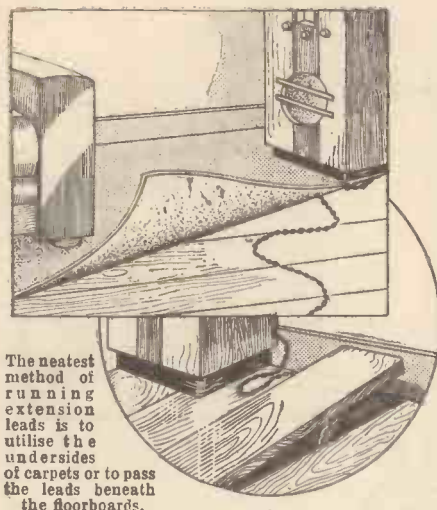
The Editor, POPULAR WIRELESS.

Dear Sir,—My earliest acquaint-
ance with POPULAR WIRELESS was
in 1922, when I wrote asking for the
circuit of a crystal set, and this duly
arrived on a small sheet of blue-
headed paper, nicely drawn in ink
and accompanied by a courteous
letter. I was at that time trying to
coax signals out of an ex-Army
trench set—a cumbersome affair,
lots bigger than the present-day
portable transmitter—and I re-
member that it was tuned by
small sliding drawers which
contained basket coils of about 12-gauge
wire embedded in paraffin wax
(shades of low loss)!

However, I soon graduated to a
nice single-valve set, using one of
those nice Dutch valves that went
blue in the face if more than 25
volts were applied to the anode.

I also used the V24 valves, which,
if my memory serves me, used to
eat a whole amp. of L.T. at 6 volts
each.

(Please turn to page 475.)



RUNNING EXTENSION LEADS

EXTENSION speakers are very popular these days, and rightly so, but one of the difficulties is that of running the necessary wires from the set to the room in which the extra speaker is placed. There are various methods of running these leads, and generally speaking you will find it better all round to keep them as near floor level as possible, for there are greater facilities for concealment down there.

Don't be misled by the inviting picture rails, if you have these running round the room. They are fine for getting the wires across the room, but when you get to the doorway or to the point where you wish to bring the leads down again, then you will find it most difficult to hide the evidences of your handiwork.

Under the Floorboards

No, stick to the floor, and when there is no convenient linoleum or carpeting, don't be put off by that, for floorboards are by no means difficult to raise.

If you have noted where the gas, water and electric light wires have been run, you will probably find that the way has been nicely prepared for you, for plumbers and gas-men nearly always only lightly nail those boards which they might at any time have to raise in order to execute repairs.

The problem of getting the leads from one room to another is easily solved in this manner in most houses. But keep your wires as far away from the pipes and power lines as you can.

Sometimes it is rather difficult to get the wires from one floor to another, and it is here that stairways come in very useful.

Another Way Out

Generally, the undersides of stairs are quite accessible from cupboards or a cellar, but if they are not, then it may be possible to take the leads up or down under the material which covers the stairs. However, you must not forget to see that they are not uncavalierly treated when the carpet or oilcloth comes up for cleaning operations. A little thought given to wiring problems nearly always results in a satisfactory solution.

PRACTICAL POINTERS

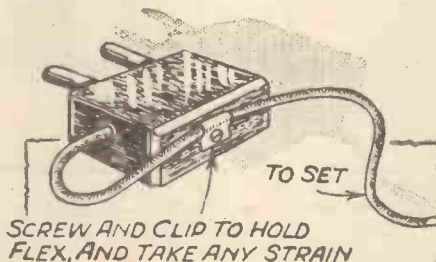
HINTS AND TIPS FOR CONSTRUCTORS

A MAINS PLUG TIP

VERY often the flex lead to an old mains plug of the wooden type gets strained accidentally and bad contact is caused by the fact that any such "pull" is taken up by the connections to the plug's metal contacts.

A simple modification is shown in sketch, where a wood screw and ordinary insulating fastener hold the flex securely on the plug, allowing the actual connecting-piece to be slack where it passes inside the plug.

If an accidental pull is given by someone tripping over the flex, or any similar mischance, the lead holds firmly, and no strain at all is imposed on the actual internal connections.



Here is a simple method of curing "pulled out" connections with old-fashioned plugs.

BRING YOUR SET UP TO DATE

THERE have been enormous improvements made in radio during the past year or two and owners of old sets might well look at them very critically.

But in these days there is a decreasing number who can afford to scrap a whole set in favour of an entirely new outfit.

However, it may be possible to improve a set a very great deal merely by exchanging certain of its parts for more modern ones.

Probably the greatest progress had been made in loudspeakers. Many three-or-four-year-old sets would sound almost as good as 1937 models if they were fitted with new speakers.

Minor Modifications

When the loudspeaker is separate it is an easy matter to make the replacement. If it is built into the set it may be difficult to replace it without serious constructional alterations.

This is by no means always the case, and it is frequently possible to make the change with only minor structural modifications so long as the new speaker is carefully chosen with this end in view.

But there is no reason why the built-in loudspeaker should not be cut out of circuit and leads taken to an external instrument. The only objections are purely aesthetic.

Modern valves are vastly superior to their predecessors, although it is not always possible easily to use them in old sets.

Special Adjustments

A pentode needs special circuit adjustments before it will act as a satisfactory substitute for an ordinary power output valve.

But a time-worn detector can safely be changed, and probably with very great advantage indeed.

Some of the older components used in their proper condition will be every bit as good as modern alternatives.

The shielding applied to present-day coils does not improve them as coils. It is a development of design intended to make them more readily adaptable to the high-efficiency circuit arrangements in compact layouts.

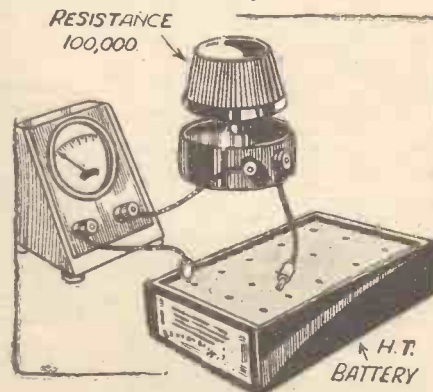
Variable condensers have improved, especially in regard to their dials. And if old ones are scrapped in their favour station-searching will probably be greatly facilitated, although we do not guarantee that, as the listener may have got so conversant with the handling of his old ones that he can do all that could be done with condensers of superior mechanical design.

On the other hand, it is difficult to see how anyone, whatever his skill, could accomplish feats of DX with tuning controls as inefficient as some that were widely marketed a few years ago. Serious slip and backlash negative the skill of the most expert operators.

A DOUBLE-RANGE VOLTMETER

THE range of a voltmeter can easily be doubled by joining a resistance in series with it, but, of course, the resistance must bear a certain definite relationship in value to the resistance of the voltmeter. It is frequently difficult to calculate the correct size of resistance mathematically, but the correct value can very simply be arrived at practically.

A variable resistance should be used for the purpose having a maximum value of 100,000 ohms. This is wired in series with the voltmeter, and should have a switch connected across it, so that the resistance can in effect be cut out when necessary.



A variable resistance in series with a voltmeter enables the voltage reading to be doubled or even trebled.

Then a battery, preferably new, should be joined up to the voltmeter and its series resistance, and in the first instance the resistance should be shorted by the switch. A convenient voltage for the required purpose would be 50, and this value should, of course, be shown on the voltmeter.

(Continued overleaf.)

PRACTICAL POINTERS

(Continued from previous page.)

Switch in the resistance, and then turn the knob so that the voltage shown on the meter drops to 25. Thus, the reading in this case being halved, it follows that any reading now obtained on the meter is half the actual voltage. The range of the voltmeter is thus doubled.

When the resistance is shorted it will give normal scale readings, of course.

By taking 60 volts in the first place and adjusting the resistance until the reading is 20, the range will be trebled. Any reading obtained in this case has to be multiplied by three.

CUTTING OUT NOISES

THE six numbered illustrations which appear on this page show the manner in which an expert would go about the solution of the particular problem.

He first hears a crackling, "zizzing" noise breaking through and tending almost to drown the programme. But his first thought is not: "Now what's gone wrong with my set?"

It might have nothing to do with the set at all. Therefore, he tunes-in another station in order to ascertain if the interference is general.

Transmission at Fault?

If he had found that all the other programmes available were quite normal, then he would conclude that the transmission was at fault, and that there was nothing to be done about it except either grin and bear it or listen to another station.

However, in our "story" the noises are heard just as loudly when the tuning is changed. So he takes the aerial off. The noises are still as loud, although the broadcasting has all but disappeared.

He has now checked the above point and also derived the information that it isn't an aerial pick-up of some very broadly tuned interference. (Being an experienced radio man he knows that atmospheric disturbances are liable to cause all kinds of queer ether sounds.)

So he now makes sure that the mains connection between his mains set and the power point is in good order. Perhaps he even hopes that the interference is a warning that it isn't, for a faulty mains connection is not likely to be difficult to put right.

He tries the power plug to see that it is fitting snugly and making good contact, as he doubtless has had experience of mains plugs being accidentally kicked or pulled loose from their sockets.

Before he goes any further he will switch off and withdraw the plug. He is then free to check his connections and

ascertain whether or not they are good and tight.

Wire is apt to crystallise, get brittle and fracture after a time, and once one or two strands of a flexible lead break off, the connection is almost certainly going to loosen.

Sparking and arcing may follow. This would cause noises.

Having examined the lead at the plug end, our expert listener will quickly inspect it at the other end, although it is rarely that trouble is experienced there.

Then he will replace the plug and switch on again.

"Bridged Earth"

The reason why he next removes the earth lead is to make sure that there isn't what is sometimes called a "bridged earth."

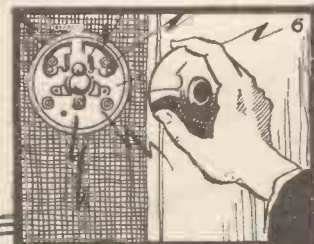
This is caused by a leakage from the mains through some part of the set to the natural earth, i.e. a water-pipe or buried earth connection if such is used.

In passing it should be noted that a slight "bridged earth" will do no harm. It is very frequently encountered, and evinces itself in the form of a hum rather than as a crackle. Many sets which are otherwise rather noisy can be made quite silent if no ordinary earth is used.

Seldom are the re-

But what about a battery set which suddenly starts to hum badly?

In most cases it will be found that this is due to a broken or faulty grid circuit. You can look first at the grid-bias batteries for this. An exhausted grid-bias battery or a bad G.B. connection will tend to send up the resistance



IT'S THAT SWITCH!

of the appropriate grid circuit until it is in effect "open" and broken.

A mains unit may give perfectly satisfactory service on one set and yet "hum" severely with another.

Sometimes the choke or transformer happens to be of the "uncased" type. If this is the case a cure may generally be effected by tightening up the nuts on the bolts which hold the laminations.

STOPPING ACCUMULATOR SPRAYING

AN accumulator is liable to bubble and froth during and for a short period after charging, and it is the minute particles of acid which are thrown up by this activity which tend to get on to the terminals and cause corrosion.

A Little Oil

The fact that the cells are almost entirely enclosed does not prevent this happening, for so long as the vitally necessary vent-

hole is there, acid vapour can result in a "creeping" of acid over the terminals.

But the spraying and creeping can be reduced to negligible proportions by pouring some hard mineral oil, such as chemically pure paraffin, into each cell. There is a special oil known as "Blancol" which is actually made for the purpose. A layer of an eighth of an inch or so above the acid will suffice.

SLOW-MOTION DIALS

FOR ordinary listening it is not necessary to have a slow-motion dial with a very high ratio. The ratio indicates the number of times the knob will have to be turned for every complete 360 degrees rotation of the vanes.

In the case of a four-to-one ratio, four revolutions of the control knob would be needed. Actually, of course, the vanes can be turned only through 180 degrees.

Ratios of fifty to a hundred to one are needed only for short-wave reception, where it is almost essential to be able easily to make extremely fine adjustments of the tuning condensers. On the medium and long wavebands a four- or five-to-one ratio is quite big enough.

TRY EARTH OFF



MAINS PLUG RIGHT?

ception results affected, especially in the case of D.C. sets, because the mains themselves will act as an earth.

Our expert eventually discovers that the interference is caused by a faulty electric light switch. There is an arcing due to a faulty contact.

The moral of this "story" is that a mains set is in effect a part of the domestic supply system and that faults in this may affect it considerably.

Battery Sets

Some of the troubles experienced are diffi-

cult to deal with. Switch clicks, for instance. Many listeners may have been puzzled and annoyed by these, particularly if they are flat-dwellers.

A faulty electric wire can create havoc with programme reception. Electric motors will at times make a terrible noise in the loudspeaker, but they can be silenced by connecting interference units across their brushes.

These units are quite inexpensive and are easy to instal.

TRY AERIAL OFF



REGIONAL, TOO!



MARCONI—THE MAN AND HIS WIRELESS

CHAPTER IX—THE HERO OF THE HOUR

Public reaction to transatlantic wireless—Canada's aid to Marconi—The cables express a fear—Pupin applauds—Marconi is told his name will stand through the ages—An augury of future conquests—Comment from T. C. Martin—Sir Oliver Lodge praises Marconi—The inventor explains his system to the Canadians—Cables are warned against being short-sighted—Marconi as seen at St. John's—He discusses future plans—Honoured by American electrical experts—A toastmaster's introduction and Marconi's reply—A tribute by The New York Times—Marconi praised as conservative scientist—Commercial possibilities outlined—Heaviside offers a new wireless theory—Thoughts Marconi carried back to England

IT was easy to understand the public reaction. One had only to look back to 1858, when the first cable actually delivered a message. Many had to hear the signals themselves before they would believe. Others were not convinced even by affidavits of those who made it possible. If the popular imagination could not be fired with a direct link between the hemispheres how could wireless, an invisible thread of communication, incite faith and dispel all doubt in a short time, despite the fact that Edison, Bell, Morse and other notables of science had taught the world to be chary of disbelief?

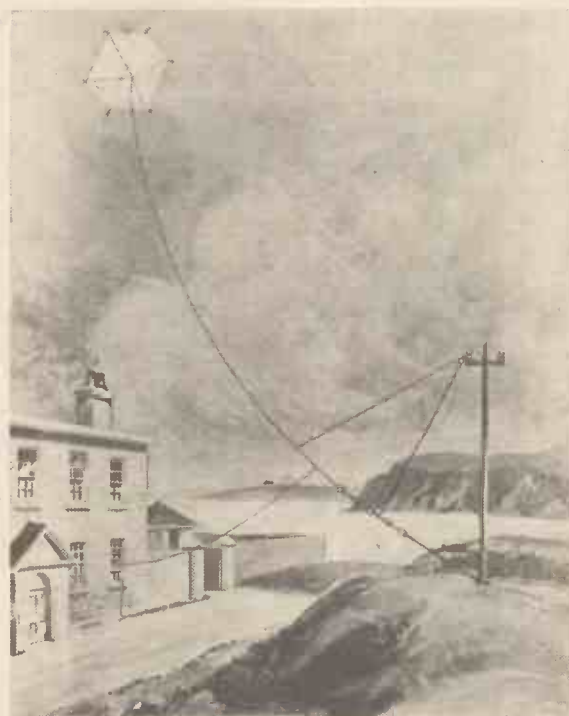
Congratulations poured in on Marconi. He dined with Sir Cavenish Boyle, Governor of Newfoundland, prior to departure for Cape Spear to select a site for the erection of a pole 200 feet high, which he believed would give the best results possible under existing conditions.

A report from St. John's, on December 15th, 1901, stated: "On Tuesday the inventor proposes to have Governor Boyle, Premier Bond and other Colonial dignitaries examine his tests so that they may satisfy themselves of the absolute genuineness of the proceedings. There is much speculation here as to the practical possibilities of wireless telegraphy. Signor Marconi is satisfied from his previous experiments that great surprises are in store for the world. He has the warmest support in this colony, where he is generally admired owing to his achievements at so young an age."

Marconi returned from St. John's to Spear on December 16th and was served with legal documents from the solicitors of the Anglo-American Telegraph Company. The papers notified him that the company possessed a monopoly of the telegraph business within Newfoundland and its dependencies, and demanded that he cease his experiments and remove his apparatus forthwith else the company would apply to the Supreme Court for an injunction restraining further trials.

All was not sunshine. At Cape Spear the inventor experienced poor luck. The weather was rendered extremely unpleasant by fog, wind and a rainstorm, making it impossible for Marconi to decide upon a site for a new station. And while his hopes were being dashed by inclement weather, he received a report, which afterwards proved to be incorrect, that

MARCONI'S KITE AERIAL



Courtesy Marconi's Wireless Tel. Co., Ltd.
A drawing of the kite-suspended aerial, by means of which the first transatlantic wireless signals were received by Marconi, at Signal Hill, Newfoundland, on December 12th, 1901.

Edison discredited the announcement of signals having been received from Cornwall. He replied that the signals were received by himself; they were absolutely genuine.

"I fully believe that Marconi succeeded in signalling between the coasts of Newfoundland and Cornwall, England, by his system of wireless telegraphy," said Michael I. Pupin, Professor of Electrical Mechanics at Columbia University.¹ "According to

¹ December 16, 1901.

the newspaper reports I have read, the signals were very faint, but that has little to do with it. The distance, which is about 1,800 miles between these two points, was overcome, and further development of the sending instruments is all that is required. . . . This new system, if it is adopted, will not affect the cables as far as I can see at the present time, for it must

be understood that the cables are being perfected constantly. At the present time there are fourteen cables between Europe and America. . . . One point which is of great value and interest to the scientific world is that Marconi has proved conclusively that the curvature of the earth is no obstacle to wireless telegraphy. . . . Marconi deserves great credit for pushing this work so persistently and intelligently, and it is only to be regretted that there are so many so-called scientists and electricians who are trying to get around Marconi's patent, and thus deprive him and his people of the credit and benefits of the work to which they are fully entitled."

"If Marconi says that he has communicated across the seas I know of no reason," said Professor A. E. Dolbear of Tufts College, himself a wireless enthusiast, "why I should not fully believe that he had solved the problem."

Editorially, under the caption, "The Epoch-making Marconi," *The New York Times* on December 17th, said:

If Marconi succeeds in his experiments with intercontinental wireless telegraphy his name will stand through the ages among the very first of the world's great inventors.

The thing he is attempting to do would be almost transforming in its effect upon the social life, the business and political relations of the peoples of the earth. The animating spirit of modern invention is to overcome the obstacles of time and space, "to associate all the races of mankind," by bringing them nearer together. Commerce, of course, has done more than any other agency to make that association intimate and lasting.

The electric telegraph, in the form of ocean cables, was a great step in advance. The sending of messages without wires through natural media of communication will be a

(Continued overleaf.)

MARCONI—THE MAN AND HIS WIRELESS—Continued

still longer and more wonderful advance, if it shall prove that the art can be perfected and made practicable up to the measure of present confident predictions.

Everything depends on that. The cables are too slow and too costly for these modern times. Professor Pupin in his comment upon Marconi's experiment says that "nobody doubts at the present time that the cable will soon be made from forty to fifty times as fast as it is at the present day."

If the capacity of ocean cables is not very soon increased by such electrical improvements as he has in mind the inventive genius of this age will be open to accusation of not keeping up with its urgent requirements. We understand that at twenty-five cents a word the fourteen Atlantic cables now in operation are fully occupied during the business hours of the day. That means that in this matter demand has outrun supply. It would be better for the world if communication between the countries that ocean divides could be much increased in volume through a saving of cost and time.

The initial success of Marconi appeals powerfully to the imagination. It will be the fervent hope of all intelligent men that wireless telegraphy will very soon prove to be not a mere "scientific toy," but a system for daily and common use. The men of science point out the obstacles. They have commonly been deemed insuperable. The first triumph is an augury of future conquests.

T. C. Martin, editor of *The Electrical World*, said:

I believed that Marconi would be successful, but did not anticipate it so soon. . . . I am sorry that Mr. Tesla, who has given the matter so much thought and experimentation, and to whose initiative so much of the work is due, should not also have been able to accomplish this wonderful feat.

I have talked with Professor Fessenden, who is now engaged on the subject for the United States Government, and with Dr. Kennelly, at one time an expert for Mr. Edison, and they agreed as to the feasibility and near possibility of the achievement.

Although Mr. Marconi is to be heartily congratulated on his magnificent results the idea is not to be jumped at that cables are any less useful than heretofore. So far as is known, there is no means of preventing successfully the interference of wireless signals, and until they become automatically selective it would mean that only one station on each side of the Atlantic, or even on each side of New York Bay, would engage in business. Even should this difficulty be overcome, as it doubtless will be, I find it hard to believe that it will be so entirely removed as to involve the complete supersession of cables.

Leaders in science the world over concurred on the remark:

"Marconi's creation, like that of the poet who gathers the words of other men in a perfect lyric, was none the less brilliant and original."

"The present is an epoch of astounding activity in applied science," said Sir Oliver Lodge. "Progress is a thing of months and weeks, almost days. The long lines of isolated ripples of past discovery seem blending into a mighty wave, on the crest of which one begins to discern some oncoming magnificent generalization."

"The suspense is becoming feverish, at times almost painful. One feels like a boy who has been long strumming on a silent keyboard of a deserted organ, into the chest of which an unseen power begins to blow a vivifying breath."

"Astonished, he now finds that the touch of the finger elicits a responsive note, and he hesitates, half-delighted, half-affrighted, lest he should be deafened by the chords which it seems he can now almost summon at his will."

Sir Oliver Lodge in his book "Talks About Wireless," commented:

"When Signor Marconi succeeded in sending the letter 'S' by Morse signals from Cornwall to Newfoundland, it constituted an epoch in human history, on its physical side, and was an astonishing and remarkable feat."

Later in the same book he remarks:

"It is needless to emphasize the world-wide character of Mr. Marconi's subsequent developments; his discovery of the power of ether waves to curve around the earth to immense distances, his discovery also of the adverse effect of sunshine, and the more recent discovery that short waves can travel efficiently to the Antipodes."

Sir Cavendish Boyle, who had cabled reports on the achievement to King Edward, arranged a luncheon in honour of Marconi. Among those present were Premier Bond, the Cabinet Ministers and the heads of departments. The affair was practically a State function. In expressing his appreciation for the courtesies of the Dominion, Marconi said:

"If my system of wireless telegraphy can be commercially established between the different parts of the earth, in regard

SIR AMBROSE FLEMING



A photograph taken a few years ago of the great inventor of the valve who wrote the letter reproduced on the facing page.

to which I may state I have not the slightest doubt, it would bring about an enormous cheapening in the methods of communication at present existing.

"The system of submarine cables of to-day fulfils the demands of communication to a great extent. But the great cost

² "Talks About Wireless," by Sir Oliver Lodge, Cassell & Company, 1925.

of the cables themselves, and their heavy working expenses, cause the existing methods to be beyond the reach of a majority of the people inhabiting the various countries of the world. But could this new method be applied, I believe the cost of what we now call cabling to England might be reduced at least twenty fold. The present rate is twenty-five cents a word. I do not see why eventually, with the wireless system this cost should not be reduced to one cent a word or less."

Discussion everywhere centred around wireless versus the cables. A dispatch from London read:

The fall in the securities of cable companies which commenced with the announcement of the success of Marconi's experiments in having signals transmitted across the ocean by his wireless system of telegraphy has been continuous throughout the week.

"Marconi and the Anglo-American," was the title of an editorial in *The New York Times* on December 19th:

The more the incident of the proceedings of the Anglo-American Cable Company against Signor Marconi is considered, the more evident it becomes that the management of that company is in the hands of short-sighted, narrow-minded, unprogressive persons who are much in need of supplementing the Lord's Prayer with a petition to be taught to know their daily bread when they see it.

Pending an adjustment of the "disagreement," Signor Marconi has gone over to Nova Scotia, where he will continue his experiments. If he should find that he can transmit intelligible signals as well from there as from Newfoundland, and that the slightly greater distance does not complicate his system or increase its difficulties in operation whatever advantage has been supposed to reside in the Anglo-American's telegraph monopoly of Newfoundland will be at an end, thus destroying another highly prized asset of the company.

People have begun to think that the eagerness, manifested by the cable companies to discredit Marconi and embarrass his experiments warrants a suspicion that the profits of the present tariff are more satisfactory than the representatives of these companies are desirous the public shall believe.

Marconi could have been helped in no better way than by recognizing his system as a dangerous competitor before he had ventured to make that claim for it himself.

On second thoughts that is the way Marconi reasoned. At first he was amazed at the warning, but as he reflected upon it he wondered, "Is this not evidence of the belief of practical men in the future commercial importance of wireless?"

For the ether to be a formidable competitor of land wires was not so easy since telegraph lines cost approximately \$100 a mile, whereas the ocean cables cost \$1,000 a mile, and require expensive steamers to repair and maintain them, so figured P. T. McGrath, editor of the *Evening Herald*, St. John's, Newfoundland.³

"A transatlantic cable represents an initial outlay of at least three million dollars, besides the cost of its maintenance," explained Mr. McGrath. "A Marconi station can be built for \$60,000. Three of these bringing the two worlds into contact will cost only \$180,000, while their maintenance should be insignificant. What his success will mean can best be grasped by considering the extent of the property

³ *The Century Illustrated Monthly Magazine*, March, 1902.

which would be displaced thereby, although it is only since August 5, 1858, forty-three years ago, that the first Atlantic cable was laid. There are now fourteen along the Atlantic bed, and in the whole world 1,769 telegraph cables of various sizes, with a total length of almost 189,000 nautical miles, enough to girdle the earth seven times.

"These require a great number of ocean-going cable steamers for their laying and repairs, and while the total value of the cables cannot be computed easily, it is known to be a fact that British capitalists have \$100,000,000 invested in cable stocks."

As the word spread that Marconi had stopped testing, he was deluged with offers of sites for experimental stations. Alexander Graham Bell, inventor of the telephone, offered him use of his property at Cape Breton. The Finance Minister of Canada extended on behalf of the government every facility for the location of a station in Nova Scotia. Marconi accepted. Before resuming work, however, he decided to return to England to consult business associates, chief among them Jameson Davis. He said he was sailing on December 22nd on the steamer *Sardinian* for England, and would return to New York in January.

As the train pulled away from the scene of his triumph in Newfoundland, across the island on the way to Nova Scotia, it seemed that every farmer and fisherman came to the depots to catch a glimpse of the wizard of wireless. He was only twenty-seven years old. The boyish smile and youthful appearance coupled with the magnitude of his achievement won the admiration of the throngs.

Ray Stannard Baker, who interviewed Marconi at St. John's several days after the transatlantic triumph, described him as somewhat above medium height and deliberate in his movements despite a highly strung temperament.⁴ He observed Marconi unlike the inventor of tradition. Those who visualised him unshaven, dishevelled and unkempt, with trousers unpressed and collar and tie missing after a long siege in the laboratory, never hold such a picture in their minds once they have met the man. He is scrupulously neat in dress and in work. No photograph or painting could portray the peculiar lustre

in his countenance when he is interested or excited.

Those who have the pleasure of meeting him are immediately impressed that they are in the presence of a man of intense nervous activity and mental absorption. He talks little; is straightforward and unassuming, submitting good-naturedly although with evident unwillingness to being lionised. In his public addresses he has been clear and sensible. He is reluctant to write for any publication; nor does he engage in scientific disputes, and even when violently attacked he lets his work prove his point.

One factor that has endeared him to the world is his acceptance of success with a

of his success at St. John's went to his mother and father in London, where they divided their time with the Marconi estate in Italy.

"There has never been the least doubt that Marconi embarked on experimental research because he loved it," said Mr. Baker. "No amount of honour or money could tempt him from the pursuit of the great things in wireless which he sees before him. Besides being an inventor, he is a shrewd business man with a clear appreciation of the value of his inventions and of their possibilities when generally introduced. What is more, he knows how to go about the task of introducing them."

This was the man the Canadians applauded.

"RECENT ADVANCES IN WIRELESS TELEGRAPHY"

This letter was written by Sir Ambrose Fleming to "The Times," wherein it appeared on Oct. 4th 1900, and from which it is reproduced by kind permission. An extract from this letter appeared in our last week's instalment of Marconi's Life Story.

TO THE EDITOR OF "THE TIMES."

Sir,—As the subject of wireless telegraphy has not yet apparently lost interest for the general reader, I venture to ask a little space to make known for the first time some recent achievements by Mr. Marconi which have astonished those who have been allowed to examine them. Everyone is aware that in his system of electric-wave telegraphy an important feature is the employment of an elevated conductor, which generally takes the form of a wire suspended from a mast. When Mr. Marconi attracted attention by his feat of establishing communication across the Channel without wires, critics raised a not altogether valid argument against its commercial utility, that a wave or signal sent out from one transmitter would affect equally all receivers within its sphere of influence, and hence the privacy of the communication would be destroyed.

No one felt the force of this objection more strongly than the distinguished inventor himself, whose original work has caused so many others to attempt to follow in his steps. For the last two years he has not ceased to grapple with the problem of isolating the lines of communication, and success has now rewarded his skill and industry. Technical details must be left to be described by him later on, but, meanwhile, I may say that he has modified his receiving and transmitting appliances so that they will only respond to each other when properly tuned to sympathy. I am well aware that other inventors have claimed to be able to do the same thing, but I do not fear refutation in saying that no one has given practical proof of possessing a solution of this problem which for a moment can compare with that Mr. Marconi is now in a position to furnish.

These experiments have been conducted between two stations 30 miles apart, one near Poole in Dorset and the other near St. Catherine's in the Isle of Wight. At the present moment there are established at these places Mr. Marconi's latest appliances, so adjusted that each receiver at one station responds only to its corresponding transmitter at the other. During a three days' visit to Poole, Mr. Marconi invited me to apply any test I pleased, to satisfy myself of the complete independence of the circuits, and the following are two out of many such tests: Two operators at St. Catherine's were instructed to send simultaneously two different wireless messages to Poole and, without delay or mistake, the two were correctly recorded and printed down at the same time in Morse signals on the tapes of the two corresponding receivers at Poole.

In this first demonstration each receiver was connected to its own independent aerial wire hung from the same mast. But greater wonders followed. Mr. Marconi placed the receivers at Poole one on top of the other, and connected them both to one and the same wire, about 40 feet in length, attached to a mast. I then asked to have two messages sent at the same moment by the operators at St. Catherine's, one in English and the other in French. Without failure, each receiver at Poole rolled out its paper tape, the message in English perfect on one and that in French on the other. When it is realised that these visible dots and dashes are the results of trains of intermingled electric waves rushing with the speed of light across the intervening 30 miles, caught on one and the same short aerial wire and disentangled and sorted out automatically by the two machines into intelligible messages in different languages, the wonder of it all cannot but strike the mind.

Your space is too valuable to be encroached upon by further details, or else I might mention some marvellous results, exhibited by Mr. Marconi during the same demonstrations, of messages received from a transmitter 30 miles away and recorded by an instrument in a closed room merely by the aid of a zinc cylinder, 4 feet high, placed on a chair. More surprising is it to learn that whilst these experiments have been proceeding between Poole and St. Catherine's, others have been taking place for the Admiralty between Portsmouth and Portland, these lines of communication intersecting each other; yet, so perfect is the independence that nothing done in one circuit now affects the other, unless desired. A corollary of these latest improvements is that the necessity for very high masts is abolished. Mr. Marconi now has established perfect independent wireless telegraphic communication between Poole and St. Catherine's, a distance of 30 miles, by means of a pair of metal cylinders elevated 25 or 30 feet above the ground at each place.

I need not enlarge on the possibilities thus opened out for naval and military purposes. The importance of this practical solution of the problem of independent electric wave telegraphy, in which each wireless circuit is as private as one with a wire, is obvious without comment. My desire is solely to mention the above facts for the benefit of general readers, whose minds will thus, perhaps, be eased of any doubts lest this brilliant application of electrical discoveries should, like some others, fall short in satisfying the requirements of practical use and be relegated to the region of imperfect inventions or unfulfilled hopes.

I am, Sir,

Yours obediently,

J. A. FLEMING.

University College, London. Sept. 28th.

calmness, almost unconcern; he certainly expected it. Boastfulness is not in his make-up. Opposition is his keenest spur to greater effort.

He speaks English as perfectly as he does Italian. He speaks little French, but with an English accent. Indeed, his blue eyes, light hair and fair complexion give him decidedly the appearance of an Englishman, so that the stranger who meets him would never suspect Italian blood in his veins. One of the first messages conveying news

both as to the number of times they were to be sent and at the speed agreed upon."

His attention was called to the suggestion of anchoring steam vessels at convenient places on the Atlantic, equipped with wireless apparatus, thus enabling messages to be relayed to ships and to the other shore.

"That is ridiculous," he replied. "There is no use for any such system. I have absolutely no sympathy with any such proposition. Messages can be sent across

(Please turn to page 480.)

⁴ McClure's Magazine, February, 1902.

RANDOM RADIO REFLECTIONS

By Victor King

A TRICKY CIRCUIT TO GET GOING—BUT WHEN IT WORKED IT WORKED WELL :: REASONS FOR BEING UP EARLY :: PASSING BY AN OLD ACQUAINTANCE

OSCILLATING CRYSTALS

I HAVE had several letters about this fascinating subject, the most useful one being from Mr. S. M. Rowe, of Mutley, Plymouth. He says:

"In answer to your query *re* oscillating crystal sets ('P.W.' July 3rd, 1937, page 400), I explored the possibilities of that principle rather thoroughly (about 1926-28, I think), and am only too happy to pass on any information.

"I tried several circuits—single and double oscillating crystal circuits of Captain Round of Marconi's—but without success; also finally a circuit (Russian, I think) which *did* work, and which certainly proved the principle up to the hilt. The design hasn't the complication of the Round circuits, but as results are the thing here it is.

"You will notice the oscillating crystal is directly in the aerial circuit, and that the oscillating circuit is separate from the receiver.

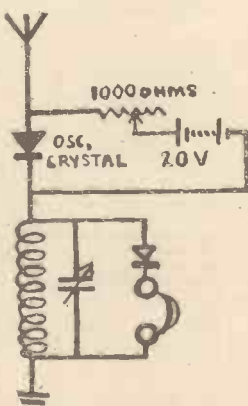
"Results: Here in Plymouth, approximately 220 miles from London, I used to receive London Regional well, and on occasions several foreigners (not identified) and at good phone strength. The local was

tremendously amplified, and my only regret is that at the time I hadn't a loud-speaker—but with phones laid down my wife and I have heard in the next room (words not distinguishable, of course, but singing very clear).

"I threw it up for two reasons: (1) It's the trickiest thing on earth to 'get going,' (2) My neighbours complained of terrible oscillations in their sets—I believe I disturbed most receivers for half a mile radius.

"Finally, the oscillating crystal assembly must be Zincite-Tellurium, and fit a very smooth resistance of about 1,000 ohms. I used Burndept spring-loaded crystal holder and adjuster (beautifully made), and maybe that helped, too.

"Regarding the recent arguments in your columns about patentees, which the Editor has now forbidden, I am sorry it has been dropped, because I do believe that every radio amateur has, at the back of his mind, the hope that he may strike some improvement in radio design, which will put him 'on the map.' This applies to even the veriest tyro, else why do we all struggle with expensive bits and pieces when excellent mass-produced receivers can be purchased so cheaply? If you tell me I am wrong—I don't believe you."



A Russian oscillating-crystal circuit which worked in the hands of a reader.

Thank you very much, Mr. Rowe. I felt I ought to publish your letter for the benefit of any other experimenters who may be interested in the fascinating crystal "squealer."

You are wrong in another matter, though, I think. The Editor certainly closed the particular correspondence battle concerning patents and inventions which was being waged in "P.W." a few months ago. But it did not mean that, given new angles, the subject could never be re-opened.

You will know I am right about that if these words are allowed to get into print!

I SEE THE SUN RISE

FOR the first time for a considerable number of years! I wonder why it is that one does one's all-night listening in the winter? Or does one? Anyway, I do. And I get off to bed just before the sun appears—if it does appear on a cold, wintry morning.

Since January or February the latest I've been up with a short-wave radio (or should it be earliest?) is about four o'clock, and that's some while back.

But the sun was pushing its dial up from the horizon at 3.30 a.m. a week or two ago. I know. I saw it. Sitting in my car on a country road. Feeling pretty blue over the first breakdown on the road I've ever had.

The curious thing is that I had said to some people I'd been visiting that very evening that I'd never been stranded on the road. And was told to "touch wood," and so on. In a most superior manner I refused to do so. And I'm still not superstitious—very!

But there I was, with black hands and a blue mind, greeting the golden dawn. At last I managed to get the engine to turn over. Extremely slowly and with just enough power to propel the car at a speed (!) of about one mile per hour. Going up hills was a trying experience.

At long last, fivish, I crept into a village. And as I rounded a corner a policeman dodged back into a doorway like a frightened hare. I pulled up opposite him and asked him where I could find a garage that might be open. Obviously shaken he came forward. I thought this strange, until he spoke.

"Do you know, sir," he said, "I imagined you was going to break into the post office, or something, the way you snuck round the corner."

Whereupon I explained that my "snuck-in" was enforced upon me.

The big sting in this adventure has yet to be related. For the first time in years I had taken the car out with neither car radio nor a portable on board!

It was sure an evil spirit that poured water in my petrol that night!

THOSE WHO PIONEERED

THE report in the newspapers that Mr. T. N. Cole has returned to the arena of the radio industry did not surprise me. Mr. Cole retired some few years ago, after about a decade of tremendous battling in the wireless trade.

I never knew such an enthusiastically hard worker. And such an enterprising genius in all aspects of manufacture and marketing. He built Lissens up and up till he was able, still comparatively a young man, to pile up a personal fortune credited to be in the



"We were attracted by the figure of an elderly man standing at the roadside."

neighbourhood of a million pounds.

And he earned every penny of it. He worked harder than anyone else in his great organisation. I remember him telling me that he often slept at the factory and hardly ever saw his family.

Obviously his energetic nature could not indefinitely be reconciled with retirement.

But continued success did not accompany the efforts of all the pioneers of the Radio Industry. Recently, I was motoring with the managing director of one of the large electrical companies.

Passing slowly through a little fishing port on the South Coast we were attracted by the figure of an elderly man standing at the roadside.

He seemed to be waiting for a 'bus. Seedily dressed in a badly fitting, ready-made suit, he still had an air of dignity, but looked a real down-and-out for all that. Old, tired and depressed.

"Let's give the poor old beggar a lift," said my companion as we rolled towards him. But as the car drew near I saw who it was, and signalled my friend to keep straight on.

That old chap would have found it embarrassing to meet us, for at one time he had

been a veritable Mogul in Radio-land, with cars—and very posh ones at that—of his own. Plus a team of smartly uniformed chauffeurs, and a big country house. He even ran a large and luxurious sea-going yacht.

He paid the penalty of thinking that the initial big boom in wireless would continue, that high prices for jerry-built apparatus could be maintained indefinitely, and that the public would never learn to discriminate between his practices and productions and those of the firms who genuinely endeavoured to serve it and which, incidentally, are the ones that survived.

Well, well! He had his day, and I'm shedding no tears for his past glories.



"Greeting the golden dawn."

TELEVISION TOPICS—Collected by A. S. Clark

"TELEFRAMES"

Items of general interest

CONSTANT CURRENT DEVICES

READERS who appreciate that the "charged" condenser in a television time-base needs charging at a constant current may wonder how a pentode valve enables this to be done. Charging through a resistance, or saturated diode, seems clear enough, but at first sight it seems that as the voltage of the condenser charged through the valve changes the anode voltage and therefore anode current must also change.

The answer to the apparent puzzle is in a characteristic of the pentode valve, namely, that its anode current is to all intents and purposes unaffected by the anode voltage so long as this is above about 50. The current is almost entirely dependent on the control-grid and screening-grid voltages.

CATHODE-RAY TUBE INSURANCE

The Commercial Union Assurance Co., Ltd., of Cornhill, London, E.C.3, we learn, have introduced insurance for cathode-ray tubes in television receivers. The premiums are 5 or 15 per cent. of the cost of a new tube.

Nearly every eventuality is covered, but loss or damage through wear and tear, gradual deterioration or wrong use of the tube are excluded.

IMPROVING G.E.C. RECEIVERS

The G.E.C. have produced a new cathode-ray tube for their television receivers, which not only gives a larger picture but also a brighter one.

It is an easy matter for this new tube to be fitted into the present receivers, and we understand that the G.E.C. are prepared to do this free of charge for present owners of their television receivers.

TWO INTERESTING PATENTS

A recent patent on cathode-ray tube improvement provides for the provision of a movable cathode, the idea being that different parts of the cathode may be brought immediately adjacent to the gun in order to ensure that emission is maintained at the desired level over a long period of use.

Another patent, bearing the name of M. von Ardenne, suggests the joining of the sides of pairs of deflectors with a high-resistance material to form a kind of open-ended box. The object is to screen the space between deflectors and electron beam from stray fields which sometimes otherwise upset the trueness of the scanning operation.

PETO-SCOTT TELEVISION KITS

All constructors will be interested in the Peto-Scott Kits of Parts for building a modern television receiver. The kits for

the complete instrument are available "in one go" or separate kits for building up the separate chassis of the receiver may be purchased independently. Ready drilled chassis and ready-wired resistance and condenser boards make the assembly simplicity itself.

We shall shortly be giving full details and a report on the actual results obtained.

* * *

FIRST TELEVISION PLAY

Pirandello's unusual play, "The Man with a Flower in his Mouth," which is to be televised in the evening of July 22nd, made television history on two previous occasions. It was the first play to be televised by the low definition system in 1930, when it was produced by Lance Sieveking, with Val Gielgud as The Man; shortly afterwards it was seen on the same flickering screen in a puppet presentation by Jan Bussell, who, incidentally, is now a television producer at Alexandra Palace.

In this presentation the part of The Man will be played by William Devlin.

Viewers who can remember the early television production of the play will be impressed by the contrast in production methods. In the old days only one camera could be used and it could not track

FOR HIGH SPEED

IN order to get very bright though small pictures on a cathode-ray tube screen so that the picture may be enlarged by projection, special electron-gun arrangements have to be made. The following brief details of the gun system used in the American tube for projection are of interest.

A particularly fine beam is required, and as a "kick-off" the electrons are first passed through three guns in the form of discs with centre holes about the size of a pencil's lead. But the beam is still too wide after this, so that it then has to pass through a fourth disc in which the hole is so fine that it compares with the thickness of a human hair.

The resulting bombardment on the screen of the tube is so intense and at such high speed that special fluorescent materials are required to stand up to it.

CIRCULAR-SCAN C-R TUBE

A CATHODE-RAY tube with novel features has recently been devised. Although at present intended for circuit investigation, the method of operation is interesting and might easily in the future find some application directly to television.

The normal oscillogram is produced on a straight axis, and in circuits of great frequency it is possible for some effect to be missed during the fly-back of the spot. In the new tube a completely circular axis is utilised so that the effects of the circuit to be examined are continuously visible.

The first feature of the tube lies in the production of the circular movement of the beam. This is achieved by means of what has been termed an electron motor.

The essentials of the electron motor are two deflecting plates opposite one another on either side of the beam and two external electromagnets arranged at right angles to the deflectors. When connected up to a suitable time-base circuit these produce the necessary revolving field to cause the electron beam to make its circular scan. The diameter of the circle is variable by means of a resistance in the time-base circuit.

On its way to the screen the circular-moving beam has to pass through the plates of a cone-shaped condenser of co-axial design. It is to this condenser that the potentials of the circuit to be examined are applied.

Apart from removing any chance of missing anything during the fly-back time in a normal straight-line oscilloscope, the circular path is also about three times as long as the straight-scan path that could be obtained on the same size of tube.

CATHODE-RAY AUDITIONS



Quite apart from television, the cathode-ray tube is being used for more and more scientific purposes every day. Here you see a device erected by an N.B.C. engineer to assist at auditions in checking up the tonal qualities of notes produced by aspiring broadcasters.

forwards or backwards. In producing "The Man with a Flower in his Mouth" Royston Morley will employ all the devices of modern television and will introduce a concealed camera taking shots through the window.

SEEN ON THE AIR

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

L. MARSLAND GANDER

I WONDER how many viewers saw Mr. George Bernard Shaw when he made his first brief appearance as a television artist? Very few, I am afraid.

The mistake was that Mr. Shaw appeared unannounced at the end of a transmission. This, perhaps, would not have mattered so much had it not been for that fatal word "Interval," which, sprawling across the screen inopportunely led most people to assume that the programme was at an end. Mr. Shaw's play "How He Lied to Her Husband" had just concluded, and it appeared as if the engineers were only awaiting the closing announcement. Most viewers, I suppose, switched off.

I only labour the point because it shows how essential it is to tighten up the programmes by elimination of all unnecessary pauses and intervals.

Mr. Shaw, paying a visit to Alexandra Palace on the occasion of the first television broadcast of one of his plays, saw the production on a receiving set. Towards the end he walked down into the studio with Mr. Gerald Cock, the Television Director, and agreed to come before the camera. I happened to be in the studio

SNAPPED AT BRIGHTON



No, Mr Leslie Mitchell was not on holiday. This untouched photo was taken by a Brighton viewer as the announcer appeared on his television screen.

when the veteran figure of Shaw stepped briskly through the door, an active stride making light of his eighty years. The idea was that he should appear through a "property" door at the back of the "set," and advance towards the camera to say his piece. Mr. Shaw scorned Mr. Cock's suggestion that he should rehearse the manoeuvre.

The consummate actor, he peered furtively round the door, and then marched into close-up. I made a hurried note of his speech. "I hope you will pardon this intrusion," he began. "You might not suppose it from my veteran appearance, but the truth is that I am the author of that ridiculous little play you have just heard.

"This is a very special occasion, because as a writer of plays I never come before the curtain and accept a call. But, you see, on this occasion you have not called me. You are not like the unfortunate people in the theatre, who, no matter how much they are bored, cannot get up and go away.

You who are still listening show your interest by that very fact. I myself very nearly went to sleep in the middle of it."

Mr. Shaw went on to say that he thought it a good idea that people watching a play should know something of the man who wrote it, and should be able to see him. He also made some allusion to the "millions" who were listening and watching, thus, I am afraid, greatly over-estimating the magnetic attraction of his play and the number of persons equipped with receiving apparatus.

A Disappearing Trick

Mr. Shaw then did a disappearing trick which caused considerable amusement in the studio. He made an exit through the property door and closed it. The transmission having ended, tension was relaxed, and Mr. Cock stepped forward to open the door and release the captive. Television has such cramped quarters that the three sides of the "room" in which the play had been performed were close up to the walls of the studio.

When Mr. Cock opened this door expecting to disclose Mr. Shaw, he stepped back hurriedly with the air of a disconcerted conjuror. Mr. Shaw had vanished. There was an astonished silence, and then a general laugh.

Presently Mr. Shaw, having squeezed with some difficulty round two sides of the "room" in between the scenery and the wall, negotiating stray wires and paraphernalia, emerged into the light. No doubt he thought there was a danger of bursting out of the door before the transmission had ended.

I have a fancy that if "G.B.S.," the pioneer, were a young man now he would be a television critic, or, at least, a radio critic. Woe betide the B.B.C. if the clock could be set back a generation! Yet I know nobody else who can launch barbed shafts that cause so little hurt.

When Mr. Shaw emerged from behind the scenery I spoke to him and found that the "burning" question uppermost in his mind was "Who chose this particular version of 'How He Lied to Her Husband'?" It ought to be burned."

I tried to steer Mr. Shaw, with partial success, to other topics. Television he thought would be all right when we had a full-sized screen. Yet he admitted that after a short time one got used to the small screen. "So you were impressed with television?" I said. "Not in the very least," he flashed back.

All Too Short

It is a source of very great regret to me that at this point I had to end the conversation, as somebody tugging at my elbow tactfully reminded me that I had promised not to pester Mr. Shaw with questions. And, besides, the cast were being introduced.

Mr. Shaw was scathing about his play, but I would remind him that it was the

successful "curtain-raiser" of 1904. We may regard "ridiculous little television" of 1937 as lifting the curtain to a new era of entertainment not so far ahead. His reply to me was, after all, nothing but the expected Shavianism.

And, by the way, it is Mr. Shaw's own fault if the radio audience cannot hear and see more mature specimens of his work. His well-known objection to cutting and adaptation makes the majority of his plays unmanageable in length and verbosity.

During the week under review there have been a number of successful programmes. "Derby Day," the A. P. Herbert-Alfred Reynolds opera, made a delightful entertainment. Tessa Deane as Rose, Frederick Ranalow as John Bitter, George Baker as Sir Horace Waters, and Frank Drew as Bert Bones, made a strong cast.

I found the television version much superior to the radio version. This is no reflection on the radio producer, but merely another glimpse of the obvious. Comic opera and musical comedy are not, in my view, ideal subjects for sound programmes. Vision makes a world of difference.

SEEN ON THE TUBE



Another television snap taken at Brighton. The two photographs were referred to by Mr. Gander in his notes in "P.W." last week.

A special word of praise also for "Douanes," a bright, lively show, with Eric Wild and his Tea-Timers, Valerie Hobson, Ernst and Lotte Berk.

Like our old, old friend the schoolmaster who professed to be hurt more than the boy who intercepted the cane with his bare flesh, may I say that I hate to end on a discordant note. But I cannot avoid further lament about the closing of Alexandra Palace transmitting station between July 24th and August 16th.

Naturally, the manufacturers are annoyed, and the B.B.C. have begun to hedge. Who can be expected to invest in a set at this moment when the station is about to shut down for three weeks? Stop the transmission and stop sales, you also stop research. So now the Davis Cup matches will be broadcast for a couple of days during the hiatus, and for the rest of the time the black cross tuning signal will be radiated.

FROM OUR READERS

(Continued from page 466.)

I see this week that Mr. King mentions oscillating crystal sets. Had a lot of fun out of this idea about 1924 or 1925. The circuit used was, I believe, invented by a Russian, and employed two crystals—one for signal location, an ordinary galena—and the other, the oscillation generator, was of specially fused zincite with a steel catwhisker.

There were two battery supplies to the idea, 4½ and 9 volts, and a potentiometer made from curtain-rod, 4 B.A. studding and "Concordin" wire was used to get the oscillation to commence.

The method was to locate a station on the galena crystal, throw over a S.P.D.T. switch and wangle the steel catwhisker till oscillations commenced, and then search, usually higher up the dial, for the station. Presumably, this was caused by a beat frequency between the natural one of the zincite crystal and that of the received signal.

Anyhow, I used to get real results from 2 LO (120 miles) and from one or two Continentals, the only fly in the ointment being that the affair was gloriously unstable, and would howl its head off if one so much as breathed on it.

I was also able to introduce reaction after a good many efforts.

I believe that the circuit, which I have no longer got, could be obtained at that time from Messrs. Russell (of Hertizte fame), who supplied the specially fused zincite. The appreciation of nearby listeners was not too great when they received the howls on their sets.

Wishing you and all "P.W." staff all the best, and continued success for "our paper."

HAROLD G. CHAMBERLAIN.

46, South Street, Draycott, nr. Derby.

TEST EVERYTHING!

The Editor, "Popular Wireless."

Dear Sir,—Having read Mr. Chester's very interesting articles on building a short-wave set, and its attendant troubles, I thought the following experience of mine might interest other readers. An O.V.O. was rigged up, using home-made coils suspended on beehive insulators, the circuit following the lines of the Hartley. Using a power valve as detector, results were very good and 20-metre amateurs flocked in.

The set worked well for a few days; then trouble began. A grating noise such as a loose wire-gives was heard. Everything appeared to be O.K., but I spent a considerable amount of time locating the fault. First the aerial was disconnected—still the same. "A little dust in the condenser vanes," I thought. Each one carefully dusted, but no better. Every wire tested for continuity, including earth return wires; still no difference. Valve, grid leak, grid condenser, H.F. choke and valve holder legs carefully inspected, but the noise just the same.

By this time I was getting exasperated. Was it the phones? No; practically a new pair! Was it the accumulator? Another was tried, but still the irritating rustling sound in the phones. Could it be the H.T. battery? "No," I thought. "It is nearly new, having only used it a few times."

But, to satisfy myself, I procured another, and the result—everything as clear as a bell! The volts were there, but some internal fault had developed whereby this annoying noise could be heard.

Moral: TEST EVERYTHING!

R. HOPPER.

130, High Street, March, Cambs.

A SUPER CIRCUIT LOST?

The Editor, POPULAR WIRELESS.

Dear Sir,—A few weeks ago I constructed a three-valve resistance-coupled set consisting of a detector and two low-frequency valves. The output valve was a pentode. The results were quite good, but on very heavy notes, such as a loud chord on the piano, there was a certain amount of distortion.

By inserting a milliammeter in each H.T. lead in turn (it is a battery set), I was able to trace the distortion to the first low-frequency valve. This was evidently caused by the voltage being too greatly reduced by the anode and decoupling resistances. I changed

over the valve holders, cut out the last stage of amplification and inserted the pentode in the second valve holder, thus making a simple two-valve detector set.

On switching on, I was astonished to find that I was getting superlative results. Many more stations than before came in quite free of interference, and much greater volume and of beautiful quality.

Splendid, I thought; everything in the garden's lovely. Why have a three-valve when I can get such results with two?

As a precaution, I put the milliammeter in circuit, to see if the valves were receiving their correct current, and was shocked to find that the reading was 25 m/a, whereas the old three-valve took under ten. Anyway, I thought, to get range and tone like this is worth a bit of extra juice. Strangely enough, putting up the bias did not alter the consumption or affect the volume and tone at all.

I therefore pulled the set to pieces and re-built it as a two-valve, taking care to place the components in the same positions as before, naturally expecting to get the same wonderful results. Not a bit of it. The results were very weak and feeble, and the H.T. current had fallen to 7 m/a. The only explanation I can think of this mysterious business is that in some way I must have made some connection which caused a feed-back. Several times since I have tried to duplicate this circuit, but have always failed. I have called it "my inadvertent circuit."

I am afraid this reads a little like a fairy-story, but I guarantee every word of it. As a correspondent in your paper said the other week, "strange things sometimes happen in the world of radio." Perhaps some reader will be able to explain what happened.

C. CASTLE.

Orchard Bungalow, Riverwoods, Marlow.

PIRATING A CALL

The Editor, "Popular Wireless."

Dear Sir,—We shall be obliged if you will give publicity to the fact that the call sign of the Experimental Station at these Works (G 6 S L) is being illicitly used on the 7 m/c. amateur band. Some time ago Morse contacts were reported and recent information indicates telephony transmissions of particularly bad quality.

The transmissions from G 6 S L are confined to the 56 m/c. band, and at present the station is in the process of reconstruction.

If any readers will give us information which will enable us to trace the offender, we shall be most grateful.

A. C. EDWARDS

(For Stratton & Company, Ltd.),
Eddystone Works, Bromsgrove Street,
Birmingham, 5.

THE THREE-FOLD CORD

The Editor, POPULAR WIRELESS.

Dear Sir,—In these troubled times, when many countries seem to be looking towards the English-speaking peoples for disinterested help and guidance, it is encouraging to note that English-speaking youth is preparing to offer a lead. In the movement known as the Three-Fold Cord, which seeks first to unite in close friendship the youth of Great Britain, the British Commonwealth, and the United States of America, we see an opportunity to build up a world unity of all nations respecting justice and loving freedom. Membership of the Three-Fold Cord should prove a real education to young people of all ages, and particularly to those who want guidance in establishing the new world on Christian principles. We recommend all parents and teachers, as well as all grown-up children, to write for particulars of membership. Donations, which are urgently required, should be sent to E. R. Appleton, Founder Three-Fold Cord, The Guildhall, Barnstaple, Devon, England.

(Signed)

WILLIAM EBOR (Archbishop of York).

MALCOLM CAMPBELL (Knight).

L. W. GRENSTED (Noloth Professor of the Philosophy of the Christian Religion, Oxford University).

CYRIL NORWOOD (President of St. John's College, Oxford, formerly Headmaster of Harrow School).

B. SEEROHM ROWNTREE, C.H.

F. S. WATERHOUSE (Professor of the Philosophy of Religion in the University of London).

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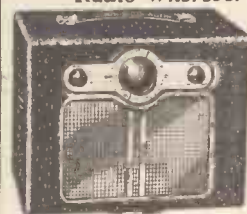
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QUESTIONS AND ANSWERS

By K. D. ROGERS

SEPARATING THE L.F. FROM THE H.F.

HOW IT IS DONE

A. W. (Torquay).—Will you tell us how the H.F. in a set is finally separated from the L.F.? I have always been given to understand that the A.C., after passing through a valve, became D.C. I take it this is so, but it's a pulsating D.C.

Readers must forgive me if I take up rather a lot of space with this, and the technically minded ones must overlook the loose expressions and rather unscientific language. It is only by everyday description that we can get this sort of explanation over in a comparatively few words.

Let's start at the speaker. What do we want to operate it? The answer is that the diaphragm must move at A.C., i.e. at speech frequency, or, in other words, at frequencies between, say, 50 and 10,000 cycles per second. These give musical notes, and the strength of the notes depends on the amplitude, or "size" of the A.C. cycles.

It is the diaphragm that matters. If we can get that to move at A.C., it does not matter if we have A.C. or fluctuating D.C. going into the speaker.

How do we obtain our movement? At the transmitting station a wave of high frequency is sent out, modulated or controlled in strength from time to time by A.C. at speech frequency.

Two Sets of Waves

We therefore get two sets of waves at the receiving station in effect. We get the H.F. and we get the effect of the L.F. wobbles on it, there being perhaps only one complete A.C. cycle for every 10,000 H.F. cycles, giving a note of, say, 100 cycles on a transmitting frequency of 1,000,000 or 300 metres.

The effects of the 100 cycles A.C. are applied on both positive and negative half-cycles of the H.F., and we have to rectify this in order to get the A.C. sorted out from the H.F. We therefore cut out either the top or bottom part of the H.F. cycles, and are left with the half-cycles containing on them the A.C. modulation which is not cut in half.

This fact is difficult to explain, but perhaps the diagrams will help. (1) Shows the H.F. without any L.F. (2) shows the L.F. which is going to be modulated on to the H.F. (3) shows the H.F. with the effect of the L.F. on it. Note how it rises and falls in amplitude above and below a mean line. Then (4) and (5) show the rectified H.F. (top and bottom halves) with the complete L.F. effect still there.

Actually, of course, there are slight time gaps between successive H.F. halves, but as they are merely matters of perhaps 500,000ths of a second they do not matter. The whole crux of the thing is that we have got the true L.F. form, and can use either the top or bottom halves of the H.F.

We rectify the H.F. so that we shall get the whole L.F. form above that mean line (which I have marked A), for then we get in the valve's anode

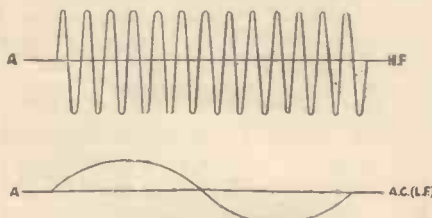


Fig. 1 (top), shows the H.F. carrier wave without any modulation. Fig. 2 (lower diagram) depicts the L.F. which is going to be modulated on to the H.F.

circuit a complete control of anode current, rising and diminishing, but always positive, as it were, or always negative.

If we were to let the whole H.F. through, we should get both positive and negative effects, and the result would cancel out.

I hope that, in spite of the loose description, you will see what I mean. It is not an easy thing to explain at the best of times, and in a short space it is even worse.

Now we have got in our detector-valve anode circuit fluctuating D.C. (the anode current controlled by the A.C. of the L.F.), and we have got the H.F. component as well. That is, the halves of the H.F. cycles. We don't want them. They simply lumber up the valves and prevent us from giving as much L.F. amplification as we would like. For you must remember that, though shown as a strong cycle in the diagram, the L.F. is often but a tenth of the strength of the H.F. and never rises in British transmitters to more than 80 per cent. of it.

We get rid of the H.F. by means of by-pass condensers which will pass the H.F., but will offer

high resistance to the passage of L.F. Then we pass the L.F. by means of a transformer (remember that, in fact, it is D.C. rising and falling, for it is merely the anode current of the detector) or through a condenser to the grid of the amplifying valve.

Now, if you apply fluctuating D.C. to a condenser or a transformer, you do not get D.C. "out of the other side." You get perfect A.C. bearing on both half-cycles the exact characteristics of the fluctuating D.C. you have "put in." That is what we want, so that at the grid of the L.F. valve we have A.C. low-frequency and no H.F.

From then on we keep the valves from rectifying by operating them on the middle points of their grid

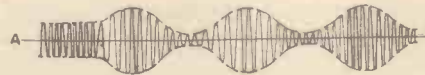


Fig. 3. Here you see the H.F. with the L.F. modulations.

voltage-anode current curves, with the result that the anode currents are controlled at A.C. Once again, however, we have fluctuating D.C. in the anode circuit, although it is amplified. So we apply it to another transformer or condenser, and turn it into A.C. again. This goes on until we reach the loudspeaker.

Then we apply the output of the last valve to the speaker. If we do it through a transformer or a condenser, we get A.C. in the speaker. If we pass the anode current right through the speaker itself, as in the case of the old-type magnetic speaker and in the case of headphones, we get the anode current D.C. with its rise and fall in value in accordance with the A.C. caused by the music.



Figs. 4 & 5. The rectified H.F. (top and bottom halves) with the L.F. effect still there.

In either case, the effect is the same. The diaphragm of the speaker is made to be attracted to a more or less degree to the magnetic field of the speaker, or is attracted and repelled alternately, and that results in the diaphragm wobbling in an A.C. manner. That is, it goes in and out, and we get the A.C. air wave, or compression and rarefaction.

I hope this is clear. The anode currents of the valves are certainly fluctuating D.C. in that they never reach zero and reverse direction: but the effect on the speaker at the end of the chain is one of A.C., and we turn the impulses into A.C. at each step in order that we shall be able to amplify the signals.

OH, THAT ROW!

P. S. (Glynde, Lewis) has to put his fingers to his ears every time he tunes his set above Droitwich or to the upper ends of the other tuning scales. It crackles and hisses, probably won't oscillate properly, or if it does the row is ten times worse. Yet the set is perfect lower down.

I am not going to pretend I know what the trouble is, but I should not be surprised if either the tuning condenser was dirty between the vanes or one or more of those vanes was trying to touch the fixed vanes—and succeeding. Possibly the touching is done through the agency of a little dirt—a speck of

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

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

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

solder, metal dust, or even common dirt. Or it may be that the spindle has a certain amount of play and allows intermittent touching when the condenser is meshed to a certain extent.

You can soon prove it, P. S. Turn the condenser until the noise starts on the long wavelength. Then switch the wavelength of the set to another band. Probably the noise will be there also, and if you turn the condenser back it will stop immediately. In other words, find out if the trouble starts with the condenser at the same point, or practically the same point, on each wavelength.

If it is not that, the cause is an obscure one, probably bound up with instability of the set at certain tuning points, and it will need a careful overhaul by an experienced man to find it.

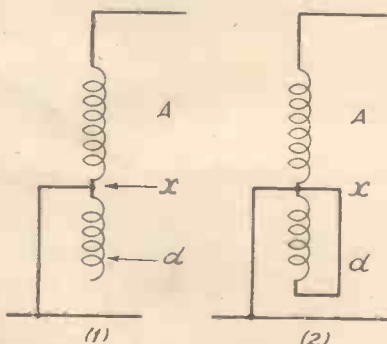
FOR BACK NUMBERS

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TECHNICALITIES EXPLAINED—No. 60

DEAD END

When an inductance coil is not wholly used and the unused part is left with a free end as in Fig. 1, that free end is said to be a dead end. It is capable of causing serious loss of efficiency owing to its capacity and its power of absorbing energy owing to the coupling with the active part of the coil. The dead end will resonate due to its own self-capacity and may cause serious tuning troubles, being in effect a tuned coil tuned to one fixed frequency hanging on to and being coupled with another tuned coil. It is best always to short-circuit any dead end, Fig. 2, if it is impossible to arrange matters so that a dead end is avoided altogether.



THE DIAL REVOLVES

(Continued from page 460.)

H P B, Geneva, on 38.47 metres, provided me with a pleasant surprise the other night; but more to my liking was T I 8 W S, Punta Arenas, Costa Rica, on 39.47 metres, a station that came in at moderate strength.

By the way, have any of you boys heard the new Alderney station yet? I picked up a powerful station testing on approximately 49 metres the other day which appeared to be Alderney Radio, as this unlicensed station is called (our G.P.O. will give 'em socks!).

WILL YOU HELP?

Remember my remarks about mistaking G 8 K L for an "Aussie," and my subsequent disillusionment? Mr. William Sturme, operator of that station, has written apologising right royally for "being the unwitting cause of your anguish!" Granted, my dear sir, but don't let it occur again!

Actually, G 8 K L sent me one of the most interesting letters I've had for some time. It's his contention that to pick up a 10-watt "G" on 20 metres out of a 15 miles radius is rarer than pulling in a VK. Well, that's another way of looking at it, I admit.

And now, boys, I'm inviting you to do a little detective work in the name of—no, not Sherlock Holmes, but science! I'll be delighted to hear how many of you have heard "G's" on the 20-metre band (and their power, if possible). This information will be passed on to our mutual friend, G 8 K L, who is interested in the matter. Indeed, he's a regular G-man!

MY SHORT-WAVE ADVENTURES

(Continued from page 463.)

the way, that I could still hear Wayne quite clearly when I had dropped down to as little as 45 volts. Perhaps with a two-valver even less "juice" might suffice—and then the batteries would be a less weighty problem, especially with a very small jelly-acid accumulator for the low-tension supply.

For the summer holidays, it seems to me a portable short-waver is a far more exciting proposition than an ordinary broadcast portable. One can usually listen-in on the hotel or boarding-house set away, but why be denied the joys of real DX when it is so easy to have short waves wherever you go? Why, indeed.

Trying Lower Down

Just for fun, I dropped down on to the Weald afterwards—and parked the car in a truly rural scene, with cows chewing the cud and all. Whether Wayne had then gone off the air I don't know—but nary a sausage could I get.

The "locals"—Rome and Zeesen, as well as Daventry this time—were quite strong, so perhaps Wayne had just gone. All the same, I do think it best to get up as high as you can when perambulating the countryside.

It is a bit of an obsession with me, this height business. I have even gone to live 700 feet up above sea-level to make sure I get good DX on the short waves. Could the DX bug bite deeper than that?

OUR CLUB CORNER

THE Southend and District Radio and Scientific Society held a very successful direction-finding contest on June 27th, when twenty-three members scoured Essex with portable receivers in an endeavour to trace a hidden transmitter, operating on a wavelength of 155.8 metres. The transmitter was well concealed, and only one competitor—Mr. Maurice Tapson, G6IF—succeeded in finding it.

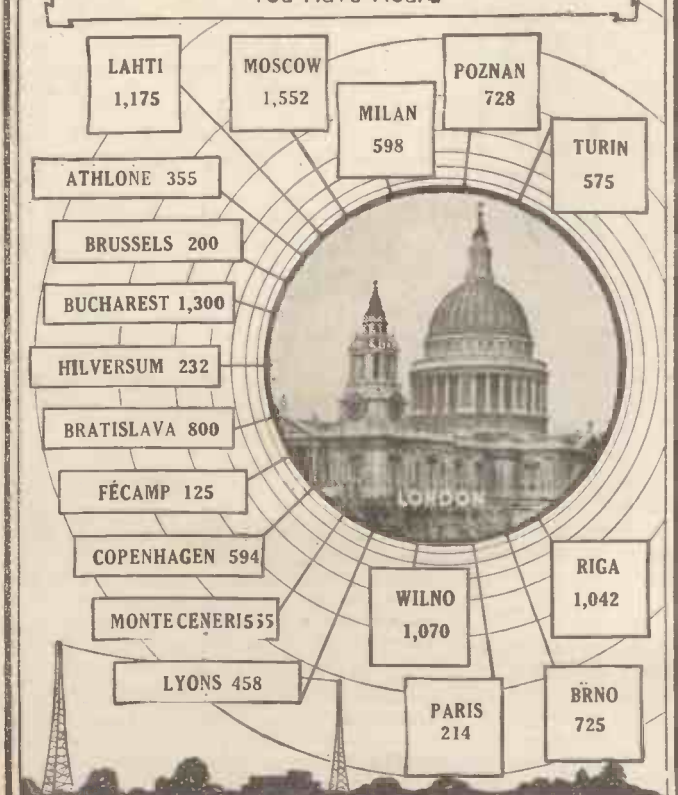
A series of similar events will be held during the summer months, and the hon. secretary, Mr. F. S. Adams, of 27, Eastern Avenue, Southend-on-Sea, will be pleased to hear from any members or other societies who would like to take part. Indoor meetings are also being held at intervals during the summer, and the full programme of lectures will be resumed in September.

NEWCASTLE RADIO SOCIETY

Excellent commodious headquarters have been obtained at 2, Duke Street, Newcastle-on-Tyne, where prospective members will be welcomed at the meetings on Thursdays, 7 to 10 p.m., Sundays, 6 to 9.30 p.m. A programme has been arranged for newcomers to radio, which is also a refresher course for the experienced. Morse instruction is given in the final half-hour of every meeting. Non-members are invited to attend, moreover. A visit to the Newcastle studios and transmitter is being planned and additions to our party can be arranged.—The Hon. Sec. is Geo. C. Castle, 10, Henry Street, Gosforth.

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WE TEST

THE "WAYFARER" MAJOR PORTABLE

THE small size of the majority of modern portables is largely responsible for their fascination. So that there is something doubly fascinating about the "Wayfarer" Major model since it is smaller than most.

But in spite of its extra smallness the results given are most excellent, reproduction being particularly attractive as provided by the moving-coil speaker. Excellent finish is another of the outstanding points about this portable.

The circuit, a straight one, has four valves. These are a screen-grid H.F., leaky-grid detector which is R.C.-coupled to a triode L.F., and a Harries output valve filter-transformer coupled to the triode L.F.

Air-spaced Condenser

An air-spaced gang condenser is employed, and this is separately trimmed on the medium and long wavebands. An attractive large-diameter slow-motion dial is fitted and is calibrated in wavelengths and station names. A permanent turntable is fixed to the underside of the cabinet.

The weight of the receiver is 14 lbs. and the dimensions as follows: 12½ ins. high, 8½ ins. wide and 6½ ins. deep. The leather carrying handle is instantly removable if desired.

The photograph accompanying this article will give a good impression of the general arrangement of the receiver. The three controls—volume, switching and tuning—are arranged under a small lid which lifts on the top of the case. This lid can be locked in the closed position with a key provided, but in doing so the back of the

An excellent, really small portable characterised by superior finish.

receiver is also locked on. This is achieved by a spring loaded plunger which is pushed in by closing the lid. Incidentally, this spring also partly lifts the lid when the catch is undone, making the lifting of the lid very convenient.

The instrument is covered with leather cloth which may be in one of seven different colours. The particular model we had for test was in polished wood, since it was intended to match up with the interior of a caravan, and no doubt other polished wood ones are available if specially specified.

The accumulator, an unspillable one, should give about thirty hours running for each charge.

Although the high-tension battery is of only 75 volts, the volume is ample and, as already mentioned, the quality excellent.

Sensitivity is extremely high; in fact we did not find any point in making use of the sockets provided for an external aerial and

earth. This high sensitivity was maintained on long waves as well as medium.

On local stations it proved necessary to turn the direction of the portable away from the station to keep volume to a desirable level, while the calibration of the dial was remarkably accurate. Tested both near London and at the side of Southampton Water, many foreigners were received with excellent volume, good station separation being another noticeable feature.

At Southampton Water, on quite low ground, some of the Continental stations came in almost like locals. Several alternative programmes were always to hand, both in daylight and at night.

Good Value

The Major is a portable that we can recommend with every confidence, and at its price of seven guineas it is good value for money. There is a seal on the chassis so that a guarantee of one year, exclusive of valves and batteries, may be given with the instrument.

The "Wayfarer" Major, a British set, is handled by The High Vacuum Valve Co. Ltd., 111-117, Farringdon Road, London, E.C.1.

READY TO USE



The controls are covered by a neat lid on top of the set.

Interference From Lightning-

LIGHTNING is one of the main causes of the form of wireless interference known as atmospherics, and those of you who go in for long-range listening well know the crackle of the lightning flash in the receiver.

In this country we have comparatively few lightning storms, and listeners sometimes wonder how it comes about that lightning is so frequently heard in a receiver when the storms appear to be so rare.

This is because lightning is continually occurring in different parts of the world and a long-range receiver will pick it up even though it may be a great distance away.

Frequent Electrical Discharges

Electrical discharges in the atmosphere are, in fact, exceedingly numerous, far more so than you would imagine if you judge merely by the relatively scarce appearance of lightning storms in the British Isles. Lightning is much more prevalent in some other countries than it is here: it occurs very frequently in some parts of South Africa, also in Italy, some parts of Spain and in some of the more easterly parts of Europe. In certain parts of South Africa brilliant lightning storms are almost a nightly occurrence.

You will see that although lightning may occur infrequently at any particular place in the British Isles, there is always plenty

★ TECHNICAL JOTTINGS ★

Items from a Radio Expert's Notebook

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

of lightning going on in some part or other of the world within range of a modern receiving set.

A well-known German meteorologist has recently been making some calculations about all this, and he tells us that something like one hundred lightning flashes occur throughout the world every second. There are some three thousand observatory stations, including the official stations and a large number of private ones, spread out over the globe and, from the information which is gathered by these stations, scientists are able to get a bird's-eye view, so to speak, of world weather, in which thunder-storms are one of the most important factors.

Thunder-clouds

Thunder-clouds will carry up to 30,000 tons of rain, sufficient to fill 6,000 large railway trucks. The reason for the sudden heavy shower of rain which accompanies a thunder-storm is that there is often a very powerful upward current of air, produced by thermal effects, and this prevents the rain

from falling, but the rain accumulates and the moment the upward current ceases down comes the rain in a terrific shower.

I dare say you have read of experiments in England and America in connection with the artificial production of very high electric voltages, as much as a million volts having been so produced. The voltages in thunder-clouds, however, are estimated to be vastly greater than anything we can produce by artificial means. An electric tension of 5,000 million volts is believed to be the kind of condition reached sometimes in a severe storm. This electromotive force, with a current from 20,000 to 50,000 amperes, would be sufficient, as you can easily work out, to supply electric power for industrial purposes on a large scale.

Power From the Sky

Two scientists of the Berlin Institute of Physics have lately been making attempts to collect large quantities of energy from thunder-clouds and to use it for power purposes. One experiment was carried out in a rocky valley in the North of Italy, noted for very severe thunder-storms. An elaborate wire-netting arrangement was hung up between the slopes of the valley and the electric energy from the air was brought to an arrangement of electrodes. In this way a spark over 50 feet long was produced, the electromotive force behind

(Continued on next page.)

TECHNICAL JOTTINGS

(Continued from previous page)

it being calculated to be in the region of ten million volts.

It is obvious that experiments of this kind are attended with great danger to the observers, as the apparatus has to be erected at a time when it is believed—or hoped—no lightning flashes will occur. Any manipulation of the apparatus is extremely hazardous, as it is impossible to know with any certainty when the atmospheric conditions may be considered to be safe.

The Radio Passenger

You may remember we were talking in these Notes some time back about the effect of car radio upon the attention of the driver. When car radio was first mooted, a lot of people thought that it would be a distraction to the driver and he might not be able to give his attention to the road.

At first sight this would appear to be a pretty reasonable criticism. We all know that driving in these days, especially in the crowded streets of London, or any other large city, needs every bit of attention on the part of the driver, and nothing is more irritating or distracting than to have someone sitting in the car pestering the driver with a forced conversation.

Keeps You Awake

But as regards a radio set in the car, curiously enough this has quite a contrary influence. As soon as you begin to consider it more carefully, and especially when you have any actual experience of it, you find that it has a soothing effect on the driver, and, so far from taking his attention away from his job, seems to act as a screen which shuts out other causes of distraction. For one thing it merely talks or sings to him and demands no particular response on his part.

Unlike the living passenger it can be listened to with varying degrees of attention or ignored altogether. On a long journey it is a very definite benefit because in these circumstances, as every car owner knows, the tedium is inclined to make you sleepy or to make you so engrossed with your own thoughts that you may get almost oblivious to your driving.

This is a very real danger, and it has been found that the companionship of a radio set keeps the driver fully awake and alive to what he is doing, and completely obviates that peculiar form of day dreaming with which he is otherwise so apt to be overcome.

The Amenity of Radio

Another important factor in connection with long road journeys is that the amenity of the radio makes the journey, if not enjoyable, at any rate much less irksome, and consequently relieves the driver of the well-known temptation to "step on it" and get the journey over. The temptation to speed and scamper on a long journey is a great danger, and one which we have all experienced; radio-in-the-car largely does away with this and, if it does not give us a reason for drawing the journey out, it makes us tend, at any rate, not to over-hurry it.

These observations are not entirely my own; they are based on careful observations of some of the leading manufacturers of car-radio sets both in Great Britain and the United States. I must say that from my

own experience I endorse them, and I expect most of you will do the same.

Worth Considering

There are still a very large number of cars in use which are not equipped with radio, and I can only recommend those of you who run cars not so equipped to give attention to this question, as it is one really worth looking into.

Car radio sets can now be obtained at quite reasonable prices; they are designed for very easy fixing into the car, and the old trouble of interference from the engine ignition system has been effectively overcome by the use of suitable suppressors.

In fact, radio-in-the-car is now a really good proposition from every point of view, and the various objections raised to it, whether on psychological or practical grounds, either do not exist or have been overcome.

Commercial Superhets

A large percentage of commercial receivers sold nowadays are built on one variety or another of the superheterodyne circuit and the proportion of home-made superhets is probably much less. At one time the superhet was the plaything of the advanced amateur constructor, and there were relatively few superhets commercially made. But with the improvements in the superhet circuit, it has now come into great favour as a commercial unit, whilst the construction of the set by the amateur constructor requires very careful attention to arrangement and adjustment to avoid instability.

When a set of this type is tuned to a powerful station you sometimes get a background of noises, whilst in other cases, although the instability may not be so bad, you get a curious form of distortion of signals, especially when these are loud.

The Pentagrid Stage

The pentagrid stage is one of the places to look for trouble, and if you find it you might try introducing a condenser and high-frequency choke, so as to decouple the pentagrid valve—the condenser should have a capacity of one microfarad.

Another dodge which is worth trying is to screen the valve by a suitable cover. These simple precautions will as a rule get over the difficulty mentioned unless, of course, there is something seriously wrong with the set or the layout, or with the matching of the components.

The outstanding features of the superhet circuit are its great range and its extraordinary selectivity. In the old days the construction and operation of a superheterodyne receiver were relatively complicated, but nowadays this type of set has been greatly simplified and the operation is comparatively straightforward. The construction is still rather tricky but, inasmuch as most of the sets of this kind are now commercially manufactured, that does not need to trouble the owner of a set.



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ceive the old
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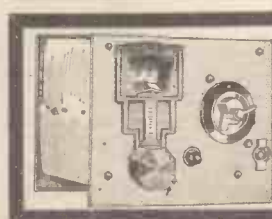
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MARCONI—THE MAN AND HIS WIRELESS

(Continued from page 471.)

the Atlantic without any intermediate stations."

The American Institute of Electrical Engineers arranged a Marconi celebration in the uniquely decorated Astor Gallery of the Waldorf-Astoria.⁵ On the wall, back of the guests' table, was a black tablet framed in smilax and studded with electric lights that spelled "Marconi." At the eastern end of the gallery, above the 300 diners, was a tablet on which, traced in electric lights, was the word "Poldhu," and on the western end was the word, "St. John's." These tablets were linked by a silken cable festooned along the wall of the gallery, and on the cable tiny electric lamps were distributed to make at intervals the letter "S" in the Morse code.

The guest table was ablaze with tiny electric lights peeping from banks of smilax and surmounted by bouquets of American beauty roses. On the menu cards was a half-tone picture of the inventor in the centre of a scene representing the transmission of the first wireless message across the ocean. The galleries were jammed with spectators.

The cue for the first applause of the evening was the entrance of a long procession of waiters bearing aloft the ices which were surmounted by telegraph poles, steamships and sailing vessels fitted with wireless. The telegraph poles were made of solid ice.

"Frozen out," was the prophetic cry of the diners as they saw the crystal poles—did they signalise the end of the telegraph? Marconi rose and clapped his hands in glee. Then the signal "S" began to flash from the tablet, "Poldhu," as Dr. Charles Proteus Steinmetz, president of the Institute, called the diners to order, and turned the meeting over to T. C. Martin, toastmaster for the occasion.

A letter was read from Thomas Alva Edison: "I am sorry not to be present to pay my respects to Marconi. I would like to meet that young man who has had the monumental audacity to attempt and succeed in jumping an electric wave across the Atlantic."

"I was talking with Mr. Edison within the last ten days," reported Mr. Martin, "and he said that he thought that some time there might be daily signals across the Atlantic without wires, but that he did not know when, and being preoccupied he did not think he would have time to do it himself. (Laughter.) He said to me, 'Martin, I'm glad he did it. That fellow's work puts him in my class. It's a good thing we caught him young.'" (Laughter.)

There were more cheers when the toastmaster turned to a letter from Nikola Tesla, who said that he felt he "could not rise to the occasion. . . . Marconi is a splendid worker and a deep thinker . . . and may prove one of those whose powers increase and reach out for the good of the race and the honour of his country."

The toastmaster's presentation of Marconi was brief: "For an introduction to such a man, look about you!"

Amid a salvo of applause the young inventor rose, and began to speak in a low but distinct tone without gestures;

with a modesty almost amounting to diffidence he told of the various disappointments leading up to his triumph:

"I can hardly find words to express my gratitude and thanks for the reception I have received here to-night. I thank you very much for the appreciation of the work which I have been fortunate enough to carry out. I feel myself to be highly honoured to be entertained by such a great body as the American Institute of Electrical Engineers. I think it is well known all over the world that Americans stand first in applied electrical engineering. I feel myself greatly honoured to be in the midst of so many eminent men, whose names are household words in the whole civilised world.

"With your permission I will give you a brief description of what my system has at present accomplished, especially in reference to use on ships, and what I hope it will accomplish in the future.

"Wireless telegraphy is now attracting very great attention all over the world, and its progress is not slow. Five years ago the system with which my name is identified was working over a distance of about two miles, but its range has been rapidly increased until a few months ago it was quite possible to communicate by means of an improved and attuned system over a distance of more than two hundred miles. The commercial application of the system has been given serious consideration, and improvements of importance have been made.

"It may interest you to know that the commercial application of the system has been tried in Great Britain, its chief base being in England. There are more than seventy ships carrying permanent installations for wireless telegraphy; of these, thirty-seven are in the British Navy, twelve in the Italian Navy, and the remainder are on the large liners, such as the Cunard Line, the North German Lloyd, and the Beaver Line. There are more than twenty stations in operation on land in Great Britain, and more are in course of construction.

"I regret very much that it is impossible for me in a brief address to go into the scientific details and the scientific developments of my system. I would like very much to do so, but I cannot at this time. I think it is right that I should correct some of the popular opinions which prevail as to the subject of wireless telegraphy.

"It seems to be the general opinion that when a message is sent into space anyone with a necessary apparatus can intercept that message and read it. Of course, this would be very awkward and would hurt the system from a commercial standpoint. No one would wish to have his private affairs made public in that way. For instance, stock quotations or other matters of secret could be found out. By experiments and improvements which have been made, messages can be read only when the receiver and transmitter are attuned.

"The perfected system is not at present in use on the ships. It has been deemed necessary that each ship should be equipped with apparatus which will permit of its reading a message from any other ship, because of the possibility of aid being required. Therefore, all ships are attuned so that one ship can call up any other ship, but it is practicable to have all the apparatus

so attuned that the messages transmitted can in no way be received by any other apparatus except that attuned to receive the message."

Marconi then reviewed his early experiments in England and expressed appreciation for the aid rendered to him by the British Government.

"Also I have been very greatly encouraged by the Government of Canada," he continued, "and the sympathy they have given has encouraged me in my work. I think it will be admitted that one of the greatest features of civilisation in all the world is the facility with which people can communicate with each other living long distances apart. My hope is that in no great distant future I shall bring my system to the point of perfection of allowing friends and relatives to communicate with each other across the ocean at small expense.

"At present by the existing cable system the sending of messages across the seas is put out of reach of people of moderate circumstances. The cost of laying the cables is so large that cable companies have to charge a high price for the service. My system will cheapen the cost very greatly.

"I have built very largely on the work of others, and before concluding I would like to mention a few names. I may miss a few of them, but I would like to mention Clerk Maxwell, Lord Kelvin, Professor Henry and Professor Hertz. I do not know if you are aware that the message received at St. John's was heard through a telephone receiver, and in connection with the telephone the name of Professor Alexander Graham Bell is inseparable.

"I hope that I may bring this work to a successful completion. As a stranger here I thank you very much for your kind expressions and for your hospitality—I drink to the health of the American Institute of Electrical Engineers!"

Marconi lifted a glass from the table, holding it high above his head, lowered it to his lips and began to drink before the diners grasped the situation. Quickly all picked up glasses and drank in silence a toast—in a few seconds cheers resounded through the banquet hall while Guglielmo Marconi bowed acknowledgment to the plaudits. There was no doubt that Americans believed in him and in his achievements.

Two days later a glowing tribute to the character and conservatism of the young man was printed by *The New York Times*:

Signor Marconi is not a stranger to the representative men of his profession in the United States, but it may be truthfully said that he leaves our shores with the respect and good wishes of every electrical engineer and the confidence of every one financially interested in the telegraph business.

At the banquet given in his honour Monday evening by the American Institute of Electrical Engineers he made his first specific statement of the results claimed by him as already achieved and of his hopes as to the future of his work. This statement was so modest, so free from every trace of exaggeration for business purposes, so generously just in its recognition of the obligation to the pioneers in experimentation along the lines he has followed, so frank in acknowledging the claims of the living as well as the dead, and withal so conservative in its predicting of what may follow the work he now has in hand, that everyone present

(Continued on next page.)

⁵ January 13th, 1902.

⁶ January 15, 1902.

MARCONI—THE MAN AND HIS WIRELESS

(Continued from previous page.)

realised that to Marconi was not only due the honour of his discoveries in the field of mechanics, but the still higher honour which belongs to one who can subordinate, all professional jealousies and rivalries to the truth.

From the wreath woven for his own brow he borrowed enough to make wreaths for his predecessors and colleagues in the study of electrical waves—Clerk Maxwell, Lord Kelvin, Professor Henry, Dr. Hertz, Alexander Graham Bell and others—and by what he took from it his own was rather enriched than impoverished.

It cannot have escaped the notice of those for whom the subject of wireless telegraphy has even a news interest, that to establish the fact that the feat of transmitting intelligible signals in prearranged order and frequency of occurrence no other evidence was needed than Signor Marconi's unsupported and unverified statement. Immediately on receipt of telegraphic intelligence from Newfoundland that this feat had been accomplished, representative engineers of the world were interviewed, and without exception their response was: "If Marconi says it is true, I believe it."

There have been few great facts in science thus accepted with unquestioning confidence on the authority of one known to be anything but disinterested. In Marconi's case all that he claimed was conceded even before the details were known. No higher tribute could have been paid by the world of science to an inventor than was paid to Marconi by this unquestioning acceptance of the announcement that he had succeeded in accomplishing the seemingly impossible.

Concerning the commercial value of Marconi's work, his own claims are all that can safely be made at the moment. He hopes to give his system commercial value; if he does it will undoubtedly facilitate and cheapen electrical communication. He makes no boasts, and indulges in no extravagant promises. He does not understand the art of promotion, perhaps, but he has established a character for truthfulness and conservatism, and when he makes the announcement that his system can compete successfully with cables and land wires for business, we venture to say that he will have no need of the services of a promoter to capitalise his invention.

When the steamer Philadelphia pulled away from the wharf on January 22nd, again Marconi was at sea, this time with plenty to read and to think about, for he had been the recipient of a large mail. There were epistles of congratulation from all walks of life: royalty, statesmen, inventors and scientists. Some wanted advice, others asked favours. Within a week he had received offers to write more articles, to lecture and to visit more places than he could in several years.

All the world suddenly became interested in this hero of the hour from picturesque Bologna—and well it might be for he was just beginning!

On the way to England he had opportunity to collect his thoughts and to study the results of the Newfoundland tests. He had been led to believe by his early experiments that long distances could be covered only from high masts and long suspended wires. The transoceanic results, however, seemed to substantiate a theory that the waves somehow follow around the earth conforming to its curve. He was convinced that one of the secrets of long-distance transmission was the use of a more powerful

current at the transmitter, and he planned to verify this idea in the next trials between the continents.

The manner in which the wireless waves apparently curved around the globe set many scientists thinking. Old theories seemed to be in error. Oliver Heaviside, an English physicist and telephone engineer who had watched the Marconi experiments with interest, had published a book on "Electromagnetic Theory," in 1893. He was not so sure that the signals clung to the curvature of the sphere as a fly crawls around an orange. He had a theory that a halo-like layer of ionized air high above the surface of the globe acted as a "mirror" reflecting the messages back to the earth.

Professor Arthur Kennelly of Harvard University agreed with Heaviside, so the "mirror" that billows up and down at high altitudes like the big top of a circus in a gale was named the Heaviside-Kennelly Layer or surface.

Marconi found that even those who believed in him still wondered if there was room for more than one or two powerful stations in the world. If a dozen or so began sending, how could any one be understood?

Tuning! That was the secret.

But what does that mean? Well, a Marconi engineer explained, if the transmitter is radiating 600,000 vibrations a second, the receiver in tune with it will take only 600,000 vibrations. The action is much the same as that of the familiar tuning-fork which responds only to another tuning-fork having exactly the same "tune" or number of vibrations a second. That is where wireless acquired the term tuning, the importance of which could not be over-estimated, for it untangled the nerves of the wireless system.

Visionary writers predicted, "the spy of the future must be an electrical expert who slips in somehow and steals the secrets of the enemy's tunes." They foresaw all ships provided with instruments tuned alike, so that they could communicate freely with one another, and have no fear that the enemy could read the message. They visualized telegraph companies each with its own tuned instruments, and each government with special tunes. Predictions were made that the time would come when banking and business houses or even families and friends would each have their own wireless system with individual secret tunes. For example, it was pointed out that since there are millions of different vibrations, there would be no lack of tunes. The British Navy might be tuned to receive only messages of 500,000 vibrations to the second; the German Navy 1,000,000 vibrations; the United States Navy 900,000 and so on indefinitely. This was the forecast in 1902.

Tuning was a great boon to wireless progress, but it was no panacea for secrecy. What it did was literally to divide "the ether" into thousands of narrow channels so a multitude of stations could operate simultaneously without interference. It was soon discovered, however, that unless the messages were coded or scrambled in some unique way there was nothing to prevent a million listeners from tuning-in on the electro-magnetic vibrations of any navy, government or business enterprise, providing, of course, that they all had receiving outfits, the dials of which could be turned from tune to tune or wave to wave.

(Continued overleaf.)

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CONI—THE MAN AND HIS WIRELESS

(Continued from previous page.)

The public watching this wireless mysticism in the heavens between the continents, unlike a theatre audience gathered to be entertained by a magician, wondered if the transoceanic trick were really possible or just what sleight-of-hand had fooled them.

If Marconi could capture an elusive signal, why not have some sort of machine automatically record the dots and dashes? That would be proof unassisted by the human element. Marconi would do it; he accepted the challenge.

CHAPTER X

On Board the Philadelphia

An attempt to record the messages—Leaving port in a storm—Surprising a sea captain—Dots and dashes on a paper tape—The magic of an electric pen—An old salt endorses the evidence—Proof for the news-hawks—Heralding a mid-ocean triumph—The scene at Poldhu 2,099 miles away—Marconi proves the mathematicians were wrong—Old theories blasted—Wireless wins new friends in business and politics—Sign-posts to new advances—Marconi discovers the sun's influence on wireless.

FRONT pages of newspapers dated February 22nd, 1902, featured news of storms on land and sea. Where was the Kronprinz Wilhelm? That was the big mystery story of the day. Somewhere on the Atlantic, tossed by a violent gale, was Prince Henry on board the Kronprinz Wilhelm long overdue at New York.

The Marconi operator of the Cunard liner Etruria at her pier in the North River tried in vain to communicate with the German ship, while agents of the North German Lloyd expressed utmost confidence in the big liner. . . . On the same night, lashed by a fierce wind, the 71st Armory in New York was burned to the ground and seventeen perished in the Park Avenue Hotel blaze. . . . A gale was raging along the Irish coast preventing the Lucania from landing passengers and mail at Queenstown, forcing her to proceed to Liverpool. . . . The White Star liner Teutonic docked a day late in New York after a "boisterous and hazardous voyage." . . . The storm routed all New York street cleaners and the headlines exclaimed "not a man braves the wind or rain." . . . Telegraph and telephone service was stopped by "the unabated fury, the worst storm in at least a dozen years."

Amid all this hurly-burly in the world's news the steamer Philadelphia slipped quietly away from Cherbourg at midnight on February 22nd, 1902. The inventor of wireless was on board en route to Canada to sign the final draft of an agreement for erection of a powerful transmitter at Glace Bay, Nova Scotia. There was too much to be done for a man of Marconi's inventive temperament to lounge idly about the decks. He had a habit of making the most of his time. Life for him proceeded, never paused. Storms ahead did not worry him; in them might lurk an opportunity for his machine!

When he walked up the gang-plank of the Philadelphia a wireless receiving set went with him, also a recording instrument that

printed blue-coloured dots and dashes on a paper tape. This was to be no voyage of vacation for Marconi. With him on the ship were: H. S. Saunders of the Marconi Wireless Telegraph Company, of London; two engineers, R. N. Vyvyan and J. D. Taylor; two operators, Messrs. Stacey and Franklin; and Marconi's secretary.

Few among the passengers were aware that this young man of twenty-seven years had the power in several small boxes to talk back and forth with people on the shore, far beyond the horizon, while the ship was rolling and tossing on its way to America. No time was lost in completing the shipboard wireless installation; it was quickly "on the air."

Several test messages were sent and received until the 250-mile preliminary experimental limit was passed. Chief Officer C. Marsden was in the wireless cabin when a message was keyed, the Philadelphia then being about 500 miles from England. He could scarcely believe it, nevertheless, he had seen the miracle performed. Excited he rushed about the ship to tell his fellow officers. But the seafaring men only laughed. Some of them knew what Marconi hoped to do but they doubted he could do it.

The Philadelphia had a pre-arranged schedule with Poldhu, so at the appointed time the next day the sceptical sailors crowded around Marconi's room. There sat the young Italian with his eyes on the clock and the wireless instruments. He lifted a little brake on a roll of tape and the white strip began to move. Tap, tap, tap clicked the inker's metallic finger as it registered what the invisible waves were saying, in fact, it was expressing the thoughts of men 1,000 miles away.

Shortly after midnight on the 24th, scores of signals were intercepted across 1,032 miles. Just before dawn on the 25th, the ship was 1,551 miles from Poldhu and the tape recorded perfectly. No telephone receiver was used. The tape and the telegraph printer told the story in writing.

Now there was no human agency to think or imagine; nothing to fool the ear or cause it to err. Someone remarked that when a machine does a thing humans believe; but as long as a man stands between, humans are likely to doubt.

Captain A. R. Mills, veteran of numerous transatlantic trips, was puzzled. He didn't know what to make of it. To think he could communicate with people on the shore more than 1,000 miles distant—well, that was almost too much for an "old salt" to comprehend!

"Let me show you how accurately these instruments operate," volunteered Marconi, turning to the captain when the ship was in mid-ocean. "Now watch and I will release the brake on the reel of tape just a few seconds before the appointed time, and we shall see when the signals begin, and whether they arrive right on the schedule."

Ten seconds prior to the zero hour Marconi lifted the latch and the tape wiggled along; the coherer ticked and the inker clicked against the paper tape. Calmly Marconi took the message off the instrument and read it aloud: "Stiff southwest breeze. Fairly heavy swell."

"Is that proof enough?" smiled the man who performed the magic.

Captain Mills was smiling too. Enthusiastically, he patted his distinguished passenger on the back and vigorously shook his hand, then took the message and signed it and the first officer too endorsed it with his signature.

"Now let us see if these instruments will get anything during the five minutes' rest period of the Poldhu operators," said Marconi. "You know some of the scientists contend the receiver may be affected by atmospheric electricity. It is possible, too, that some of the other ocean liners equipped with wireless may be operating within range of this ship. If they are we shall not know it, for these instruments are tuned to receive messages from the Cornwall station only. But some people say I cannot tune the messages."

Again the captain and the inventor waited. The tape was allowed to unroll during the Poldhu rest period. Then suddenly, and as strangely as before, the telegraphic inker tapped, leaving a line of blue marks. The operators were back on the job, and Marconi, half-way across the ocean, heard the click every time they pressed the key that released a dot or a dash of energy. Day after day the signals continued, and the last were picked up when the Philadelphia was 2,099 miles from Lands End. The Poldhu to Newfoundland record had been broken and the inventor had printed proof of his achievement.

There were yards of "telegraph" tape dotted and dashed with thousands of signals to bear witness. By way of voucher, the ship's captain and chief officer signed and certified the messages which they saw jotted down by the instruments. This evidence included the dispatches received up to 1551.5 miles and signals which had travelled 2,099 miles.

Reporters were on the dock to meet Marconi when the Philadelphia arrived in New York on March 1st, and he met them again later in the day at the Hoffman House for an interview in which questions flew thick and fast. Here was front page news.

The newspaper headlines of March 2nd featured: "Marconi's Triumph in Mid-ocean." And the reporters had noted that Marconi, although he said he was not at all surprised at the results, was nevertheless a very happy young man.

Proudly he showed them a chart of the Atlantic compiled by Captain Mills, tracing the route of the Philadelphia, and the points at which messages were received from Poldhu were indicated by little red stars. The chart was autographed by the captain and first officer with this notation:

Messages received on board steamship Philadelphia from Marconi station at Poldhu (Cornwall) as follows: No. 1—250.5 miles; No. 2—464.5 miles; No. 3—1,032.3 miles; No. 4—1,163.5 miles; No. 5—1,551.5 miles.

Signals 2,099 miles from Poldhu when we were in Latitude 42°01' N., and Longitude 47°23' W.

"Will they now say I was mistaken in Newfoundland?" asked Marconi with a look of defiance.

**NEXT WEEK—Continuing Chapter X—
More about the amazing Philadelphia
Tests.**